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ORIGINAL ARTICLE

NEEDLE STICK AND SHARP INJURIES AMONG RESIDENTS PRACTICING SURGICAL INTERVENTION IN A TERTIARY HOSPITAL, ADDIS ABABA

Wuletaw Chane, MD[1], Yishak Suga, MD[1], Suga Y.[1], Luli Baissa, MD[1], Biassa L.[1]

ABSTRACT

Introduction: *Needle stick and sharp object injury is a common occupational hazard to healthcare workers.*
Objective: *The study aims to assess the occurrence and circumstances surrounding needle stick & sharp injuries and behavior associated with the reporting of injuries among residents practicing surgical intervention.*
Methods: *A cross sectional study was employed among residents in training at the St. Paul's hospital millennium medical college and who practice surgical intervention on patients. Data was collected using pretested and structured questionnaire from all participants and who are at different post graduate year of their specialty training from February 1st, 2018 till March 30th, 2018.*
Result*: A total of 122 residents participated on the study, of which 32.8% are general surgery residents. Of the respondents, 84 (68.9%) residents sustained needle stick and sharp object injury at least once over the study period, among which 14.8% are involved in high risk patients. Of the 84 injuries, 67 (54.9%) were self-induced and occurred in the operation room. 37(44%) of the residents attributed rushing as the cause of the injury. only 12 (14.3%) reported their recent injury to incidence office or antiretroviral treatment clinic. The most frequent reason for not reporting is the consideration of residents that source patients are not high risk 39 (49.4%). Highest level of injury is seen among residents from departments of orthopedics & traumatology and maxillofacial whereas the least injury seen from department of ophthalmology.*
Conclusion: *Incidence of Needle stick and sharp object injury among residents practicing surgery is high. Most injuries are self-inflicted. Adopting or designing prevention methods and providing training for residents on safety issues is mandatory to decrease Needle stick and sharp object injury .*
Key words*: Needle Stick, sharp injury, Occupational hazard*

INTRODUCTION

Health care providers are always at risk to be exposed to harmful contaminants. Most commonly encountered are biological hazards (blood, body fluids or tissue specimens), chemical hazards (detergents, disinfectants or powder placed into the surgical gloves which can cause allergies), physical hazards (intra operative radiation exposure while using fluoroscope or laser based instruments), ergonomic hazards (back pain & musculoskeletal pain because of standing for long hours), psychological hazards (work induced weak family relations, burnout due to overtime work) and fire explosion & electrical hazards (while using oxygen and alcohol). (1)
Needle stick and sharp injuries (NSSIs) are one of the common biological occupational hazards. Health care workers are prone to acquire acute and chronic infections caused by HBV, HCV, & HIV/AIDS and different forms of psychological consequences after sustaining NSSI.

Residents practicing surgical procedures are susceptible to sustaining needle stick and sharp injuries due to their frequent use. Although NSSIs are one of the common occupational hazards that they face, the magnitude of the problem is not well understood (9).

The risk of acquiring HBV from a single needle sticking ranges from 6%-30% while it is lower for HIV/AIDS, an average rate of 0.3% per injury. Average incidence of acquiring HCV is 1.8% per injury (10). Estimated number of 16,000 HCV, 66,000HBV and 1000 HIV infections has been acquired among HCW throughout the world in the year 2000 (11).

An estimated 600,000-800,000 needle stick & other percutaneous injuries reported annually among HCWs in United States (13). The Botswana public health sector reported the lifelong prevalence of needle stick injuries to be 48.9% (14).

[1] St. Paul's Hospital Millennium Medical College, Department of Surgery.
*Corresponding Author E-mail: wulexc@gmail.com

In Ethiopia, different studies showed that there is high prevalence of NSSI among health care workers. A study done in 4 hospitals of bale zone showed that the prevalence of life time NSSIs among HCW was 37.1% to 42.5%. And the figure in this study is lower than earlier studies in Ethiopia where the life time risk was 66.6% in TASH and 59% in Bahir-dar hospital (15-17).

Timely reporting is essential to ensure appropriate counseling, prophylaxis or early treatment and in some countries the data is used to establish legal prerequisites for worker compensations (18,20). Underreporting of sharp injuries by employees is common according to different literatures. It is higher among surgeons and surgical residents. One study has showed that 74% of surgeons never reported or reported only some of the injuries and the main reasons they mentioned were considering most patients as low risk (22.5%) and lack of concern (30%) (22). A study done among surgical residents at TASH, Addis Ababa University, Ethiopia, showed that most frequently cited reasons for not reporting were lack of awareness about the existence and functionality of incidence office in the hospital (22.2%) and considering that the process takes a long time (38.8%) (23). Underreporting results in significant underestimation of the magnitude of the problem and impedes interventions that could benefit the injured ones.

The study aims to assess the occurrence and circumstances surrounding needle stick & sharp injuries and behavior associated with the reporting of injuries among residents practicing surgical intervention.

METHODS

This is a cross-sectional study conducted from March 1 - 30, 2018 on all residents practicing surgical intervention and training at the St. Paul's Hospital Millennium Medical College (SPHMMC) at different postgraduate level of their specialty program. These include all residents who are in General surgery from 2nd to 4th year residency, Gynecology & Obstetric residents from 2nd to 4th year residency, Orthopedics & Traumatology residents from 2nd to 3rd year, Ophthalmology residents from 2nd to 3rd year, maxillofacial surgery from 2nd to 3rd year, ENT residents from 2nd to 3rd year and Emergency medicine residents on their 2nd year.

All 1st year surgical residents were excluded for they started their residency program only 2 months prior to data collection period. Residents who were not willing to participate in the study were excluded.

Study participants who fulfill the inclusion criteria were selected by simple random sampling technique using the list and proportionate allocation to size was made for each year of residency in each specialty to share the total sample size. Data was collected using pre-tested self-administered structured questionnaire which contains questions about socio demographic data, current level of training, and the number of NSSIs during the immediate past one academic year (Sep1st 2016 – Aug 31st 2017), NSSIs involving a high risk patient (patients with confirmed HIV, HBV & HCV infections) and a set of detailed questions about the recent (the last) NSSI the resident remembers sustaining over the past one year.

The collected data were checked for completeness and consistency and entered into Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive analysis was performed; Tabulation of the dependent with the independent variables done and data were analyzed using chi-square test with a significance level of 0.05. Kruskal-Wallis a non-parametric test was used to compare frequency of needle stick injuries per resident according to surgical specialty type.

RESULT

A total of 122 residents practicing surgical intervention participated in the study (response rate = 86.5%). Of 122 respondents, 40 (32.8%) were general surgery residents and 15 (12.3%) residents were from orthopedics & traumatology surgery (Table 1).

These residents were in their different level of residency training i.e.; 44.3% (54) in 2nd year, 50% (61) 3rd year and 5.7% (7) in 4th year. 99 (81.1%) were male and 23 (18.9%) were female.

Of the 122 respondents, 84(68.9%) had sustained at least one NSSI over the past one academic year of their residency program. (Range 1-10, mean=1.6). Of the 84 injuries, 18 (14.8%) of them occur while they are involved in management of high-risk patients. (Figure 1).

Table 1: Sampling stratification of participants in needle and sharp object injury study, St. Paul's Hospital Millennium Medical College, Addis Ababa, March 1 - 30, 2018

Total number of surgical residents fulfilling the inclusion criteria, 172

General Surgery	OBGYN	Orthopedic	Ophthalmology	Maxillofacial	ENT	Emergency medicine
49	**67**	**18**	**11**	**8**	**10**	**9**
RII=8 RIII=33 RIV=8	RII=26 RIII=30 RIV=11	RII=12 RIII=6	RII=6 RIII=5	RII=4 RIII=4	RII=4 RIII=6	RII=9

The total sample size is 141

General Surgery	OBGYN	Orthopedic	Ophthalmology	Maxillofacial	ENT	Emergency medicine
40	**55**	**15**	**9**	**7**	**8**	**7**
RII=7 RIII=26 RIV=7	RII=21 RIII=25 RIV=9	RII=10 RIII=5	RII=4 RIII=5	RII=3 RIII=4	RII=3 RIII=5	RII=7

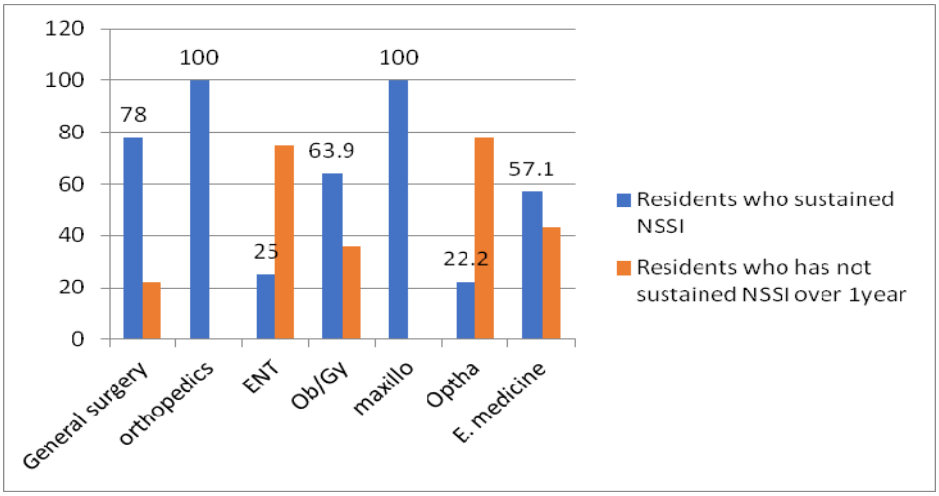

Figure 1: Comparison of needle and sharp object injured and non-injured residents, St. Paul's Hospital Millennium Medical College, Addis Ababa, March 1 - 30, 2018

The highest rate of injury (100%) was found among orthopedics and maxillofacial surgery residents (15/15 and 7/7, respectively), followed by General surgery residents 31/40 (77.5%) ObGyn residents, 23/36 (63.9%), and emergency medicine residents 4/7 (57.1%) (Table 2). The differences are statistically significant (p=0.000). The frequency of NSSIs per a resident per year was analyzed within each surgical specialty with the use of Kruskal-Wallis test and results showed that the mean ranks of NSSI per a resident are significantly different among the different surgical specialty. (X^2=27.150, 6 d.f., p=0.000). The highest was found among orthopedics and maxillofacial surgery residents with a mean number of injuries over one year is 3 and 2.71 respectively. Thirty-eight (45.2%) out of the 84 NSSIs were among residents in their 1st year of residency, 41 (48.8%) injuries to residents on their 2nd year, and five (6%) injuries to residents on their 3rd year of training program. No significant association was found between occurrence of NSSI and level of residency (p=0.925) (Table 2).

Table 2: Patterns needle and sharp object injury (NSSI) by surgical specialty type, St. Paul's Hospital Millennium Medical College, Addis Ababa, March 1 - 30, 2018

Surgical Specialty	No. of Residents	Residents with NSSI	Mean No. of NSSI per resident
All surgical Specialty	122	84	1.62
General Surgery	40	31	1.85
Orthopedics and Traumatology	15	15	3
Ear, Nose and Throat	8	2	0.63
Obstetrics and Gynecology	36	23	1.33
Maxillofacial	7	7	2.71
Ophthalmology	9	2	0.63
Emergency medicine	7	4	0.57

Of the 84 injuries, 67 (79.7%) were self-inflicted. Highest number of injuries occurred in the operating theatre-69 (82.1%), followed by emergency room - 11(13.1%), 2 (2.4%) at the bedside (wards & ICU) and 2 (2.4%) in the out-patient department. There is association between place where the injury happened and occurrence of NSSI (p=0.000). Procedures related with high risk of injury were suturing - 59 (70.2%) and manipulating a needle or sharps - 9 (10.7%) (see table 3) The result were found statistically significant (p=0.000).

Solid needle accounted for 65 (77.4%), sharp instruments for 12 (14.3%) and hollow bore needle for 7 (8.3%) of the NSSIs. 37 (44%) of the residents involved in the study attributed rushing as the cause of the injury. Other reasons mentioned are use of inappropriate equipment in 21 (25%), fatigue/hungry while performing procedures n 10 (11.9%), negligence in following the principle of prevention method six (7.1%), lack of assistance in nine (10.7%) and lack of skill in 1 (1.2%) (Table 3).

Out of 84 residents who sustained, only 12 (14.3%) reported their recent injury to incidence office or ART clinic. In addition, among the 18 recent injuries which involved in high risk patients, only 11 (61.1%) were reported. The most frequent reason for not reporting was the feeling of residents that source patients are not high risk 39 (49.4%).

Other reasons included lack of awareness about existence of the incidence office in the hospital in 10 (12.7%), 9 (11.4%) thought that the process takes too much time, five (6.3%) did not want to take prophylaxis due to its side effects, 5(6.3%) because of negligence and one (1.3%) believed reporting has no significant use (Table 4).

Table 3: Circumstances under which the recent NSSI occurred

		Frequency	Percentage
Source of the injury			
	Self-induced	69	82.1%
	By someone else	15	17.9%
Place where injury occurred			
	In the OR	69	82.1%
	In the ER	11	13.1%
	At the bedside (Wards, ICU)	2	2.4%
	OPD	2	2.4%
Tasks performed during injury			
	suturing	59	70.2%
	Manipulating a needle or sharp in a patient	9	10.7%
	Cutting	5	6%
	Exchanging instruments	3	3.6%
	Recapping a needle	2	2.4%
	Cleaning up	2	2.4%
	others	4	4.8%
Type of equipment used			
	Solid needle	65	77.4%
	Sharp instruments	12	14.3%
	Hollow bore needle	7	8.3%
Perceived cause of injury			
	Feeling of being rushed	37	44%
	Not using appropriate equipment	21	25%
	Fatigued/hungry	10	11.9%
	Lack of assistance	9	10.7%
	Negligence in following the principles of prevention method	6	7.1%
	Lack of skill required	1	1.2%

Table 4: Reason for not reporting NSSI

Reason for not reporting the most recent NSSI	Frequency	Percentage
Number of residents who did not report their most recent NSSI	72	100%
The source patient was not of high risk	39	54.2%
I don’t know if the unit exists	10	13.9%
The process takes too much time	9	12.5%
I don’t want to take prophylactic drug	5	6.9%
Negligence	5	6.9%
It has no significant use	1	1.4%
Other	1	1.4%
Missing	5	6.9%

DISCUSSION

NSSI among residents is a very serious occupational safety issue. Even though seroconversion following a single needle stick injury is rare, the lifetime risk of contracting an infection is noteworthy. This study revealed that NSSI among residents practicing surgery is common. More than two-thirds of residents, (68.9%), have sustained NSSIs within the study time. This result is almost comparable to other studies conducted in a university hospital in Saudi Arabia (58.9%) and Mulago Hospital, Uganda (60.7%) (2,5,24,25). The level of residency is not a determining factor for NSSI from our study. This is comparable to a study done in southern California. (26) But in most of the literature, the likely hood of injury increased as residents practice more. (2,5,7,8,8,26) This could be a result of engagement in more emergency procedures, long working hours, and sleep deprivation.(4,5,12,16,25,26)

The higher number of NSSI among orthopedics and maxillofacial residents from our study is comparable to surveillance done in Nigeria. This unique risk of percutaneous injuries during surgical procedures could be related to the usage of a wide array of sharp instrumenta-tion and routine handling of sharp bony edges by orthopedic and Maxillofacial trainees.(5,13,14,28) The high frequency of solid needle injury seen in the OR related to suturing is also similar to other works of literature (2,5,10,13,21).

The most important reasons are; rushing, use of inappropriate equipment, fatigue/hungry, negligence in following the principle of prevention method, lack of assistance, and lack of skill. Almost all reasons are seen in most of the literature including one done in black lion hospital, Ethiopia. (5,7,11,23). As we can see from above most of the mechanisms of injuries are preventable by adherence to standardized sharps-handling guidelines (e.g creating a neutral zone to avoid hand-to-hand passing), providing continuous education and training, applying newer technologies like using adhesives for skin closure. Especially as rushing is the most important reason, an increasing number of residents and OR tables during emergency hours may help a lot by reducing the workload and fatigue. (1,5,13,23)

Underreporting is significant, only 12 (14.3%) reported their recent injury to incidence office or ART clinic. Which is similar to most of the literature (e.g in Saudi Arabia, 9% reported).(2,5,8,9,19,23,25,26,28) (Also, among the 18 recent injuries involved in high-risk patients, only 11 (61.1%) were reported. The most frequent reasons for not reporting are; the feeling of residents that source patients are not high risk, lack awareness about the existence of the incidence office in the hospital, thinking the process takes too much time, negligence, and others.

From above it seems the factor that has a great impact on the attitude of doctors toward injuries is the belief that the patient is a low risk. In some of the literature, it is shown, if the incidence reporting unit is nearby and accessible also during night shifts, reporting is improved. (1,13,15) So continuous awareness creating sessions in each level of residency that emphasizes, If surgeons do not consistently report their sharps injuries, they may be more likely to incur such injuries which, in turn, poses a greater risk to themselves and their patients, could help a lot. (5, 22,28)

In conclusion, the incidence of NSSI among residents practicing surgery is high. Most injuries are self-inflicting. The reporting habit and rate is inadequate, which can have a serious consequence even for those who considered their injury is related to a low-risk patient as some of them can be in the window period. Adopting universal precautions which are the gold standard in the prevention of blood-borne pathogens is the key.

This includes using protective barriers such as gowns, gloves and masks, protective eye-wear, and taking precautions when handling sharp instruments such as scalpels and needles. This involvement of the teaching university management team is crucial in making sure training is being given timely, practiced accordingly, and most importantly showing these kinds of results to policymakers so that newer technologies will be available.

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Competing Interest:

The authors declare that this manuscript was approved by all authors in its current form and that no competing interest exists.

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