



Prevalence of Needle Stick Injury among Healthcare Workers in Savelugu Municipal Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Sub-Saharan Africa is home to over 28 million HIV-positive individuals, and over 95% of HIV infections occur in poor nations there. In Ghana, there are no official mechanisms in place that allow individuals to report Needle Stick Injuries (NSIs) and receive advice specific to occupational health. Health care management does not prioritize it because of financial restrictions, and HCWs have not yet recognized it as a significant problem. The purpose of this study is to evaluate the prevalence of needle stick injuries among staff at Savelugu Hospital.

Methods: Savelugu Hospital health trainees provided data for a descriptive cross-sectional study design. Three hundred and thirty-three health professionals were interviewed using the closed-ended and open-ended questionnaire. A simple random sampling method was employed to select research participants. A 95% confidence level was applied to all statistical analyses, and a P value of less than 0.05 was considered significant.

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Findings: The age distribution is 34.00 with a standard deviation of 6.3. Of the 122, more over half (55.2%) were nurses, and 96.6 percent had infection prevention control (IPC) training. The majority of respondents (87.2%) reported having sustained a needle stick injury; 62.1% of those who suffered NSI did so using a hypodermic needle. According to the study, needle stick injuries were significantly correlated with age ($p=0.031$), sex ($p=0.045$), and highest educational status ($p=0.004$). The following are contributing factors to needle stick injuries: lack of guidelines on handling healthcare sharps (65.0%), poor housekeeping (20.7%), overuse of medical sharps (36.9%), unsafe medical sharps (36.9%), inadequate supply of barrier products (57.1%), unclear work procedure (57.1%), and unsafe practices (68.5%).

In conclusion: our study showed that among healthcare workers at Savelugu Hospital, NSIs were highly prevalent. The majority of NSIs were caused by hypodermic needles, one of the common sharps used in hospitals, and most responders had suffered an injury between one and two times in the past. Needlestick injuries were correlated with age, sex, and educational attainment.

Keywords: Prevalence; needle stick; Stick; Injury; health workers.

1. INTRODUCTION

Every year, about 35 million healthcare workers (HCWs) suffer percutaneous injuries from contaminated sharp objects, making needlestick injuries (NSI) or needlestick and sharp injury (NSSI) a serious occupational hazard on a global scale [1]. In addition to the obvious physical effects, NSIs have a significant psychological cost; research shows that impacted healthcare workers frequently experience considerable anxiety and mental discomfort [2]. Evidence showing that around 80% of HCWs' percutaneous blood contact occurs as a result of NSIs highlights the seriousness of these episodes, exposing workers to possible diseases such as HIV, hepatitis B, or hepatitis C [3].

Non-serious infections (NSIs) are considered to be linked to 2.5% of HIV infections and around 40% of hepatitis B and C infections among healthcare professionals. NSIs significantly increase the burden of blood-borne disorders worldwide [4]. With two-thirds of all HIV infections worldwide occurring in sub-Saharan Africa, this effect is especially noticeable there. Regrettably, this area also bears an excessive weight of needlestick injuries (NSIs); health care workers (HCWs) sustain two to four NSIs on average each year, mostly from handling tainted sharps [5,6].

Ghana represents, in the African environment, a microcosm of distinct NSI-related concerns. It is imperative to address occupational safety problems as healthcare personnel in Ghana are believed to be more susceptible to blood-borne infections than the general population[7]. Ghana's present NSI scenario is believed to be similar to other African nations with alarmingly

high NSI rates, such as South Africa and Uganda, despite the lack of comprehensive statistics on NSIs in Ghana. HCWs in Ghana who are not vaccinated face an exceptionally high risk of contracting hepatitis B, further complicating matters. This is a sign of a global issue where more than 80% of healthcare workers in some regions are not vaccinated despite the vaccine's effectiveness [8].

Ghana suffers, like many other places, from a dearth of official channels for reporting non-specific injuries (NSIs) and receiving professional advice on occupational health. Financial constraints and healthcare management's low priority for NSI reporting compound these systems' shortcomings. Moreover, HCWs in Ghana must immediately become more cognizant of the gravity of NSIs as a pervasive problem.

This study attempts to pinpoint the exact variables influencing needle stick injuries among medical staff at Savelugu Municipal Hospital in order to solve these intricate difficulties. Researchers and stakeholders in the healthcare system aim to develop targeted interventions that reinforce workplace safety protocols and lower the number of non-specific injuries (NSIs) in Ghana. This will improve the resilience and overall health of healthcare workers in the region by analyzing the complex variables that lead to NSIs. The motivation for this study is to ensure occupational safety, reduce the spread of pathogens, assess infection control measures, inform policy development, carry out cost-benefit analyses, customize education programs, increase public awareness, and support global health initiatives, the research aims to better understand needlestick injuries in healthcare

settings. It seeks to recognize trends, establish evidence-based procedures, and establish a secure working environment for community members, patients, and healthcare professionals.

2. METHODS

2.1 Study Setting

The Savelugu Municipal Municipality in Ghana, one of the 16 MMDAs in the Northern Region, is the subject of the study. The municipality, which has 122,888 residents, is mostly an agricultural one, growing cashew, soy beans, cotton, and sheanuts. The literacy rate is 31.96%, and there are 212 schools with 36,457 students. In terms of healthcare, the municipality has sixteen health institutions, including a referral center hospital—Savelugu Hospital—serving as both a primary healthcare provider and a referral center for complex cases. Malaria, anaemia, hypertension, pregnancy-related complications, and snake bites are the top causes of hospital admissions and deaths. Despite malaria control efforts, it still constitutes over 40% of outpatient visits. Additionally, the district faces challenges in water accessibility, with only 75% potable water coverage, leaving 25% of the population without safe drinking water.

2.2 Study Design

The study collected data from a single point in two places using a descriptive cross-sectional research design that focused on quantitative approaches to examine differences across variables and groups.

2.3 Study Population

This study includes all health staff in Ghana's Northern Region's Savelugu Municipality.

2.4 Inclusion and Exclusion Criteria

The inclusion requirements emphasize that health personnel must only be recruited from the Savelugu Municipal Hospital, with a focus on their current state of not being ill. Health professionals must voluntarily give informed consent and participate in the study only voluntarily.

2.5 Sample Size

The study uses information from the Savelugu Municipal Hospital's end-of-year (2022) report,

which shows that 335 healthcare workers (HCWs) from different cadres make up the overall population. Taro Yamane's simple formula is used to calculate the sample size for the study, with a margin of error of 5% and a desired confidence interval of 95%. After computation, 200 is the sample size. In order to adjust for possible non-respondents, five percent of the overall sample size—ten people—is added. As a result, 210 healthcare workers will be the study's ultimate total sample size.

2.6 Sampling Techniques

Simple random sampling, a probability sampling technique that guarantees every member of the population has an equal chance of selection, was used as part of the sample strategy for this investigation. Health professionals randomly selected a paper with the words "yes" and "no" on it after shaking a box containing the papers. The method was repeated until the entire sample size was used, and those who answered "Yes" were included in the study.

2.7 Dependent and Independent Variables

Needlestick injury is the study's dependent variable, and its independent variables are things like education, skill, age, sex, job category, training, availability and use of personal protective equipment (PPE), cleanliness of the workplace, availability and use of safety devices, and particular procedures like injection, recapping, suturing, disposal, and cleaning.

2.8 Data Collection Tools and Procedures

Questionnaires were used to collect data, and their design was informed by a range of sources, including proven instruments from earlier research[9–11]. The questionnaire was designed to be in line with the particular goals of the study and included both open-ended and closed-ended questions. Participants' responses were gathered using structured questionnaires; individuals who could read and write were given the form to complete and return at a later time. To help with correct responses, the questionnaire was translated into a local language for participants who couldn't read or write, such some security guards and cleaners. The translation was done using translate-back-translate techniques. The English version of the questionnaire was

translated to Dagbani and Hausa, then the translated version was also given to another set of persons independent of the first translators to translate the local version questionnaire back to English. In the end, the final script was compared with the original questionnaire to identify discrepancies. The study was also piloted among 15 health workers in Tamale Metropolis, this further validated the questionnaire and allow for better restructuring before the actual data collection. Permissions from the Medical Superintendent, Matrons, and unit heads in charge of the facilities used for data collection were obtained before beginning the project. Nurses in every ward received brief information sessions regarding the trial and its protocols. After the briefings, 'yes' votes were cast, and study participants were chosen from among those who cast ballots. Oral and written consent was needed from respondents prior to the questionnaire being administered.

2.9 Data Cleaning and Analysis

Manual editing was required for data analysis and display in order to remove any duplicates or incorrect information. After editing, the data was coded and statistical analysis was performed using SPSS version 25.0, the Scientific Package for Social Sciences. Frequencies, percentages, and graphical representations were utilized to convey the findings. Descriptive statistics like mean and standard deviation were employed to describe the data. Statistical significance was defined as a p-value of less than 0.05 (<0.05) at the significance level.

3. RESULTS

3.1 Socio Demographics Characteristics

Out of the 203 health workers analyzed in this research, the majority (59.1%) fell within the 30-39 age bracket, with an average age of 34.00 and a standard deviation of 6.3. The majority of participants (62.1%) were female. Regarding educational background, 90.1% possessed postsecondary degrees, while 9.9% had completed senior high school. The findings indicated that over half of the respondents (50.2%) had less than 5 years of work experience, with an average of 6.3 years and a standard deviation of 5.4. A significant portion of the participants (94.1%) reported having clear work procedure guidelines in their roles (Table 1).

3.2 Prevalence of Needle Stick Injury among Healthcare Workers

According to the survey, 26.6% of participants utilized auto-retractable hypodermic needles. Incidents of needle stick injuries varied from one to 10 punctures, with a standard deviation of 1.9 and a mean of 2.9 punctures.

In terms of the conditions that result in needle stick injuries, injections by patients accounted for 27.1% of the cases; unsupervised needles accounted for 7.3%; IV-line setup for 16.4%; recapping for 11.3%; suturing for 10.7%; coworker mishaps accounted for 2.3%; cleaning for 7.3%; and needle disposal for 17.5% (Table 2).

Table 1. Socio-demographic characteristics of the respondents (n=203)

Variable	Category	Frequency	Percentage
Age	20-29 years	49	24.1
	30-39 years	120	59.1
	40-49 years	27	13.3
	50-59 years	7	3.4
	Mean(SD)		34.0(6.3)
Sex	Female	126	62.1
	Male	77	37.9
Highest educational status	SHS	20	9.9
	Tertiary	183	90.1
Work experience	< 5 years	102	50.2
	5-10 years	66	32.5
	>10 years	35	17.2
	Mean (SD)		6.3(5.4)
Are you given clear work procedure guidelines in your job?	Yes	191	94.1
	No	12	5.9

Table 2. Prevalence of needle stick injury among healthcare workers (n=203)

Variable	Category	Frequency	Percentage
Do you use hypodermic needles with auto-retractable needles	Yes	54	26.6
	No	149	73.4
How many times in the course of your practice at the hospital	Minimum		1
	Maximum		10
	Mean (SD)		2.9(1.9)
During what procedure or activity did the incident/accident of needle stick injury(n=177)	Injecting	48	27.1
	Unattended needle	13	7.3
	Putting up IV line	29	16.4
	Recapping	20	11.3
	Suturing	19	10.7
	Accident from colleague	4	2.3
	Cleaning	13	7.3
	Disposal	31	17.5

3.2 Prevalence of Needle Stick Injury

The Majority of participants, consisting of 177 individuals (87.2%), reported having experienced needle stick injuries in the past. On the other hand, 26 individuals (12.8%) did not report any occurrence of needle stick injuries (Fig. 1).

3.3 Causes of Needle Stick Injury

Among individuals who reported needle stick injuries, the occurrences were classified as follows: 110 (62.1%) involved hypodermic needles, 34 (19.2%) were associated with lancet insulin needles, 42 (23.7%) occurred through the

use of intravenous cannula (Catheter), 3 (1.7%) were attributed to butterfly needles, and 30 (16.9%) were linked to suture needles (Fig. 2).

3.4 Association between socio Demographics Characteristics and Needle Stick Injury

On the association of socio demographic characteristics and needle stick injury, the study showed that there was a significant association between needle stick injury and age ($p=0.031$), sex ($p=0.045$), highest educational status ($p=0.004$) (Table 3).

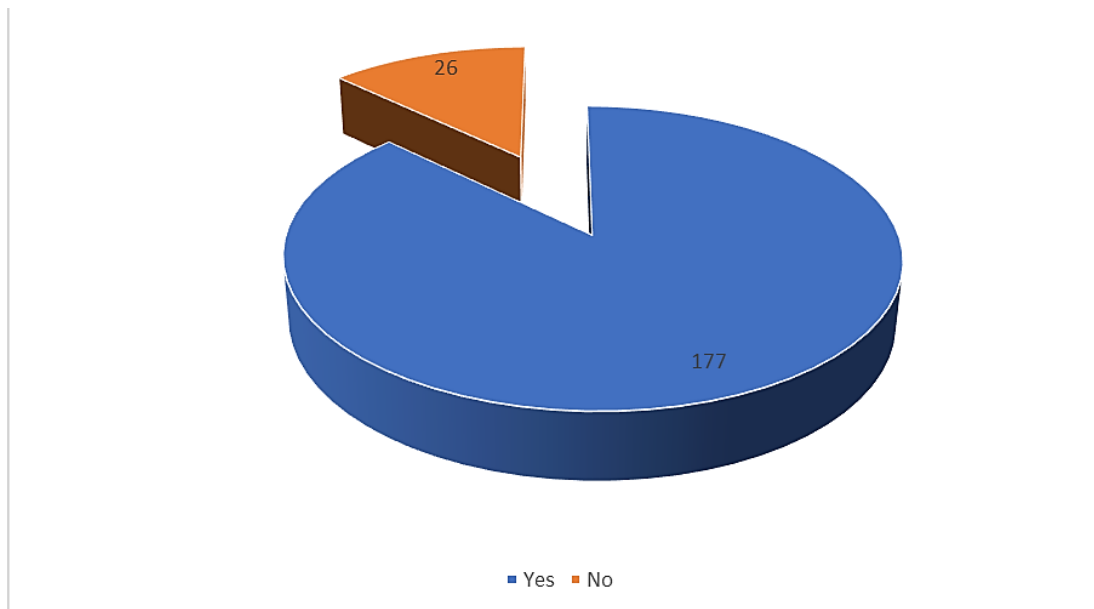


Fig. 1. Prevalence of needle stick injury (n=203)

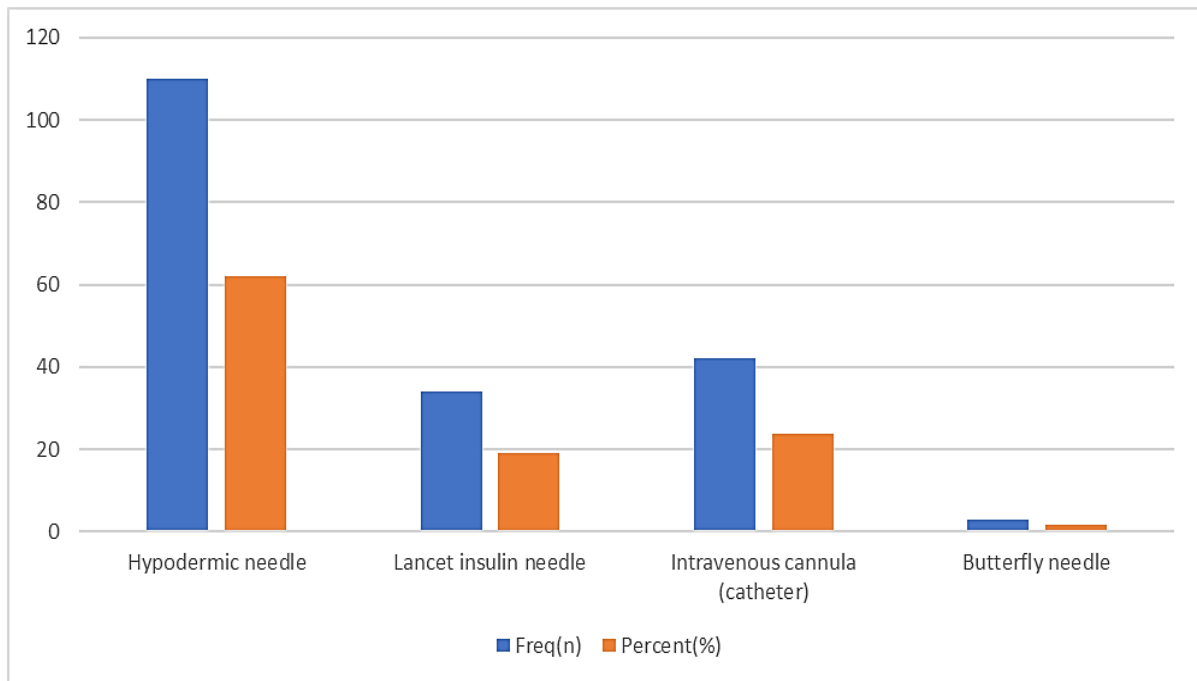


Fig. 2. Causes of needle stick injury (n=177)

Table 3. Association between socio demographics characteristics and needle stick injury

Variable	Category	Needle Stick Injury		Statistical test
		Yes	No	
Age	20-29 years	45(91.8%)	2(8.2%)	P=0.031
	30-39 years	100(83.3%)	20(16.7%)	
	40-49 years	25(92.6%)	2(7.4%)	
	50-59 years	7(100.0%)	0(0.0%)	
Sex	Female	106(84.1%)	20(15.9%)	p=0.045
	Male	71(92.2%)	6(7.8%)	
Highest educational status	SHS	20(100.0%)	0(0.0%)	p=0.004
	Tertiary	157(85.8%)	26(14.2%)	
	No	6(85.7%)	1(14.3%)	
Work experience	< 5 years	87(85.3%)	15(14.7%)	p=0.056
	5-10 years	59(89.4%)	7(10.6%)	
	>10 years	31(88.6%)	4(11.4%)	
	Surgery	32(94.1%)	2(5.9%)	
Are you given clear work procedure guidelines in your job	Yes	166(86.9%)	25(13.1%)	p=0.633
	No	11(91.7%)	1(8.3%)	

3.5 Contributory Factors to Needle Stick Injury

The study revealed contributory factors to needle stick injuries among respondents. Fatigue was identified by 145 (71.4%) as a prominent factor. Additionally, 75 (36.9%) attributed needle stick injuries to unsafe medical sharps, while an equivalent percentage identified overuse

of medical sharps as a causative factor. Inadequate supply of barrier products, such as gloves and pads, was reported by 116 (57.1%). Unclear work procedures were noted by 121 (57.1%). Lack of guidelines on handling healthcare sharps was acknowledged by 132 (65.0%), and unsafe procedures were cited by 139 (68.5%) as contributing to needle stick injuries (Fig. 3).

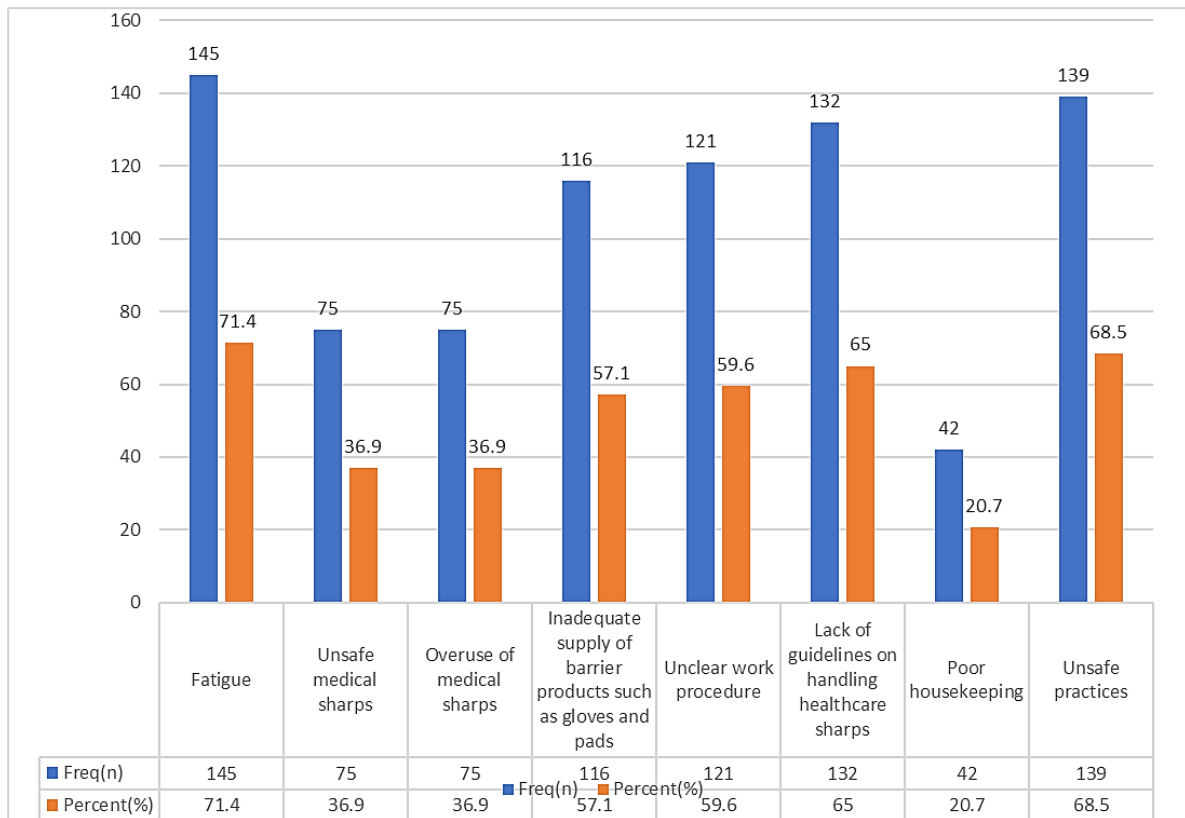


Fig. 3. Contributory factors to needle stick injury (n=203)

4. DISCUSSION

This study discovered that 87.2% of the participants experienced at least one Needle Stick Injury (NSI), which is a lower prevalence compared to similar studies. For instance, a study by Hanafi et al.[12] found that over two-thirds (67.9%) of healthcare workers (HCWs) had sustained at least one NSI in the 12 months preceding the study. Lower NSI prevalence rates were reported in Malaysian teaching hospitals (31.6% and 52.9%, respectively) by Ng & Hassim [13]. In Nigeria, Akeem et al. (2011) reported that 38% of physicians and 66% of nurses experienced a sharp stick injury in the previous 9 months. In South Africa, Garus-Pakowska & Górajski [14] found that 91% of junior doctors sustained an NSI in the previous 12 months, with 55% of these injuries coming from HIV-positive source patients.

Our study provides descriptive epidemiological evidence regarding the occurrence of NSIs, including circumstances, devices, and types of procedures involved. The reported patterns of NSIs align with findings from other studies [15–17]. Physicians, who generally do not administer

injections, have a lower risk of injury exposure compared to nurses. Housekeepers, who handle cleaning and waste collection without protective equipment, face a higher risk of injury exposure.

In our study, 26.6% of respondents used hypodermic needles with auto-retractable features, reducing the risk of NSIs. These needles automatically retract from the patient into the syringe barrel, minimizing exposure to contaminated needles. Proper disposal of needles is crucial, as improperly discarded needles can pose risks to other workers.

NSIs in our study were caused by various devices, with hypodermic needles being the most common, followed by ampoules, intravenous cannulas, and suture needles. Other studies also identified hollow bore needles as a common cause of NSIs. Some studies highlighted that a significant number of NSIs occur during sharps disposal [18].

This study revealed that participants experienced Needle Stick Injuries (NSIs), with a prevalence lower than reported in comparable studies. For instance, other research found higher incidence

rates among healthcare workers (HCWs), ranging from 67.9% to 91% in different regions [8,9,19]. Lower NSI rates were reported in certain locations, such as Malaysian teaching hospitals (31.6% and 52.9%) [13], and Nigeria (38% of physicians and 66% of nurses) [10]. The findings contribute to our understanding of NSIs, highlighting consistent patterns across various studies. Physicians, who typically do not administer injections, showed a lower risk of injury compared to nurses. In contrast, housekeepers, engaged in cleaning and waste collection without protective equipment, faced an elevated risk of injury exposure.

Among respondents, a portion used hypodermic needles with auto-retractable features, providing a tangible intervention to mitigate NSI risks. These needles automatically retract into the syringe barrel post-use, minimizing exposure to contaminated needles [20]. Proper needle disposal remains crucial to preventing risks to other workers.

Various devices contributed to NSIs in this study, with hypodermic needles being the most prevalent, followed by ampoules, intravenous cannulas, and suture needles. Consistent with other studies, hollow bore needles were identified as a common cause of NSIs. Some studies underscored that a substantial number of NSIs occur during sharps disposal [8].

The implications of these findings underscore the persistent risk of NSIs among healthcare workers, emphasizing the need for targeted interventions and education. The higher prevalence among nurses and housekeepers highlights specific occupational vulnerabilities that warrant focused safety measures. Implementation of safety protocols, including the use of auto-retractable needles and proper sharps disposal, could significantly reduce the occurrence of NSIs.

As a result, rather than direct transmission, the significance of needlestick injuries in the context of COVID-19 rests in the possibility of co-occurrence. The stress and responsibilities of caring with COVID-19 patients may put healthcare personnel at risk for needlestick accidents [21–24]. The primary worry in the event of a needlestick injury is the possibility of coming into contact with bloodborne infections including HIV, hepatitis B, and hepatitis C [11]. The general guidelines of infection prevention and control, such as timely reporting and sufficient follow-up following needlestick injuries, are essential in

healthcare settings to safeguard the safety of healthcare workers, even if COVID-19 is not a bloodborne pathogen.

The study also highlights the significance of customized training programs for healthcare professionals, particularly those who are more vulnerable, in order to raise awareness and encourage safe work practices.

The association between socio-demographic characteristics and Needle Stick Injury (NSI) is a critical aspect of the study's findings. The data revealed significant relationships between NSI occurrence and three key socio-demographic factors: age, sex, and highest educational status.

The study indicated a statistically significant association between age and NSI, with a p-value of 0.031. The findings suggest that the prevalence of NSI varies across different age groups. It is noteworthy that age can influence job roles, responsibilities, and experience levels, which, in turn, may affect the likelihood of encountering NSIs[9]. Younger individuals may have different work exposures compared to older counterparts, potentially impacting their vulnerability to needle stick injuries[18]. The observed associations underscore the multifaceted nature of NSI occurrences, highlighting the importance of considering socio-demographic factors in injury prevention strategies. Younger healthcare workers may benefit from targeted training on safe practices, while gender-specific risk factors should inform tailored interventions.

The association between sex and NSI was found to be statistically significant ($p=0.045$). This implies that there are gender-based differences in the likelihood of experiencing NSIs [9]. The nature of tasks performed by male and female healthcare workers may contribute to variations in injury risks. Understanding these distinctions is crucial for tailoring preventive measures and training programs to address specific needs based on gender.

The study demonstrated a significant association between the highest educational status and NSI ($p=0.004$). This finding suggests that individuals with different educational backgrounds may have distinct risk profiles for NSIs. Healthcare workers with varying educational qualifications may engage in diverse tasks or work in different settings, influencing their exposure to needle stick injuries [11]. Recognizing these patterns can guide targeted interventions and training

programs. Moreover, the correlation between educational status and NSI emphasizes the need for educational programs that cater to the specific challenges faced by individuals with varying levels of education. Enhancing awareness and implementing preventive measures, such as the use of auto-retractable needles, may be particularly beneficial.

While this study is considered a novel contribution to the field within the Savelugu region, it is not without limitations. Notably, the research was exclusively conducted among health workers within the study setting. As a result, caution must be exercised when attempting to generalize the findings to broader populations or different settings. The limited scope of participants from a specific geographical area may impact the external validity of the study. The unique characteristics of the study population, local healthcare practices, and contextual factors may limit the generalizability of the results to other regions or diverse populations. Furthermore, the study's exclusive focus on health workers may overlook potential variations in needle stick injury patterns among different occupational groups or community members who may also be at risk. In future research, it would be beneficial to broaden the study's scope by including diverse populations and multiple healthcare settings to enhance the applicability of the findings beyond the immediate study area. Additionally, considering other occupational groups could provide a more comprehensive understanding of needle stick injury prevalence and associated factors in the broader community.

5. CONCLUSION

The Savelugu Hospital's HCWs had a high prevalence of NSIs, according to this study. Most NSIs among the sharps often used in hospitals included hypodermic needles, and most of the responders had sustained injuries once or more in the past. Both the departments in which they work and the occupational category of "Health Care Workers" were unrelated to NSIs. The vast majority of respondents did not inform management of NSIs. dangerous medical sharps, excessive usage of medical sharps, a lack of barrier goods like gloves and pads, unclear work, a lack of procedures for handling healthcare sharps, poor housekeeping, and dangerous practices are all contributing factors to needle stick injuries.

CONSENT AND ETHICAL APPROVAL

The Department of Nursing & Midwifery, Technical University College, Ghana-Tamale granted ethical permission for the research, which followed the Declaration of Helsinki's guidelines. Participants were guaranteed that their involvement would be academic and that their information would be kept private. They also gave verbal and written informed consent. By using the data only for research, the study's ethical obligation was reaffirmed.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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