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Original Article

PREVALENCE AND FACTORS ASSOCIATED WITH NEEDLESTICK INJURIES AMONG NURSING OFFICERS IN NATIONAL HOSPITAL (NHSL) COLOMBO, SRI LANKA: A CROSS-SECTIONAL STUDY

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Abstract

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Introduction: Needlestick injuries (NSIs) remain a serious occupational hazard for healthcare workers, particularly nurses, who are at the frontline of patient care. Data on NSIs among nursing officers in Sri Lanka remain limited.

Objective: This study aimed to assess the prevalence and factors associated with NSIs among nursing officers in the National Hospital, Colombo, Sri Lanka (NHSL).

Methodology: A descriptive cross-sectional study was conducted among 389 nurses with more than one year of experience, excluding those on leave, selected through convenience sampling. Ethical approval was obtained from the Ethics Review Committee (ERC) at KIU (KIU/ERC/23/221), and administrative approval from NHSL. Data were collected using a pre-tested, researcher-developed, self-administered questionnaire covering socio-demographics, prevalence, and factors associated with NSIs. Data was analyzed using SPSS version 25, incorporating descriptive and inferential statistics (Chi-square tests).

Results: Most of the participants were females (92%, $n = 357$), and 60% ($n = 233$) had over five years of working experience. The prevalence of NSIs was 48% ($n = 186$), with over half of them (56%, $n = 104$) reporting two to five needlestick injuries within the past two years. Injuries occurred mainly during recapping (28%, $n = 51$) and disposal (25%, $n = 47$), often during the night shift (41%, $n = 75$). Injuries were most frequent among nurses in medical (52%, $n = 95$) and surgical wards (20%, $n = 38$), yet only 45% ($n = 84$) reported them. Nearly all participants (98%, $n = 382$) emphasized the need for continuous education. NSI were significantly associated with age ($p = 0.007$), bending used needles before disposal ($p = 0.006$), and use of one-hand recapping ($p = 0.041$).

Conclusion: Approximately half of the nurses at NHSL experienced NSIs. Strengthening education, enforcing reporting practices, and promoting adherence to universal precautions are essential to minimize this occupational risk.

Keywords: Associated factors, Needlestick injury, Nurses, Prevalence

Introduction

Needlestick Injury (NSI) is defined as an accidental skin-penetrating stab wound caused by a hollow-bore needle or other sharp object contaminated with another person's blood or body fluids. These injuries commonly occur during or immediately after use of sharp objects, but before proper disposal in designated sharps disposal containers (El-enen et al., 2020). NSIs pose a significant occupational hazard, particularly in healthcare environments, due to the risk of transmitting blood-borne pathogens. For Health Care Workers (HCWs) worldwide, NSIs are among the most serious occupation-related injuries (HosseiniPalangi et al., 2022). Nurses, being at the forefront of patient care and handling needles frequently, are particularly vulnerable to these injuries (Gaudel, 2023).

Awareness of NSIs as a critical occupational concern has increased in recent years due to the global burden of blood-borne infections such as Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV), which can be transmitted through contaminated sharps. A global meta-analysis reported a pooled NSI prevalence of 41% among nurses, with significantly higher rates in low- and middle-income countries, including 50% in Southeast Asia (Abdelmalik et al., 2023). Globally, approximately 45% of HCWs have reported experiencing accidental needlestick and sharps injuries during their careers (Behzadmehr et al., 2023). These risks continue to exist despite awareness and established protocols. In response, many countries have adopted enhanced prevention policies, such as vaccination and the implementation of safer medical devices (Abdo Almoliky et al., 2024).

The National Hospital of Sri Lanka (NHSL), situated in Colombo, is the largest tertiary teaching hospital and the final referral centre in the country, where more than 3000 nurses are serving more than 240,000 inpatients and two million outpatients annually (National Hospital of Sri Lanka, 2023). A survey conducted at

NHSL in 2018 found that 67% of nurses with less than five years of clinical experience had experienced an NSI (Aberathna et al., 2019). Similarly, a study reports an annual prevalence of 69% in India. In contrast, 37% in Pakistan, and 35% in Saudi Arabia (Bhargava et al., 2013) were reported. Given this evidence, prevalence rates of NSIs vary by region. These figures underscore the burden of NSIs in both regional and national healthcare settings and highlight the urgent need for effective interventions tailored to specific contexts and work environments. Due to the evolving nature of healthcare systems, modifications in occupational safety protocols, and the significant influence of the COVID-19 pandemic on nursing workloads and exposure risks, current evidence is necessary to comprehend the extent and factors contributing to needlestick injuries among nursing officers at NHSL. Regular assessment of needlestick injuries is essential for evaluating the effectiveness of existing preventive measures and guiding institutional occupational health policies.

The risks of NSIs are influenced by various factors, including recapping of needles, excessive or inappropriate use of sharp instruments, absence of safety-engineered devices, lack of Personal Protective Equipment (PPE), improper sharps disposal, and insufficient training (Alfulayw et al., 2021). Moreover, staffing shortages, heavy workloads, and unpredictable patient behavior can contribute to increased vulnerability. Exposure to NSIs is not only a physical threat but also causes psychological distress among affected HCWs and their families (Bazie, 2020). Pathogens transmitted through NSIs can cause life-threatening conditions, especially HBV, which is a leading cause of liver cancer. Vaccination remains a crucial preventive tool, and the HBV vaccine is widely recommended for HCWs (Ali et al., 2023). In addition, effective prevention requires supportive workplace strategies, such as safer injection techniques, PPE, staff training, adequate disposal containers, and engineered safety devices (Jahangiri et al., 2016).

Given the risks and burden associated with NSIs, this study was conducted to assess the prevalence and associated factors of NSIs among nursing officers working in the NHSL.

Methodology

A descriptive cross-sectional study was conducted to evaluate the prevalence and associated factors of NSIs among nursing officers at NHSL, Colombo. The study was carried out over a six-month period from January to June 2024. The target sample size of 389 participants was determined using the Yamane formula. A convenience sampling method was used to recruit eligible nursing officers. Nurses with less than one year of work experience and those on leave during the data collection period were excluded from the study.

Data was collected using a researcher-developed, self-administered questionnaire comprising three sections: (A) sociodemographic characteristics, (B) prevalence of NSIs, and (C) factors associated with NSIs. The primary outcome was defined as self-reported occurrence of at least one needlestick injury within the past two years (2022–2023). Prior to the data collection, the questionnaire was pretested among 10 nurses not included in the main study to evaluate the clarity and feasibility of the questionnaire. Ethical clearance was obtained from the ERC of KIU (KIU/ERC/23/221), and administrative approval was obtained from NHSL. Written informed consent was obtained from all participants prior to enrollment.

Completed responses were cleaned, coded, and entered into Microsoft Excel before being imported into IBM SPSS Version 25 for statistical analysis. Descriptive statistics for categorical variables, including socio-demographic characteristics and behavioral factors, were expressed as frequencies (n) and percentages (%). Continuous variables, specifically age and years of clinical experience, were gathered raw and subsequently classified into distinct categories to facilitate descriptive profiling. Bivariate

analysis was conducted utilizing the Chi-square test (χ^2) to determine statistically significant associations between the hypothesized factors and the occurrence of NSIs. For all inferential tests, statistical significance was set at a p -value < 0.05 .

Results

A total of 389 nurses completed the questionnaire with a 98% response rate. The majority of nurses were females (92%, $n = 357$), aged between 31 and 40 years (41%, $n = 160$). Most of the nurses (45%, $n = 175$) had 6–10 years of work experience and completed a nursing diploma as their highest level of education (49%, $n = 189$). Of the total participants, 48% ($n = 186$) reported having experienced NSIs (Figure 1) and as illustrated in Figure 2, most sharp injuries were caused by disposable syringe needles, accounting for 135 cases (73%), making them the most frequently involved device (Figure 2).

Table 1: Frequency distribution of socio-demographic characteristics of the participants

Variable	Frequency (n=389)	Percentage (%)
Gender		
Male	32	8
Female	357	92
Age group		
23 – 30 years	156	40
31 – 40 years	160	41
41 – 50 years	56	14
51 – 60 years	17	4
Marital status		
Married	275	71
Unmarried	114	29
Years of experience as a nurse		
1 – 5	156	40
6 – 10	175	45
11 – 15	41	11
More than 15 years	17	4
Education level		
Nursing diploma	189	49
Post basic nursing education	37	9
BSc nursing	156	40
Post graduate nursing education	6	2
Others	1	0.4
Attendance of any in-service educational program on prevention and factors associated NSIs		
Yes	158	40
No	231	60

Figure 1

Prevalence of Needle Stick Injuries

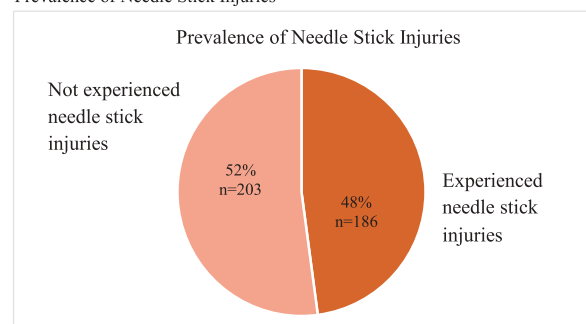
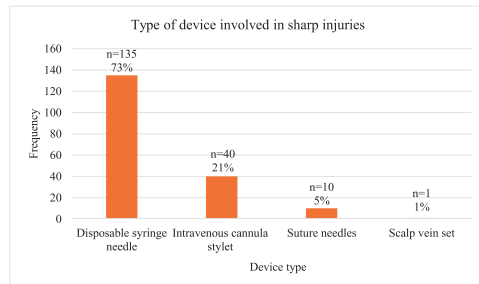


Figure 2

Type of Device Involved in Sharp Injuries



Needlestick Injury-related Respondents

Among those who had experienced NSIs within the past two years (2022-2023), the majority had been injured 2–5 times (56%, $n = 104$), while the most common activities leading to NSIs included recapping needles (28%, $n = 51$) and improper disposal (25%, $n = 47$). A notable proportion (21%, $n = 38$) cited all listed risk activities as contributors (Table 2). NSIs occurred most frequently during night shifts (41%, $n = 75$). Regarding the workplace at the time of injury, the medical unit accounted for the highest proportion (52%, $n = 95$), followed by the surgical unit (20%, $n = 38$).

After injuries, only 39% ($n = 73$) of respondents followed all recommended protocols, such as washing the site, applying antiseptics, and reporting the incident. As perceived by all 389 nurses, the most common causes for NSIs were not following safety protocols (32%, $n = 124$) and failure to adopt universal precautions (27%, $n = 106$). The sharp bin was correctly identified by 91% ($n = 354$) as the safest disposal method. However, only 45% ($n = 84$) reported their injury. Among those who did not report (26%, $n = 102$), the main reasons cited were mainly due to fear of stigma (46%, $n = 48$) or lack of awareness (24%, $n = 24$). Among those who reported, only 14% ($n = 12$) received medical care. Regarding preventive measures, nearly all participants (98%, $n = 382$) indicated that continuous education on needle stick injury prevention is necessary (Table 2). However, only 40% ($n = 156$) reported having attended an in-service education program on NSIs prevention (Table 1), highlighting the need of continues educational and training initiatives among nursing officers.

Table 2: Prevalence of needle stick injury among respondents

Description	Frequency (n=389)	Percentage (%)
Occurrence of needle stick injuries within the past two years		
Yes	186	48
No	203	52
Frequency of injury		
Once	68	37
2 – 5	104	56
More than 5 times	10	5
Cannot recall	4	2
Workplace at the time of injury		
ETU	15	8
Medical unit	95	52
Surgical unit	38	20
Orthopedic ward	18	10
Medical Intensive Care Unit	10	5
Surgical Intensive Care Unit	10	5

Activity associated with injury		
During disposal	47	25
Recap injuries	51	28
IV Cannulation	15	7
Sudden movement of patient	35	19
All above	38	21
Duty shift during which needle stick injury occurred		
Night	75	41
Morning	41	22
Afternoon	47	25
All three shift	23	12
Type of device involved in sharp injuries		
Disposable syringe needle	135	72
Intravenous cannula stylet	40	22
Suture needles	10	5
Scalp vein set	1	1
Standard protocols followed after needle stick injuries		
Washing the injury site with water	15	8
Apply antiseptic to the skin	1	1
Reporting the injury to one's superior	9	5
All above are correct	73	39
Answers 1 and 3 are correct	88	47
Possible causes of needle stick injuries as perceived by nurses		
Failure to adopt universal precaution	106	27
Not follow protocol safety	124	32
Performing risky procedure	23	6
Overcrowded patient setting	106	27
Lack of members in duty shift	30	8
Safest method for disposing of sharp instruments and needles		
Clinical waste	26	7
General waste bin	8	2
Polythene and plastic waste bin	1	0
Sharp bin	354	91
Reporting of injuries to the appropriate person after occurrence		
Yes	84	45
No	102	55
If "no", reasons for not reporting injuries		
Thinking not important	19	19
Lack of awareness	24	24
Fear to stigma	48	46
Other reasons	11	11
If "yes", did you get medical care after being injured?		
Yes	12	14
No	72	86

Responsible individuals notified following injury incidents

Ward in charge	20	24
Infection control unit	5	6
Friend	16	19
Cannot remember	41	49
No body	2	2

Recognition of the necessity for ongoing education and training in infection control practices

Yes	382	98
No	7	2

Factors Associated with Needlestick Injuries

Age was the only sociodemographic variable with a statistically significant association with NSIs ($\chi^2 = 12.08$, $p = 0.007$).

Among behavioural factors, bending used needles before disposal ($\chi^2 = 7.54$, $p = 0.006$) and use of the one-hand recapping technique ($\chi^2 = 4.18$, $p = 0.041$) showed statistically significant associations with NSI occurrence (Table 3).

Table 3: Behavioral actors associated with NSIs

Variable	Category	NSI Yes n (%)	NSI No n (%)	χ^2	p-value
Use gloves while treating patients	Yes	121 (49)	124 (51)	2.567	0.277
	No	11 (34)	21 (66)		
	Sometimes	54 (48)	58 (52)		
Recapping needle after injection	Yes	96 (48)	101 (52)	0.889	0.641
	No	29 (43)	39 (57)		
	Sometimes	61 (49)	63 (51)		
Bending used needles before disposal	Yes	9 (26)	26 (74)	7.540	0.006*
	No	167 (49)	173 (51)		
	Sometimes	10 (71)	4 (29)		
Protective pad use when breaking needles/ampule	Yes	101 (46)	118 (54)	0.578	0.749
	No	32 (50)	32 (50)		
	Sometimes	53 (50)	53 (50)		
Discharge safety box at 3/4 capacity	Yes	165 (50)	165 (50)	5.152	0.076
	No	7 (47)	8 (53)		
	Sometimes	14 (32)	30 (68)		
Sealing sharp waste container	Yes	159 (49)	162 (51)	2.309	0.315
	No	7 (44)	9 (56)		
	Sometimes	20 (38)	32 (62)		

Avoid breaking/bending needles after injection	Yes	148 (48)	157 (52)	0.759	0.684
	No	6 (38)	10 (62)		
	Sometimes	32 (47)	36 (53)		
Use of safety box for needle disposal	Yes	168 (47)	189 (53)	1.295	0.523
	No	6 (50)	6 (50)		
	Sometimes	12 (60)	8 (40)		
One-hand needle recapping technique	Yes	49 (41)	71 (59)	4.180	0.041*
	No	26 (63)	15 (37)		
	Sometimes	111 (49)	117 (51)		

Discussion

This study assessed the prevalence and factors associated with NSIs among nursing officers at NHSL. The findings showed that 48% of nurses reported experiencing at least one NSI within the past two years, with disposable syringe needles being the most frequently involved device (73%). Recapping needles and improper disposal were the leading activities associated with injuries. Significant factors for NSIs included age, bending needles before disposal, and the use of the one-hand recapping technique.

The prevalence observed in this study is lower than that reported in a previous NHSL survey conducted in 2018, which found 67% of nurses with less than five years of experience had sustained NSIs (Aberathna et al., 2019). This difference may be explained by variations in participant characteristics. In the current study, the majority of participants had over five years of clinical experience, which may have contributed to greater adherence to infection control practices and safer handling of sharps. In contrast, the previous study included a larger proportion of early-career nurses, who are more likely to be exposed due to limited experience. Additionally, improvements in institutional safety protocols, infection control training, and the adoption of safer devices over the past years may have further reduced NSI prevalence. Regional comparisons show that NSI rates among nurses range from 45% to 48% in South India and Pakistan (Gulnaz

et al., 2024; Uddin Mohammed & Reddy, 2021), suggesting that the observed prevalence aligns with trends in similar healthcare settings.

The study also highlights that recapping remains a major risk factor. In this study, 28% of NSIs occurred during recapping and 8% during cannulation. These findings are consistent with international studies from Iran and Ethiopia, where improper handling, including recapping, significantly increased the risk of NSIs (Fathizadeh et al., 2023; Mengistu & Tolera, 2020). A meta-analysis also reported that syringe needles were involved in the majority of NSIs and that double-handed recapping substantially increased injury risk (Aliyo & Gemechu, 2024). The lower rate of recapping-related injuries observed in our study may reflect better compliance with infection control training and stricter institutional enforcement in Sri Lankan hospitals.

Behavioral and demographic factors were significantly associated with NSIs in this study. Younger nurses, particularly those aged 23 to 40 years, experienced higher injury rates, which is consistent with findings from studies in Malaysia and India, where early-career nurses were more likely to sustain NSIs due to limited clinical experience and higher involvement in high-risk procedures (Lyngdoh et al., 2018; Othman et al., 2024). This suggests that experience plays a protective role, as nurses with longer service are generally more familiar with safe handling

practices and institutional protocols. Unsafe practices, including bending needles before disposal and the use of the one-hand recapping technique, were associated with increased NSI risk. Similar patterns have been observed in studies from Iran and Ethiopia, where improper needle handling significantly elevated the likelihood of injury (Fathizadeh et al., 2023; Mengistu & Tolera, 2020). These findings underscore that despite theoretical knowledge of universal precautions; behavioral compliance remains a critical determinant of occupational safety.

Despite high awareness regarding safe disposal methods (91% correctly identified the sharp bin), under-reporting of NSIs was common; only 45% of incidents were officially reported. This aligns with reports from Pakistan and South India, where fear of stigma, lack of awareness, and perception that injuries were minor led to significant under-reporting (Gulnaz et al., 2024; Uddin Mohammed & Reddy, 2021). Limited reporting has important implications for occupational health monitoring, post-exposure prophylaxis, and institutional policy enforcement.

Education and training emerged as crucial protective factors. Only 40% of nurses attended in-service programs on NSI prevention, yet nearly all (98%) recognized the need for ongoing education. Comparable studies from Trinidad and Malaysia have similarly shown that formal training improves adherence to safety practices and reduces the incidence of NSI (Kwanzaa et al., 2020; Othman et al., 2024). These findings indicate that while awareness of safe practices is high, practical reinforcement through regular, structured training remains essential to further reduce occupational risk.

This study has some limitations. First, convenience sampling may limit the representativeness of findings to other hospitals or regions. Second, self-reported retrospective data are subject to recall bias, potentially underestimating the true frequency of NSIs. Third, the single-site, cross-sectional design precludes causal inference. These limitations

should be considered when interpreting and generalizing the findings.

Conclusion

The findings of the study revealed a high prevalence of NSIs among nurses, with a particularly elevated risk among those who practiced one hand recapping. Age, bending used needles before disposal, and the use of the one-hand technique for needle recapping were the factors found to be significantly associated with NSIs. These results highlight the urgent need to strengthen occupational safety regulations in low- and middle-income countries. To reduce the incidence of NSIs, it is essential to first implement targeted prevention strategies, such as comprehensive training programs on safe injection practices, proper handling and disposal of sharps, and the consistent use of PPE. In addition, awareness campaigns using Information, Education, and Communication (IEC) materials should be prominently displayed at all worksites to reinforce best practices. Hospital administrations should ensure adequate staffing, especially in high-risk wards, and include NSI prevention strategies in Continuing Professional Development (CPD) programs for nurses. The establishment of a clear and efficient NSI reporting mechanism is critical. A user-friendly and confidential reporting system will encourage prompt reporting of injuries, which enables timely medical interventions, including post-exposure prophylaxis and necessary treatment.

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Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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