

A Cross-sectional Study of Needle Stick Injuries and Associated Risk Factors among Healthcare Workers in Hospital Canselor Tuanku Muhriz during Pre-COVID-19 and COVID-19 Pandemic Period

PARVEEN A^{1,2}, MD ZHAHIR SS^{3*}, AHMAD NS¹, SALLEH SA⁴

¹Department of Emergency Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia

²Department of Emergency Medicine, Hospital Raja Permaisuri Bainun, Jalan Raja Ashman Shah, 30450 Ipoh, Perak

³Department of Emergency Medicine, ⁴Infection Control Unit, Hospital Canselor Tuanku Muhriz, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia

Received: 21 May 2024 / Accepted: 05 Sept 2024

ABSTRAK

Kecederaan tusukan jarum merupakan satu risiko bahaya pekerjaan di kalangan tenaga pekerja kesihatan yang menyebabkan kesan trauma emosi dan juga pertambahan kos untuk proses rawatan selanjutnya. Kajian retrospektif ini bertujuan untuk menentukan prevalens kecederaan tusukan jarum di kalangan kakitangan kesihatan Hospital Canselor Tuanku Muhriz (HCTM) sebelum COVID-19 dan semasa pandemik COVID-19 serta faktor risiko yang berkaitan. Data diambil dari Unit Kawalan Infeksi, HCTM dari Mac 2018 sehingga Disember 2021 di mana sejumlah 286 sampel telah dikumpulkan menggunakan teknik persampelan rawak. Bagi menentukan jenis penggunaan peralatan perlindungan diri (PPE) dan hubungannya dengan kecederaan tusukan jarum, responden yang telah memberikan keizinan telah dihubungi untuk mendapatkan maklum balas. Prevalens kecederaan disebabkan penggunaan jarum sebelum COVID-19 (2018-2019) adalah sebanyak 150 orang berbanding dengan 136 kakitangan kesihatan semasa COVID-19 pada tahun 2020-2021. Faktor risiko yang dikenalpasti dalam kajian ini bagi tempoh sebelum dan semasa COVID-19 termasuklah umur 20 hingga 30 tahun, pelatih, bekerja di jabatan perubatan, dan kecederaan akibat jarum suntikan semasa penggunaan (nilai $p < 0.01$). Prevalens kecederaan tusukan jarum adalah lebih tinggi sebelum era COVID-19 berbanding dengan semasa pandemik COVID-19. Semasa penggunaan jarum, ia merupakan faktor utama yang menyumbang kepada kecederaan tusukan jarum.

Address for correspondence and reprint requests: Dr Siti Sarah Md Zhahir. Hospital Canselor Tuanku Muhriz, Universiti Kebangsaan Malaysia, Jalan Yaacob Latif, Bandar Tun Razak, 56000 Cheras, Kuala Lumpur, Malaysia. Tel: +603-91455493 Email: dr.sarah.hctm@ukm.edu.my

Kata kunci: COVID-19; kakitangan kesihatan; kecederaan tusukan jarum

ABSTRACT

Needle stick injuries are a significant occupational hazard among healthcare workers posing emotional trauma and financial burdens for further medical evaluation. This retrospective study aimed to determine the prevalence of needle stick injuries during pre-COVID-19 and COVID-19 pandemic period among healthcare workers in Hospital Canselor Tuanku Muhriz (HCTM) and its associated risk factors. Data were collected from the Infection Control, HCTM from March 2018 till December 2021 with a total of 286 samples obtained using convenient sampling method. The relationship between usage of personal protective equipment (PPE) causing needle stick injuries was obtained by contacting directly to the consented staffs. The prevalence of needle stick injuries in pre-COVID-19 (2018-2019) were 150 staffs compare to 136 cases during COVID-19 period (2020-2021). The risk factor that had been identified in this study for both pre-COVID-19 and COVID-19 were age 20 to 30, interns, works in medical departments and needle stick injury during utilisation (p -value <0.01). To conclude, prevalence of needle stick injuries was higher during pre-COVID-19 compared to during COVID-19 period. During utilisation of needles was the primary factor contributing to the occurrence of needle stick injuries.

Keywords: COVID-19; healthcare workers; needle stick injuries

INTRODUCTION

Needle stick injuries (NSIs) is the most common professional occupational hazard for healthcare workers (HCWs) in health care industry (Alfulayw et al. 2021). Sharp injury is defined by the Centre for Disease Control and Prevention (CDC) as any object that can cause penetration to the skin including needles, scalpels, any broken capillary tubes, and exposed ends of dental wires (The National Institute for Occupational Safety and Health 2022). The primary concern regarding needles stick injuries is the risk of transmitting blood-borne viruses like human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) (Alfulayw et al. 2021). In view of NSI is a largely preventable occupational hazard,

it is set as one of the national indicators in the health quality assurance program under the Ministry of Health Malaysia (MOH), with zero incidence set as the target (Mengistu & Tolera 2020).

The prevalence of NSI globally is estimated to be around 20.9% to 77.0% based on the exposure risk (Behzadmehr et al. 2023). A large number of cases are also under reported since it's a voluntary based reporting, with under reporting rate ranging from 9.6-60% globally (Battista et al. 2021; Occupational Health Unit 2007). Preventive methods can be tailored accordingly to avoid future mishap again for our HCWs, besides providing adequate training and improving our personal protective equipment (PPE) application (Battista et al. 2021; Ministry of Health

Malaysia 2020).

The comparison between pre-COVID-19 and during COVID-19 pandemic periods regarding NSI among HCWs is vital due to several significant factors. Prior to the pandemic, studies indicated a relatively stable rate of NSIs, with a reported 112 incidents in 2019, predominantly affecting nurses (53.6%) and doctors (16.8%) during routine medical procedures (Moyo et al. 2022). However, the onset of COVID-19 introduced new challenges, including increased workloads and the necessity for PPE, which often impaired visibility and dexterity, thereby raising the risk of accidents (Keri et al. 2021). During the pandemic, the total reported NSIs decreased to 82 in 2020, suggesting a reduction in routine patient interactions; however, the demographic of affected workers shifted, with a rise in injuries among cleaning staff and nurses (Moyo et al. 2022).

The general objective of this study was to determine the prevalence of NSIs among HCWs in Hospital Canselor Tuanku Muhriz (HCTM) during pre-COVID-19 and during COVID-19 pandemic period. While the specific objective was to compare the prevalence of NSIs during pre-COVID-19 and during COVID-19 pandemic period, to determine the department with the most number of NSIs during pre-COVID-19 and during COVID-19 pandemic period and lastly to identify risk factors associated with NSIs among health care personnel.

MATERIALS AND METHODS

This retrospective study was conducted at HCTM, Kuala Lumpur after obtaining approval from Universiti Kebangsaan Malaysia (UKM) Research Ethics

Committee (Ethics code: HTM-2022-019). It involved 286 HCWs whom sustained NSIs from year 2018 till 2021. The records sourced from Infection Control Unit, HCTM. A survey was carried out, by messaging directly to the consented HCWs from year 2020 till 2021 (during COVID-19 pandemic) to determine the type of PPE used during NSI. It was done to see the relationship between wearing a PPE and possibilities of it causing NSIs. There were two time frames in this study, pre-COVID-19 (2018-2019) and during COVID-19 pandemic (2020-2021).

All employee who worked in health care system in HCTM and exposed to needle stick injuries from March 2018 till December 2021 were included to this study. In the present study, a convenience sampling method was employed to select the study participants. Data were sourced from the NSIs record book, which contained detailed accounts of each incident. The researchers focused on collecting relevant information, including demographic data (such as age, gender, and job role), the mechanism of injury and the treatment received following the injury. Medical doctors here included interns, medical officer, medical specialist and medical consultant. In this study, interns and doctors (including masters student, medical officer and specialist) were divided separately. Hence a detailed information can be gained. Only records that met the predefined inclusion criteria were considered, ensuring that the selected data accurately represented the population of interest. This process continued until the desired sample size was achieved.

A telephone survey was conducted to gather additional information regarding

NSIs. A standardised script was used during the survey. HCWs involved were queried about PPE they wore and the challenges they encountered when handling needles. Informed consent was obtained from all HCWs involved prior to the commencement of the survey.

Sample size for 2 proportion was calculated using the link: <https://statistics.co.uk/calculators/sample-size-calculator-two-proportions> (Krejcie & Morgan 1970) based on the study by Stojic et al. (2022). Proportion of NSIs pre-COVID-19 was 60% and during COVID-19 was 40%. To avoid missing data and dropout, 10% was added to the sample size given. Hence, a total of 105 participants was recruited for each pre and during COVID-19 era.

Data collected were transferred to Statistical Package for Social Science (SPSS) version 26 for analysis. Data were analysed using SPSS version 26. Result on demographic characteristics, occupational group, risk factors were described as frequency number (n) and percentage (%). In addition, the cross-tables method with chi-square or Fisher's exact test was applied for the univariate analysis of categorical data.

RESULTS

A total of 286 HCWs who fulfilled inclusion criteria were identified from March 2018 till December 2021. From the total of 286 samples, for duration of employment, 15 were missing data due to incomplete answers, 11 for the pre-COVID-19 period and another four-missing data during COVID-19 pandemic period. For pre-COVID-19 from the year 2018 till 2019, a total of 150 HCWs were in the group, while for during COVID-19 from the year

2020 till 2021 another 136 HCWs were identified (Table 1).

From the total of 150 in the pre-COVID-19 group, 48 (32%) were male and another 102 (68%) workers were females. For during COVID-19 group, from the sample of 136 HCWs, 49 (36%) was male and another 87 (64%) were female workers. In both groups, there was more female workers who sustained NSIs.

For age group category, it was divided according to range of between 20 to 30 years, 30 to 40 years and more than 40 years. For both groups, the highest incident of NSIs occurred among those between 20 to 30 years old. This showed for both group of staff the affected range was between 20 to 30 years, with a total of 165 HCWs out of the total 286.

For profession type, it was divided generally between doctors (including medical officer, master student and specialists), nurses, intern, assistant medical officer (PPK) /porter, and others (which included cleaning, radiology and laboratory personnels). For both groups interns recorded the highest number of NSIs with a total of 61 during pre-pandemic and 58 during pandemic period.

NSIs according to educational status was categorised for pre and during COVID-19 time. For both groups degree holders was the highest contributors to NSIs. Education status under others category included Penilaian Menengah Rendah (PMR).

Medical department ranked the highest incident of NSIs with 51 personnels during pre-COVID-19 and another 46 personnels during COVID-19, followed by surgical department with a total of 45 personnels respectively. Emergency and trauma department stood at third high with total

TABLE 1: Demographic characteristics of the study participants

Characteristics	Pre-pandemic (2018-2019) n (%)	During Pandemic (2020-2021) n (%)	p-value
Gender			
Female (%)	102 (35.7%)	87 (30.4%)	0.51
Male (%)	48 (16.8%)	49 (17.1%)	
Age (years)			
20-30 years	98 (34.3%)	67 (34.5%)	0.02*
30-40 years	44(19.8%)	57 35.3%)	
>40 years	8 (4.0%)	12 (8.6%)	
Profession			
Doctor	20 (7.0%)	31 (10.8%)	0.07
Nurse	42 (14.7%)	22 (7.7%)	
Intern	61 (21.3%)	58 (20.3%)	
PPK/Porter	14 (4.9%)	15 5.2%)	
Others	13 (4.5%)	10 (3.5%)	
Educational status			
SPM	13 (4.5%)	15 (5.2%)	0.19
Diploma	46 (16.1%)	27 (9.4%)	
Degree	78 (27.3%)	79 (37.6%)	
Masters	8 (2.8%)	12 (3.6%)	
PhD	1 (0.3%)	2 (0.6%)	
Other	4 (1.4%)	1 (0.3%)	
Department			
Surgery	23 (8.0%)	22 (7.7%)	0.29
Emergency	13 (4.5%)	23 (8.0%)	
Medical	51 (17.8%)	46 (16.1%)	
ICU/OT	12 (4.2%)	7 (2.4%)	
Orthopedic	9 (3.1%)	9 (3.1%)	
Gynaecology	7 (2.4%)	4 (1.4%)	
Ophthalmology	5 (1.7%)	5 (1.7%)	
Radiology	5 (1.7%)	9 (3.1%)	
Forensic	9 (3.1%)	5 (2.7%)	
Histopathology	11 (3.8%)	3 (1.0%)	
Others	5 (1.7%)	3 (1.0%)	
Duration of employment			
Less than 6 months	32 (11.2%)	33 (11.5%)	0.25
6 months to 1 year	19 (6.6%)	20 (7.0%)	
1 to 3 years	37 (12.9%)	41 (14.3%)	
3 to 5 years	11 (3.8%)	6 (2.1%)	
5 to 10 years	18 (6.3%)	7 (2.4%)	
10 to 15 years	8 (2.8%)	13 (4.5%)	
More than 15 years	14 (4.9%)	12 (4.2%)	
Location of NSI			
Surgery	23 (8.0%)	22 (7.7%)	0.29
Emergency	13 (4.5%)	23 (8.0%)	
Medical	51 (17.8%)	46 (16.1%)	
ICU/OT	12 (4.2%)	7 (2.4%)	
Orthopedic	9 (3.1%)	9 (3.1%)	
Gynaecology	7 (2.4%)	4 (1.4%)	
Ophthalmology	5 (1.7%)	5 (1.7%)	
Radiology	5 (1.7%)	9 (3.1%)	
Forensic	9 (3.1%)	5 (1.7%)	
Histopathology	11 (3.8%)	3 (1.0%)	
Others	5 (1.7%)	3 (1.0%)	

*Chi-square test; p<0.05 was considered as significant

of 36 HCWs.

For both categories, working experience between 1 to 3 years ranked the highest for duration of employment with a total of 78 from total staff. For this category, there was 15 missing data, 11 for pre-COVID-19 and another 4 during COVID-19 period.

For both pre-COVID-19 and during pandemic, location of NSIs in workplace, medical department had the highest number of NSIs, followed by surgical and Emergency Department. There was no significant difference between location of NSIs.

For both groups, interns had the highest number for occupational group (Table 2). This was followed by nurses and medical doctors. However, there was no significant difference between occupation and incident of NSIs.

Risk factors associated with procedural steps involved in needle stick incidents was analysed (Table 3). There was 1 missing data for the during COVID-19 period. Needle usage had the highest for risk factors associated with NSIs with odds ratio of 1.626. Incident of NSIs during usage, contributed to 149 staff, with 87 people during pre-COVID-19

and another 62 during COVID-19. There was significance association between procedural steps involved in needle stick incidents and COVID-19 period.

From 136 staffs who sustained NSIs during COVID-19, only 12 HCWs consented for this question (Table 4). Feedback from phone call survey, 10 responders stated they were no difficulty with usage of PPE during blood taking or procedures with the needle, while 2 people who were wearing level 2 PPE agreed they had communication difficulty, blurring of vision and loose grip with wearing double glove. There was no any information obtained for level 3 PPE usage in this study. Few numbers of response were the limitation in this study for relationship between types of PPE used and incident of NSIs.

DISCUSSION

Generally, there were higher cases of NSIs during pre-COVID-19 (2018-2019) with a total of 150 staffs compared to during COVID-19 (2020-2021) with a total of 136 staffs. A study by Diktas et al. (2021), in the year 2021 in Sisli Hamidiye Etfal

TABLE 2: Comparison of occupational group of healthcare workers during pre-pandemic and during pandemic

Occupational group	Pre-COVID-19 (2018-2019) n (%)	During COVID-19 (2020-2021) n (%)	p-value
Doctor	20 (13.3%)	31 (22.8%)	0.07
Nurse	42 (28.0%)	22 (16.2%)	
Intern	61 (40.6%)	58 (42.6%)	
PPK/Porter	14 (9.3%)	15 (11.1%)	
Others	13 (8.6%)	10 (7.4%)	
Total	150 (100.0%)	136 (100.0%)	

*Chi-square test; p<0.05 was considered as significant

TABLE 3: Risk factors associated with procedural steps involved in needle stick incidents

Procedural steps	Pre-COVID-19 (2018-2019) n (%)	During COVID-19 (2020-2021) n (%)	Odds ratio	p-value
During needle usage	87 (58.0 %)	62 (45.9%)	1.626	0.003*
While recapping	7 (4.6 %)	2 (1.5%)		
Device left	4 (2.6 %)	19 (14.1%)		
While disposing	45 (30.0 %)	47 (34.8%)		
After disposal	7 (4.6 %)	5 (3.7%)		
Total	150 (100.0 %)	135 (100.0 %)		

*Chi-square test; p<0.05 is considered as significant

TABLE 4: Type of PPE used during needle stick injuries during COVID-19

Types of PPE	During COVID-19 needle stick injuries (n)
Level 1 (surgical mask, disposable glove)	4
Level 2 (disposable eye protection, protective disposable apron/gown, N95 mask, disposable glove)	8
Level 3 (disposable eye protection, long sleeve fluid repellent disposable gown, PAPR, disposable glove)	0
Total	12

training and research hospital, Istanbul, Turkey, also found increased number of NSIs during pre-pandemic in 2019 (pre-pandemic period), with a total of 27.65% compared to 2020 (pandemic period), 21.4%, respectively (Diktas et al. 2021). However, taking into consideration the difference between both categories, the lower number of reported NSIs during the COVID-19 pandemic might be due to under-reported cases, as voluntary notification systems are prone to incomplete reporting (Moyo et al. 2022). The exact number of HCWs who sustained NSIs might be even higher during this time. The difference between the pre-COVID-19 and COVID-19 periods can be most likely attributed to a smaller number of patients visiting hospitals during the pandemic due to fear of contracting

the disease, leading to fewer procedures performed on patients and a reduced risk of NSIs during the COVID-19 period (Keri et al. 2021).

According to our study, NSIs were most common in workers aged 20-30 years (165 cases), followed by 30-40 years (101 cases), and over 40 years (20 cases). Age significantly impacted injury rates. A study conducted by Rampal et al. (2010), needle stick and sharp injuries and factors associated among HCWs in a Malaysian hospital, showed the highest contributors ranged from 22 years to 45 years with a median of 29 years. The result showed that there was a significant relationship between prevalence of NSIs and age (p<0.01). This difference can be likely due to more newly appointed personnel in this study, mainly interns. Most of the

time, blood taking in wards will be done by interns. Hence the highest age group related injuries happen to be between 20 to 30 years of age (Rampal et al. 2010).

The highest number of NSIs occurred among interns, with 61 cases reported pre-COVID-19 and 58 cases during COVID-19. Interns total up to 119 staff out of the 286 whom sustained NSIs. Nurses fall into the second highest category with a total of 64 people. Doctors fall into the third highest category, with 20 people during pre-COVID-19 and another 31 during COVID-19, bringing to a total of 51 people. This is followed by PPK/porter and others. A study by Ishak et al. (2019), NSIs among Malaysian HCWs in Occupational Medicine journal year 2019, showed subgroups, medical doctors (21.1 injuries per 1000 HCWs), are the highest, followed by dental staff (7.5), pharmacy staff (4.2), nurses (3.7), medical assistants (3.4) and allied and auxiliary personnel.

By investigating the high incidence of NSIs among house officers, who are primarily responsible for blood collection procedures, we can develop strategies to prevent these incidents. Providing more training and guidance to newly appointed interns on proper needle handling techniques during their job duties may help to mitigate the risk (Rampal et al. 2010). Nurses, who fall into the second highest category for NSIs, often administer injections while dispensing medications to patients. While the implementation of drug dispensing nurses wearing special protective coats is a step in the right direction, additional measures to prevent NSIs among nurses should be reviewed and improved (Rampal et al. 2010). In other study, a systematic review identifies factors associated with needle stick injuries

among HCWs, with the highest rates seen in nurses and house officers (Motaarefi et al. 2016).

Medical department recorded the highest number of NSIs, followed by surgical and emergency department. In a study by Alfulayw et al. (2021), in the year 2021, factors associated with NSIs among HCWs and implications for prevention, most NSIs occurred in wards (32%) and followed by emergency ward (25.4%). The medical ward had the highest number of NSIs, likely due to the high patient volume and the frequency of procedures such as repeated blood withdrawals, blood cultures, and the administration of medications and injections. These factors contribute to a greater incidence of NSIs in medical wards compared to other departments (Kye et al. 2014). The increased workload and the nature of tasks performed in the medical ward create a higher risk environment for HCWs, particularly during routine procedures that involve sharp instruments (Wilburn & Eijkemans 2004). Furthermore, a study by Gita & Rao (2017) regarding NSIs in a tertiary care hospital in India: observations from a clinical audit, showed that medical and surgical wards were the two most common wards where NSIs occurred. The higher incidence of NSIs in these wards could be attributed to the increased frequency of using a needle for clinical care. This correlates with a study by Mohd Fadhli et al. (2018), NSIs and adherence to the follow-up protocol among HCWs, which was found higher number of NSIs in medical based department 64 people (44.8%), followed by surgical based department at 49 people (34.3%). Study by Ishak et al. (2019) found that drawing blood and bodily fluid was the most

common task reported as the cause of injury (29%), followed by administering injection (26%), surgical procedure (18%) and setting intravenous (IV) line (13%). Other non-specific tasks (14%) include finger prick for glucose monitoring or cleaning of instruments. Out of the five risk factors, NSIs during usage contributed the highest number.

This can be attributed to improper disposal of needles post-procedure or when sharps bins are fully occupied until the top level. Proper care and guidance should be followed to prevent injuries during needle disposal (Wilburn & Eijkemans 2004). Needles left in unusual locations contributed to a total of 23 HCWs sustaining NSIs during both periods. This is most likely due to needles not being kept in kidney dishes after use, causing accidental pricks, or needles being picked up by others without proper equipment for disposal (Rampal et al. 2010). Unfortunately, recapping needles also contributed to needle stick injuries in this study. Nine staffs fell under this category, with seven during the pre-COVID-19 period and another two during COVID-19. They should have been reprimanded for recapping used needles, which could have been easily prevented (Kye et al. 2014). HCWs must know to dispose of needles immediately after usage in proper sharps bins and never attempt to recap the needles after using them. There was a significant value between the usage of needles and associated risk factors. Causes of NSIs during usage could have been negligence or failure to follow protocol when handling sharps (Rampal et al. 2010). This correlates with a study by Alfulayw et al. (2021) published in BMC Health Services Research, which

investigated factors associated with needlestick injuries among healthcare workers (HCWs). The study highlighted that, in 2021, the highest risk of injury occurred during usage among HCWs, underscoring important implications for prevention. A more profound and detail study can be done further to analysis the causes of during use of needles which contribute to NSIs. A lack of experience with handling needles and blood taking, rushing to finish the task or improper setting for the procedure might be some of the other causes of NSIs during use. As NSIs are a preventable occupational hazard, measures must be taken to prevent this from occurring.

Lastly, types of PPE used during NSIs was analysed during COVID-19 time. However, very few responded to this question, out of 136 staff only 12 answered. Out of these 12 staff, 10 people stated there was no any difficulties in usage of PPE during blood taking procedures. While two staff who wore type two PPE agreed they had difficulties during blood taking. To the best of our knowledge, this is the first study comparing between prevalence of NSIs during pre-COVID-19 and COVID-19 time locally. However, due to low number of respondents, this was a limitation in this study. A study by Stojic et al. (2022) in Emergency Department, in University Hospital Dubrova, Croatia, among HCWs from January 2019 to February 2021 it was found that there was an increase in number of needle stick injuries among the HCWs. This was a dedicated COVID-19 care centre, where they attributed the increase in NSIs due to use of PPE which caused blurring of vision and difficult communication. Hence, more studies can be done in other centres locally to

determine the relationship between NSIs and usage of PPE.

The COVID-19 pandemic has led to a notable reduction in NSIs among HCWs, primarily due to decreased patient interactions and the implementation of enhanced safety protocols. During the pandemic, many patients avoided hospitals for non-COVID-related issues, resulting in fewer routine procedures that typically involve needles, such as blood draws and injections. A study indicated that the number of reported NSIs decreased from 112 in 2019 to 82 in 2020, highlighting this trend (Kye et al. 2021). Additionally, the pandemic prompted healthcare institutions to adopt stricter safety measures, including the use of safety-engineered devices and comprehensive training on proper needle handling and disposal, which further contributed to the decline in NSIs (Wilburn & Eijkemans 2004).

CONCLUSION

NSIs in HCTM were more frequent during pre-COVID-19 (2018-2021). Interns had the highest injury rates, with fewer cases occurring during the COVID-19 period. Medical Department showed highest number NSIs for both pre pandemic and during pandemic period. Thus, there were no any difference in departments during pre and COVID-19 period. During usage of needles for procedures contributed to the highest risk factor associated with incident of NSIs. There were a significant finding for age related and during usage of needles as risk factors for incident of NSIs. However, some of the figures shown here may not represent the actual incident as the reporting was voluntary based. From this study, looking at the number of incidents

of NSIs, 286 staffs from the year 2018 till 2021, this incident should not be taken lightly, as this is a preventable occupational hazard. More stringent measures and monitoring during procedures involving needles must be taken, as during usage contributed to highest incident. Staff must be given training regularly, senior staff supervise juniors when doing procedure and encourage staff who sustained NSIs to acknowledge to appropriate personnel for further monitoring and follow up. Insights gained from the pandemic can inform future prevention strategies by emphasising the need for continuous training and the adoption of safety devices even in post-pandemic settings. The significant decrease in NSIs suggests that maintaining a focus on safety protocols, such as proper disposal of sharps and avoiding needle recapping, is essential. Furthermore, healthcare organisations should consider implementing mandatory reporting systems for NSIs to accurately track incidents and identify high-risk areas. By learning from the pandemic experience, healthcare facilities can enhance their safety protocols and reduce the risk of NSIs, ultimately protecting HCWs and improving workplace safety. An internal audit in each department should be carried out to look at the problems leading to NSIs, either from lack of proper universal precaution during blood taking and disposal of the sharps equipment or lack of proper disposal sharp bins. Hence, improvements and prevention can be tailored accordingly. This change highlights the need for targeted interventions and training to address the evolving risks associated with NSIs in the context of a pandemic, emphasising the importance of maintaining safety protocols even amidst

crisis conditions. The researcher would like to highlight some limitations of this study, including low responders in giving feedback on the types of PPE used during NSIs. Additionally, the reporting of NSIs is voluntary and may not accurately reflect the actual number of incidents. Future studies could focus on identifying the risk factors associated with NSIs.

DECLARATION OF CONFLICT OF INTEREST

The authors would like to declare no conflict of interest in this study.

REFERENCES

- Alfulayw, K.H., Al-Otaibi, S.T., Alqahtani, H.A. 2021. Factors associated with needlestick injuries among healthcare workers: Implications for prevention. *BMC Health Services Research* 21(1): 1-8.
- Battista, R.A., Ferraro, M., Piccioni, L.O., Malzanni, G.E., Bussi, M. 2021. Personal protective equipment (ppe) in covid 19 pandemic: Related symptoms and adverse reactions in healthcare workers and general population. *J Occup Environ Med* 63(2): e80-5.
- Behzadmehr, R., Balouchi, A., Hesaraki, M., Alazmani Noodeh, F., Rafiemanesh, H., J. Nashwan, A., Behmaneshpour, F., Rahdar, M., Dastres, M., Atharyan, S., Jahantigh, M., Malekshahi, F. 2023. Prevalence and causes of unreported needle stick injuries among health care workers: A systematic review and meta-analysis. *Rev Environ Health* 38(1): 111-23.
- Diktas, H., Oncul, A., Tahtasakal, C.A., Sevgi, D.Y., Kaya, O., Cimenci, N., Uzun, N., Dokmetas, I. 2021. What were the changes during the COVID-19 pandemic era concerning occupational risks among health care workers? *J Infect Public Health* 14(10): 1334-9.
- Gita, N., Rao, N.P. 2017. Needle stick injuries in a tertiary care hospital in India: Observations from a clinical audit. *Int J Res Med Sci* 5(7): 2938.
- Ishak, A.S., Haque, M.S., Sadhra, S.S. 2019. Needlestick injuries among Malaysian healthcare workers. *Occup Med* 69(2): 99-105.
- Keri, V.C., Kodan, P., Gupta, A., Jorwal P. 2021. Needle stick injury from a COVID-19 patient-fear it or forget it? *J Bioeth Inq* 18(3): 377-8.
- Krejcie, R.V., Morgan, D.W. 1970. Determining sample size for research activities. *Educ Psychol Meas* 30: 607-10.
- Kye, M.M.S., Ratana, S., Amit, B., Adinegara, L.A. 2014. Needle sticks injury among medical students during clinical training, Malaysia. *Int J Collabor Res Internal Med Public Health* 6(5): 121-8.
- Mengistu, D.A., Tolera, S.T. 2020. Prevalence of occupational exposure to needle-stick injury and associated factors among healthcare workers of developing countries: Systematic review. *J Occup Health* 62(1): 1-9.
- Ministry of Health Malaysia. 2020. Recommended PPE to be used when managing patient under investigation (PUI)/ Confirmed COVID-19-19 in health care facilities. <https://mma.org.my/web/wp-content/uploads/2020/02/RECOMMENDED-PPE-COVID-19-IN-HEALTHCARE-FACILITIES-PICTORIAL.pdf> [July 2022].
- Mohd Fadhli, M.F., Safian, N., Robat, R.M., Nur Adibah, M.S., Hanizah, M.Y. 2018. Needlestick injury cases and adherence to the follow-up protocol among healthcare workers in Selangor. *Mal J Public Health Med* 18(1): 55-63.
- Motaarefi, H., Mahmoudi, H., Mohammadi, E., Hasanpour-Dehkordi, A. 2016. Factors associated with needlestick injuries in health care occupations: A systematic review. *J Clin Diagn Res* 10(8): 1E01-4.
- Moyo, E.D., Mhango, T., Feresu, M., Moyo, P. 2022. Prevalence of needlestick injuries and factors associated with their occurrence among health care workers at a private hospital in northern Namibia. *Hum Factors Healthc* 2(2022): 100028.
- Occupational Health Unit. 2007. *Sharps Injury Surveillance*. Putrajaya: Ministry of Health Malaysia.
- Occupational Safety and Health Administration (OSHA) [2001]. Bloodborne pathogen standard. Washington, DC: U.S. Department of Labor, Occupational Safety and Health Administration, 29 CFR 1910.1030. <https://www.osha.gov/laws-gulations/standardnumber/1910/1910.1030> [July 2023].
- Rampal, L., Zakaria, R., Sook, L.W., Zain, A.M. 2010. Needle stick and sharps injuries and factors associated among health care workers in a Malaysian hospital. *Eur J Soc Sc* 13(3): 354-62.
- Stojic, J., Grabovac, V., Lucijanic, M. 2022. Needlestick and sharp injuries among healthcare workers prior to and during the coronavirus disease 2019 (COVID-19) pandemic. *Infect Control Hosp Epidemiol* 43(12): 1966-8.
- The National Institute for Occupational Safety and Health. 2022. Reducing work-related needlestick and other sharps injuries among law enforcement officers. <https://www.cdc.gov/>

[niosh/docs/wp-solutions/2022-154/pdfs/2022-154.pdf?id=10.26616/NIOSH PUB2022154](https://www.niosh.gov/docs/wp-solutions/2022-154/pdfs/2022-154.pdf?id=10.26616/NIOSH PUB2022154) [July 2022].

Wilburn, S.Q., Eijkemans, G. 2004. Preventing needlestick injuries among healthcare workers: A WHO-ICN collaboration. *Int J Occup Environ Health* **10**(4): 451-6.