


The Prevalence of Needlesticks and Sharp Injuries, and the Associated Factors Among Midwives and Nurses in North Wollo Zone Public Hospitals, North East Ethiopia: An Institution-based Cross-sectional Study

This article was published in the following Dove Press journal:
Drug, Healthcare and Patient Safety

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Background: Health professionals are at high risk of exposure for needlestick or sharp injury due to repeated exposure in clinical areas. This exposure leads to the acquiring of different infectious diseases like human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and other infectious diseases. Nurses and midwives having repeated exposure due to long working time, not wearing personal protective equipment, less work experience, and who are unable to apply infection prevention utilization guidelines are at high risk of needlestick and sharp injuries.

Methods: An institutional-based, cross-sectional study design was conducted in North Wollo Zone public hospitals. A simple random sampling technique was applied to select study subjects. The method of data collection was self-administered questionnaires that are structured and pretested from February to March 2019. The data were analyzed using both descriptive and analytical statistics. Binary logistic regressions were used to test the association between variables. Then, P -value <0.05 was considered as statistically significant in this study.

Results: Of the 147 respondents who participated in the study, 50.3% were female and 49.7% were male. The prevalence of needlestick and the sharp injuries was 75.5%. Recap practice of needle (AOR: 3.880; 95%CI: 1.666–9.036), working room (maternal care room) (AOR: 2.968; 95%CI: 1.012–8.703), and contagious room like emergency room (AOR: 3.587; 95%CI: 1.383–9.301) are significantly associated with needlestick and sharp injuries.

Conclusion: This study showed that three-quarters of the study subjects were exposed to needlestick injury at least once in the past year. Needle recapping practice and working room were associated with needlestick and sharp injuries. Then, health personnel should avoid the practice of recapping a needle and take care themselves to avoid needle and sharp injuries in the workplace.

Keywords: needlestick injury, sharp injury, North Wollo zone, nurse, midwives

Introduction

Needlestick and sharp injuries (NSSIs) are defined as the presence of body surface puncture or wound by needles or sharp cutting materials which might be contaminated with body fluids, mainly blood. NSSIs are major occupational risks among health-care workers (HCWs) like nurses and midwives. These HCWs commonly

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use needles and sharp materials to conduct different procedures in health institutions which makes them vulnerable for different injuries.¹ HCWs who use needles and sharp materials in their clinical activities are at risk of acquiring a needlestick or sharp injury which may lead to different infectious diseases that can be transmitted by body fluids like blood. Among the common infectious diseases which might be caused by NSSIs are, HIV, HBV, HCV being the most common.²

Globally, the risk associated with NSSIs such as transmission of disease can cause different problems in the body's system.³ The highest risks of injuries are from blood-filled hollow bore needles which account for 63% of the needlestick injuries. While the use of safe needle devices can prevent needlestick injury by 80%, the conjunction of this safe needle device with worker education and work practice control can reduce injuries by more than 90%.⁴ Around 70.4% of nurses who are working in the operation room are experienced NSSI at least once a year. Working units like the preoperative room and being emotionally exhausted during the working time significantly increased the risk for NSSIs.^{3,5}

In European countries, the prevalence of NSSIs was 42.5% and nurses are more affected than other health professionals which accounts for 44%.⁶ Although, all health professionals are at risk, NSSIs are more common in nurses and midwives, which accounts for 50.7%, 72.6%. Nearly one-third of the injuries occurred in the emergency unit and staff who worked in medical wards and intensive care units account for 15.6% and 9.5%, respectively. The injuries have mostly occurred during the drawing of blood and injection of medications (29.9%).^{3,5} There is a NSSI every second which is not reported. There are an estimated 13,567 NSSIs every year among HCWs.⁷

In Africa, 68.3% of nurses were injured by NSSIs. Hollow bore needles were the most common cause of injury which was (68.5%) followed by suturing needles (10.6%).^{8,9} Practice of needle recap, cigarette smoking, lack of training on occupational health and safety, more working hours per week, job dissatisfaction, and less work experience were found to be the major identified risks.

In developing countries including Ethiopia, the risk of having an NSSI injury is 10 to 20 times higher than the developed countries.³ The episode of NSSIs was different in different regions. More than 45% of HCWs had at least one episode of percutaneous injury.¹⁰ The studies showed that practicing needle recap,¹¹ cigarette smoking, lack of

training on occupational health and safety, job satisfaction,¹² on the job training,¹³ work experience, working hours, presence of personal protective equipment, and infection prevention guideline utilization were found to increase the risk of NSSIs.¹⁴ The prevalence of NSSIs can be reduced through the improved training and use of safety devices, education, and awareness. Thus, preventive measures such as the use of protective goggles and face shields, together with personal protective equipment should be emphasized and encouraged.¹⁵ Even though there are studies conducted in different parts of the world, the prevalence and associated factors of NSSIs are not well known in Ethiopia, specifically in the North Wollo Zone. Thus, this study aimed to assess the prevalence of NSSIs and the associated factors among nurses and midwives working in North Wollo Zone hospitals, Amhara region, Ethiopia.

Methods and Materials

Study Setting and Design

The institutional-based cross-sectional study design was conducted at hospitals found in North Wollo Zone from February to March 2019. North Wollo Zone is found in the Amhara region with the capital city of Woldia. Woldia city is 521 km away from the capital city of Addis Ababa. There are five hospitals found in the North Wollo Zone. These include Woldia hospital, Kobo hospital, Lalibela hospital, Mekiet hospital, and Wadila hospital.

Study Population

Midwives and nurses who are working in hospitals found in North Wollo Zone were considered as the study population. Midwives and nurses who had at least six months of work experience were included in the study and nurses and midwives who were unable to respond and on annual and maternal leave during the study period were excluded from the study.

Sample Size Determination

The sample size was calculated using a single population proportion formula designated as $(n = (Z\alpha/2)^2 p(1-p)/d^2)$; where n = the required minimum and feasible sample size, $Z\alpha/2(1.96)$: significance level at $\alpha=0.05$ with 95%CI, p : the proportion of NSSIs from a previous study (18.7%),¹⁶ and d : margin of error (5%). The final sample size calculated was 147 after considering 10% nonresponse rate.

Sampling Technique and Sampling Procedure

All hospitals found in the North Wollo zone were included in the study. The total sample size was proportionally allocated to the numbers of nurses and midwives in each hospital. Then, the study participants from each hospital were selected by a computer-generated simple random sampling technique.

Data Collecting Tool and Procedure

The data were collected using pretested, structured self-administered questionnaires prepared in English. The questionnaires include information on sociodemographic characteristics and environmental characteristics. The tool was adapted and modified from different articles.^{11,17} The data were collected by five BSc nurses and supervised by three MSc nurses.

Data Analysis and Presentation

After the data collection, the questionnaires were checked for completeness and consistency. Then, the data template format was prepared, coded, and entered into EpiData version 4.2. The data was exported to SPSS version 24 for analysis. Both descriptive and analytical statistics were used to describe the percentages and distributions of variables. Bivariate and multivariate analysis was used to identify the association of variables. Odds ratios like crude odds ratio and adjusted odds ratios with 95%CIs were computed. A *P*-value <0.05 was considered as statistically significant in this study. The results were presented in the form of text and tables.

Result

Of 147 respondents, 50.3% were female and 49.7% were male. One hundred and ten (74.8%) were below the age of 30 years, 24.5% were between 30 and 40 years, and (0.7%) were above 40 years. The mean ages of the respondents were 28.31 with a standard deviation (± 4.399) (Table S1). Of the total participants, 57.8% participated in training on occupational safety and 56.5% of the participants practiced recap of a needle after use (Table 1).

The overall prevalence of NSSI was 75.5%. Of this, 31.3% faced only needlestick injury, 27.2% faced surgical equipment injury, and 59.2% faced medication vial injury (Table 2). More than two-thirds (66.9%) of injured staffs did not have post exposure prophylaxis, but 69.4% of respondents receive care after an injury. Among the total

study subjects who had experienced NSSIs, 38.7% of the injuries occurred in Woldia general hospital (Table S2).

Factors Affecting Needlestick and Sharp Injuries

This study revealed that recap of the needle can expose nurses and midwives to NSIs. Nurses and midwives who had practiced recap of the needle were 3.88 times more likely to be faced by NSSIs than those who did not practice recap of the needle (AOR: 3.88; 95%CI: 1.67–9.04). The current working room is also associated with needlestick and sharp injuries. Nurses and midwives who work in the maternal care room were 2.97 times more likely to face NSSIs than those who worked in a less contagious room; outpatient department (OPD), ophthalmic room, and medical ward (AOR: 2.97; 95%CI: 1.01–8.70). Nurses and midwives who work in a contagious room; injection, dressing, emergency, surgical ward, and operation room were 3.59 times more likely to faced NSSIs than those who work in a less contagious room; OPD, ophthalmic room, or medical ward (AOR: 3.59; 95%CI: 1.38–9.30) (Table 3).

Discussion

This institutional-based cross-sectional study was done to identify factors affecting NSSIs among nurses and midwives in the North Wollo zone governmental public hospital. This study gives important findings regarding factors about NSSIs and the possible improvement measures that could be implemented to enhance infection prevention protocol for health-care providers. In this study, the prevalence of NSSIs was 75.5%. This is higher than studies done in Gonder referral hospital (42.2%),¹⁸ Poland (20.5/1000),⁷ central Tigri (25.95% and 38.5% for needlestick and sharp injuries, respectively),¹² Jimma University specialized teaching hospital (61.76%),¹⁷ Ethiopia regional hospital (32.8%), Balie Zone 37.2%,¹¹ and Dessie town (34.5%).¹⁹ The variation might be due to the difference in study participants. The current study includes only nurses and midwives who have spent a longer time in contagious rooms than the other HCWs, whereas the previous studies were done among all HCWs. It might be also due to the difference in the number of hospitals included in the study. In this study, nurses and midwives from five hospitals were included, but the previous studies were conducted in a single institution. Regarding the degree of injury, 56.1% of respondents in Dessie town public hospitals

Table 1 Environmental Factors Affecting Needlestick and Sharp Injuries Among Midwives and Nurses Working at Hospitals Found in North Wollo Zone, Amhara, Ethiopia, 2019

Question		Frequency	Percent
Participate training on occupational safety	Yes	85	57.8
	No	62	42.2
Participate training on universal precaution	Yes	64	43.5
	No	83	56.5
Information access to safety standard	Yes	126	85.7
	No	21	14.3
Practice professional universal precaution	Yes	95	64.6
	No	52	35.4
Recap of needle	Yes	83	56.5
	No	64	43.5
If yes their recapping practice	Sometimes	32	25.9
	Little time recap	20	15.0
	Always recap	31	21.1
Availability of safety box in working room	Yes	141	95.9
	No	6	4.1
Presence of needles and sharp materials out of safety boxes	Yes	32	21.8
	No	115	78.2
Condition of safety box	Overfilled	59	40.12
	Turnout	37	25.18
	Empty	51	34.70
Waste disposal methods	Burn and Barry	29	19.7
	Incinerator	104	70.7
	Open dumping	14	9.5

were reported as superficial injury. However, in this study, 66.1% were superficial injuries. This difference may depend on the occurrence of episodes. According to the American Nurses Association needlestick injury prevention guideline, after a sustained injury, nurses should wash the hand with soap and water, identify the source patient, immediately report to employee health service, get tested immediately (confidentially for HIV, HBV, and HCV) to

Table 2 Circumstances of Needlestick and Sharp Injuries Among Midwives and Nurses Working at Hospitals in North Wollo Zone, Amhara, Ethiopia, 2019

Question		Frequency	Percent
Did you encountered NSSIs the past one year?	Yes	111	75.5
	No	36	24.5
Faced needlestick injury	Yes	46	31.3
	No	101	68.7
Faced surgical equipment injury	Yes	40	27.2
	No	107	72.8
Faced medication vial injury	Yes	87	59.2
	No	60	40.8
What was the task you performed during injury?	Suture	28	19.0
	Injection	42	28.6
	Sample drawing	25	17.0
	Needle recapping	16	10.9
Type of injury	Severe	5	4.5
	Moderate	33	29.5
	Superficial	73	66.1
Source patient identifiable	Yes	85	76.5
	No	26	23.5
Receive care after injury	Yes	99	89.1
	No	12	10.9

take prophylaxis, and get personal protective equipment when the source patient is unknown or positive.²⁰ However, in this study, 66.9% of injured nurses did not have post-exposure prophylaxis. However, 69.4% of respondents receive care after an injury. Although many countries have vaccination programs for blood borne diseases, the coverage of vaccines in Ethiopia is low compared to exposure of HCWs to human body fluids.²¹ Health-care workers are likely to be exposed to blood born infections after an injury such as the hepatitis B virus.²² The most common feared infection after sustained NSSIs is HBV. However, the vaccination status of subjects is below WHO's estimation of vaccination rates among HCWs in developing countries, which is a major public health problem for a country with a high prevalence of HBV.²³ Medical surveillance in occupational medicine helps to reduce HBV transmission to HCWs.²⁴

Table 3 Bivariate and Multivariable Analysis of Needlestick and Sharp Injuries Among Midwives and Nurses Working at Hospitals in North Wollo Zone, Amhara, Ethiopia, 2019

Variables		Faced NSSIs		COR (95%CI)	AOR (95%CI)
		Non (%)	Yesn (%)		
Professional category	Nurse	34 (30.3)	78 (69.7)	2.11 (1.24–8.18)	1.62 (0.69–3.81)
	Midwives	6 (12.2)	29 (87.8)	1.00	1.00
Income class	<5000	32 (30)	75 (70)	1.71 (0.24–1.41)	1.44 (1.17–2.18)
	5000–10,000	8 (20)	32 (80)	1.00	1.00
Current working room	Less contagious	25 (39.6)	38 (60.4)	1.00	1.00
	Maternal care	6 (18)	27 (82)	2.96 (1.07–8.20)	2.97 (1.01–8.70)
	Contagious	9 (21.4)	42 (78.6)	3.070 (1.274–7.396)	3.59 (1.38–9.30)
Recap of needle	Yes	16 (19)	68 (81)	0.38 (1.24–5.51)	3.88 (1.67–9.04)
	No	24 (38)	39 (62)	1.00	1.00
Information access to safety standard	Yes	35 (27.7)	91 (72.3)	1.23 (0.11–1.44)	0.34 (0.09–1.32)
	No	5 (23.8)	16 (76.2)	1.00	1.00
Training on occupational safety	Yes	19 (22.3)	66 (77.7)	0.56 (0.86–3.70)	2.10 (0.88–5.01)
	No	21 (33.8)	41 (66.2)	1.00	1.00

Notes: Less contagious: outpatient department, ophthalmic room, and medical ward. Contagious: injection, dressing, emergency, surgical ward, and operation room.

Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; NSSIs, needlestick and sharp injuries.

This study showed that the prevalence of NSSIs was higher among nurses and midwives working in Woldia hospital (38.7%) than others included in the study. This might be due to the variation of patient flow, which in Woldia hospital was higher than in other hospitals included in the study. This study revealed that the current working room and recapping practice of needle were significantly associated with NSSIs. This is due to the reason that the recapping of the needle causes self-injury and contagious rooms like maternal care room, injection, dressing, emergency, surgical ward, and operation room are places where different procedures are conducted. This study is in line with studies done in Nigeria,⁸ Bale zone,¹¹ and Jimma University's specialized teaching hospital.¹⁷ This might be because nurses and midwives working in contagious rooms like the operation room, emergency room, surgical ward, and others are repeatedly exposed to different procedures like suturing and injecting medications. As a result, repeated exposure can cause NSSIs.

Conclusion

Generally, this study revealed that more than three quarters of the study subjects had NSSIs at least once in a year. Recapping of a needle and current working room (injection and dressing room) were the significant factors affecting NSSIs. Therefore, HCWs should avoid any recapping of a needle after use and

use infection prevention precautions while doing procedures. Ministry of Health should create awareness by giving in-service training regarding NSSIs.

Strengths and Limitation of the Study

The strengths of the study was that this study may be considered the first to assess the prevalence of NSSIs in the North Wollo Zone and multiple logistic regression was used to control the possible confounding factors to assess the relative effect of independent variables. As a limitation, the study was not supported by observation techniques and qualitative methods.

Abbreviations

AIDS, acquired immunodeficiency syndrome; FMOR, Federal Ministry of Health; HCP, health care providers; HCWs, health care workers; HIV, human immunodeficiency virus; IRB, Institutional Review Board; ICU, intensive care unit; MMIS, making medical injection safe; NIOSH, National Institute for Occupational Safety and Health; NSSI, needlestick and sharp injury; WHO, World Health Organization.

Data Sharing Statement

All the datasets used for analysis are available from the corresponding author on reasonable request.

Ethical Approval and Consent Form

Ethical clearance was obtained from the Institutional Review Board of Woldia University. An official letter was written to all hospitals included in the study. Permission was obtained from the administrative staff of each hospital. Verbal informed consent was approved by the Institutional Review Board of Woldia University and the data were collected after taking informed oral consent from study participants. The study participants were also informed of the attainment of confidentiality and anonymity or any identifiers. The study was conducted in accordance with the Declaration of Helsinki.

Acknowledgments

We are grateful to thank all the study participants and the hospital administrators for their willing and full participation with the timely fashion.

Author Contributions

All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

Funding

Woldia University: The funder has no role in the study design, data collection, analysis, and publication.

Disclosure

The authors declare that they have no competing interests in this work.

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