

Magnitude and Impact of Occupational Related Needle Stick and Sharp Injuries and Associated Factors among Health Care Workers in Dire Dawa, Eastern Ethiopia

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Abstract

Background: In African countries including Ethiopia occupational exposure of needle stick and sharp injuries is higher than elsewhere and it is still a major public health problem. It accounts for 86% of all occupationally related infection transmissions; expose Health Professionals to more than 20 blood borne pathogens. In Dire Dawa, Ethiopia, the magnitude of needle stick and sharp injuries and its health impacts remain unknown. In addition, available statistics underestimate the severity of the problem because most health care workers do not report their injuries.

Objective: To determine the prevalence and associated factors of needle stick and sharp injuries among health care workers of public health facilities, Dire Dawa.

Methods: A facility based cross sectional study was conducted using quantitative methods on a samples of 305 health care workers from five selected health facilities of Dire Dawa.

Results: Both the life time and the last 12 months prevalence of NSSI were 149(53.8%) and 75(26.6%), respectively. The prevalence of NSSIs among clinical nurses, laboratory technologist and midwifery was 57%, 46% and 20%, respectively. Among the 75 cases occurred in the last one year, 49(65.3%) did not report the incident due to absence of reporting protocol (53.1%), fear of isolation and/or discrimination (20.4%), too busy to report (16.3%) and that it was not important to report the incident (10.2%). Although 80% HCWs took HBV vaccine, only 45% completed the full dose. Both before (crude analysis) and after the results were adjusted for selected variables, profession of medical laboratory ($p=0.037$), sometimes use of personal protective equipment ($p=0.001$), sometimes recapping needles after use ($p=0.001$), inadequate availability of post exposure prophylaxis ($p=0.011$), and working more than 40 H a week ($p=0.009$) were factors significantly associated with occupational exposure NSSI.

Conclusion: This study revealed high prevalence of NSSIs in the study area. This suggests distribution of adequate safety materials and prophylaxis is mandatory. Exposure prevention among the HCWs must be all health facilities concern and completion of three doses of Hepatitis B must be reiterated. More importantly distribution of syringe and needles which sheath or retract after use, and replace the older one, can be cost effective intervention strategy.

Keywords: Needle stick; Sharp injury; Health professionals; Dire Dawa

Introduction

Needle-stick and sharp injury (NSSI) refers to any penetration of skin resulting from a needle or other sharp objects which prior to the exposure was in contact with blood, tissue, or other body fluid [1]. It is a common event and most prevalent within the healthcare environment. Every day health care workers (HCWs) are exposed to more than 20 dangerous and deadly blood borne pathogens through contaminated NSSIs or splash exposures [2]. According to United States Occupational Safety and Health Administration (US-OSHA), about 5.6 million HCWs in the healthcare industry are at risk of occupational exposure to blood-borne diseases via percutaneous injury [3].

It was indicated that NSSIs is responsible for 37.6% of HCWs contracting HBV, 39% HCWs contracting HCV, and 4.4% HCWs contracting HIV infection [4]. Hepatitis B infection carry the greatest risk of transmission and health impact, with 37-62% of exposed HCWs eventually show sero-conversion and 22-31% in which hepatitis B infection clinically manifests [5]. Previous study indicated that only small percentages of HCWs in Ethiopia partially vaccinated for HBV [6].

In Sub-Saharan countries exposure of NSSIs is higher than elsewhere and becoming a significant public health issue due to the

fear of occupational infections faced by ill paid, ill protected and overworked HCWs. It accounts for 86% of all occupationally related infection transmissions and causes 1000 infections per year [7,8]. The Centers for Disease Control and Prevention also estimates that HCWs sustain approximately 385,000 sharps-related injuries annually [9].

Studies conducted across Ethiopian country yielded prevalence of NSSIs, and it was 61.2% at country level [6], 35.8% in Hawassa city [10], 66.6% in Addis Ababa [11] and 31.0% in Bahir-Dar Referral Hospital [12]. It is observed from these findings that the prevalence varies with different study area and study period. On reviewing similar studies, it was also indicated that lack of injection safety training,

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Received May 04, 2018; **Accepted** May 21, 2018; **Published** May 28, 2018

Citation: Mekonnen R, Yosef H, Teklegiorgis K, Tesfaye F, Dagne I (2018) Magnitude and Impact of Occupational Related Needle Stick and Sharp Injuries and Associated Factors among Health Care Workers in Dire Dawa, Eastern Ethiopia. Med Saf Glob Health 7: 141. doi: [10.4172/2574-0407/1000141](https://doi.org/10.4172/2574-0407/1000141)

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infection prevention training, disassembling of syringe and needle, availability of safety box, and workload are the major contributing factors exposing HCWs to NSSIs [11,13]. Lack of access to appropriate personal protective equipment (PPE), or alternatively, employee failure to utilize provided equipment increases the risk of occupational NSSI [8]. The lack of knowledge also contributes to increasing incidence of NSI among HCWs. In turn, a NSI may pose a risk for a patient if the injured HCW has a blood borne illness [14].

Developing a culture of self-reporting NSSI incidence among HCWs is an important factor for understanding the magnitude and severity of the problem so as to take appropriate public health actions against the problem [15]. However, the Centers for Disease Control and Prevention estimates that HCWs sustain approximately 385,00 sharps-related injuries annually and that at least half of these injuries are unreported [9]. For instance, although 90% of the occupational exposures of NSSIs occur in the developing world, only 10% was reported [16]. This is also true in Ethiopia where available statistics underestimate the severity of the problem because most HCWs do not report their injuries [6].

In Dire Dawa Administration, Ethiopia, all health facilities do not have adequate and uniform distribution of PPE, PEP and HBV vaccine, IP committee may not be well organized and functional. On the other hand, self-reporting of NSSI incidence is poorly practiced by HCWs. So, available data about the true magnitude and severity of the problem in the study area is limited and the health impact posed by NSSIs remains unknown. In spite of this, there is no published literature and/or previously conducted research in the study area. Therefore, this study aimed to determine the prevalence and self-reporting rate of NSSIs and its associated factors among HCWs in Dire Dawa, Eastern Ethiopia.

Materials and Methods

Study area

This study was conducted in Dire Dawa Administration public health facilities. Dire Dawa is located in the eastern part of Ethiopia about 515 km away from capital Addis Ababa. It lies with a latitude and longitude of 9°36'N, 41°52'E. Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), Dire Dawa has a total population of 342,827. Of whom 171,930 were men and 170,897 women; 232,854 (69.92%) of the population are considered urban inhabitants, with an estimated area of 1,231.20 square kilometers [17]. The Administration has two public hospital, fifteen health centers and thirty-four health posts, all consisting of 307 units/departments (i.e., 253 units in health center, 23 units in hospital and 34 health posts). There are 1043 health professionals working at public health facilities, consisting of 64 Health officers, 95 Clinical Nurses, 78 Midwifery, 103 Pharmacist, 71 Laboratory Technologist, 31 Environmental Health professionals and 27 HIT and 274 different specialties. Except for the regional health bureau, it has no zonal or district health office [18].

Study design and period

A facility based cross-sectional study was conducted to assess prevalence of NSSI among HCWs working in public health facilities from June 01 to 25, 2017.

Sample size determination

Sample size (n) for this study was determined using a formula for estimating single population proportion, taking 31% prevalence of NSSI (p=0.31) from the previous study done in Bahir-Dar [12], 95% confidence interval (z=1.96) and 5% marginal error (d=0.05):

$$n = \frac{(Z_{\alpha/2})^2 \times p(1-p)}{d^2}$$
$$\frac{(1.96)^2 \times 0.31(0.69)}{(0.05)^2}$$
$$n=354$$

Since the total number of health professionals in Dire Dawa is 1043 (which is less than 10,000), sample size correction/reduction formula was used to calculate the final sample size as follows:

$$n_f = n_i / (1 + n_i / N)$$
$$n_f = 354 / (1 + 354 / 1043)$$
$$n_f = 265$$

Adding 15% contingency (40 subjects) for non-response rate, the final sample size was

$$1 / (1 - 0.1) \times n_f = 305$$

Sampling technique

First lottery methods were used to randomly select representative health facilities among the seventeen public health facilities found in the administration. Accordingly, three health centers (namely Goro, Gende-kore and Addis ketema Health Center) and two hospitals (namely Dilchora referral hospital and Sabiyan Primary hospital) were included. Then the total sample size was distributed among selected health facility proportional to their population size. Finally, using staff profiles obtained from Regional Health Bureau, Human Resource Unit, as sampling frame the study subjects were selected by simple random sampling methods.

Data collection methods

A face to face interview of the study participants using pre-tested structured questionnaires was employed to collect primary data. The questionnaire was adapted from previous study done in Bahir-Dar [12] and it was further modified based on the specific objectives of this study. Six diploma nurses from private health facilities were assigned as an interviewer. After written consents obtained from the participants, data on exposure status was asked and collected from June 01 to 25/2017.

Data quality control

The principal and co-investigators gave two days training for the data collectors. During the training the aim of the study was briefly explained and the contents of the questionnaire and data collection techniques was also clearly explained. Following this, data collection tool and technique was pre-tested on 5% of the total sample size before the start of actual data collection. The principal and co-investigators had performed the supervision of data collection procedures on daily basis and onsite assistance was also given to data collectors. The collected data was submitted on daily basis, checked for completeness at the end of data collection day.

Data analysis

All the collected data was coded, entered and cleaned using Epi-Data version 3.02. Statistical analysis was done using SPSS version 20. Descriptive statistics such as frequency, percentage and cross tabulation as well as logistic regression was used to present the finding and to identify possible factors associated with the outcome

of interest. All variables with p -value ≤ 0.2 in bivariate regression analysis were selected and adjusted (forward stepwise model). Then adjusted variables were evaluated whether individual predictor was independently significantly associated with the outcome of interest. A p -value < 0.05 was considered as level of significant.

Results

Socio-demographic characteristics of study participants

A total of 282 HCWs from public health facilities of Dire Dawa Administration were participated with response rate of 92.5%. More than half 148(52.5%) of study participants were in the age group of 20-29 years and 20(7.1%) were forty years and above. One hundred sixty-two (57.4%) participated HCWs were females. About 203(72.0%) were first degree holders and only 6(2.1%) were second degree holder. Considering profession of the study participants, 141(50%) were Clinical Nurses, 50(17.7%) Lab Tech, 11(3.9%) Medical Doctors and least 2(0.7%) were Anesthetics. One hundred sixteen (41.1%) of the study subjects had between 1 to 5 years of work experience and 129(45.7%) had salary between 2500 to 5000 Eth. Birr (Table 1).

Prevalence and impact of NSSI

As displayed in (Table 2) below, about 149(52.8%) of study participants had one or more lifetime prevalence of NSSI. Similarly, the one year prevalence of occupational NSSI incidence was 75/282(26.6%). Among the 75 cases occurred in the last one year, 49(65.3%) did not report the incident due to absence of reporting protocol (53.1%), fear of isolation and/or discrimination (20.4%), too busy to report (16.3%) and that it was not important to report the incident (10.2%). Moreover, 19/75(25.3%) HCWs did not received PEP after the incident.

Similarly, 62(82.67%) out of the 75 exposed HCWs believed that NSSI exposure affected their life and that 33(53.2%) reported their motivation of work was affected, 14(22.6%) hated their profession, 9(14.5%) were confused and depressed, and 6(9.7%) were emotionally hurt due to fear of isolation and discrimination (Table 2).

Behavioral and organizational characteristics

As displayed in (Table 3) below, majority 253(89.7%) of participated HCWs had a concern about risk of occupational NSSI, 177(62.8%) rated NSSI as highly risk and 38(13.5%) believed the risk of NSSI exposure is unavoidable. However, 22(7.8%) of study subjects responded they never use PPE and 147(52.1%) sometimes use PPE. Considering recapping of needles after use, 30(10.6%) responded they always recap and 82(29.1%) sometimes recap used needles.

Regarding availability of safety facilities, about 27(9.6%) of HCWs responded PPE is not available in their work place while 175(62.1%) responded PPE is available but inadequate. Similarly, 11(3.9%) of HCWs responded unavailability of safety box near their work station, 27(9.6%) responded PEP is not available while 146(51.8%) reported PPE is available but inadequate. On the other hand, availability of safety guidelines and NSSI reporting protocol was 147(52.1%) and 128(45.4%), respectively. Majority 197(69.9%) and 216(76.6%) of HCWs responded there was no safety and IP training in the past one year.

Two hundred fifty two (89.4%) participated HCWs responded availability of Hepatitis B vaccine in their facilities, 226(80.1%) took the vaccination but only 102(45.1%) of them took the full dose. Most 177(62.8%) of HCWs work more than 40 h a week and 125(44.3%) HCWs did not satisfy on their work environment (Table 4).

Variables	Frequency	Percentages
Age categories		
20-29 years	148	52.5
30-39 years	114	40.4
40 years and above	20	7.1
Sex		
Male	120	42.6
Female	162	57.4
Educational status		
Diploma	73	25.9
Degree	203	72
Masters and above	6	2.1
Profession/ Job		
Medical doctor	11	3.9
Clinical nurse	141	50
Midwifery	25	8.9
HO	17	6
Lab tech	50	17.7
Anesthetist	2	0.7
Others professions	36	12.8
Service year		
1-5 yrs.	116	41.1
6-10 yrs.	104	36.9
> 11 yrs.	62	22
Monthly income		
<2500 E birr	23	8.2
2500-5000 E birr	129	45.7
> 5000 E birr	130	46.1
Current working Department		
Emergency	42	14.9
Pediatrics	11	3.9
Maternity	24	8.5
OPD	41	14.5
Medical ward	29	10.3
Surgical ward	9	3.2
ICU	9	3.2
Laboratory	48	17
Others Departments	69	24.5

Table 1: General characteristics of participating health professionals working in Public Health Facilities in Dire Dawa, Eastern Ethiopia (n=282).

Bivariate and multivariate analysis

In (Table 5) below, it is indicated that 67(45.0%) of HCWs with 1-5 service years exposed to NSSI. On the other hand, 85(57%) of clinical nurse, 34(22.8%) Lab tech, 10(6.7%) Midwifery and least 1(0.7%) of medical doctors had exposed to NSSI. About 93(62.4%) HCWs sometimes use PPE and 59(39.6%) HCWs sometimes recap used needles had exposed to NSSI. About 83(55.7%), 112(75.2%) and 125(83.9%) NSSI occurred among HCWs responded lack of safety guidelines, safety and IP training, respectively. Similarly, 84(56.4%) and 78(52.3%) of NSSI occurred among HCWs working more than 40 h a week and who were not satisfied with their work environment, respectively.

On the bivariate analysis of the dependent and independent variables, service year of 6-10 years, profession of clinical nurse and lab tech, sometimes use of PPE, sometimes recapping needles after use, inadequate availability of PPE, PEP and safety box, lack of safety guideline, safety training and IP training, working more than

Variables	Frequency	Percentages
Did you ever had NSSI exposure		
Yes	149	52.8
No	133	47.2
Had NSSI incidence in last 12 Months		
Yes	75	26.6
No	207	73.4
Received medical care (PEP) and advice after your injury		
Yes	56	74.7
No	19	25.3
Did you report the injury to safety offer		
Yes	26	34.7
No	49	65.3
If no to Q 18, reason for not reporting		
Lack of awareness (didn't know where/ whom to report)	5	10.2
Fear of discrimination	10	20.4
No reporting protocol	26	53.1
Too busy to report	8	16.3
Do you think that being exposed with NSSI has brought any psychological or social impacts on your life?		
Yes	62	82.67%
No	13	17.33
If "Yes" can you mention the effects that you experienced after the exposure?		
My motivation of work has affected	33	44%
I hated my profession	14	18.67%
I was confused, depressed and started behaving differently	9	12%
I was emotionally hurt due to fear of isolation and discrimination	6	8%

Table 2: Prevalence of NSSI among participating health professionals working in Public Health Facilities in Dire Dawa Administration, Eastern Ethiopia (n=282).

Variables	Frequency	Percentages
Do you concerned about risk of NSSI		
No	29	10.3
Yes	253	89.7
How do you rate the risk of NSSI		
Not risk	9	3.2
Low risk	34	12.1
Moderate risk	62	22
Highly risk	177	62.8
Is risk of NSSI avoidable		
No	38	13.5
Yes	244	86.5
Do you know disease can be transmitted by NSSI		
Yes	265	94
No	17	6
Did you use PPE		
Never	22	7.8
Sometimes	147	52.1
Always	113	40.1
Do you recap needles after use		
Never	170	60.3
Sometimes	82	29.1
Always	30	10.6

Table 3: Behavioral response of health professionals working in Public Health Facilities in Dire Dawa Administration, Eastern Ethiopia (n=282).

Variables	Frequency	Percentages
Availability of PPE		
Not available	27	9.6
Available not enough	175	62.1
Available enough	80	28.4
Availability of safety box		
Not available	11	3.9
Available not enough	148	52.5
Available enough	123	43.6
Availability of safety guideline		
Yes	147	52.1
No	135	47.9
Availability of NSSI report protocol		
Yes	128	45.4
No	154	54.6
Availability of PEP in facility		
Not available	27	9.6
Available not enough	146	51.8
Available enough	109	38.7
Availability of safety training		
Yes	85	30.1
No	197	69.9
Availability of IP training		
Yes	66	23.4
No	216	76.6
Availability of HBV vaccine in your Facility		
Yes	252	89.4
No	30	10.6
Did you take HB vaccination		
Yes	226	80.1
No	56	19.9
if yes Q27, how many doses		
Partial	124	54.9
Full	102	45.1
Working hour per week in the department		
40 h	105	37.2
>40 h	177	62.8
Working h per day in department		
8 h	139	49.3
> 8 h	143	50.7
Satisfied on your work		
Yes	193	68.4
No	89	31.6
Satisfied on your work environment/place		
Yes	157	55.7
No	125	44.3

Table 4: Organizational variables among participating health professionals working in Public Health Facilities in Dire Dawa, Eastern Ethiopia (n=282).

40 h a week and not satisfied on their work environment showed significant association with NSSI ($p \leq 0.05$). However, when adjusted on multivariate analysis, profession of lab tech {AOR (13.4), 95%CI (1.17, 152.28); p-value (0.037)}, sometimes use of PPE {AOR (3), 95%CI (1.55, 5.86); p-value (0.001)}, sometimes recapping needles after use {AOR (3.6), 95%CI (1.69, 7.57); p-value (0.001)}, inadequate availability of PEP {AOR (2.5), 95%CI (1.24, 4.95); p-value (0.011)}, and working more than 40 h a week {AOR (0.4), 95%CI (.199, .796); p-value (0.009)} were statistically significantly associated with occupational exposure to NSSI (Table 5).

Discussion

Needle stick and sharp injuries are a common event and most prevalent within the healthcare environment and every day health professionals are exposed to dangerous and deadly blood borne pathogens through contaminated needle sticks, sharps, or splash exposures [2]. The finding of this study indicated that life time prevalence of one or more NSSI among HCWs was 52.8%. This was higher compared with reported prevalence of 23.5% (19), 35% (20), 31.0% in Bahir-Dar Referral Hospital [12], and 35.8% in Hawassa city [10]. Possible reasons include lack of adequate PPEs, non-adherence to standard precautions as well as study time differences. Other reasons might be due to the absence of trainings and safety guidelines that advocate for proper patient and self-care.

Similarly, one year prevalence of NSSI was 26.6% which is higher than the study conducted in New York 13.8% [19-21]. However, our finding is comparable to the reported prevalence of 22.2% in the study conducted in Gojjam [22] and 31.0% in Bahir-Dar Referral Hospital [12]. This comparability might be due to having relatively similar socio-demographic characteristics and geographical location.

Needle sticks and sharp injuries case reports are an important factor in the improvement of protection against the problem [15]. Low reporting rate of NSSI is a great danger for HCWs, even though it is due to the lack of awareness [23]. This study revealed that, in the past 12 months more than half (65.3%) of HCWs did not report their injury to concerned body and this was similar with other study findings where 51% of NSSI exposures were not reported [20,21]. The major reasons of the HCWs that affected self-reporting was due to absence of reporting protocol (53.1%), fear (20.4%), too busy to report (16.3%) and that it was not important to report the incident (10.2%) which is supported by a similar study where time limitation and lack of information on reporting were reasons for not reporting [21].

The lack of knowledge, access or failure to use appropriate practice in the form of personal protective equipment contributes to increasing incidence of NSI among HCWs [14]. In this study 94% participated HCWs had the knowledge that diseases can be transmitted by NSSI and 86.5% believe NSSI is avoidable by adherence with safety precaution, but 59.9% HCWs did not always use PPE and 39.7% recap needles after use. This shows that HCWs had good knowledge about risk of

Variables		NSSI Exposure		COR (95%CI)	AOR (95%CI)	P-value
		Yes (%)	No (%)			
Service year	1-5 years	67(45.0%)	49(36.8%)	1 ^R	1 ^R	
	6-10 years	44(29.5%)	60(45.1%)	.54(.31, .92)*	.48(.223, 1.049)	.066
	>11 years	38(25.5%)	24(18.0%)	1.2(.62, 2.17)	1.2(.522, 2.81)	.657
Profession	GP	1(0.7%)	10(7.5%)	1	1	
	C. Nurse	85(57.0%)	56(42.1%)	15.(1.9,121.8)*	10.3(.98, 108.03)	.052
	Midwifery	10(6.7%)	15(11.3%)	6.7(.73,60.5)	2.8(.226, 34.67)	.422
	HO	5(3.4%)	12(9.0%)	4.2(.42,41.8)	2.2(.162, 30.95)	.548
	Lab tech	34(22.8%)	16(12.0%)	21.5(2.5,180.5)*	13.3(1.17,152.3)	.037
	Anesthetic	1(0.7%)	1(0.8%)	10(.3,315.3)	8.9(.202, 395.9)	.257
	Other HP	13(8.7%)	23(17.3%)	5.6(.65,49.3)	1.3(.108, 15.86)	.834
Use of PPE	Never	10(6.7%)	12(9.0%)	1.2(.48,3.04)	1.2(.374, 4.21)	.712
	Sometimes	93(62.4%)	54(40.6%)	2.5(1.5,4.2)*	3.0(1.55, 5.86)	.001
	Always	46(30.9%)	67(50.4%)	1	1	
Recapping of used needle	Never	72(48.3%)	98(73.7%)	1	1	
	Sometimes	59(39.6%)	23(17.3%)	3.5(1.97,6.2)*	3.5(1.67, 7.57)	.001
	Always	18(12.1%)	12(9.0%)	2.0(.92,4.5)	1.6(.572, 4.52)	.368
Availability of PPE	Not available	15(10.1%)	12(9.0%)	1.7(.7,4.1)	1.2(.362, 4.15)	.743
	Available not enough	100(67.1%)	75(56.4%)	1.8(1.05,3.08)*	1.3(.613, 2.83)	.479
	Available enough	34(22.8%)	46(34.6%)	1	1	
Availability of safety box	Not available	9(6.0%)	2(1.5%)	6.3(1.32,30.6)*	6.3(.828, 48.05)	.075
	Not adequate	89(59.7%)	59(44.4%)	2.1(1.31, 3.46)*	0.7(.345, 1.422)	.324
	Available enough	51(34.2%)	72(54.1%)	1 ^R	1 ^R	
Reporting protocol	Yes	61(40.9%)	67(50.4%)	1 ^R	1 ^R	
	No	88(59.1%)	66(49.6%)	.68(.43, 1.09)	1.3(.614, 2.67)	.510
Safety guideline	Yes	66(44.3%)	81(60.9%)	1 ^R	1 ^R	
	No	83(55.7%)	52(39.1%)	.5(.31,.82)*	.54(.257, 1.141)	.107
Safety training	Yes	37(24.8%)	48(36.1%)	1 ^R	1 ^R	
	No	112(75.2%)	85(63.9%)	.58(.35,.98)*	.73(.352, 1.530)	.409
IP training	Yes	24(16.1%)	42(31.6%)	1 ^R	1 ^R	
	No	125(83.9%)	91(68.4%)	.42(.23,.73)*	.55(.243, 1.251)	.154
Availability of PEP	Not available	11(7.4%)	16(12.0%)	.97(.42,2.3)	.67(.22, 2.10)	.737
	Available not enough	93(62.4%)	53(39.8%)	2.5(1.5,4.2)*	2.5(1.24, 4.96)	.011
	Available enough	45(30.2%)	64(48.1%)	1 ^R	1 ^R	
Working hour per week	40 hours	65(43.6%)	40(30.1%)	1 ^R	1 ^R	
	>40 hours	84(56.4%)	93(69.9%)	.56(.34,.91)*	.4(.199, .796)	.009

* is p-value<0.005

Table 5: Bivariate and multivariate analysis of associated factors of NSSI among HCWs Working in Public Health Facilities in Dire Dawa, Ethiopia (n=282).

NSSI, but have poor practice of safety precaution. This is supported by a similar study in Malaysian Hospital where 66.1% HCWs had the misconception that needles should be recapped after use [19].

It was reported that higher rates of hepatitis B vaccination among the general public and HCWs alike have reduced the risk of transmission [8]. In this study, reported availability of HBV vaccine in the facility was 89.4% and 80.1% of HCWs took the vaccine, but only 45% completed the full dose. This finding is similar with previous study that only small percentages of HCWs in Ethiopia partially vaccinated for HBV [6]. This is an alarming medical and public health issue.

Job category is an important risk factor for blood born pathogen exposures. A study conducted in Malaysia reported statistically significant association between NSSIs and job categories ($p=0.03$) [19]. This study reveals 57% clinical nurse, followed by 22.8% Lab tech and 6.7% Midwifery exposed to NSSI which is similar with the finding of other studies where 27.9% and 39% staff nurses had the highest prevalence [19,24]. Moreover, medical laboratory professionals had 14 times higher incidence of NSSI {AOR (13.4), 95%CI (1.17, 152.28); p -value (0.037)} than medical doctors. The possible reason for our finding may be due to the fact that Lab Tech in this study area have more contact with needles and other sharp materials during routine blood collection, processing and analysis activities.

Effective measures to prevent infections from occupational exposure of HCWs to blood include immunization against HBV, eliminating unnecessary injections, implementing Universal Precautions, eliminating needle recapping and disposing of the sharp into a sharps container immediately after use, use of safer devices, provision and use of PPE, and training workers in the risks and prevention of transmission [25]. About 62.4% NSSI occurred among HCWs who failed to use PPE and they had 3 times higher NSSI exposure {AOR [3], 95%CI (1.55, 5.86); p -value (0.001)} than HCWs who always use PPE. Similarly, 39.6% NSSI occurred among HCWs sometimes recap used needles and they had 3.6 times more NSSI exposure {AOR (3.6), 95%CI (1.69, 7.57); p -value (0.001)} than HCWs who never recap used needles. This finding is supported by similar study reported significant association of NSSI with disassembling of syringe and needle (AOR=5.380, 95% CI: 2.684, 10.785) (11), (AOR 1.55, 95% CI 1.09-2.204) [13]. This might be due to the fact that increased risk of injury when recapping needle after use. Other reasons could be that applying universal precautions can act as a barrier from exposure to blood and body fluid.

Post-exposure prophylaxis with antiretroviral medications can reduce the risk of HIV transmission by 80% [26]. According to the study by Gershon [21] 70% of the exposed nurses did not get PEP, which is comparably higher than our findings of 25.3% exposed HCWs did not received PEP after injury. However, HCWs working in lack of access and availability of PEP were 2.5 times more likely to be exposed {AOR (2.5), 95%CI (1.24, 4.95); p -value (0.011)} than HCWs working in enough available PEP.

Previously conducted studies showed that sharp injury was associated with having infection prevention training (AOR=0.299, 95% CI: 0.177, 0.504) [11] and learning about infection prevention (AOR 0.44, 95% CI 0.17-1.17) [13]. Although significant association was not observed in our study, about 55.7%, 75.2% and 83.9% NSSI occurred among HCWs working without safety guidelines, safety and IP training, respectively.

Similarly, 56.4% NSSI occurred among HCWs working more than 40 h a week. Accordingly, HCWs working more than 40 H a week were 60% more likely to have NSSI {AOR (0.4), 95%CI (.19, .79); p -value

(0.009)} than HCWs working only 40 hours a week. This finding is supported by similar study where significant association was found between rates of NSSI with working hours [21]. Possible reasons could be HCWs in this study area usually had long working hour (14 H a day including night time duty) which is stressful and lengthy working hour that might lead them to be exposed to NSSI. It has also been observed that the stress at work place can also put HCW at increased risk for NSSIs [14].

Conclusion

The life time prevalence of one or more NSSI among HCWs was found to be high in the study area. One year prevalence of NSSI was also comparably higher. Clinical nurse, Lab tech and Midwifery were most frequently exposed. There was under reporting rate of NSSI incidence by HCWs. The major reason includes lack of access of reporting protocol, fear of isolation and/or discrimination, too busy to report and that it was not important to report the incident. This represents a missed opportunity for initiating post exposure prophylaxis, early detection of seroconversion and implementation of prevention strategies. Moreover almost all exposed HCWs had experienced psychological and social impacts on their life, so further psychological treatments and follow up mechanisms should be initiated.

There was inadequate availability of PPE, PEP, safety box, safety guidelines and reporting protocol in most facilities. On the other hand, adherence to universal safety precaution was not strictly practiced by most HCWs. There still exist a large gap between their knowledge, attitude and practice of the universal work precaution.

Although HBV vaccine is available and accessible in their facilities, most HCWs only partially vaccinated. This means that they remains at risk for HBV infection and might be a source of infection transmission, exposing their patients and beloved families to dangerous and deadly blood borne pathogens.

Profession of medical laboratory, irregular use of PPE, sometimes recapping of needles, inadequate availability of PEP, and working >40 h a week had statistical significant association with exposure to NSSI and found to be independent predictors for NSSI exposure.

Recommendations:

For HCWs:

- HCWs must develop a culture of self-reporting NSSI incidents as poor reporting can under estimate the severity of problem and can shift the attention of health planners toward other priority problem.
- Every HCWs must be aware of their responsibility for NSSI exposure prevention.
- Completion of three doses of Hepatitis B must be reiterated and HCWs must also be aware of their antibody status.
- Clinical nurse, Lab tech and Midwifery should give due emphasis to avoid risk of NSSI incidence by adherence with universal safety precaution.

For Health Facilities:

- IP committee should be strengthened in all facilities.
- Exposure prevention among the HCWs must be all health facilities concern.

- Health facilities should avail PPE and make accessible in every department.
- Incident report protocol and safety guideline must be available and accessible to the staffs.
- Since exposed HCWs complaints psychological and social impact, psychological treatment must be provided and follow up mechanisms should be designed.

For DD-RHB:

- Regular Safety and IP training for HCWs is mandatory.
- Effective intervention aimed at decreasing incidence of NSSI must be planned and implemented.
- Since the prevalence is higher in this study area, DD-RHB should organize a strong IP task force which will follow and evaluate facility's IP committee and also invite NGOs and other stakeholders working in IP area.

For FMOH:

- Since comparably higher prevalence of NSSI was noticed across the country, we recommend the FMOH to regularly distribute auto-jack needles (needles that sheath or retract after use) and replace the older one.

Acknowledgement

The authors are grateful to the study participants, data collectors and health facility authorities.

Authors' Contributions

RM was major contributor designed the study, participated in the data collection, analysis, interpretation and write-up, drafted the manuscript and critically revised the manuscript. HY, KT and FT participated in the study design, interpretation and write-up, ID participated in the data analysis and drafting the manuscript. All authors read and approved the final manuscript.

Funding

The present study received no funding from any source other than Dire Dawa University, Ethiopia.

Conflict of Interest

All authors declare no conflict of interest.

Ethical Approval

Ethical clearance was obtained from Social and Public Health Research Ethics Review Committee, College of Medicine and Health Sciences, Dire Dawa University. Signed consent was obtained from Dire Dawa Regional Health Bureau, head of the health facilities and participated health professionals.

References

1. The National Surveillance System for Healthcare Workers (NaSH) (2007) Summary Report for Blood and Body Fluid Exposure.
2. Leigh JP, Gillen M, Franks P, Sutherland S, Nguyen HH, et al (2007) Costs of needle stick injuries and subsequent hepatitis and HIV infection. *Curr Med Res Opin* 23: 2093-2105.
3. Kirchner B (2012). Safety in ambulatory surgery centers: Occupational safety and health administration surveys. *AORN Journal* 96: 540.
4. Nagandla K, Kumar K, Bhardwaj A, Muthalagan D, Yhmin C, et al (2015). Prevalence of needle stick Injuries and their under-reporting among health care workers in the departments of obstetrics and gynaecology. *Inter Arc of Med* 8.
5. Anderson JM (2008) Needle stick injuries: Prevention and education key (Clinical report). *Journal of Controversial Medical Claims*; 15:12.
6. Desalegn Z, Gebreselassie S, Asemamaw Y (2015) Epidemiology of needle stick-sharp injuries (NSSIs) and potential high risk exposures among health professionals in Ethiopia: Neglected public health concern. *Amer Jou of Health Research* 3: 298-304.
7. Singru SA, Banerjee A (2008) Occupational exposure to blood and body fluids among health care workers in a teaching hospital in Mumbai, India. *Indian J Community Med* 33: 26-30.
8. Tarigan LH, Cifuentes M, Quinn M, Kriebel D (2015) Prevention of needle-stick injuries in healthcare facilities: A meta-analysis. *Infection Control and Hospital Epidemiology* 36: 823.
9. CDC (2010) Sharps injuries stop sticks campaign. Centers for Disease Control and Prevention; National Institute for Occupational Safety and Health.
10. Beyene H, Desalegn Yirsaw B (2014) Occupational risk factors associated with needle-stick injury among healthcare workers in Hawassa City, Southern Ethiopia. *Occup Med Health Aff* 2: 156.
11. Berhanu EF (2013) Prevalence and determinant factors for sharp injuries among Addis Ababa hospitals health professionals. *Science Journal of Public Health* 1: 189-193
12. Walle L, Abebe E, Tsegaye M, Franco H, Birhanu D, et al (2013) Factors associated with needle stick and sharp injuries, among healthcare workers in Felege Hiwot Referral Hospital, Bahir Dar, Northwest Ethiopia: Facility based cross-sectional survey. *Inter Jou of Infec Control* 9:1-9.
13. Yeshitila M, Mengistie B, Demessie A, Godana W (2015) Prevalence and associated factors of needle stick injury among nursing and midwifery students at Haramaya and Jigjiga University, Eastern Ethiopia. *Primary Health Care* 5: 186.
14. Combined tool for assessing the safety of injections, suturing, phlebotomy, intravenous access (insertion of IV and piggybacks) and needle stick injury prevention strategy among healthcare workers (injection providers and healthcare waste handlers) (2005) Tool for the Assessment of injection safety (Who7V&B/01.30) under WHO project to prevent needle stick injury and HIV transmission among health care workers.
15. Thomas W, Murray J (2009) The incidence and reporting rates of needle-stick injury amongst UK surgeons. *Annals of the Royal College of Surgeons of England* 91: 12.
16. Sagoe CM, Pearson JD, Perry J, Jagger J (2001) Risks to health care workers in developing countries. *N Engl J Med* 345: 538-539.
17. CSA (2007) Central Statistics Agency, Ethiopia
18. <http://www.ethiopia.gov.et/statediredawa>
19. Lekhray R, Rosidah Z, Azhar Md, Leong W (2010) Needle stick and sharps injuries and factors associated among health care workers in a Malaysian Hospital. *Euro Jou of Social Sci* 13.
20. Quinn MM, Markkanen PK, Galligan CJ, Kriebel D, Chalupka SM, et al. (2009) Sharps injuries and other blood and body fluid exposures among home health care nurses and aides. *Amer Jouof Public Health* 3:710.
21. Gershon RR, Qureshi KA, Pogorzelska M, Rosen J, Gebbie KM, et al. (2007) Non-hospital based registered nurses and the risk of blood borne pathogen exposure. *Industrial health* 45:695-704.
22. Aderaw Zewdie (2013) Assessment on magnitude of needle stick and sharp injuries and associated factors among health care workers in East Gojjam Zone Health Institutions, Amahara Regional State, Ethiopia. *Global Journal of Medical Research Diseases* 13: 1-11.
23. Shokuhi S, Gachkar L, Alavi-Darazam I, Yuhanaee P, Sajadi M (2012) Occupational exposure to blood and body fluids among health care workers in teaching hospitals in Tehran, Iran. *Iranian Red Crescent Medical Journal* 14: 402
24. Butsashvili M, Kamkamidze G, Kajaia M, Morse DL, Triner W, et al. (2012) Occupational exposure to body fluids among health care workers in Georgia. *Occupational Medicine (Oxford, England)* 62: 620-626.
25. World Health Organization (2003) Aide-Memoire for a Strategy to Protect Health Workers from Infection with Bloodborne Viruses. Geneva, Switzerland: WHO.
26. Susan Q, Wilburn BSN, Eijkemans G (2004) Preventing needlestick injuries among healthcare workers: A WHO-ICN collaboration. *Int J Occup Environ Health* 10: 451-456.