Needle stick and sharp injuries and associated factors among nurses working in Dire Dawa city administration public health facilities, Eastern Ethiopia: A facility based cross-sectional study

Tigabu Munye*, Bezatu Mengistie, Firehiwot Mesfin and Solomon Demis

Department of Public Health, College of Medicine and Healthsciences, Haramaya University, Harar, Ethiopia
Department of Public Health, College of Medicine and Healthsciences, Haramaya University, Harar, Ethiopia
Department of Nursing, College of Health Sciences,
Debre Tabor University, DebreTabor, Ethiopia

Abstract

Background: *Needle-stick and sharp injuries are the most common and preventable occupationalhazards that health care workers are exposed for the transmission of a variety of blood borne infectionssuch as HBV, HCV, and HIV/AIDS. However, there is limited information in the study area that describes about the prevalence of needle-stick and sharp injuries and associated factors among nurses.* ***Objective****: to assess the prevalence of needle stick and sharp injuries and associated factors amongnurses working in Dire Dawa city administration public health facilities.*

Method and Materials: *An institutional based cross sectional study design was conducted among nurses working in Public Health Facilities. All nurses (413) working in all public health facilities were included in the study. Data were collected using pretested structured English version self-administered questionnaire. Binary logistic regression was used to identify predictors of needle stick and sharp injuries. Bivariate and multivariate analyses were used to see the association between the outcome variable and each independent variable.*

Results: *This study revealed that the one year and lifelong prevalence of needle stick and sharp injury was 33.16% (95%CI: 29.93%, 36.01%) and 52.3% (95%CI: 47.2%, 56.8%) respectively. This study showed that year of service/work experience (AOR=2.36, 95%CI: 1.22, 4.59), job related stress (AOR=2.23, 95%CI: 1.28, 3.87), training on infection prevention (AOR=0.52, 95%CI: 0.30, 0.89) and presence of contaminated sharp materials at work place (AOR=2.77, 95%CI: 1.61, 4.75) were statistically significant with the occurrence of NSSIs among nurses.*

Conclusions and Recommendations: *This study indicated that there is high prevalence of needle stickand sharp injuries among nurses. Therefore, strengthening regular provision of information and trainingon infection prevention and safety to nurses at all levels should be given attention and nurses also should practice proper use of safety box and use personal protective equipment (PPEs) during handing and working with needles and other sharp materials.*

Keywords: *Needle stick and sharp injuries, nurses, dire dawa city administration public health facilities*

Introduction

Needle-stick and sharp injury (NSSI) is defined as "an accidental penetrating wound with an instrument that is potentially contaminated with the body fluid of another person". Needle stick and sharp injuries are notably the most common and preventable occupational hazards that health care workers are exposed and become high risk for the transmission of a variety of blood borne infections such as hepatitis B virus(HBV), hepatitis C virus(HCV), andhuman immunodeficiency virus (AIDS) [1, 2].

This occurs when health care workers perform their clinical activities in the health institutions such as hospitals, health centers and clinics [3]. The majority of NSSIs occur during administering injections, securing IV lines, drawing blood, checking blood sugar, recapping needles, poor handling and disposing of needles, and transferring blood or body fluids from a syringe to a specimen container [4].

Blood-borne infections following NSSIs have serious consequences, including long-term illness, psychological stress to the victims, colleagues and family, disability and death [5]. In addition to the potential risks for infectious diseases, NSSIs also incur direct costs required for laboratory tests, including tests for HIV antibodies, hepatitis B serology, and a baseline test for hepatitis C, as well as any treatments for these infections [6].

The implementation of education, universal precautions, elimination of needle recapping, and use of sharps containers for safe disposal have reduced the chance of needle stick and sharp injuries by 80% [7]. Health care workers (HCWs) who followed universal precautions were 66% less likely to have NSSIs than those who did not follow [8].

In Ethiopia, where primary health care services are covered by nurses, it is important to develop their knowledge and practice on universal precautions since the risks of getting infections following NSSIs are high in their day to day activities [9].

However, there is limited information in the study area that describes the prevalence of needle-stick and sharp injuries and associated factors among nurses.

Therefore, the aim of this study was to determine the prevalence of needle-stick and sharp injuries (NSSIs) and associated factors among nurses working in Dire Dawa city administration public health facilities, Eastern Ethiopia, 2018.

Method and materials
Study area and period
This study was conducted among nurses working in Dire Dawa city administration public health facilities, Eastern Ethiopia from January 16-31, 2018.

Study design and participants characteristics
A cross sectional study for all 413 nurses working in all public health facilities of Dire Dawa city.

Sample size determination and sampling procedures
To determine the sample size (n), single population proportion was used at 95%CI, with 5% margin of error, and by assuming the Prevalence of needle stick and sharp injuries (NSSIs) among nurses to be 61.76% in the previous study conducted in JUSTH (Beker and Bamlie, 2015). Based on this assumption, the actual sample size (n) for the study was calculated as:

$$n = \frac{(Z\alpha/2)^2 \, P \, (1-P)}{d^2}$$

Where: - n= the minimum sample size required for the study, Z= standard normal distribution (Z=1.96) with 95% confidence interval, P= proportion of nurses who experience needle and sharp injury (61.76%=0.6176), d=is a tolerable margin of error (d=5%=0.05).

$$n = \frac{(1.96)^2 0.6176(1-0.6176)}{(0.05)^2}$$

n=363. Then by adding 10% (0.1) non-response rate, the total sample size (n) is
n=363+ (363×0.1) =363+36.3=400.
Since it is the minimum sample size required and the source population was only 413, all source population (413) was taken as a sample size for this study.
All nurses(413) working in all public health facilities (Hospitals & Health Centers) of Dire Dawa city

Administration were included in the study.

Data collection tool
Structured and pretested self-administered English version questionnaire was used to collect the data.

Data quality control
Five percent of the questionnaire was pre- tested in Hiwot Fana Specialized University Hospital (HFSUH) to assess the reliability, clarity, sequence, consistency, understandability and the total time that it will take to finish the questionnaire before the actual data collection. Then after, the necessary comments and feedbacks were incorporated in the final tool to improve its quality. Training was given for both data collectors and supervisors for two consecutive days regarding the objective of the study, data collection tool, ways of data collection, checking the completeness of the collected data and how to maintain confidentiality. Proper coding and categorization of data was done for the qualityof the data to be analyzed. All data were checked for completeness, accuracy, clarity and consistency by principalinvestigator and supervisors before data entry in to software.Double data entry was done for its validity and compare to the original data. Outliers were checked & simple frequencies and cross tabulation were done for missing values and variables.

Data processing and analysis
The collected data were checked for completeness, cleaned, edited, coded manually and entered into Epi data version 3.1 to minimize logical errors and design skipping patterns. Then, the data were exported to SPSS window version 22 for analysis. Binary logistic regression was used to identify predictors of needle stick and sharp injuries. Bivariate and multivariate analyses were used to see the association between the outcome variable and each independent variable.

Ethical considerations
Ethical clearance was obtained from Haramaya University, College of Health and Medical Sciences, Institutional Health Research Ethics Review Committee (HU-IHRERC) and a written & signed informed voluntary consent formwas obtained from all study participants prior to the data collection. Personal information was not included and the information obtained from them was treated with complete confidentiality.

Results
Out of the total 413 study participants, 392 of them were included in the final analysis giving a response rate of 94.92%.

Socio-demographic related attributes: Out of the total respondents, 210 (53.6%) were females and 229 (58.4%) were between age of 25-34 with the mean ± SD of age 30.22 ± 6.63 years. On the other hand, 146 (37.2%) have worked for less than 5 years with the mean ± SD work experience of 8.11±6.65 years (Table 1).

Table 1: Socio-demographic characteristics of the study participants in Dire Dawa city administration public health facilities, Eastern Ethiopia, 2018 (n=392).

Variables	Category	Frequency	Percentage (%)
Sex	Male	182	46.4
	Female	210	53.6
Age	≤24	75	19.1
	25-34	229	58.4
	35-44	67	17.1
	≥45	21	5.4
Marital status	Single	190	48.5
	Married	185	47.2
	Divorced	12	3.1
	Widowed	5	1.3
Educational level	Diploma	138	35.2
	BSc	250	63.8
	Masters	4	1.0
Year of service	<5	144	36.7
	5-10	132	33.7
	>10	116	29.6
Monthly salary in ETB	Below mean (<4923.68ETB)	223	56.9
	Above mean (≥4923.68ETB)	169	43.1

Nurses' behavior related factors

Out of the total respondents, 102 (26%) chew chat, 34 (8.7%) smoke cigarette, 283 (72.2%) have problem of sleeping disturbance, 217 (72.09%) follow universal precaution guide line during working. The majority, 316 (80.61%) of them practiced needle recapping after use. On the other hand, 198 (50.5%) of respondents have inadequate knowledge about standard precaution. One hundred eighty six (47.45%) were satisfied by their job and 194 (49.49%) have job related stress (Figure 1).
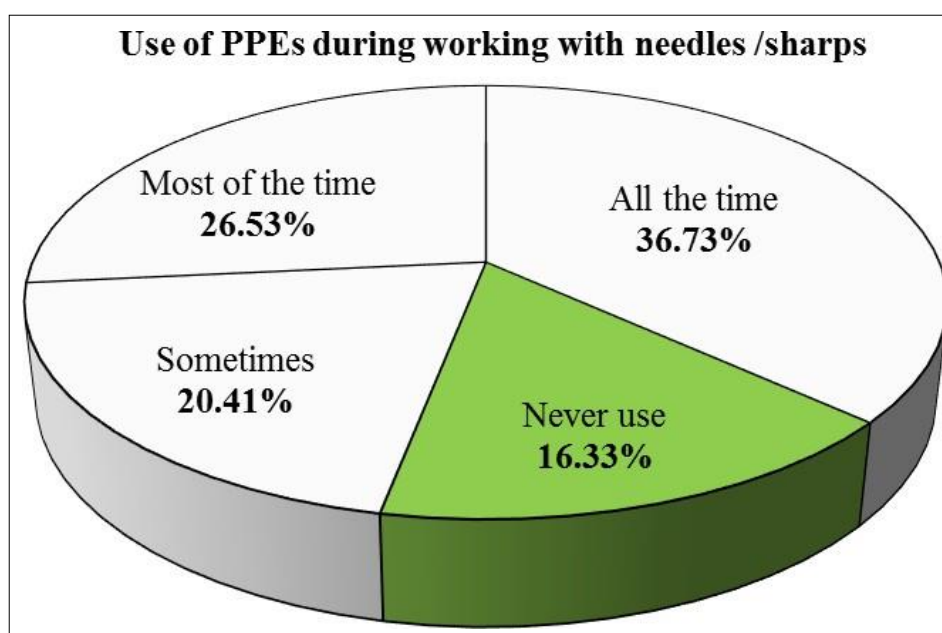

Fig 1: Distribution of nurses by use of personal protective equipments during working with needles or sharps in Dire Dawa city administration public health facilities, Eastern Ethiopia, 2018.

One hundred forty two (36.2%) of participants recap needle after use all the time, and76 (19.40%) never recap (figure 2).
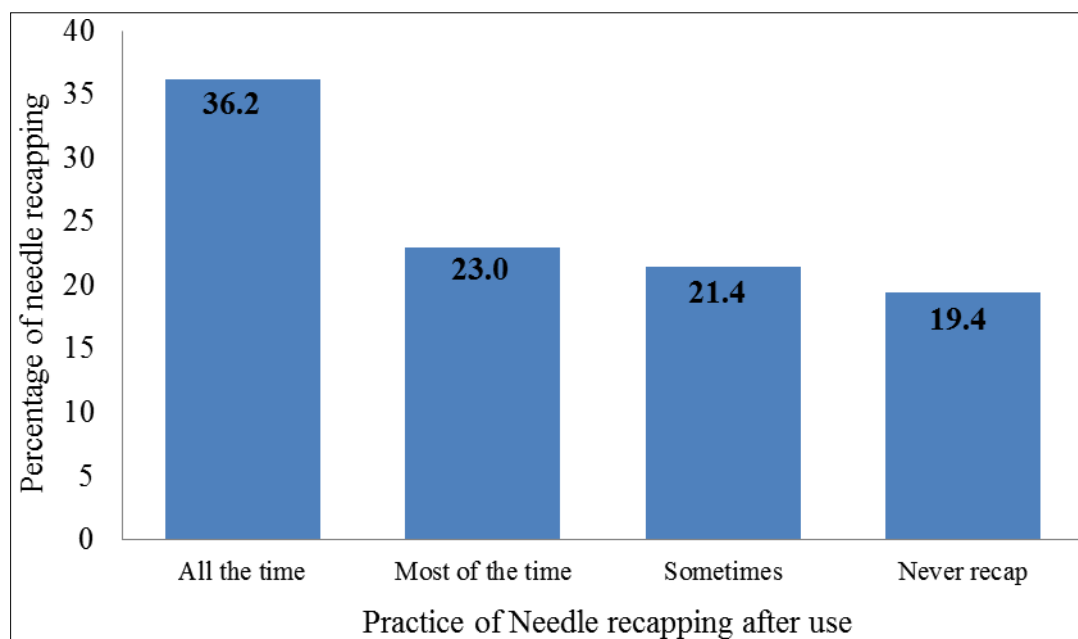
Fig 2: Distribution of nurses by recapping of needles after use in Dire Dawa city administration public health facilities, Eastern Ethiopia, 2018.

Working environment related factors

Out of the total respondents 196 (50%) had work load in their working unit and the majority, 322 (82.1%) had morning shift work. Two hundred two (51.5%) stayed for a maximum of 8 hours/shift at work and 304 (77.6%) had health and safety information access. One hundred ninety five (49.7%) got training on infection prevention and 186 (47.4%) had been supervised by the concerned bodies for the practice of infection prevention. One hundred ninetyseven (50.3%) of respondents stated that there werecontaminated needles and sharp materials at work place (Figure 3).
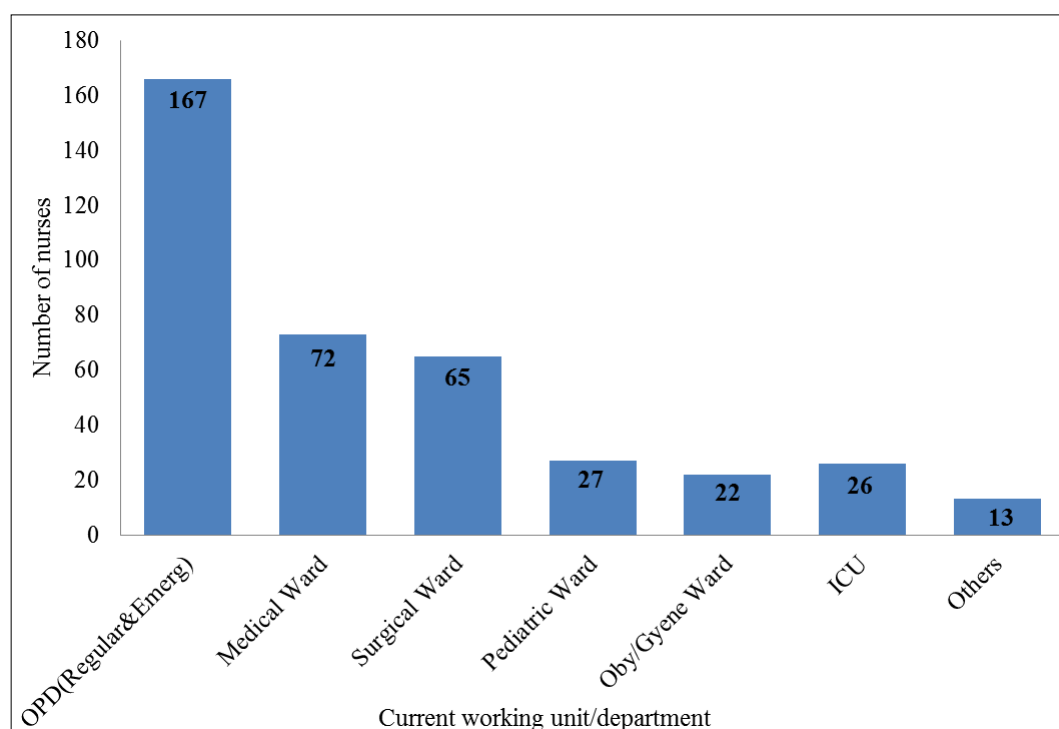

Fig 3: Distribution of nurses by assigned working unit in the last 12 months in Dire Dawa city administration public health facilities, Eastern Ethiopia, 2018.

Prevalence of needle stick and sharp injury and related attributes

From the total respondents, 122 (59.51%) had encountered needle stick and sharp injuries 1 to 2 times. Recappingneedle after use, 134 (38.73%), sudden abrupt movement of patients, 119 (34.39%) and sharp collection, 78 (22.54%) were the major activities that lead to NSSIs. Regarding the types of injuries, 138 (39.88%) were slight skin penetration and concerning the condition of needle stick/sharp injuries, 118 (57.56%) of nurses were injured by dirty needles/sharps. Ninety eight (47.84%) of injuries were from the source patients/clients of unknown health status, and

only 65 (31.71%) of cases were reported for the concerned body. The major reason for not reporting cases was due to lack of support by management, 114 (32.95%). Concerning measures taken after exposures, 118 (34.10%) of them washed with alcohol, iodine and chlorine. Two hundred seventeen (55.36%) of respondents were not vaccinated against HBV and not availability of the vaccine was the major reason for not being vaccinated, 158 (72.82%).

The major types of needles/sharps that cause injuries tonurses were intravenous needles, 112 (32.37%), intramuscular needles, 74 (21.39%) and suturing needles, 63 (18.21%).

Predictors of Needle stick and sharp injuries

In multivariate analysis, work experience or year of service (AOR= 2.36, 95%CI: 1.22, 4.59), nurses' level of job related stress (AOR=2.23, 95%CI: 1.28, 3.87), training on infection prevention (AOR= 0.52, 95%CI: 0.30, 0.89) and presence of contaminated needles and sharp materials at work place

(AOR= 2.77, 95%, CI: 1.61, 4.75) had shown statistical association with the occurrence of NSSI at $P<0.05$ (Table 2).

Those nurses who had more than 10 years of service were 2.4 times more likely to encounter NSSI as compared with nurses who had work service of less than 5 years (AOR=2.36, 95%CI: 1.12, 4.59) and nurses who had job related stress were 2.2 times more likely to experience the chance of NSSI as compared with nurses who had not job related stress (AOR=2.23, 95%CI: 1.28, 3.87). On the other hand, Nurses who were trained on IP were 48% less likely to get NSSI as compared with nurses who were not trained on infection prevention(AOR= 0.52,95% CI:0.30,0.89). Additionally, nurses who had worked in the area with the presence of contaminated needles and sharp materials were 2.8 times more likely to get the chance of needle stick and sharp injury as compared with nurses who had worked in the area which was free from contaminated needles andsharp materials (AOR=2.77,95%CI:1.61,4.75).

Table 2: Showing the association between independent variables with NSSI among nurses working in Dire Dawa city administration public health facilities, Eastern Ethiopia, 2018 (n=392).

Variables	Categories	NSSIs		COR (95%CI)	AOR (95%CI)
		Yes (%)	No (%)		
Year of service	<5	63 (30.73)	81(43.32)	1.00	1.00
	5-10	70 (34.15)	62 (33.16)	1.45 (0.90,2.33)	1.39 (0.74,2.61)
	>10	72 (35.12)	44 (23.52)	2.10 (1.28,3.47)	2.36 (1.22,4.59)***
Sex	Male	112 (54.63)	70 (37.43)	2.01 (1.34,3.02)	1.97 (0.93,4.18)
	Female	93(45.37)	117 (62.57)	1.00	1.00
Way of needle recapping practice	With both hands	96 (57.14)	54 (40.30)	1.98 (1.25,3.13)	1.54 (0.89,2.65)
	With one hand	72 (42.86)	80 (59.70)	1.00	1.00
Nurses' knowledge of standard precaution	Inadequate knowledge	120 (58.54)	78 (41.71)	1.97 (1.32,2.95)	1.41 (0.81,2.44)
	Adequate knowledge	85 (41.46)	109 (58.29)	1.00	1.00
Nurses' job satisfaction	Satisfied	119 (58.05)	67 (35.83)	2.48 (1.65,3.73)	1.95 (0.97,3.34)
	Not satisfied	86 (41.95)	120 (64.17)	1.00	1.00
Nurses' job stress level	Stressed	123 (60)	71(37.97)	2.45 (1.63,3.68)	2.23 (1.28,3.87)**
	Not stressed	82 (40)	116 (62.03)	1.00	1.00
Work load in the unit	Yes	116 (56.59)	80 (42.78)	1.74 (1.17,2.60)	1.42 (0.84,2.43)
	No	89 (43.41)	107 (57.22)	1.00	1.00
Training on IP	Yes	83 (40.49)	112 (59.89)	0.46 (0.31,0.68)	0.52(0.30,0.89)****
	No	122 (59.51)	75 (40.11)	1.00	1.00
Presence of contaminated needles/sharps at work place	Yes	129 (62.93)	72 (38.50)	2.71 (1.80,4.08)	2.77 (1.61,4.75)*
	No	76 (37.07)	115 (61.50)	1.00	1.00

*Significant with P≤ 0.001, **Significant with P=0.005, ***Significant with P=0.011, and ****Significant with P=0.018.

Discussion

This study revealed that the one year and lifelong prevalence of NSSI was 33.16% (95%CI: 29.93%, 36.01%) and 52.3% (95%CI: 47.2%, 56.8%) respectively. This study showed that year of service/work experience (95%CI: 1.22, 4.59), job related stress (95%CI: 1.28, 3.87), training on infection prevention (95%CI: 0.30, 0.89) and presence of contaminated needles and sharp materials at work place (95%CI: 1.61, 4.75) were statistically significant with the occurrence of NSSIs among nurses.

This study showed that the one year prevalence of NSSI was 33.16%; whereas a study conducted in JUSH, South west Ethiopia showed that the one year prevalence of NSSI among nurses was 44.12% [3] and a study conducted in public hospitals of Jimma Zone, South West Ethiopia also showed that the one year prevalence of needle stick injury(NSI) among nurses was 39.3% [9].

This showed that there is a difference with the current study. This difference may be due to the fact that this study was conducted among nurses working in 16 health centers and 2

hospitals (1 primary &1 referral hospital) where the number of screening, diagnostic and/ or other intervention procedures which use needles and other sharp materials maybe less in health centers and primary hospitals as compared with specialized referral hospitals. The other possible reasonmay be workload due to patient over flow in specialized referral hospitals as compared with health centers and primary hospitals.

This study is also lower than a study conducted in South Korea which showed that the one year prevalence of NSSI among registered nurses (RNs) was 70.4% [6]. This difference may be due to increased work experience/ year ofservice in addition to the above reasons.

On the other hand, the lifelong prevalence of NSSI was 52.3% in this study. This is higher than a study conducted in three hospitals, Izmir, Turkey (44.3%) [2], but lower than studies conducted in Public Sector Tertiary Care Hospitals of Pakistan (67%) [10] and JUSH, Southwest Ethiopia (61.76%) [3]. In this study, the major types of needles/sharps that cause injuries to nurses were intravenous needles,

intramuscular needles, and suturing needles (32.37%, 21.39% and 18.21%) respectively. Whereas, a study conducted in JUSH, Southwest Ethiopia had showed that IV needles, surgical blades and IM needles were the majorcauses of injury to nurses (25.6%,23.2% and 20.8%) respectively [3]. In this study, the statistical analysis showed that male nurses were more victims for NSSIs as compared with female nurses. This may be due to the fact that females are better in safety precautions as compared to males. But another study conducted in JUSH, Southwest Ethiopia showed that there was statistically significant association between nurses′ sex and the occurrence of NSSIs [3]. In this study, the occurrence of NSSIs among diploma nurses (60.14%) was the highest. This finding is in line with a study conducted in public hospitals of Jimma Zone, South West Ethiopia which showed that the highest rate of NSIs occurred among diploma nurses (40.0%) [9].

The occurrence of NSSI was the highest in the morning shift (54.29%) in this study. It may be due to the fact that patient admissions/discharges, lab investigations, and surgical management procedures are more common in the morning shift as compared with evening and night shifts. The occurrence of NSSI was also the highest among nurses who had sleeping disturbance problem (51.96%) in this study. It is due to the fact that sleeping disturbance has a significant role in exposing to needle stick and sharp injuries.

In this study, work experience/year of service showed statistically significant association with the occurrence of NSSI among nurses at $p < 0.05$. This finding is similar with studies conducted in three hospitals, Izmir, Turkey [2], and secondary care hospital, Gaza Strip [11] showed that work experience/year of service had shown statistically significant association with the occurrence of NSSI among nurses at $p < 0.05$. It is due to the fact that as year of service increases, the chance of getting NSSI also increases.

In this study, nurses who were trained on IP were 48% less likely to get the chance of NSSI as compared with nurses who were not trained on IP(AOR= 0.52,95%CI:0.30,0.89). This finding is in line with a study conducted in public hospitals of Jimma Zone, South West Ethiopia [9] showed that nurses who were trained on IP were 88% less likely to get the chance of needle stick injury (NSI) as compared withnurses who were not trained. It is due to the fact that training about IP helps to know & practice standard precaution which in turn reduces the chance of getting NSSIs.

Job related stress had statistically significant association with the occurrence of NSSIs among nurses in this study. This result is comparable with a study conducted in JUSH, Southwest Ethiopia which showed that job related stress had showed statistically significant association with the occurrence of NSSIs among nurses (Beker and Bamlie, 2015). It is due to the fact that job related stress may make nurses to be hopeless and practice their daily activities unsafely.

Presence of contaminated needles and sharp materials atwork place had statistically significant association with the occurrence of NSSIs among nurses at $P < 0.05$ in this study. This result is comparable with a study conducted in JUSH, Southwest Ethiopia which showed that presence of contaminated needles and sharp materials in the work place had showed statistically significant association with the occurrence of NSSIs among nurses at $p < 0.05$ [3]. It is due to the fact that the presence of contaminated needles and sharp materials increases the chance of getting NSSIs in their day to day activities.

Conclusion

This study revealed that the one year and lifelong prevalence of needle stick and sharp injuries among nurses working in Dire Dawa public health facilities were 33.16% and 52.3%respectively.

Generally, this study finding indicated that there is high prevalence of needle stick and sharp injuries and work experience/year of service, job related stress, training on infection prevention and presence of contaminated needles and sharp materials at work place were independent predictors of NSSIs among nurses working in Dire Dawa public health facilities.

Recommendations

1. Ministry of health, Dire Dawa health bureau, different NGOs, health facility administrators, nursing service directors and supervisors in collaboration should strengthen regular provision of health & safety information and training on IP to nurses at all levels.
2. Ministry of health, Dire Dawa health bureau, different NGOs, health facility administrators, nursing service directors and supervisors in collaboration should also strengthen their role by addressing fair & equal benefit package and chance of promotion, answering workload and other related issues raised by nurses to improve nurses′ job satisfaction.
3. All stakeholders including staff nurses should work together to identify and reduce job stressors among nurses.
4. Safety box should be available in each working unit and nurses should practice proper use of safety box in order to avoid the presence of contaminated needles and other sharp materials at work place.
5. Nurses should avoid needle recapping after use by using both hands.
6. Nurses should also use personal protective equipment (PPE) during handing and working with needles and other sharp materials in order to reduce the chance of getting NSSIs.
7. Other researchers should conduct further investigations by using other tools and study designs to identify additional factors.

Abbreviations and Acronyms

AIDS: Acquired Immune Deficiency Syndrome
AOR: Adjusted Odds Ratio
CI: Confidence Interval
CSA: Central Statistical Agency
EBN: European Biosafety Network
ENSS: Expanded Nursing Stress Scale
HBV: Hepatitis B Virus
HCV: Hepatitis C Virus
HCWs: Health Care Workers
HIV: Human Immune deficiency Virus
IHRERC: Institutional Health Research Ethics Review Committee
IP: Infection Prevention
JSS: Job Satisfaction Survey
JUSTH: Jimma University Specialized Teaching Hospital
NGOs: Non-Governmental Organization

NSSI: Needle Stick and Sharp Injury
PEP: Post Exposure Prophylaxis
PPE: Personal Protective Equipment
SPSS: Statistical Package for Social Science
VCT: Voluntary Counseling and Testing

Competing interests
We declared that we have no conflict of interests.

Consent for Publication
Consent for publication was obtained from each study participants.

Authors' contributions
Tigabu Munye: Wrote the research proposal, conducted the study, did data entry and analssis.

Bezatu Mengistie and Firehiwot Mesfin: Involved in write up of the proposal, data entry and analysis.

Solomon Demis: Involved in the proposal development, conducted the study, did data entry and analysis, prepared the final manuscript.

References
1. Jahangiri M, Rostamabadi A, Hoboubi N, Tadayon N, Soleimani A. Needle stick injuries and their related safety measures among nurses in a university hospital, Shiraz, Iran. Safety and health at work. 2016; 7(1):72-7.
2. Akyol A, Kargin C. Needle Stick and Sharp Injuries among Nurses. Glob J Nurs Forensic Stud. 2016; 1(109):2.
3. Beker J, Bamlie T. Needle stick and sharp injuries and associated factors among nurses working in jimma university specialized hospital, south west Ethiopia. Journal of Nursing & Care. 2015; 4:1-8.
4. Kumar A, Khuwaja AK, Khuwaja AM. Knowledge practice gaps about needle stick injuries among healthcare workers at tertiary care hospitals of Pakistan. Journal of Ayub Medical College Abbottabad. 2012; 24(3-4):50-2.
5. Markovic-Denic L, Maksimovic N, Marusic V, Vucicevic J, Ostric I, Djuric D. Occupational exposure to blood and body fluids among health-care workers in Serbia. Medical Principles and Practice. 2015; 24(1):36-41.
6. Cho E, Lee H, Choi M, Park SH, Yoo IY, Aiken LH. Factors associated with needlestick and sharp injuries among hospital nurses: a cross-sectional questionnaire survey. International Journal of Nursing Studies. 2013; 50(8):1025-32.
7. Vaz K, McGrowder D, Crawford T, Alexander-Lindo R, Irving R. Prevalence of injuries and reporting of accidents among health care workers at the University Hospital of the West Indies. International journal of occupational medicine and environmental health. 2010; 23(2):133-43.
8. Bekele T, Gebremariam A, Kaso M, Ahmed K. Factors associated with occupational needle stick and sharps injuries among hospital healthcare workers in Bale Zone, Southeast Ethiopia. PloS one. 2015; 10(10):e0140382.
9. Bidira K, Woldie M, Nemera G. Prevalence and predictors of needle stick injury among nurses in public hospitals of Jimma Zone, South West Ethiopia. International Journal of Nursing and Midwifery. 2014; 6(7):90-6.
10. Habib H, Khan EA, Aziz A. Prevalence and Factors Associated with eedle Stick Injuries among Registered urses in Public Sector Tertiary Care Hospitals of Pakistan, 2011.
11. Elsous A, Ouda M, Mohsen S, Shaikh MA, Mokayad S, Hamad AAR. Needle stick injuries among nurses of secondary care hospital: A cross-sectional study from Gaza Strip, 2016.