

## Needle Stick and Sharp Injuries and Associated Factors among Nurses Working In Jimma University Specialized Hospital, South West Ethiopia

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### Abstract

**Introduction:** Needle Stick and Sharp Injuries (NSSIs) are the commonest route by which blood borne infections such as HIV, HBV and HCV can transmit. Such infections serve as high occupational risks and threats to health professionals. The objective of this study was to assess the prevalence of Needle stick and sharp injuries and associated factors among nurses working in Jimma University Specialized Hospital, South West Ethiopia.

**Methods:** An institutional based cross sectional study design was employed among nurses with at least one year work experience in Jimma University Specialized Hospital from March 31 to April 04, 2014. A total of 173 study subjects were selected using simple random sampling technique from sampling frame using lottery method. Data was collected using pretested English version questionnaire through self-administered interview. To maintain the quality of data pretesting and supervision of data collection process was done. The collected data were checked for completeness, edited and entered into EpiData version 3.1 and exported to SPSS version 21.00 for analysis. To explain the study variables descriptive statistics was used. Association between dependent and independent variables was calculated using chi square test. P-value of less than 0.05 was considered as significant association.

**Results:** Out of the total 173 study subjects, 170 were included in the final analysis and giving a response rate of 98.3%. Majority of the study subjects 95 (55.88%) were female nurses. This study indicates that nurses' sex, monthly salary, marital status, work experience, working Unit/department/, training on IP and patient safety, presence of contaminated needle and sharps materials in the working area, job satisfaction, level of job stress on nurse respondents, use of personal protective and gloves during the practice work by needles/sharps and recapping of needles after use had significant association with the occurrence of sharp and needle stick injury in nurses. In general this study revealed that no single factor accounted for the occurrence of NSSIs.

**Conclusion and recommendation:** This study demonstrated a relatively high prevalence of NSSIs among nurses of JUSTH. The high prevalence of NSSIs highlights the need for developing effective preventing strategies. Training of nurses should be emphasized and essential in preventing high NSSIs risks in the hospital.

**Keywords:** Needles stick and sharp injuries; Nurses; Jimma University Specialized Hospital

### Introduction

Needle stick and sharp injuries (NSSIs) are accidental skin penetrating wounds caused by sharp instruments in a health care setting. This occurs when health professionals perform their clinical activities in the health institutions such as hospitals, health centres and clinics. As a result of this, they are exposed to blood borne infections by pathogens such as blast mycosis, crypto mycosis, diphtheria, Ebola, gonorrhoea, hepatitis B, hepatitis C, HIV/AIDS, strep pyogens, tetanus, herpes, malaria, tuberculosis, syphilis, toxoplasmosis, leptospyrosis, rocky mountains, spotted fever, scrub typhus, streptococcal infection, staphylococcal. Among these diseases Hepatitis B, Hepatitis C and HIV/AIDS are at most concern because they can cause significant morbidity or death [1].

According to the national institute of occupational safety and health study the design of device can increase the risk of injury such as devices with hollow bore needles, needle devices that need to be taken

apart or manipulated by the health care worker like blood drawing devices that need to be detached after use, syringes that retain a exposed needle after use [2].

The activities that expose nurses to NSSIs includes recapping after use, handling specimens, collision between health care workers or sharps during clean up manipulating needles in patient line related work, passing handling devices or failure to dispose of the needle in puncture proof containers [3].

The World Health Organization (WHO) estimated that global disease burden from contaminated sharp injuries to nurses professional at the work place covered; occupation, environment, life style, diet, health practices and substance abuse. According to this report every year hundreds of thousands of HCWs are exposed to deadly viruses such as HBV, HCV, and HIV as a result of needle stick and sharp injuries. These preventable injuries expose workers to over twenty different blood borne pathogens and results in an estimated 1,000 infections per year, the most common being HBV, HCV and HIV [2].

NSSIs have significant indirect consequences in health care delivery for nurses especially in the developing countries, where already the qualified nurse professional are limited with respect to the disease burden in the population. These injuries not only potentiate health consequences but also cause emotional distresses which results in missed work days and directly affects the health care services and resources.

A study done by Lihan and Durkan showed that the percentage of nurses experiencing needle stick injuries during the year professionals' time was 79.7% and the incident of body fluid exposure in one year was 68.4%. Age less than 24 years, less than four years of nursing work experience, working in surgical intensive care unit and working for more than eight hours per day were the factors identified to increase needle stick injuries [4]. In developing country like Ethiopia where the basic rules of occupational safety and health is implemented poorly the prevalence NSSIs related infections among nurse professional increase dramatically.

Strategies are available to prevent infections due to NSSIs including education of nurses on the risks and precautions, reduction of invasive procedures, use of safer devices and management of exposures. In industrialized world occupational surveillances assess and monitor the health hazards related to blood borne pathogens and prevention measures which reduce the risk of transmission [5]. In contrast to this, in Ethiopia exposure and health impacts are rarely monitored and much remains to be done to protect nurses from such risks that cause infections, illnesses, disability and death that may intern impact on the quality of health care. This study would be the baseline for further related studies for nursing and other professions. Farther more, the result of the study will be helpful for Local health planners and Local health departments for improving the risk of infections due to NSSIs among nurses.

## Methods and Subjects

### The study setting

An institutional based cross sectional study was conducted among nurses who were worked in Jimma University Specialized Hospital, Jimma, Ethiopia. During the study period, there were 387 nurses who worked at JUSH. The data were collected over a period of 15 days (from March 31-April 15, 2014 G.C).

### Population

All randomly selected nurses in Jimma University Specialized Hospital were included by considering both inclusive and exclusive criteria. Based on this staff nurses who were worked for at least one year in JUSTH were included in the study however those of Staff nurses who were critically ill during study period and Staff nurses who were under sick leave, delivery leave and annual leave during study period were excluded.

### Sample size

The sample size for this study was calculated using the single population proportion formula:

$$ni = \frac{(z\alpha/2)^2 \times p(1-p)}{d^2}$$

Where n=Sample size (the desired sample size)

$Z \alpha/2$ =Standard normal deviation, set at 1.96, to correspond to the 95% confidence interval

p=Prevalence of NSSIs among health care workers was 22% (30).

q=1.0-p

d=Margin of error/an absolute precision=5%=0.05

$$ni = \frac{((1.96)^2 \times 0.22(1-0.22))}{(0.05)^2}$$

$ni=264$

For population less than 10,000 populations we use the following correction formula.

$$nf = ni/1 + (ni/N) = 264/1 + 264/387 = 157$$

Where, nf=the desired sample size when the population is <10,000.

ni=the desired sample size when the population is >10,000.

N=the estimate of the population size who are worked for at least one year (387).

- By considering 10% non-response rate; the total final sample size was 173.

### Sampling technique

The sample size was selected using simple random sampling technique from sampling frame using lottery method.

### Data collection technique

Data was collected from the study individuals using self-administered questionnaire which consists of description on socio-demographic characteristics, behavioral characteristics, and environmental characteristics of the respondents. Data was collected by four trained B.Sc. Nurses.

### Data quality control

Five percent of the questionnaires were pre- tested in Bedelle Hospital to assess the reliability, clarity, sequence, consistency and understandability and the total time it takes to finish the questionnaire before the actual data collection. Then after, the necessary comments and feedbacks were incorporated in the final tool.

### Data analysis and presentation

Data were checked for completeness, edited and entered into EpiData version 3.1 and exported to SPSS version 21.00 for analysis. Chi-squared test was done to see the association between important baseline variables and outcome variable. P-value of less than 0.05 was considered as significant association.

### Ethical considerations

Ethical clearance and approval to conduct the research was obtained from Jimma University College of health science, Ethical Review Board. Then a letter was secured from the university to respective hospital management to gain support for the study. Prior to administering the questionnaires, the aims and objectives of the study were explained to the participants and personal consent was also being obtained from study participant after explaining the objective of study.

They were also told that participation is voluntarily and confidentiality and anonymity will be ensured throughout the execution of the study as participants are not required to disclose personal information on the questionnaire.

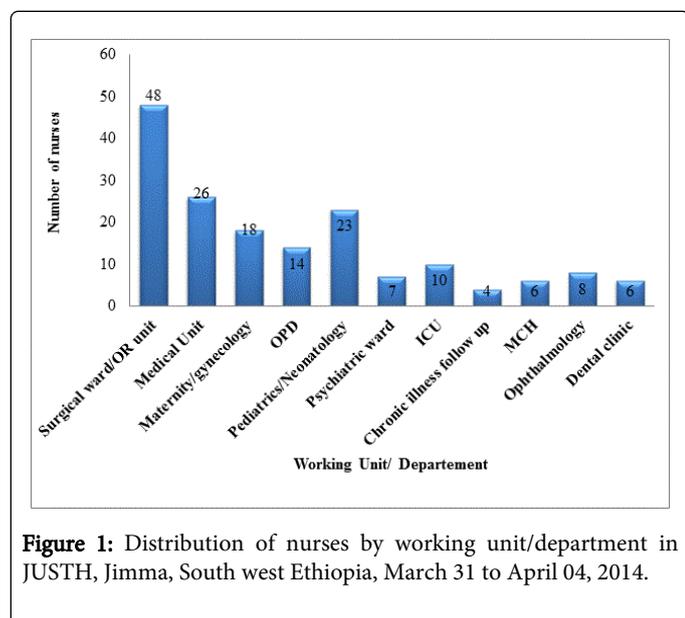
## Result

A total of 173 study subjects participated in the study. Three of them were excluded due to the incomplete filling of the questionnaires. Thus, 170 study subjects were included in the final analyses giving a response rate of 98.3%.

From the total respondents 95 (55.88%) were female nurses while 75 (44.12%) were male nurses and 56 (32.94%) were between age of 25-29 with the mean age of 29.56 years (SD 8.1 years). Seventy two (42.4%) were Orthodox Christians followed by Protestant which accounts 51 (30%). In the context of ethnicity 105 (61.70%) were Oromo followed by Amhara which accounts 32 (18.82%). In the marital status condition of nurse, 95 (53.53%) were single followed by married which accounts 66 (38.82). One hundred fifteen (67.65%) nurses have work experience of 1-5 years with the mean work experience of 5 year (SD 6.6 years). Majority to the study subjects 99 (58.23 %) were clinical nurses by profession.

### Working environment characteristics

Out of the total nurses working in JUSTH, majority 48 (28.24%) were working in surgical/OR unit and 26 (15.29%) worked in medical units followed by pediatric/neonatology unit which accounts 23 (13.53%) (Figure 1).



**Figure 1:** Distribution of nurses by working unit/department in JUSTH, Jimma, South west Ethiopia, March 31 to April 04, 2014.

From the total respondents, one hundred fifty (88.24%) had night shift work in the hospital, 122 (71.76%) had got information about health and safety information access, only 39 (22.94%) had got training on infection prevention and patient safety in the last one year prior to the study and 90 (52.94%) had been supervised by the concerned body on the application of infection prevention. 123 (72.35%) have safety box in their working rooms to dispose infectious wastes including needle stick and sharp materials and 75 (44.12%) of

the respondents had reported that there are contaminated needle stick and sharp materials around their working area (Table 1).

Variable	Response	Frequency	Percent
Night shift work	Yes	150	88.24
	No	20	11.76
Health and safety information access	Yes	122	71.76
	No	48	28.24
Training on IP and patent safety	Yes	39	22.94
	No	131	77.06
Supervision by others in working room	Yes	90	52.94
	No	80	47.06
Presence of contaminated needle and sharps materials in the working area	Yes	75	44.12
	No	95	55.88
Presence of safety box in the room for used needles	Yes	123	72.35
	No	47	27.65
Condition of safety box in the working unit	Over filled	53	43.09
	Turnout	42	34.15
	Empty	28	22.76
	Total	123	100

**Table 1:** Showing working environment of nurses working in JUSTH, Jimma, South west Ethiopia, March 31-April 04, 2014.

### Nurses behavior related attributes

From the total respondents, 28 (16.47%) chew khat, 11 (6.47%) smoke cigarettes, 69 (40.59%) have a problem of sleeping disturbance during work time. 93 (54.71%) of the workers were satisfied by their job and 91 (53.53%) have job related stresses. Majority of them 147 (86.47%) believe that needle stick and sharp injury is a preventable problem and they believes that nurses have high risk to NSSIs 96 (56.47%) (Table 2).

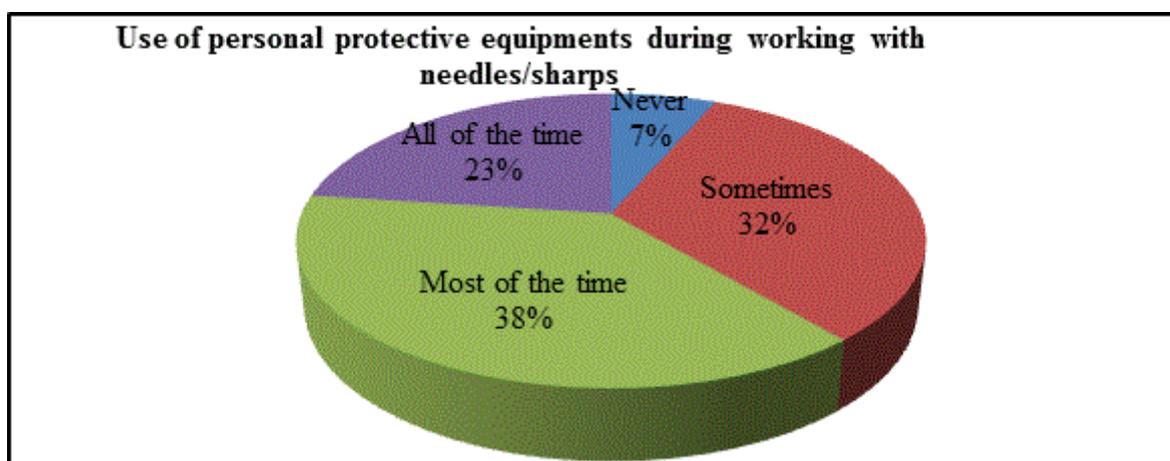
Variable	Category	Frequency	Percent
Chat chewing	Yes	28	16.47
	No	142	83.53
	Total	170	100
Cigarette smoking	Yes	11	6.47
	No	159	93.53
	Total	170	100
Sleeping disturbance	Yes	69	40.59
	No	101	59.41
	Total	170	100

Belief on preventability of Needle stick/sharp injuries	Yes	147	86.47
	No	23	13.53
	Total	170	100
Belief on risky nature of nurses to needle stick/sharp injuries	High risk	96	56.47
	Moderate risk	46	27.06
	Low risk	28	16.47
	Total	170	100
Job satisfaction level of nurse respondents	Dissatisfied	77	45.29
	Satisfied	93	54.71

Level of job stress on nurse respondents	Total	170	100
	Not stressed	79	46.47
	Stressed	91	53.53
Total	170	100	

**Table 2:** Showing behavior related attributes of nurses working in JUSPH Jimma South west Ethiopia March 31-April 04, 2014.

Related to PPE usage, 65 (38.24%) of the study subjects used most of the time, 55 (32%) sometimes, 39 (23%) all of the time and 11 (7%) never used PPE (Figure 2).

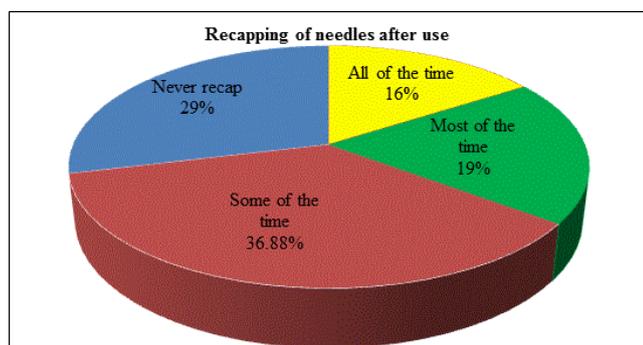


**Figure 2:** Distribution of nurses by use of personal protective equipments during working with needles/sharps in JUSTH, Jimma, South west Ethiopia, March 31-Aril 04, 2014.

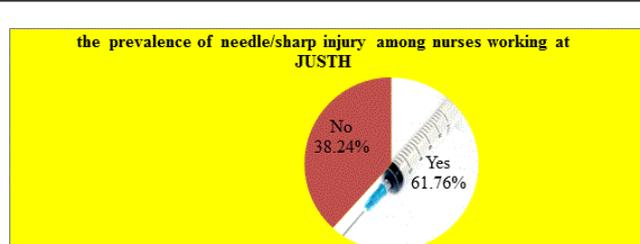
On recapping of needles after use, 61 (35.88%) of the respondents recap needles sometimes, 49 (28.83%) never recap, 33 (19.41%) recap most of the time and 27 (15.88%) recap all of the time (Figure 3).

### Prevalence of needle stick and sharp injury

The prevalence (occurrence) of needle stick and sharp injury to nurses in JUSTH was 61.76% (105) (Figure 4).



**Figure 3:** Distribution of nurses by recapping of needles after use in JUSTH, Jimma, South west Ethiopia, March 31-April 04, 2014.



**Figure 4:** The prevalence of needle/sharp injury among nurses working at JUSTH, Jimma, South west Ethiopia, March 31-April 04, 2014.

The frequency of needle stick and sharp injury 1-2 times was 53 (50.48%), 3-4 times was (30.48%). Concerning the condition of needles/sharps during injury 61 (58.09%) nurse respond that they were injured by dirty needles/sharps. The types of injury sustained were superficial 47 (39.49%) and slight skin penetration 40 (33.62%). In the health status of source clients/patients in relation to blood borne

pathogens 47 (44.76%) were unknown status followed by clinically suspected HIV/AIDS cases which accounts 21 (20.19%). Almost all nurses 167 (98.24%) were not vaccinated against Hepatitis B virus because not available in the hospital 150 (88.24%). One hundred sixty (94.12%) respondents knew the presence of prophylaxis service to HIV after injury by needle /sharp in the hospital (Table 3).

Variable	Category	Frequency	Percent
The frequency of injury occurred on respondents	1-2 times	53	50.48
	3-4times	32	30.48
	>5times	20	19.04
	Total	105	100
The condition of the needles sharps during injury	Dirty needle/sharps	61	58.09
	Sterile needle/sharp	20	19.05
	Both sterile and dirty needle/ sharps	24	22.86
	Total	105	100
Type of injury sustained	Deep	32	26.89
	Slight skin penetration	40	33.62
	Superficial	47	39.49
	Total	119	100
Health status of clients in relation to blood borne pathogens	Known HIV/AIDS positive	19	18.27
	Clinically suspected HIV/AIDS case	21	20.19
	Jaundiced and clinically diagnosed hepatitis patient	10	9.5
	Unknown states	47	44.7
	Total	105	100
Report concerning body to	Yes	84	80
	No	21	20
	Total	105	100
Measures take they after exposure	Washing with soap and water	41	19.62
	Wash with alcohol, iodine, chlorine	66	31.58
	Take TAT	11	5.26
	Visiting VCT	63	30.14
	Seek Post Exposure Prophylaxis	19	9.09

Vaccination against hepatitis B virus	Squeezing to extract more blood	9	4.31
	Total	209	100
	Yes	3	1.76
	No	167	98.24
Reasons why not vaccinated	Total	170	100
	High cost	17	10.18
	Not aware	3	1.79
	Not available	147	88.02
Transmission of diseases by dirty needles/sharps	Total	167	100
	Yes	158	92.94
	No	12	7.06
	Total	170	100
Diseases that can be transmitted through dirty needles/sharps	Hepatitis B	140	33.18
	Hepatitis C	121	28.67
	HIV	161	38.15
	Total	422	100
Program should initiate to protect staff nurses from risk of Needle stick and sharp injuries	Improved facilities for needle/ sharps	153	27.42
	Enforced AIDS testing of all patients before admission to hospital	141	25.27
	Education talks on risky behaviors	53	9.49
	Improved reporting procedures for injuries	123	22.04
	Increased punishment for staffs who don't properly dispose needles/sharps, therefore place other staffs at risk	88	15.77
	Total	558	100

**Table 3:** Needle stick and sharp injury related attributes among nurses working in JUSTH, Jimma, southwest Ethiopia, March 31-Aril 04, 2014.

The major types of needles/sharps that cause injury to nurses were IV needle 32 (25.6%) followed by surgical blade 29 (23.2%) and IM needles 26 (20.8%) (Figure 5).

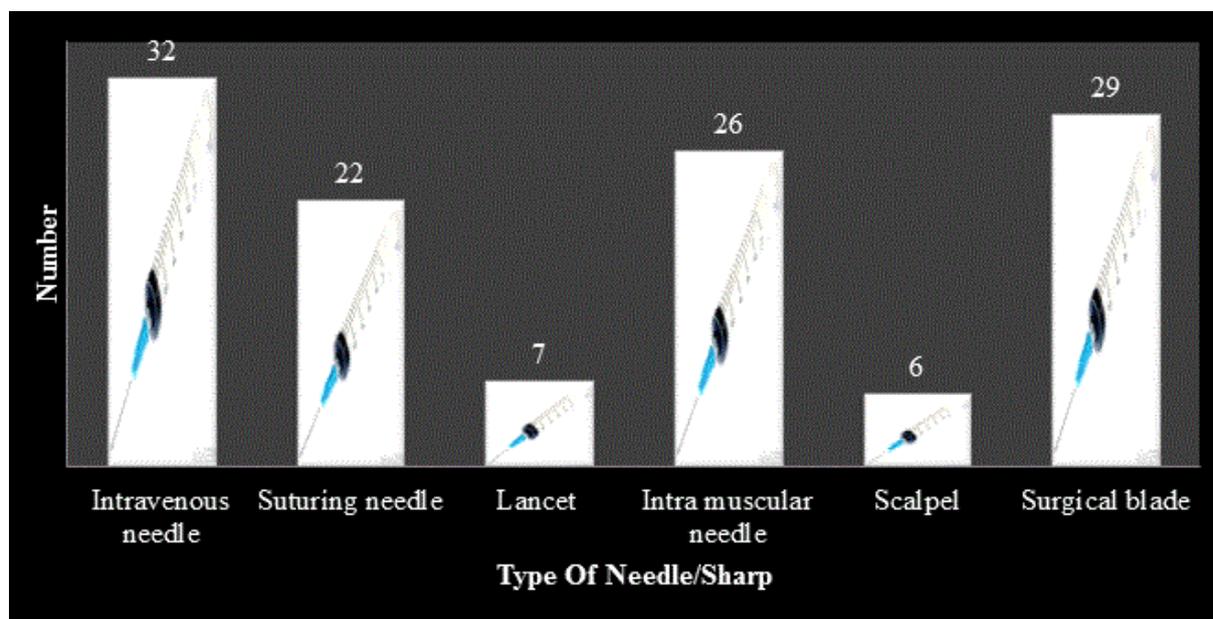


Figure 5: Distribution of nurses by type of needle/sharp that causes the injury in JUSTH, Jimma, South west Ethiopia, March 31-April 04, 2014.

Recapping needle after use and suturing/injection, 36 (24.16%) and 37 (24.83%) were the major activities that lead to NSSIs, respectively. The least activities that lead to NSSIs were immunization, patient aggressiveness and negligence which account 1 (0.01%) 6 (0.04%) and 10 (0.07%), respectively (Figure 6).

and sharps materials in the working area had showed significant association at  $p < 0.05$ .

Among the worker behavior related factors job satisfaction, Level of job stress on nurse respondents, Use of personal protective and gloves during the practice work by needles/sharps and Recapping of needles after use had showed a significant association at  $p < 0.0$  (Table 4).

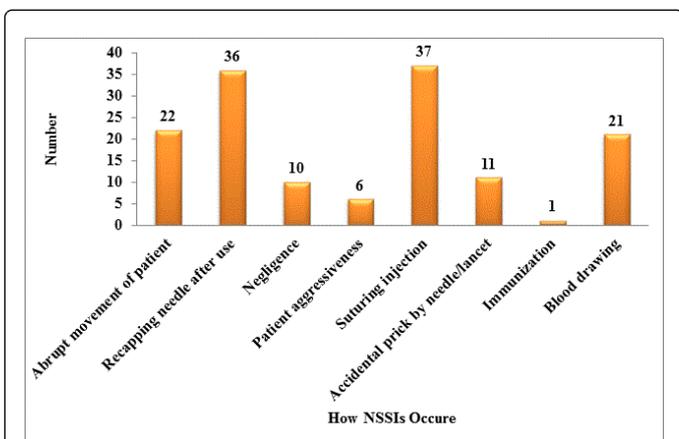


Figure 6: Distribution of nurses how NSSIs are occurred among nurses working in JUSTH, Jimma, South west Ethiopia, March 31-April 04, 2014.

#### Association between independent variable with NSSIs

Among the socio demographic variables sex, monthly salary, marital status and work experience had shown association with the occurrence of needle stick and sharp injury at  $p < 0.05$ .

Working environment related variable working Unit/department/, training on IP and patient safety and presence of contaminated needle

Variable	Category	NSSIs		Value s	P
		Yes	No		
Sex	Male	56	19	9.46	0.002
	Female	49	46		
Marital status	Single	70	21	19.1	0.001
	Married	29	37		
	Divorced	6	7		
	Widowed	-	-		
Monthly salary in ETB	<1500	22	33	16.3	0.001
	>1500	83	32		
Year of service	5-Jan	73	42	6.6	0.037
	10-Jun	13	17		
	>10	19	6		
Working department/ Unit/	Surgical wards	38	10	8.23	0.001
	Medical wards	19	7		
	Maternity/Gynecology	10	8		
	OPD	9	5		

	Pediatrics/ Neonatology	10	13	28	0.001
	Psychiatric ward	6	1		
	ICU	8	2		
	Chronic Illness	0	4		
	MCH	1	5		
	Ophthalmology	2	6		
	Dental clinic	2	4		
Training on IP and patent safety	Yes	10	29	28	0.001
	No	95	36		
Presence of contaminated needle and sharps materials in the working area	Yes	54	21	5.95	0.015
	No	51	44		
level of job satisfaction	Satisfied	32	45	24.3	0.001
	Dissatisfied	73	20		
Level of job stress on nurses'	Not stressed	37	42	13.9	0.001
	Stressed	68	23		
Use of personal protective equipment during handling needles/ sharps	Never	7	4	7.93	0.047
	Sometimes	41	14		
	Most of the time	39	26		
	All of the time	18	21		
Recapping needles after use	All of the time	22	5	50.4	0.001
	Most of the time	27	6		
	Some of the time	46	15		
	Never	10	39		

**Table 4:** showing the association between independent variables with NSSIs among nurses working in JUSTH, Jimma, South west Ethiopia, March 31-April 04, 2014.

## Discussion

This study revealed that the one year prevalence of needle stick and sharp injury was 44.12%. The study conducted on one year prevalence of needle stick and sharp injury in East Gojjam Zone Health Institutions, Sidama Zone and North western Ethiopia had showed 22%, 32% and 31% respectively [6]. There is big difference with current study this difference might be related to the fact that the above studies were conducted by mixing all types of health professionals from hospitals, health centers and clinics so that the number of screening, diagnostic, follow up and other intervention procedures that use needles and medical sharp materials were less in health centers. The other possible reason might be related to work load.

In this study the major types of needles/sharps that cause the injury to nurses were IV needle 25.6%, surgical blade 23.2% and IM needles 20.8%. Hollow bore needles are responsible for the occurrence of

46.4% of NSSIs. This result is lower than study done by National surveillance for health care workers (NASH) of USA show that 59% of all sharp injuries were caused by hollow bore needles and study conducted in India showed that 71% the needles involved in the NSSIs injury were hollow bore needles [7,8]. This variation might be due to the use of hollow bore needles by nurses in this hospital may be less than the above countries.

Concerning the condition of needles/sharps during injury this study showed that 61 (58.09%) nurse were injured by dirty needles/sharps. This result is lower than Study conducted in Saud Arabia, showed that 89.3% of the sharp items involved in the injuries are contaminated. But this study result is higher than a result of a study done in Japan showed that 22% NSSIS involved device that had been used on a patient prior to the NSSIS (contaminated devices) [9].

Recapping needle after use 24.16%, suturing/injection 24.83% and blood withdrawal 14.09% were the major clinical activities that lead to NSSIs in this study. Study conducted in Saud Arabia, showed that most of the injuries occur during suturing/injections 31.8% and drawing of venous blood samples 17.2% [9]. And study conducted in India showed that the commonest clinical activities to cause NSSIS in that study were, 55% blood withdrawal, 20.3% suturing, 11.7% vaccination and recapping needles after use was 66.3% and according to a study done in Malaysia hospitals nurses 27.2% NSSIs causes were recapping of syringes after use [10].

One hundred sixty (94.12%) respondents knew the presence of prophylaxis service to HIV after injury by needle /sharp in the hospital in this study. This result is more and greater than a result of study conducted in India which showed that only about 40% health care workers knew the availability of post exposure prophylaxis services in the studied hospital [10]. This may be due to there is good awareness about post exposure prophylaxis of nurses in JUSH. Almost all nurses 98.24% were not vaccinated against Hepatitis B. This result is lower than a study done in Addis Ababa hospitals showed that 11.6% of the study subjects were vaccinated for hepatitis B vaccine. This variation may be due to the absence of the vaccine in JUSH [11].

Working Unit/department/, training on IP and patent safety and presence of contaminated needle and sharps materials in the working area had significant association with the occurrence of sharp and needle stick injury in nurses. Among the worker behavior related factors, job satisfaction, level of job stress on nurse respondents, use of personal protective and gloves during the practice work by needles/ sharps and recapping of needles after use showed a significant association with the occurrence of needle stick and sharp injuries ( $p < 0.05$ ). This result is almost similar with study conducted in East Gojjam Zone Health Institutions health care workers which showed the following results: sex of the worker, monthly salary of worker, infection prevention and safety information access, getting training on infection prevention and, sleeping disturbance problem, job satisfaction and job stress showed a significant association with the occurrence of needle stick and sharp injuries in health care workers [12]. This similarity may be related to similarity of the setups they use (standard precaution guidelines).

## Conclusion

This study revealed that the lifelong and one year prevalence of needle stick and sharp injuries among nurses in this hospital was 61.76% and 44.12% respectively. In general, this study findings

indicate a relatively high prevalence of needle stick and sharps injuries among nurses.

In general this study revealed that no single factor accounted for the occurrence of NSSIs. So nurses' sex, monthly salary, marital status, work experience, working Unit/department/, training on IP and patient safety, presence of contaminated needle and sharps materials in the working area, job satisfaction, level of job stress on nurse respondents, use of personal protective and gloves during the practice work by needles/sharps and recapping of needles after use; had significant association with the occurrence of sharp and needle stick injury in nurses.

### Recommendation

Based on the findings of this study the following recommendations were forwarded to reduce the occurrence of NSSIs and the consequences of NSSIs among nurses working in JUSTH:

- Hospital administrates, nursing service directors and different nongovernmental organizations should strengthened regular provision of information on infection prevention and safety to nurses at all levels.
- The hospital administrator should work hard with other stakeholders to avail Vaccination against hepatitis B virus for the staff nurses.
- Hospital administrates, nursing service director and supervisors should strengthen mechanisms to improve nurses' job satisfaction.
- All stakeholders including staff nurses' should work together to reduce job stressors.
- Nurses' should practice proper use of safety box and personal protective equipment during handing needle and sharps.
- Special attention should be given for nurses with low monthly salary.

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