

**PREVALENCE OF SURGICAL INJURIES, COMMONEST
CAUSES OF THE SAME AND UPTAKE OF PEP AMONGST
HEALTH WORKERS AT JINJA REGIONAL REFERRAL
HOSPITAL**

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**A DISSERTATION SUBMITTED TO THE FACULTY OF
CLINICAL MEDICINE AND DENTISTRY IN PARTIAL
FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF
BACHELORS OF MEDICINE AND BACHELORS OF SURGERY
DEGREE OF KAMPALA INTERNATIONAL UNIVERSITY**

NOVEMBER, 2018

DECLARATION

I Kirabira Tonny registration number **BMS/0027/133/DU** declare that the work here in this report due for presentation to faculty of clinical medicine and dentistry in partial fulfillment for the award of bachelors of medicine and bachelors of Surgery degree of Kampala International University is original and has never been presented either wholly or in part for the award of any academic qualifications. Where other people's works has been quoted, references have been made.

Signature..........Date.....20/12/2018.....

CERTIFICATION

I MR. OKEDI FRANCIS XAVIOUR the supervisor of Kirabira Tonny, certify that this research report developed under supervision is now ready for submission to the Research and Ethics Committee and to the Dean faculty of clinical medicine and Dentistry of Kampala International University

MR. Okedi Francis Xaviour

Signature



Date

10-DEC-2018

DEDICATION

I dedicate this report to my family especially Mr. Mawejje Andrew for his continued trust and support as I pursued my studies.

ACKNOWLEDGEMENT

This work would have never been put forward at this level without the encouragement of my family.

Special regards to all the ancillary staff of Kampala International University for their guidance and encouragement throughout my writing of this proposal especially my supervisor and mentor MR. Okedi Francis Xaviour

Sincere gratitude to my family members for their will to invest in me through education, fellow comrades of 133 series for their continued support during my proposal development and above all to the almighty God for his sufficient grace and guidance during my entire course of study.

ABBREVIATIONS

TERM	DEFINITION
<i>HCV</i>	Hepatitis C Virus
<i>NSI</i>	Needle Stick Injury
<i>HIV</i>	Human Immunodeficiency Virus
<i>HCWs</i>	Health care workers
<i>KIUTH</i>	Kampala International University Teaching Hospital
<i>PEP</i>	Post Exposure Prophylaxis
<i>WHO</i>	World Health Organization
<i>JRRH</i>	Jinja Regional Referral Hospital

DEFINITION OF OPERATIONAL TERMS AND CONCEPTS

TERM	DEFINITION
Needle Stick Injury	A needle stick injury, percutaneous injury, or percutaneous exposure incident is the penetration of skin by a needle or other sharp object, which was in contact with blood, tissue, or other body fluid before the exposure. (WHO 2018)
Compliance	A patient's (or doctor's) adherence to a recommended course of treatment or action. (Medical Dictionary 2018)
Protocol	A set of rules followed by providers such as EMTs or nurses. Often considered to be stricter than a guideline, and to carry more weight with the law. (Medical Dictionary 2003)
Incidence;	Is a measure of the probability of occurrence of a given medical condition in a population within a specified period of time. (MedicineNet 2018)
Occupational Exposure	Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood, bodily fluids, or other potentially infectious material that may result from the performance of one's professional duties. (CDC 2016 Sept 30)
Sero-conversion	Is the time period during which a specific antibody develops and becomes detectable in the blood. After seroconversion has occurred, the disease can be detected in blood tests for the antibody. (AIDSinfo 2018)

TABLES AND FIGURES

	Title	pages
Fig 1	Conceptual framework	16
Table 1	Incidence of NSIs	25
Fig 2	Percentage incidence of NSIs	25
Fig 3	Incidence among occupational groups	26
Fig 4	Places where NSIs occur	27
Fig 5	Timing of NSIs	27
Fig 6	Circumstances surrounding NSIs	28
Fig 7	Culprit devices	29
Table 2	Occupational groups and locations	29
Table 3	PEP uptake	30

Contents

DECLARATION	2Error! Bookmark not defined.
CERTIFICATION	Error! Bookmark not defined.
DEDICATION	4
ACKNOWLEDGEMENT	5
ABBREVIATIONS	6
DEFINITION OF OPERATIONAL TERMS AND CONCEPTS.....	7
TABLES AND FIGURES	8
ABSTRACT	11
CHAPTER 1	12
1.0 Introduction	12
1.1 Background.....	12
1.2 Statement of the problem.....	13
1.3 Aim of study	14
1.4 Specific Objectives.....	14
1.5 Research Questions	14
1.6 Justification of the study	14
1.7 Scope of the study	15
1.8 Conceptual framework.....	16
CHAPTER 2	17
Literature review	17
2.1. Prevalence	17
2.2 Common Causes	19
2.3 PEP Uptake	21
CHAPTER 3	23
3.0 Methodology.....	23
3.1 Study Design	23
3.2 Study Area.....	23
3.3 Study Population	23
3.4 Sample size determination (Morgan's table)	23
3.5 Inclusion and exclusion criteria	23

3.6 Definition of variables	23
3.8 Research Instruments	24
3.9 Data collection method.....	24
3.10 Data processing and Analysis	24
3.11 Data Presentation	24
3.13 Ethical consideration.....	24
3.14 Study Limitations	24
CHAPTER 4.....	25
4.0 RESULTS	25
4.1 Incidence of NSIs	25
Occupational groups and injuries.....	26
4.2 Common causes of NSIs.....	27
4.3 Uptake of PEP	30
Table 3	30
CHAPTER 5	31
DISCUSSION.....	31
5.2 Common causes of NSIs.....	32
5.3 Uptake of PEP	33
CONCLUSION	34
6.1 Prevalence of NSIs.....	34
6.2 Common causes of NSIs.....	34
6.3 Uptake of PEP.....	34
RECOMMENDATIONS	35
APPENDICES	36
REFERENCES	39

ABSTRACT

BACKGROUND; A needle stick surgical injury is said to have occurred if a medical practitioner punctures the skin with a needle or sharp instrument that has been in contact with a patient's blood. Splashing of blood or other body fluids to the conjunctiva is also included.

OBJECTIVE; To determine the prevalence of surgical injuries, commonest causes attributed to the same and uptake of PEP amongst health workers at Jinja Regional Referral Hospital.

METHODS; A descriptive cross sectional retrospective study was used with 168 documents reviewed.

RESULTS; The study revealed a significant number of HCWs getting needle prick accidents and majority of these being nurses (35%) and interns (20%).

38% of accidents occur in the procedure rooms and 29% in the inpatient department wards and 20% of the injuries occurred in theatre. Majority, (48%) of the injuries occur during the night when HCWs are on night shift.

Surgical needle manipulation 23%, disposal 17% and IV access 15% were the biggest culprit processes responsible for most injuries. Syringe needles were responsible for 36% of injuries followed by suture needles which were responsible for 26%, phlebotomy needles, 15%, IV cannula 12% and scalpel 11%. 68 HCWs were started on PEP after the NSI with 58 of them getting well and only 4 of them acquiring an infection.

RECOMMENDATIONS; Refresher courses are required for HCWs who are less experienced. Safety guidelines need to be pinned in visually accessible sites in both procedure rooms and inpatient wards since most injuries occur there for easy reference in case need arises. Strict and proper schedule programming for staff and adequate breaks after long working hours to avoid fatigue. Closer monitoring and possible daily counseling of workers that have been initiated on PEP treatment.

CHAPTER 1

1.0 Introduction

The chapter gives a general overview of the topic of study relating to surgical injuries. It clearly stipulates the problem statement, justification of study, study objectives and the conceptual frame work.

1.1 Background

A needle stick surgical injury is said to have occurred if a medical practitioner punctures the skin with a needle or sharp instrument that has been in contact with a patient's blood. Splashing of blood or other body fluids to the conjunctiva is also included. (Adib-Hajbaghery & Lotfi, 2013)

Needle stick surgical injuries are the commonest route by which blood borne viruses and or infections such as HIV, Hepatitis B and C are transmitted from patients to health care workers. Medical students are also at risk of such infections and injuries due to accidental contamination during their practical occupational Exposure.(Mungure, Gakonyo, Mamdani, & Butt, 2010)

It is therefore important that there are occupational health measures that are put in place to reduce on the number of incidences medical professionals and medical students have during their work. One of these measures is implementation of protocols that must be followed in cases where the occupational Health measures have failed. This is aimed at reducing the risk of transmission of pathogens from the patients to the health workers at risk.

Two things are therefore involved; the common causes of the needle prick injuries and the uptake of PEP after the accidents have occurred. Cases of new infections from blood borne pathogens spread in such a manner are still on the rise among health workers worldwide and the question still remains; are the occupational health measures effective enough or there is poor compliance to the PEP uptake? (Salelkar, Motghare, Kulkarni, & Vaz, 2010) in his study found out that around 34.8% (200/575) of the Health care workers had experienced a needle stick injury in the last one year. (Aslam et al., 2010) study estimated that participants with history of at least one time NSI was found in 66% of the respondents and around 13% of them had one or more needle stick injury in the previous one month at work and half of them were affected by non-sterile needle. None of them sought medical care.

(Khader, Burgan, & Amarin, 2009) in his study found out that of those that were injured, 77.9% did not report the injury for very many various reasons.

In one study, of the 98 surgeons in the hospital, 44% anonymously admitted to having a needle-stick injury. Only 3 of those who sustained a needle-stick injury said that

they followed the agreed local policy. Twenty-three surgeons performed first aid type procedures such as informing scrub nurse, changing needle and gloves. Seven surgeons simply ignored the incident and continued (Thomas & Murray, 2009). Reporting is one other aspect that needs to be practiced, however this seems not to be followed, and this therefore needs to be enforced so as to abate transmission of infection.

There is therefore a paucity of information regarding compliance of needle stick injury protocols in Uganda and this necessitates investigations. Let alone the common causes of needle prick injuries.

1.2 Statement of the problem

Acquiring diseases through accidents during work from the blood borne pathogens should be history in our current society, however it is still an issue ranging from senior health workers to medical students thus placing us in an unfavorable position. This causes psychological torture to the involved, significant financial burdens to both the hospital management and governments and labor inefficiency.

A number of medical practitioners will leave work temporarily after involvement in a needle prick accident due to emotional distress (Gopar-Nieto, Juarez-Perez, Cabello-Lopez, Haro-Garcia, & Aguilar-Madrid, 2015) and in the event that they acquire an infection, significant direct and intangible costs would be incurred. (Mannocci et al., 2016) in her study showed that Direct costs including testing the source and exposed medical personnel as well as post-exposure medical visits and treatment; annual treatment costs and lifetime medical costs for HBV (\$3,600 and \$31,306, respectively), HCV (\$24,424 and \$23,173, respectively), and HIV infection (35,745 and \$441,342, respectively).

According to (Bekele, Gebremariam, Kaso, & Ahmed, 2015), the prevalence of lifetime needle stick and sharp injury was 37.1% among HCWs in southern Ethiopia. In another study (Dilie, Amare, & Gualu, 2017), when queried, 18.7% of the respondents' encountered needle stick and sharp injury in the last 1 year. These statistics are quite worrying with the prevalence rate for most studies high and therefore a need to find the common causes.

(Lema & Teka, 2014) in their study revealed that 30.1% of health care workers experienced needle-stick injury within the last one year with commonest factors associated with occurrence of injuries were; work experience, ward they work in, knowledge on standard precaution and average hour involved in work and organization with policy/protocol. All these observations evidenced that, needle-stick

injuries were common problem among HCWs in studied health facilities suggesting a need for identification of hazards and implementation of a comprehensive prevention program to reduce needle-stick injuries.

Optimization of current needle prick protocols or adoption of new, more-effective protocols is crucial for the continued effectiveness of the personnel and health systems.

In this report, the prevalence and common causes of NSI are explored and steps for effective implementation are suggested.

1.3 Aim of study

To determine the prevalence of surgical injuries, commonest causes attributed to the same and uptake of PEP amongst health workers at Jinja Regional Referral Hospital.

1.4 Specific Objectives

1. To determine the prevalence of needle stick surgical injuries among HCWs in JRRH.
2. To identify the commonest causes of needle stick surgical injuries among HCWs in JRRH.
3. To find out the uptake of PEP after accidents among HCWs in JRRH.

1.5 Research Questions

1. What is the prevalence of Needle stick surgical injuries among HCWs in JRRH?
2. What are the commonest causes of needle stick surgical injuries among HCWs in JRRH?
3. What is the level of uptake of PEP after Needle prick surgical accidents among HCWs in JRRH?

1.6 Justification of the study

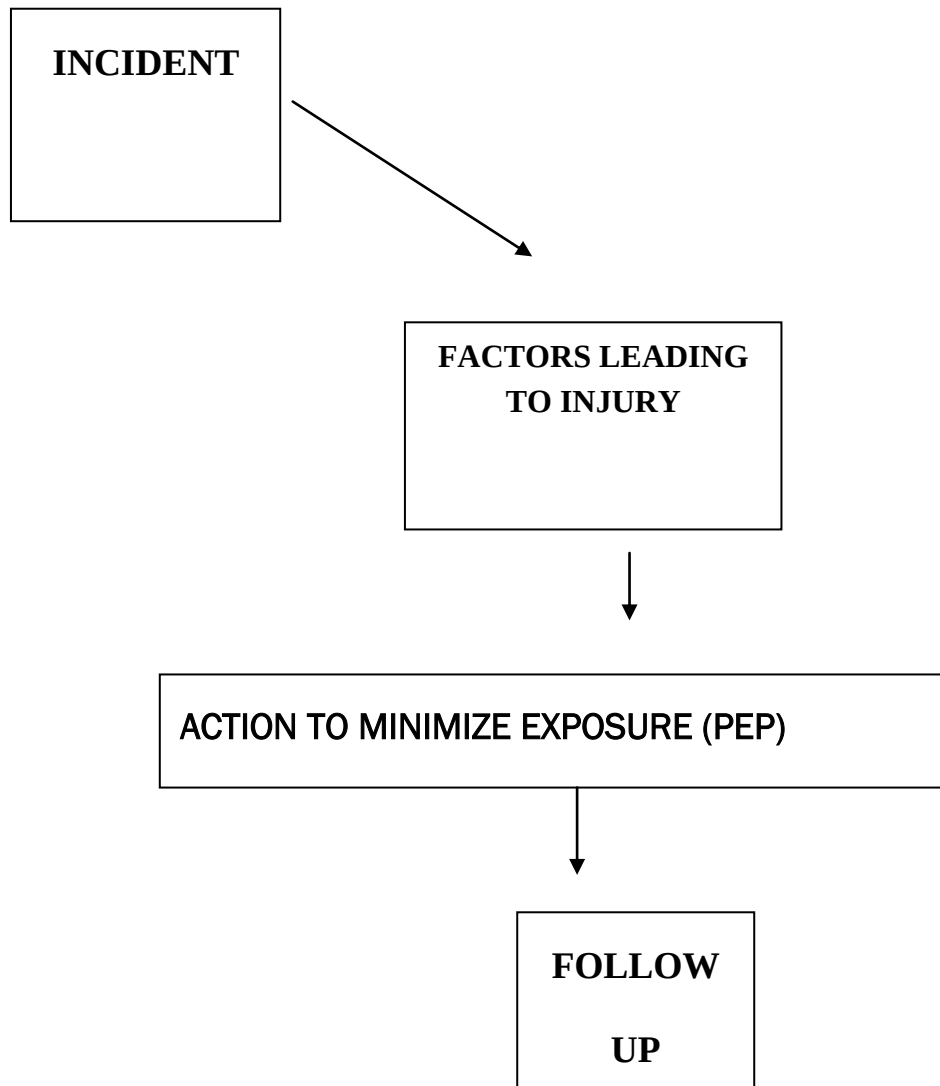
In this study, the sound knowledge of the common causes and acceptance of PEP after NSI were explored as these are important to minimize the risk of getting infections. It is also important as NSIs have a psychological burden on those who have experienced the injuries and furthermore reduce the cost burden of NSIs. Most importantly the findings of this study will be an anchor on which proper protocols should be formulated and enforced to all medical personnel in medical facilities and to the ministry of health to come up with guidelines and also tools including but not limited to drugs to help in the proper adherence to these protocols.

The findings will also provide for future reference and researching on this topic and also the identified gaps filled by future researchers.

1.7 Scope of the study

This study covered the prevalence of NSI injuries among HCWs in JRRH. It also aimed at revealing the common causes of NSI and the uptake of PEP after the injuries. Jinja Regional Referral Hospital is a government institution located in Jinja town in the district of Jinja in Eastern Uganda. This study was carried out in the months of October and November 2018. Data for 5 years was considered from 2014 to October 2018.

1.8 Conceptual framework



Incident which is the NSIs (independent variable) as caused by the commonest factors (dependent variable) leading to these injuries. This is later followed by an action to minimize exposure and, required follow up (outcome variable).

Fig1

CHAPTER 2

Literature review

This chapter largely contains information about surgical injuries. The chapter elucidates prevalence and commonest causes of surgical injuries among staff at JRRH as well as uptake of PEP. The information contained herein is mostly from textbooks, medical journals, magazines and previous researches on surgical and related needle prick injuries.

2.1. Prevalence

(Swe, Somrongthong, Amit, & Adinegara Lutfi, 2014), in their study found the prevalence of NSI was 63 (19.9%) and majority of cases occurred in the medical ward (n=51, 81%). The cause of injury was mainly due to lack of experience and it occurred during recapping and during blood withdrawal. 54 (85.7%) cases were wearing gloves when injuries occurred. Most of the injuries were caused by a hollow bore needle and only 32 (50.8%) cases have taken immediate post-exposure actions such as hand washing, encouraging bleeding, reporting and immunization. The awareness of the student with regards to NSI and the preventive measures and their application on practical training was poor.

(Askarian, Malekmakan, Memish, & Assadian, 2012) in his study found 73% of students reported at least one NSI during the past year. Activities most frequently associated with injuries involved use of a hollow-bore needle during venous sampling or IV injection in both groups, followed by wound suturing in nursing and midwifery students and recapping in dental students. NSIs and non-reporting of NSIs were highly prevalent in these participants. The reason for not reporting injuries included not knowing the reporting mechanism or not knowing to whom to report.

(Jahangiri, Rostamabadi, Hoboubi, Tadayon, & Soleimani, 2016) in their study on health and safety measures among nurses in a university hospital in Iran found that the rate of underreporting NSIs was 60.2% and the major reasons for not reporting the NSIs were heavy clinical schedule (46.7%) and perception of low risk of infection (37.7%).

(Bhattarai, Smrit, Pradhan, Lama, & Rijal, 2014); of all the study participants, 90 students (42.8%) reported at least one injury. Among those injured, two students reported exposure to Human immunodeficiency virus (HIV) positive cases and four to Hepatitis B virus (HBV) positive cases. Most of the injuries (44%) occurred during Internal Medicine rotation and the most common sharp involved (56.3%) was Hypodermic needle. Most injuries (35.6%) occurred while manipulating needle into patients. Following exposure, only 11.4% took Post exposure prophylaxis and 19.54%

went for a Post-exposure serology test. Needle-stick and Sharps-related Injuries occur frequently among health care workers including trainee students keeping them at high risk for acquiring dreadful infections like HBV, HCV and HIV. They need to be protected from unwarranted hazards by adopting routine Hepatitis B vaccination programs and by reinforcing education regarding universal precautions.

(Ouyang et al., 2017), found that eighty-eight (25%) respondents reported experiencing at least one injury. In total, our survey identified 195 total injuries. Surgical trainees were significantly more likely to incur injuries than non-surgical trainees. Orthopedic surgery trainees had the highest risk of a needle stick injury, being over 12 times more likely to be injured than emergency medicine trainees. Only 28 of the 88 most recent needle stick injuries were reported to occupational health. Trainees reported a perception of insignificant risk, lack of resources and support for reporting, and injury stigmatization as reasons for not reporting needle stick injuries.

According to a study by ("Knowledge , Attitude and Practice Towards Needle Stick Injury Among Health Care Workers in a Tertiary Sudanese Hospital," 2016) it was noticed that almost thirty percent of the study population didn't hear about the term post exposure prophylaxis up to the time of the study while the college curriculum and hospital were the main source. Almost one of every five didn't recognize the presence of occupational health service in the hospital. More than 90% knew that HIV, HBV, and HIV can be transmitted through NSI. Almost 80% chose to use antiseptic solution immediately after NSI compared to only 20% who chose to use water and soap. One third of respondents believed that post exposure prophylaxis should be used only when the syringe is used on HIV/HBV seropositive patients. Around 43-50% admitted they didn't know the time of prophylaxis initiation nor investigations that should be done after NSI. More than 83% of respondents were worried about NSI. However, around 60% believed that patient care has the priority over protection from NSI. Eighty percent believed that NSI is preventable and 92% agreed that NSI should be reported immediately.

(Wu, Wu, Chou, Ting, & Siebers, 2012) in his study found out that none of the First Aid Responders officially reported their percutaneous injuries primarily because they thought reporting was not mandatory and that the reporting process was too complicated. About one in eight EMTs had experienced at least one percutaneous injury in the preceding year. None of these injuries was officially reported to their organization. Ways to make reporting more user friendly are required, along with resources to minimize percutaneous injuries among first aid responders in Taiwan.

According to (Gopar-Nieto et al., 2015), the most common reasons for not reporting are: the belief that the exposure has low risk of infection, the lack of knowledge of reporting systems and the assumption that it is difficult to notify.

According to the South American Journal of Clinical Research Volume 3, Issue 1,

2016, ("Knowledge , Attitude and Practice Towards Needle Stick Injury Among Health Care Workers in a Tertiary Sudanese Hospital," 2016), One of the most important issue in NSI is reporting the accident. Around 34% only did that. Participants didn't report their injuries due to different reasons. For example, the participant thought that it is not important (the outcome remaining unchanged by reporting). Others said that it takes time to report, thought that the exposure was non-significant, or didn't know how to report their injuries. Some thought that it would not be infectious while others were already immunized.

2.2 Common Causes

(Bernard, Dattilo, & Laporte, 2013) found that the most common single instrument responsible for sharps injuries among all groups was the solid-bore needle; students and residents were significantly more likely than faculty to have a sharps injury from a solid-bore needle than all other devices combined. Medical students were more likely to ignore the exposure than residents or faculty. Only 12.5% of medical students followed all the steps of the post exposure prophylaxis and this was attributed to poor knowledge of reporting incidences.

(Choi et al., 2017) noted in his study that; the overall report rate following an initial SNI was 64%. Surgical staff reported SNIs more frequently, with an incidence rate ratio (IRR) of 1.33 when compared with attendings. When compared with surgical attendings, medical students (IRR of 2.86) and residents (IRR of 2.21) were more likely to cite fear as a reason for not reporting SNIs. Approximately 65% of respondents did not report their exposure either because of the time consuming process or the patient involved was perceived to be low-risk or both. The 2 most common reasons for not reporting SNIs at our institution are because of the inability to complete the time consuming reporting process and fear of embarrassment or punitive response because of admitting an injury.

According to Swiss medical weekly (Voide et al., 2012), 260/2,691 employees (9.7%) had sustained at least one NSSI during the preceding twelve months. NSSIs were more frequent among nurses (49.2%) and doctors performing invasive procedures (IPs) (36.9%). NSSI rate by occupation was 8.6% for nurses, 19% for doctors and 1.3% for domestic staff. Of the injured respondents, 73.1% reported all events, 12.3% some and 14.6% none. 42.7% of doctors performing invasive procedures underreported NSSIs and represented 58.6% of underreported events. Estimation that transmission risk was low (87.1%) and perceived lack of time (34.3%) were the most common reasons for non-reporting. Regarding reporting procedures, 80.1% of respondents knew to contact occupational health services.

In a study by (Iqbal, Jawaid, Abbas, & Ahsan Malik, 2013) from Rawal medical journal, a total of 155 doctors participated with mean +/- SD duration of clinical

experience was 20.06 $\pm$ 30 months. Total 93% respondents were vaccinated against HBV but only 24% knew their antibody titer. Only 31% always wear gloves while performing venepuncture. For discard of used needles, 49.7% recap and throw, 41.3% bend and throw and only 9% used needles cutters. Nearly half (43%) suffered from NSI during last six months. Among sufferers 34% discard blood, 13% wash with soap and water, 28% did nothing after the incidents. Only 9% reported the incident to the concerned authorities. The study highlighted several deficiencies in safe needle practice that endangers the safety of doctors working in tertiary care teaching hospitals. There is also lack of adverse incident reporting facility and guidelines. Increasing awareness about the hazards, preventive measures and reporting strategies after needle injuries will help to optimize the occupational safety of health care workers.

Other studies showed that the reasons were fear of stigmatization and discrimination, feeling embarrassed, fear of the consequences, the patient was low risk, good local anti-sepsis undertaken at time of injury, heavy clinical schedule, students more concerned with finishing their clinical requirements and not knowing that there is a reporting protocol, negative faculty reaction and negative patient reaction.

It is quite clear there is a general lack of knowledge about the protocol of NSI amongst medical professionals and this most likely applies to their students as well. Based on this fact, it is obviously in the line of fire that compliance to this protocol is absolutely poor. The proper knowledge and practice are very important to increase compliance levels to NSI.

Incident reporting is one of the commonest mechanisms used to learn from harm events and near misses. Only a relatively small number of incidents that occur are actually reported and different groups of staff have different rates of reporting. (Hotton, Jordan, & Peden, 2014) in their study found that nationally, junior doctors are low reporters of incidents, assessment of their knowledge, confidence and understanding of incident reporting, education on how and why to report incidents with a focus on reporting on clinical themes during a specific time period, and evaluation of the experience of those doctors who reported incidents. Junior doctors were asked to focus on incident reporting during a one week period. Before and after this focused week, they were invited to complete a questionnaire exploring their confidence about what an incident was and how to report. Prior to "Incident Reporting Week", on average only two reports were submitted a month by junior doctors compared with an average of 15 per month following the education and awareness week. This project highlights the fact that using a focused reporting period and/or specific clinical themes as an education tool can benefit a hospital by promoting awareness of incidents and by increasing incident reporting rates. This can only assist

in improving hospital systems, and ultimately increase patient safety.

From Pakistan journal of medicine, (Waqar, ul Siraj, Razzaq, Malik, & Zahid, 2011) found that the commonest reasons for needle injury in stick injuries were heavy work load (36.8%) followed by hasty work (33.6%) and needle recapping (18.6%). About 66% health care workers were already vaccinated against hepatitis B. Only 13% workers followed universal guidelines of needle stick injuries and no case was reported to hospital authorities. Health care workers had inadequate knowledge about the risk associated with needle stick injuries and do not follow standard preventive measures. A standard protocol regarding the training and compliance to follow preventive measures should be followed in all health care institutions.

2.3 PEP Uptake

In a study on post exposure prophylaxis among Ugandan nurses, (Mill, Nderitu, & Richter, 2014), report showed Sixteen nurses from a variety of units in a large teaching hospital participated. Needle-stick injuries were a fairly common occurrence, but written policies were frequently inaccessible to nurses and they did not have adequate knowledge of PEP. Some nurses were reluctant to report injuries and avoided following PEP procedures due to lack of knowledge about PEP, concerns about anti-retroviral side effects and the stigma associated with PEP. Participants were aware of PEP however there was a wide variation in their understanding of the procedure to follow after a needle-stick injury. Employers therefore have a responsibility to update PEP guidelines and to orientate HCWs to these. Educators must ensure that medical personnel have a comprehensive understanding of universal precautions and current practice for PEP.

In a study by (Y.-W. et al., 2015) about quality control strategy; Strategies for improvement included: meeting for discussing on how to improve the needle stick injury, let the in charge person to pay attention, slang for preventing needle stick injury, guidelines and make films for educational training and safeguard interventions, increasing using safety needle devises and properly using safety needle devises. It was later noted that the rate of needle stick injury was declining given that the rate for needle stick injury in year 2013 was 2.6%, which was lower than that of year 2012 (3.0%). Strategies therefore are effective gearshifts of these injuries depending on predilections of each institution and a various cluster of professionals.

According to Occupational Health Unit (2002), Standard Precaution is the most important strategy for successful infection control in the health care setting. Students who had not attended any training of prevention and management of needle stick injuries were significantly at greater risk of sustaining the injuries compared with those who had attended some kind of training”(Nsubuga& Jaakkola, 2005).

In a study done by (Tarigan, Cifuentes, Quinn, & Kriebel, 2015) six eligible studies

evaluated the effectiveness of training interventions, and the summary effect of the training intervention was 0.66 (95% CI, 0.50-0.89). The summary effect across the 5 studies that assessed the efficacy of SEDs was 0.51 (95% CI, 0.40-0.64). A total of 8 studies evaluated the effectiveness of training plus SEDs, with a summary effect of 0.38 (95% CI, 0.28-0.50). Training combined with SEDs can substantially reduce the risk of NSIs.

Post exposure action of needle stick injury especially post exposure prophylaxis (PEP) is very important to minimize diseases infection. Health care workers are advised to report the incident according to the protocol in the hospital and get blood testing for HBV, HCV and HIV. The percentage of poor compliance is too high and protocols ought to be covered in a workshop given to health workers for example when they are first employed at internship or be included in the curriculum at undergraduate level.

CHAPTER 3

3.0 Methodology

The chapter describes the methods and procedures that were undertaken in the course of the study. It includes study area and design, sample size, sample technique, data collection, instruments used, exclusion and inclusion criteria, limiting factors.

3.1 Study Design

The research design used for this study was a Descriptive retrospective cross sectional study. Retrospective design was chosen because it is less time consuming and data collected more easily.

It enabled that the sample population assessed in one point at one time without trying to make interference. Also, it is a way to get the information regarding a condition or disease and to study the pattern and connection between the different variables in order to plan for future intervention.

3.2 Study Area

The study was conducted at Jinja Regional Referral Hospital in Jinja District located in Eastern Uganda. It has a total average population of 300 people including Doctors, Nurses, Interns, Support staff and students.

3.3 Study Population

It involved the populations of support staff and medical personnel; doctors, nurses, interns and medical students who worked in JRRH in the previous 5 years. These were chosen so as a larger variety of staff can be assessed for their involvement.

3.4 Sample size determination (Morgan's table)

Morgan's table was used for sample size determination due to its ease. (Refer to the indices)

Based on the population size of 300 persons, considering a confidence of 95% and a margin of error of 5.0%, a population size of 169 people was considered.

3.5 Inclusion and exclusion criteria

Medical personnel who had NSI between the years of 2013 and 2018 and the years before these were not considered.

3.6 Definition of variables

This study will included; the prevalence common causes of needle stick prick injuries

and uptake of PEP among HCWs in JRRH.

3.8 Research Instruments

Data collection forms were used in this study because it is a retrospective study and data collected from administrative data center.

3.9 Data collection method

Data collection forms were filled with input from the data center.

3.10 Data processing and Analysis

SPSS 21 and MS Excel 2013 were used in the proper analysis of data.

3.11 Data Presentation

Study results are presented on pie charts, bar graphs and tables. Descriptive statistics are used where percentages for each point of interest are calculated to give the lesson learnt and conclusion.

3.13 Ethical consideration

Ethical approval was sought from Kampala International University Western Campus Research and Ethics committee and JRRH administration. A letter of permission and Introduction on the purpose of the work at hand was sought from the committee to be presented to the concerned. Purpose and objectives were also included and confidentiality was utmost priority.

3.14 Study Limitations

It was quite expensive since a lot of paper work was required for printing.

There was a disabling time constraint since the timing of the study was not well thought as it was required to be done during school time where very many programmes were ongoing.

During data collection, some of the important data was not captured as it was not recorded in the logbook.

CHAPTER 4

4.0 RESULTS

This chapter gives the findings of the descriptive retrospective cross sectional study that was done.

Data were reviewed for the years 2014– 2018, and all were for the HCWs that had had a NSI and had reported to the relevant authorities.

4.1 Incidence of NSIs

Table 1

Year	No. of injuries	%
2018	29	17
2017	38	23
2016	28	17
2015	40	24
2014	33	20

Table 1 shows the number of injuries that occurred over the years 2014 – 2018. Majority of the cases (24%) occurred in 2015. The least injuries (17%) occurred in 2016. In 2014 20% of the total cases occurred and 23% of cases occurred in 2017. By the time of the research, 17% of cases had occurred in 2018 and probably many more could occur as the year comes to an end.

Figure 2; Percentage number of injuries

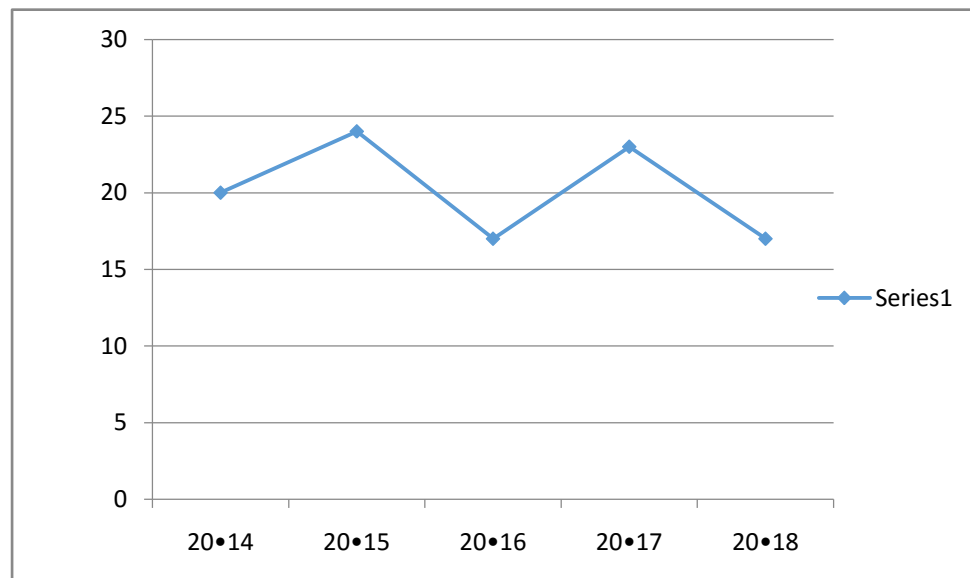


Figure 2 shows a fairly consistent rise and fall in the percentage number of injuries that have occurred over the years with a percentage difference of at least 5%.

Occupational groups and injuries

Figure 3; Percentage Injuries in different occupational groups

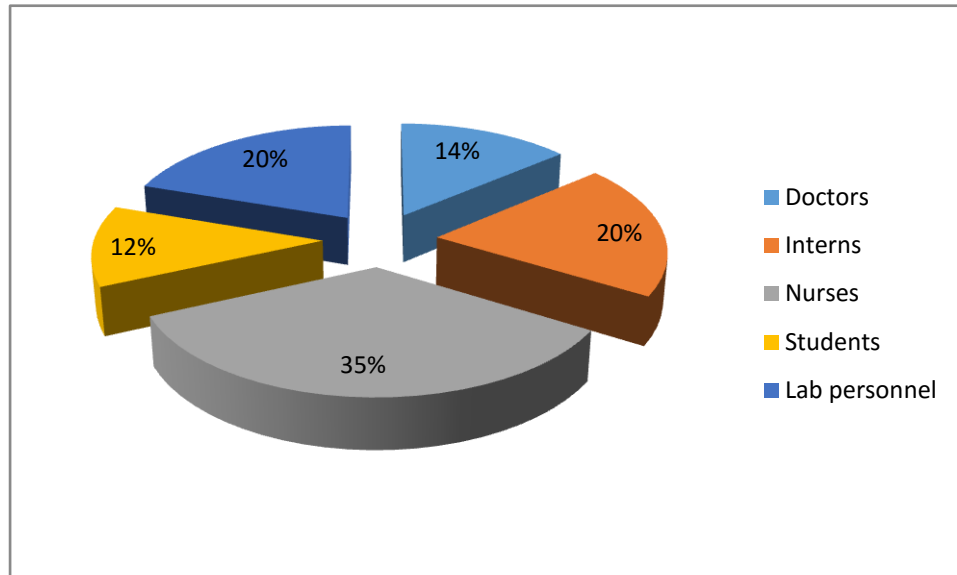


Figure 3 shows the percentage number of injuries among the different occupational groups with the majority of injuries, 35% (59 of the documents reviewed) occurring among the nurses. Then 20% (33 of the reviewed documents) among the interns, 20% (33 of the reviewed documents) among the lab personnel and 14% (23 of the reviewed documents) and 12% (20 of the reviewed documents) among the doctors and students respectively.

4.2 Common causes of NSIs

Figure 4; Where injuries occur

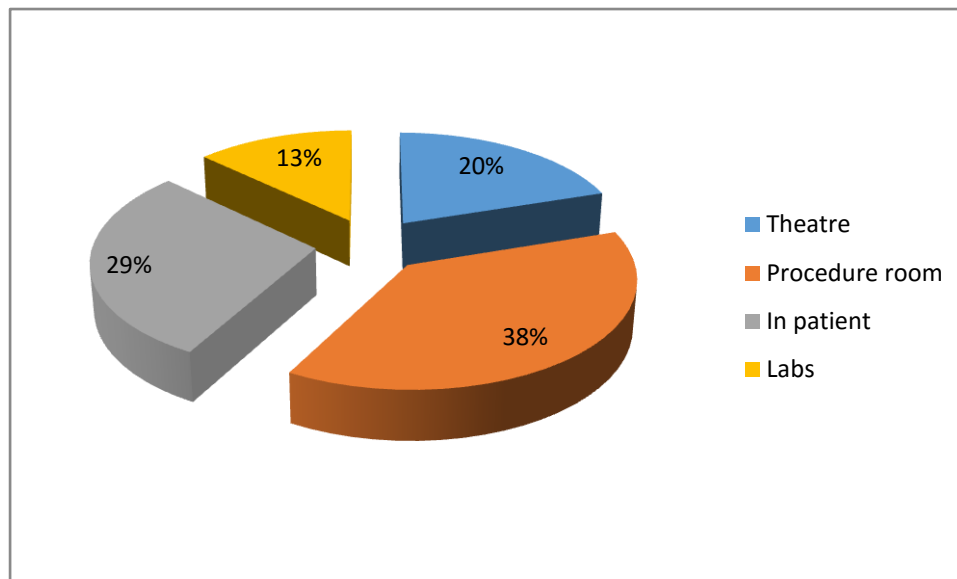


Figure 4 shows the number of injuries and where they occurred. Findings show that majority of the injuries occurred in the procedure rooms (38%), 29% of the injuries occurred in the Inpatient departments, 20% in the theatre and 13% of the injuries in the labs. There is a statistical significance between the percentage number of injuries occurring in the procedure rooms and the injuries (35%) occurring amongst the nurses.

Figure 5; Timing of the injuries

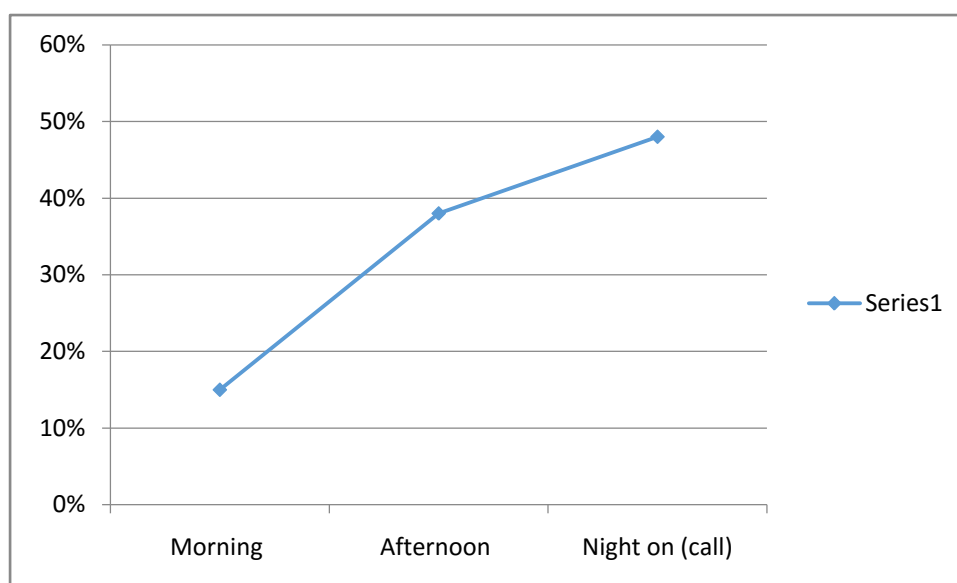


Figure 5 shows the percentage number of injuries and their timing. There is an exponential increase in the number of injuries that occurred from morning to the night, where the majority, 48% occurred over the night as HCWs are on call. It was then followed by the afternoon where 38% of the injuries occurred with the least injuries having occurred in the morning 15%.

Figure 6; Circumstances leading to injury

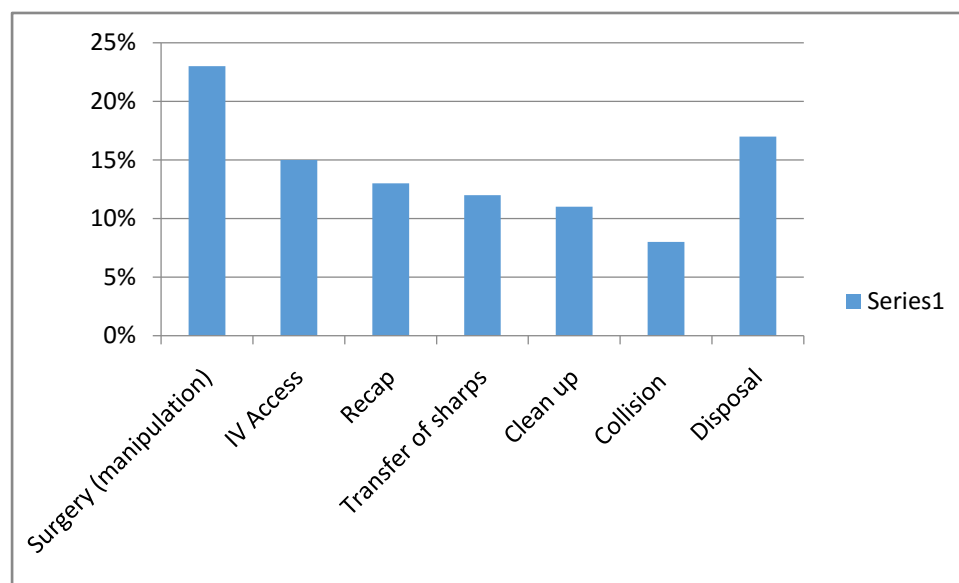


Figure 6 shows the percentage injuries occurring as a result of the different circumstances. Manipulation of needles especially during surgical procedures was responsible for 23% of the injuries that occurred during 2014 and 2018 in JRRH and it was the leading cause of NSI accidents. 15% of the injuries were as a result of IV access occurring during cannula insertion. Recapping was responsible for 13% of the injuries. Transfer of sharps after use responsible for 12% of NSIs. During clean-up of surgical Instruments, injuries occurred and these were responsible for 11% of the overall injuries. Collision was responsible for 8% of injuries and this was the least cause of NSIs. During disposal, 17% of the injuries occurred and it was the second leading cause of circumstances leading to injury.

Figure 7; Percentage injuries and common culprit devices

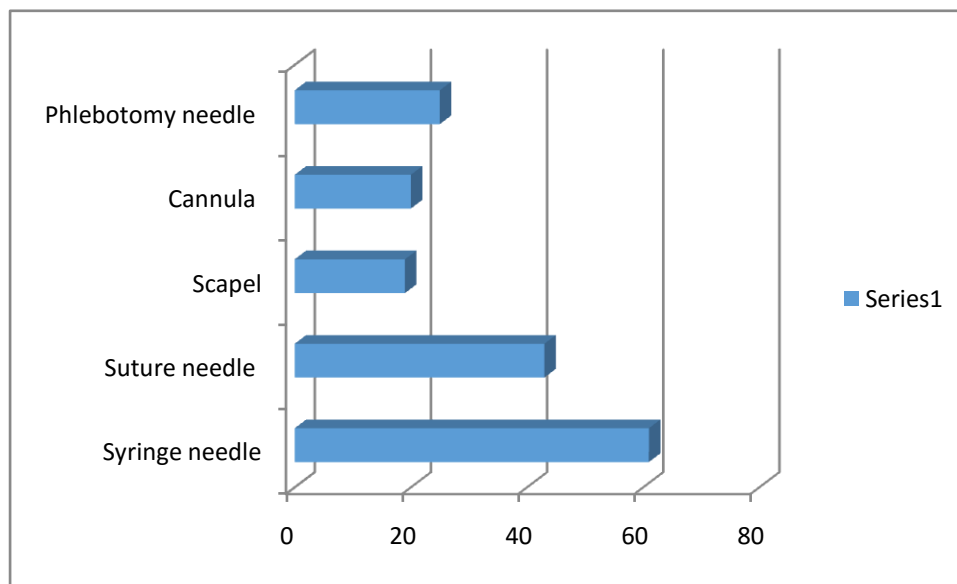


Figure 7 shows the percentage number of injuries and the common culprit devices responsible for the NSIs. Syringe Needles were the biggest culprit of NSIs and were responsible for 36% of the total injuries. These were followed by suture needles which were responsible for 26% of the injuries. Phlebotomy needles were third commonest culprit with a 15% of the total injuries. Cannula and Scapel were the least implicated with 12% and 11% injuries respectively.

Table 2; Percentage number of injuries among different groups and locations

	Theatre	Procedure room	Inpatient	Labs
Doctors	24%	16%	16%	-
Interns	44%	29%	22%	-
Nurses	21%	46%	39%	-
Students	12%	10%	22%	27%
Labs	-	-	-	73%

Table 2 shows the percentage number of injuries that occurred in the various locations by different occupational groups.

Doctors had 24% of the injuries occurring in theatre, 16% in the procedure room and 16% of the injuries in the inpatient departments.

Interns had 44% of the injuries occurring in theatre and these were the biggest number of injuries that occurred in theatre. 29% in the procedure room, 22% of injuries in the inpatient departments.

Nurses had the largest number of injuries (46%) in the procedure rooms, 39% in the inpatient departments and 21% of injuries in theatre.

Students had 12% of the injuries in theatre, 10% in procedure rooms, 22% in inpatient departments and 27% in the labs.

Of all the NSIs occurring in the labs, 73% of them occurred to the lab technicians.

4.3 Uptake of PEP

Table 3

Cader	Number
Doctors	08
Interns	18
Nurses	21
Students	05
Lab personnel	10

Of the 168 documents reviewed, 62 of the culprits were started on PEP after the injuries with the majority being nurses followed by interns, then lab technicians, doctors and lastly students. The final outcome was good for the majority (58) that started PEP but however a few (4) proceeded to acquiring Infection.

CHAPTER 5

DISCUSSION

In this chapter, we shall discuss the findings from the research that was carried out with similarities and differences from other literature included.

5.1 Incidence of NSIs

Findings showed a consistent rise and fall in the number of reported cases over the years with a percentage difference of about 5% per year. This could have been as a result of the new staff in form of interns that the hospitals admit every year and these come with inexperience which may be thought to have been one of the causes of the needle stick injuries.

According to a study done by (Dilie et al., 2017), it showed that one of the reasons for NSIs was lack of required skill by the HCWs. The prevalence of needle stick injury in the present study found to be 76.7% (Tripura, Sharma, Acharjee, Professor, & Student, 2018). This revealed a high prevalence of NSIs among health care workers and this is in line with the big numbers of injuries that occur in JRRH as evidenced by an average of 33 HCWs getting needle stick accidents every year.

Different occupational groups and injuries

Findings showed that the 35% of the reviewed documents revealed nurses as the occupational group with the highest number of NSIs followed at 20% by the interns. This could have been attributed to the fact that they are in direct contact and care for the patients with most of the time doing drug administration, minor surgical procedures and other procedures requiring needle manipulation. (Kaweti & Abegaz, 2016) showed that nurses and cleaners were at increased risk for the occurrence of NSIs. (Huang et al., 2017) also in his study showed that the highest number of injuries occurred in nursing staff (10.3%). (Badiie-aval et al., 2017) also in his study found that radiology and physiotherapy personnel had the highest percentage of needle stick contact, followed by nurses. All the above studies further correlate with the findings of this research showing nurses with the highest percentage of injuries. These were later followed by injuries with the lowest prevalence among doctors and students at 14% and 12% respectively and this could be attributed to the fact that they spend less time with the patients as opposed to the nurses and interns who had a higher percentage of injuries.

5.2 Common causes of NSIs

Locations and injuries

Majority of the injuries, 38% occurred in the procedure rooms at the wards and emergency procedure rooms followed by the inpatient departments at 29%. It is in these locations that most of the procedures are done by the intern doctors with the assistance of the nurses and students at times. The highest number of injuries occurred in nursing staff (10.3%). (Huang et al., 2017) showed that injuries took place most frequently on general wards (44.5%). This correlates with our study which found that most injuries occurred on the inpatient departments and the procedure rooms at those inpatient departments. Theatre injuries were up to 20% (34) of the documents reviewed. According to (A et al., 2014), the prevalence of NSIs was 32 (20.9%) and majority of it occurred during assisting in operation theatre 13(37.4%). Among them six (18.8%) were specialist, 12(37.5%) medical officer, 10 (31.2%) house officer and four staff nurses (12.5%).

Timing of injuries

Findings showed that majority of the injuries occurred in the night while HCWs were on call and this was relating to the level of fatigue since they have been on duty for the better part of the day. Injuries increase in number as the day goes by. According to (Annu Kaushik, 2015) majority (62%) of the NSI was sustained during night shift. (Jahangiri et al., 2016) found a statistically significant relationship between the occurrence of NSIs and sex, hours worked/week, and frequency of shifts/month. All these directly correlate with level of fatigue and increase in the number of injuries that occurred.

Processes of Injury and common devices

Manipulation of sharps was the commonest cause of accidents with a 23% prevalence followed by injuries during disposal 17%, and then during IV access with 15% prevalence. (Annu Kaushik, 2015) in their study revealed that more than half (56%) of the NSI incidents occurred while the nurses were recapping the needle, 10% of the incidences occurred while passing needle and 10% while disposing the needle and or breaking. The most common cause of NSI as perceived by nurses was lack of proper equipment for disposal (50%) followed by increased workload (24%), carelessness (18%) and fatigue (8%). (Huang et al., 2017) also reported that the circumstances that involved most frequent injuries include surgical needle insertion, removing an arteriovenous needle from a patient and recapping the needle. Single-use syringe caused more injuries incidents than other instruments. (Gopar-Nieto et al., 2015) also found that the most commonly associated procedures are injection, venepuncture, suture, and insertion and manipulation of IV catheters. From the above findings commonest culprits of sharp related accidents were recapping, needle manipulation,

IV access lines, and disposal of sharps were the commonest sited processes of injuries. This also further revealed that syringe needles were the biggest culprit device (36%) for needle prick accidents followed by suture needles with 26%, phlebotomy needles 15%, cannula 12% and scalpel 11%.

Interns had the biggest number of injuries in theatre (44%) of all theatre injuries, Nurses had the highest number of injuries in the procedure rooms (46% of injuries in the theatre rooms) and the inpatient departments with doctors and students having lesser accidents in each of those locations. The injuries to the interns are highly related to their level of experience as compared to the doctors who had lesser injuries and are of course more experienced by the interns. (A et al., 2014) in their study revealed the incidence of NSI among health care workers at orthopaedics ward was not any higher in comparison with the similar studies and it was found out that the prevalence was more in junior doctors compared with specialist and staff nurses and it was statistically significant. This further justifies the findings that inexperience is a major factor in needle prick accidents. (Nsubuga & Jaakkola, 2005) in their study showed a high rate of needle stick injuries among nurses and midwives working in Uganda. The strongest predictor for needle stick injuries was lack of training. Other important risk factors were related to long working hours, working habits, and experience. This relates to the findings of this study as most nurses have injuries followed by the interns who actually have a bigger workload and have longer working hours than the rest of the staff. In the same vein they are also at risk of pressure from work this trying to work against time increasing their chances of injury. (Rais & Jamil, 2013) showed that some circumstances such as pressure of work and time constraint was a contributing factor. (Maken et al., 2016) revealed that despite knowing the risks, incidence of NSI was higher in HCWs which reflect bad practices due to overburden and carelessness.

5.3 Uptake of PEP

PEP uptake after injury was good with 58 of the 62 that were initiated on PEP not proceeding to acquiring disease and only 4 of whom were culprits reported non adherence as a common reason for the progression to infection with HIV.

CONCLUSION

6.1 Prevalence of NSIs

The study revealed a significant number of HCWs getting needle prick accidents and majority of these being nurses (35%) and interns (20%). Lab personnel accounted for 19%, doctors 14% and students 12%.

38% of accidents occur in the procedure rooms and 29% in the inpatient department wards and 20% of the injuries occurred in theatre.

6.2 Common causes of NSIs

Majority, (48%) of the injuries occur during the night when HCWs are on night shift, 38% NSIs occur in the afternoon and 15% injuries occurred in the morning.

Surgical needle manipulation 23%, disposal 17% and IV access 15% were the biggest culprit processes responsible for most injuries. Needle recap was responsible for 13% injuries, during transfer 12%, during clean up 11% and collisions responsible for 8% of injuries.

Syringe needles were responsible for 36% of injuries followed by suture needles which were responsible for 26%, phlebotomy needles, 15%, IV cannula 12% and scalpel 11%.

6.3 Uptake of PEP

68 HCWs were started on PEP after the NSI with 58 of them getting well and only 4 of them acquiring an infection.

RECOMMENDATIONS

It is important that most of these under skilled staff be taken through a training refresher course much more often on how to prevent occurrence of these injuries.

Safety guidelines need to be pinned in visually accessible sites in both procedure rooms and inpatient wards since most injuries occur there for easy reference in case need arises.

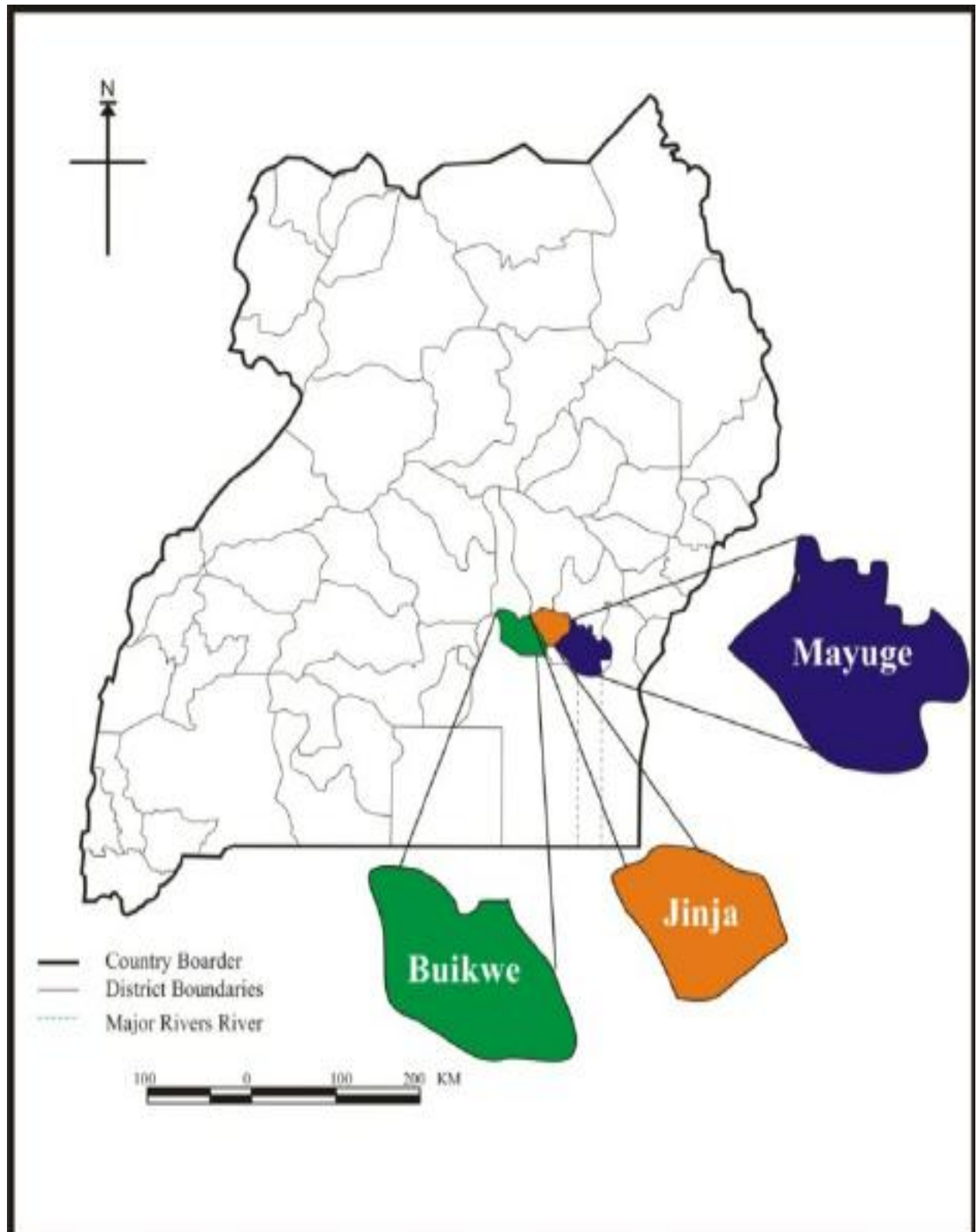
There is need for strict and proper schedule programming for staff and adequate breaks after long working hours to avoid fatigue.

Proper disposal practices, double gloved cleaning of instruments with much more care is required. Non recapping of needles and careful insertion of needles should be practiced as well.

Closer monitoring and possible daily counseling of workers that have been initiated on PEP treatment is important as this may help in eliminating cross infection since proper adherence has proven effective in the prevention of cross infection.

APPENDICES

Appendix I; Map of Uganda showing Jinja town and Jinja Hospital



MORGAN'S TABLE FOR SAMPLE SIZE

Population Size	Confidence = 95%				Confidence = 99%			
	Margin of Error				Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1000	278	440	606	906	399	575	727	943
1200	291	474	674	1067	427	636	827	1119
1500	306	515	759	1297	460	712	959	1376
2000	322	563	869	1655	498	808	1141	1785
2500	333	597	952	1984	524	879	1288	2173
3500	346	641	1068	2565	558	977	1510	2890
5000	357	678	1176	3288	586	1066	1734	3842
7500	365	710	1275	4211	610	1147	1960	5165
10000	370	727	1332	4899	622	1193	2098	6239
25000	378	760	1448	6939	646	1285	2399	9972
50000	381	772	1491	8056	655	1318	2520	12455
75000	382	776	1506	8514	658	1330	2563	13583
100000	383	778	1513	8762	659	1336	2585	14227
250000	384	782	1527	9248	662	1347	2626	15555
500000	384	783	1532	9423	663	1350	2640	16055
1000000	384	783	1534	9512	663	1352	2647	16317
2500000	384	784	1536	9567	663	1353	2651	16478
10000000	384	784	1536	9594	663	1354	2653	16560
100000000	384	784	1537	9603	663	1354	2654	16584
300000000	384	784	1537	9603	663	1354	2654	16586

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**OFFICE OF THE DEAN
FACULTY OF CLINICAL MEDICINE & DENTISTRY**

27/11/2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: KIRABIRA TONNY (BMS/0027/133/DU)

The above named person is a fifth year student at Kampala International University pursuing a Bachelor of Medicine, Bachelor of Surgery (MBChB) Programme.

He wishes to conduct his student research in your hospital.

Topic: Prevalence commonest causes of surgical injuries and uptake of PEP amongst health workers at Jinja Regional Referral Hospital

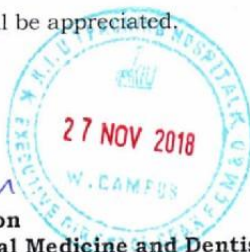
Supervisor: Dr. Okedi Francis Xavier

Any assistance given will be appreciated.

Yours Sincerely,



Prof. Ssebuufu Robinson
Dean Faculty of Clinical Medicine and Dentistry



"Exploring the Heights"

Assoc. Prof Ssebuufu Robinson, Dean (FCM & D) 0772 507248 email: rssebuufu@gmail.com
Dr. Akib Suraf Associate Dean FCM & D) email: doctorakib@yahoo.com

REFERENCES

- A, bhardwaj, N, S., MF, Y., AH, M., KMM, S., & NK, S. (2014). The Prevalence of Accidental needle Stick Injury and their reporting among healthcare Workers in orthopaedic Wards in General hospital Melaka, Malaysia. *Malaysian Orthopaedic Journal*, 8(2), 6–13. <https://doi.org/10.5704/MOJ.1407.009>
- Adib-Hajbaghery, M., & Lotfi, M. S. (2013). Behavior of healthcare workers after injuries from sharp instruments. *Trauma Monthly*, 18(2), 75–80. <https://doi.org/10.5812/traumamon.12779>
- Annu Kaushik, D. J. S. (2015). Prevalence of Needlestick Injuries and Its Related Factors Among Nurses. *IOSR Journal of Nursing and Health Science (IOSR-JNHS)*. <https://doi.org/10.9790/1959-04550106>
- Askarian, M., Malekmakan, L., Memish, Z. a, & Assadian, O. (2012). Prevalence of needle stick injuries among dental, nursing and midwifery students in Shiraz, Iran. *GMS Krankenhaushygiene Interdisziplinär*, 7(1), Doc05. <https://doi.org/10.3205/dgkh000189>
- Aslam, M., Taj, T., Ali, A., Mirza, W., Ali, H., Dar, M. I., & Badar, N. (2010). Needle stick injuries among health care workers of public sector tertiary care hospitals of Karachi. *J Coll Physicians Surg Pak*, 20(3), 150–153. <https://doi.org/03.2010/jcpsp.150153>
- Badiee-aval, S., Yaghoobi, M., Ezzati, M. H., Ziaee, M., Vafaeenejad, R., Bakhtiari, G., ... Samiee Daluee, B. (2017). Needlestick Injuries in Healthcare Workers in the North East of Iran. *Mashhad University of Medical Sciences*, 5(2), 509–512. <https://doi.org/10.22038/PSJ.2017.20740.1148>
- Bekele, T., Gebremariam, A., Kaso, M., & Ahmed, K. (2015). Factors associated with occupational needle stick and sharps injuries among hospital healthcare workers in bale zone, Southeast Ethiopia. *PLoS ONE*, 10(10). <https://doi.org/10.1371/journal.pone.0140382>
- Bernard, J. A., Dattilo, J. R., & Laporte, D. M. (2013). The incidence and reporting of sharps exposure among medical students, orthopedic residents, and faculty at one institution. *Journal of Surgical Education*, 70(5), 660–668. <https://doi.org/10.1016/j.jsurg.2013.04.010>
- Bhattarai, S., Smrit, K. C., Pradhan, P. M. S., Lama, S., & Rijal, S. (2014). Hepatitis B vaccination status and Needle-stick and Sharps-related Injuries among medical school students in Nepal: A cross-sectional study. *BMC Research Notes*, 7(1). <https://doi.org/10.1186/1756-0500-7-774>
- Choi, L. Y., Torres, R., Syed, S., Boyle, S., Ata, A., Beyer, T. D., & Rosati, C. (2017). Sharps and Needlestick Injuries Among Medical Students, Surgical Residents, Faculty, and Operating Room Staff at a Single Academic Institution. *Journal of Surgical Education*, 74(1), 131–136. <https://doi.org/10.1016/j.jsurg.2016.06.003>
- Dilie, A., Amare, D., & Gualu, T. (2017). Occupational Exposure to Needle Stick and

- Sharp Injuries and Associated Factors among Health Care Workers in Awi Zone, Amhara Regional State, Northwest Ethiopia, 2016. *Journal of Environmental and Public Health*, 2017, 1–6. <https://doi.org/10.1155/2017/2438713>
- Gopar-Nieto, R., Juarez-Perez, C. A., Cabello-Lopez, A., Haro-Garcia, L. C., & Aguilar-Madrid, G. (2015). [Overview of sharps injuries among health-care workers]. *Revista Medica Del Instituto Mexicano Del Seguro Social*, 53(3), 356–361.
- Hotton, E., Jordan, L., & Peden, C. (2014). Improving incident reporting among junior doctors. *BMJ Quality Improvement Reports*, 3(1), u202381.w2481–u202381.w2481. <https://doi.org/10.1136/bmjquality.u202381.w2481>
- Huang, S. L., Lu, Q., Fan, S. H., Zong, Z. Y., Hou, T. Y., Chen, B. Y., ... Wang, N. N. (2017). Sharp instrument injuries among hospital healthcare workers in mainland China: A cross-sectional study. *BMJ Open*, 7(9). <https://doi.org/10.1136/bmjopen-2017-017761>
- Iqbal, M., Jawaid, M., Abbas, S., & Ahsan Malik, K. (2013). Needle Stick injuries among doctors working in a tertiary care hospital of Karachi. *Rawal Medical Journal*, 38(3), 226–229.
- Jahangiri, M., Rostamabadi, A., Hoboubi, N., Tadayon, N., & Soleimani, A. (2016). Needle Stick Injuries and their Related Safety Measures among Nurses in a University Hospital, Shiraz, Iran. *Safety and Health at Work*, 7(1), 72–77. <https://doi.org/10.1016/j.shaw.2015.07.006>
- Kaweti, G., & Abegaz, T. (2016). Prevalence of percutaneous injuries and associated factors among health care workers in Hawassa referral and adare District hospitals, Hawassa, Ethiopia, January 2014. *BMC Public Health*, 16(1). <https://doi.org/10.1186/s12889-015-2642-0>
- Khader, Y., Burgan, S., & Amarin, Z. (2009). Self-reported needle-stick injuries among dentists in north Jordan. *Eastern Mediterranean Health Journal*, 15(1), 185–189.
- Knowledge , Attitude and Practice Towards Needle Stick Injury Among Health Care Workers in a Tertiary Sudanese Hospital. (2016), (July). <https://doi.org/10.21522/TIJCR.2014.03.01.Art010>
- Lema, M., & Teka, F. (2014). Needle-stick injuries and contributing factors among healthcare workers in public health facilities in Jigjiga zone, Eastern Ethiopia. *World Journal of Medical Sciences*, 11, 490–496. <https://doi.org/10.5829/idosi.wjms.2014.11.4.86144>
- Maken, Z. H., Neha, S., Maria, F., Malik, Z. I., Rahy, F., Saba, I., & Maria, K. (2016). Knowledge attitude and practices regarding needle stick injuries in health care workers and medical students working in a tertiary care hospital of Islamabad Pakistan. *Pakistan Journal of Public Health*, 6(1), 37–40.
- Mannocci, A., Carli, G. De, Bari, V. Di, Saulle, R., Unim, B., Nicolotti, N., ... Torre, G. La. (2016). How Much do Needlestick Injuries Cost ? A Systematic Review of the Economic Evaluations of Needlestick and Sharps Injuries Among Healthcare Personnel, 37(6). <https://doi.org/10.1017/ice.2016.48>
- Mill, J., Nderitu, E., & Richter, S. (2014). Post-exposure prophylaxis among Ugandan

- nurses: "Accidents do happen." *International Journal of Africa Nursing Sciences*, 1, 11–17. <https://doi.org/10.1016/j.ijans.2014.05.003>
- Mungure, E. K., Gakonyo, J. M., Mamdani, Z., & Butt, F. (2010). Awareness and experience of needle stick injuries among dental students at the University of Nairobi, Dental Hospital. *East African Medical Journal*, 87(5), 211–214. <https://doi.org/10.4314/eamj.v87i5.63076>
- Nsubuga, F. M., & Jaakkola, M. S. (2005). Needle stick injuries among nurses in sub-Saharan Africa. *Tropical Medicine and International Health*, 10(8), 773–781. <https://doi.org/10.1111/j.1365-3156.2005.01453.x>
- Ouyang, B., Li, L. D. X., Mount, J., Jamal, A. J., Berry, L., Simone, C., ... Tai, R. W. M. (2017). Incidence and characteristics of needlestick injuries among medical trainees at a community teaching hospital: A cross-sectional study. *Journal of Occupational Health*, 59(1), 63–73. <https://doi.org/10.1539/joh.15-0253-FS>
- Rais, N., & Jamil, H. M. (2013). Prevalence of needle stick injuries among health care providers. *International Journal of Endorsing Health Science Research*, 1(2), 73–79. Retrieved from <http://aeirc-edu.com/wp-content/uploads/Download-full-paper6.pdf>
- Salelkar, S., Motghare, D. D., Kulkarni, M. S., & Vaz, F. S. (2010). Study of needle stick injuries among health care workers at a tertiary care hospital. *Indian J Public Health*, 54(1), 18–20. <https://doi.org/10.4103/0019-557X.70540>
- Swe, K., Somrongthong, R., Amit, B., & Adinegara Lutfi, A. (2014). Needle sticks injury among medical students during clinical training, Malaysia. *International Journal of Collaborative Research on Internal Medicine and Public Health*, 6(5), 121–131.
- Tarigan, L. H., Cifuentes, M., Quinn, M., & Kriebel, D. (2015). Prevention of Needle-Stick Injuries in Healthcare Facilities: A Meta-Analysis. *Infection Control and Hospital Epidemiology*, 36(7), 823–829. <https://doi.org/10.1017/ice.2015.50>
- Thomas, W. J. C., & Murray, J. R. D. (2009). The incidence and reporting rates of needle-stick injury amongst UK surgeons. *Annals of the Royal College of Surgeons of England*, 91(1), 12–17. <https://doi.org/10.1308/003588409X359213>
- Tripura, K., Sharma, A., Acharjee, A., Professor, A., & Student, M. (2018). needle stick injury Issue 01 Ver. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) E-ISSN*, 17, 5–07. <https://doi.org/10.9790/0853-1701050507>
- Voide, C., Darling, K. E. A., Kenfak-Foguena, A., Erard, V., Cavassini, M., & Lazor-Blanchet, C. (2012). Underreporting of needlestick and sharps injuries among healthcare workers in a Swiss University Hospital. *Swiss Medical Weekly*, 142(FEBRUARY). <https://doi.org/10.4414/smw.2012.13523>
- Waqar, S. H., ul Siraj, M., Razzaq, Z., Malik, Z. I., & Zahid, M. A. (2011). Knowledge, Attitude and Practices about Needle Stick Injuries in Healthcare Workers. *Pakistan Journal of Medical Research*, 50(3), 111–114.
- Wu, F. F. S., Wu, M. W., Chou, Y. H., Ting, M. H., & Siebers, R. (2012). Incidence of percutaneous injuries and non-reporting rates among first-aid responders in Taiwan. *Journal of Occupational and Environmental Hygiene*, 9(9), 535–537. <https://doi.org/10.1080/15459624.2012.697349>

Y.-W., H., C.-K., C., W.-C., L., Y.-F., W., C.-H., L., C.-H., L., ... Y.-C., L. (2015). Quality control circle (QCC) strategy on reduction of the rate of needle stick injury and bloodborne exposure. *Journal of Microbiology, Immunology and Infection*, 48(2 SUPPL. 1), S99–S100. <https://doi.org/10.1016/j.jmii.2015.02.352>