

**WORK RELATED INJURIES AND ASSOCIATED WORK RELATED
INJURIES AND ASSOCIATED FACTORS AMONG HOSPITAL
WORKERS, A CASE OF IRINGA, TANZANIA, 2012**

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**Master of Applied Epidemiology
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**FACTORS AMONG HOSPITAL WORKERS, A CASE OF IRINGA,
TANZANIA, 2012**

By

Godbless Lucas

**A dissertation Submitted in (partial) Fulfillment of the Requirements for the Degree of
Master of Applied Epidemiology of
Muhimbili University of Health and Allied Sciences**

**Muhimbili University of Health and Allied Sciences
October, 2013
CERTIFICATION**

The undersigned certifies that she has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled **Work Related Injuries and Associated Factors among Hospital Workers, a Case of Iringa, Tanzania, 2012**, in fulfillment of the requirements for the degree of Master of Science in Applied Epidemiology of the Muhimbili University of Health and Allied Sciences.

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Date: _____

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ABSTRACT

Background: Injuries from sharps and needles among hospital workers are major risk factors for blood borne infections. Globally, Hepatitis B, Hepatitis C and HIV infections accounted by sharp injury are 37%, 39% and 4.4% respectively among all the occupational infections affecting health care workers (HCW). This study aimed at assessing the injuries and associated factors that expose hospital workers to risks of contracting blood borne infections.

Methods: We conducted a Cross-sectional study between December 2012 and May 2013. We derived study sample from four hospitals in which we obtained study subjects by simple random sampling from hospital sections. The study included 258 health care workers which represented 86% of eligible hospital workers. Data was collected using self administered questionnaire and was analyzed using SPSS software. Chi square test and binary logistic regression for categorical variables was performed and alpha was set at 5% level.

Results: Of all participants, 27.9% had experienced at least one episode of work-related injury in twelve months prior to the study. Most of these injuries were needle pricks (72.2%) and cuts by sharps (23.6%) of which among all the injuries, 51.4% and 14.3% happened during use and after use of the item respectively. Of all 72 study participants who experienced Work Related Injuries (WRI), majority (41.7%) suffered the injury due to unexpected movement from patient. Likelihood of injury experience decreased if a hospital worker was trained on health and safety (OR: 0.42, 95% CI: (0.19, 0.91) or hospital worker was provided with health and safety guidelines (OR: 0.52, 95% CI: (0.28, 0.97)).

Conclusion: Work-related injuries especially needle-stick injuries were common among HCWs of the four hospitals we studied. Training HCW about health and safety, and provision of health and safety guidelines for HCWs will reduce the likelihood of exposure to WRI in HCWs. Small size of some of categories of participants might have resulted in large uncertainty intervals of their estimated association with an injury. The identified magnitude of WRIs suggests a need for trainings to enhance HCWs awareness and implementation of the standard precautions and procedures to health and safety.

Key words: Injury, Health, Workers, Iringa

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LIST OF ABBREVIATIONS

CDC	Centers for Disease Control and prevention
MHSW	Ministry of Health and Social Welfare
OSHA	Occupational Safety and Health Authority
NIOSH	National Institute of Occupational Safety and Health
WHO	World Health Organization
HWs	Hospital Workers
HCWs	Health Care Workers
WRIs	Work Related Injuries
IPC	Infection Prevention Control
PPE	Personal Protective Equipments
HIV	Human Immunodeficiency Virus
HBV	Hepatitis B Virus
HCV	Hepatitis C virus
SPSS	Statistical Package for Social Sciences
MUHAS	Muhimbili University of Health and Allied Sciences
OPD	Out Patient Department

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Globally, occupational HBV and HCV infections were estimated to account for about 37% and 39% of all HBV and HCV infection among HCWs occur through a sharp injury. The overall fraction of HIV infection acquired through a sharp injury among HCWs was 4.4%. (Rapiti E *etal*, 2003). Safe Injection Global Network provides that, the risk of infection following a needle-stick injury with needle from an infected source patient is approximately 0.3% for HIV, 3% for hepatitis C and 6- 30% for hepatitis B (www.injectionsafety.org)

The best practice requires discarding the needle and syringe, or needle and tube holder, as a single unit, into a sharps container that is clearly visible and within arm's reaching. The size of the container should permit disposal of the entire device rather than just the needle. These Injuries from sharps (i.e. items such as needles that have corners, edges or projections capable of cutting or piercing the skin) commonly occur between the use and disposal of a needle or similar device (CDC, 1997).

One way to reduce accidental injury and blood exposure among health workers is to replace devices with safety (engineered) devices (Perry J *etal*, 2003). Safety devices can avoid up to 75% of percutaneous injuries (Lamontagne, 2007); eliminating needle recapping and instead immediately disposing of the sharp into a puncture-resistant sharps container (i.e. a safety container) obviously reduces needle-stick injuries (Wilburn S *etal*, 2004).

Healthcare workers are at risk of occupational exposures to chemical hazards, biological hazards, mechanical hazards, ergonomic hazards or physical hazards while executing their routine tasks in their work environment and especially when hospital receives infected patients. Risk factors for hospital related injuries vary according to the type of health-care facility and to the care area where the healthcare worker is performing.

A health hazard is a material substance or circumstance that poses a danger to human health. Hazards may be physical, chemical, biological, mechanical or psycho-social. Examples of hazards that hospital workers face are physical hazards such as radiation, leading to sickness, burns and cancers; chemicals hazards, leading to contact dermatitis and allergic asthma; psychological hazards, which may result from worker-worker relationship, worker-management group relationship and line management relationships. These relationships determine and contribute a lot to job satisfaction as a result of their effects on efficiency and productivity at work, conditions of work, social justice in terms of just promotion at work and other deserved recognition for work done. (Asuzu MC, 1994)

Health-care workers (HCWs) need protection from these workplace hazards just as much as do mining or construction workers. Yet, because their job is to care for the sick and injured, HCWs are often viewed as “immune” to injury or illness. Their patients come first. They are often expected to sacrifice their own well-being for the sake of their patients. Protecting health-care workers has the added benefit to contributing to quality patient care and health system strengthening. Some of the same measures to protect patients from infections, such as adequate staffing, protect health-care workers from injury. (http://www.who.int/occupational_health/activities/en/)

Mechanical hazards are very common in the healthcare facilities because of the frequent use of pointed and sharp instruments such as needles, scalpel and knives, lancets, orthopaedic pin, cannula, retractor, scissors and from broken glass. This results in injuries that expose hospital workers to diseases such as AIDS, hepatitis B, hepatitis C, hepatitis A, herpes zoster, Cryptococcus, malaria, tuberculosis (Ofili AN, *etal*,2004).

There are different types of accidental injuries in the health industry but needle stick injury remains the commonest of all (Camilleri AE *etal*, 1991). A study of 1201 health care workers exposed to blood from patients infected with HIV or patient's meeting the Center for Disease Control case definition of AIDS found that 962 (80%) received needle stick injuries, 103 (8%)

were cut with sharp objects and 79 (7%) had contaminated mucus membranes (Marcus *etal*, 1998)

A study to assess work related injuries by Hadadi and others reported that drawing blood samples, setting up IV lines and giving injections were the other hazardous procedures exposing the HCWs to potential infectious material. (Hadadi A, *etal*, 2008).

In Tanzania, a study conducted at Bugando hospital revealed that proportion of needle stick injuries was 9.2% of 623 nurses and 1.3% of 118 doctors and medical assistants who were interviewed and reported to have had pricked themselves in the preceding week (Gumodoka B. *etal*, 1993). Another study conducted in Tanzania reported that Needlestick injuries accounted for the largest part of the most common accidents (52.9%); burn injury from chemicals (10.6%); and slippery floors (5.9%) (Manyele SV. *etal*, 2008).

The main focus of this study was to explore injuries and their associated factors that expose hospital workers in various work sections of hospitals to risks of contracting the above mentioned infections, harm, and discomfort. We obtained crucial information to perceive the existing situation regarding work related injuries and recommend on measures to prevent or minimize the problem.

Policymakers and hospital administrators need to reflect on factors influencing work related injuries among hospital workers which in turn guide the formulation and implementation of health promotion strategies for the prevention.

1.2 PROBLEM STATEMENT

There is limited information on occupational health and safety problems among healthcare workers in Tanzania. During problem analysis the work related injuries among hospital workers were mainly attributed to the following factors; There are no guidelines and policies about workers' health and safety; Lack of close supervision of newly employed workers or incase of use of new devices; Waste containers not separated or labeled for different types of waste materials; Improper location of sharps containers; Not following the standard operating procedures; Poor communication between care providers and clients; Lack or inadequate sharp storage facilities; Lack of periodic health and safety risk assessment; Lack of surveillance of work related injuries; Inadequate equipments

There is no periodic training of hospital workers on occupational health and safety. Long work shifts; Lack of occupational health and safety personnel; increased work load to workers.

In studies to assess occupational health and safety situation in the healthcare facilities in Tanzania found that injuries were mostly due to needle pricks (Manyele, 2008, Gumodoka, 1993) and medical assistants, nurses, laboratory technicians were affected to a different extent (1%, 22% and 25% respectively).

Despite the available information on work related injuries among hospital workers, there is no information describing the risk factors associated with high incidents of work related injuries in the healthcare settings. Other risk groups in the hospital setting such as the housekeepers are overlooked notwithstanding the fact that they are also a risk group. In this case, the main focus of this study will involve assessment of work related injuries and associated risk factors among service providers in hospital settings.

The risk of health workers acquiring these diseases increases with increase in injury incidents. In this context, it is essential that the two authorities (MoHSW and OSHA) initiate or extend their surveillance and response systems regarding sharps and other form of injuries suffered by workers in the healthcare system so that preventable factors can be identified. This practice will play a significant role in the strengthening of their infection control capacities.

1.3 RATIONALE

The study explored types of work related injuries in healthcare settings and the associated risk factors. It also provide information on the spectrum of occupation related injuries among hospital workers and related factors and on the shortcomings of surveillance systems of occupational health and safety problems prevailing in the healthcare system in Tanzania to inform policy for improvement.

Since occupational injuries are the most frequent route of transmission of infections due to blood-borne pathogens, a reduction in such injuries could be expected to result in a proportional decrease in occupational morbidity and mortality from pathogens.

The study findings will improve awareness of the risk factors for occupational injuries in a healthcare setting. This will therefore inform interventions such as developing proper preventive guidelines and educational programmes to increase safe practices and then reduce chances of acquiring work related injuries and subsequently occupational infections as well as decreased productivity.

The information from this study will also inform Occupational Safety and Health Authority (OSHA) and the Ministry of Health and Social Welfare (MoHSW), of the magnitude of the problem and means to intervene the situation in health care facilities with regard to work-related injuries.

1.4 RESEARCH QUESTIONS

- What was the magnitude of work related injuries suffered by hospital workers (HWs) in four hospitals in Iringa?
- What were the factors associated with work related injuries among hospital workers in the sample?

1.5 RESEARCH OBJECTIVE

1.5.1 Broad Objective

To determine the magnitude of work-related injuries and associated risk factors among hospital workers in order to develop mitigation measures

1.5.2 Specific Objectives

- To determine prevalence of work related injuries among hospital workers.
- To identify form of injuries suffered by hospital workers based on nature of injuries, and working conditions.
- To identify risk factors for occurrence of work related injuries among workers in their specific work environments.
- To assess the implementation of universal precautions by hospital workers.

CHAPTER TWO

2. LITERATURE REVIEW

Magnitude of work related injuries; In a study of the epidemiology of needle stick and sharp injuries among health care workers in Nigerian hospitals found that 84.2% of the respondents had experienced at least one injury since joining to their respective careers, while 62.2% of them sustained their recent injury within the past one year. Doctors and nurses from two hospitals were followed up for two three-monthly periods to ascertain the occurrence of injuries and the survey revealed high incidence rate of 3.9 per person years and 2.2 for the first and second quarters respectively. Doctors in the surgical specialties and house officers had the highest rate (Momah PH, 1992)

A questionnaire survey of 8645 health care workers (physicians, nurses, laboratory technicians, and cleaners) conducted in Taiwan to determine the annual incidence and causes of sharps injuries in health-care, found that reported incidence of needle stick and other sharps injuries was 1.30 and 1.21 per person in the past 12 months, respectively. Of most recent episodes of needle stick/sharps injury, 52.0% were caused by ordinary syringe needles, generally in the patient units. The most frequently reported circumstances of needle stick were recapping of needles, and those of sharps injuries were opening of ampoules/vials. Of needles which stuck the health-care workers, 54.8% had been used in patients, 8.2% of whom were known to have hepatitis B or C, syphilis, or human immunodeficiency virus infection (Guo YL *etal*, 1999).

A study of epidemiology of occupational injury among cleaners in the healthcare sector in Canada provides that a total of 145 injuries were identified among cleaners, with an annual incidence rate of 32.1 per 100 person-years. After adjustment for age, gender, subsector, facility, experience and employment status, Poisson regression models demonstrated that a significantly higher relative risk (RR) of all injury, musculoskeletal injury and cuts was associated with cleaning work in acute care facilities, compared with long-term care facilities. It was also found that female cleaners were at a higher Risk of all injuries and contusions than

male cleaners. A lower risk of all injury incidents among part-time or casual workers was found. Cleaners with more than 10 years of experience were at significantly lower risk for all injury (Alamgir H *etal*, 2008)

Rahul S and fellows in their study of prevalence and response to needle stick injuries found that 72 (22.4%) reported having received a injury within the last month in which 60.9% washed the site of injury with water and soap while 38 (14.8%) took no action.

Forms of work related injuries; A prospective surveillance study conducted in Spain revealed that, Of the 20,235 incidents, 15,860 (80.7%) occurred to women; 50% (9,833) accidents were among nursing staff. The type of incident most frequently reported was percutaneous injury (81.1%). The highest frequency of accidents was seen in medical (28%) and surgical (25.6%) areas. Administration of intramuscular or intravenous medication was the activity associated with the highest accident rate at 20.3 %.(Monge V, *etal*, 2001)

A study carried out in Tanzania showed an incidence rate of five per health care worker per year of percutaneous injuries (WHO, 1998). Manyele and fellows identified five types of hazards/accidents among healthcare workers which are injuries caused by needle pricks accounted for (52.9%), burn injury from chemicals (10.6%); and slippery floors (5.9%). Many cases of needle stick injuries were reported from Mawenzi and KCMC hospitals. Most of hazardous activities are carried out by nurses and attendants. Chemicals used in hospitals are mainly antiseptics and disinfectants which causes skin burns during handling and use. The most hazardous activities were injection, cleaning, patient care, bedding, dressing of wounds, and surgical operations (Manyele, *etal*, 2008)

Factors associated with work related injuries; Considering the need to develop effective policy measures for reducing the risk of work related injuries, it is essential to understand what contributes to the incidence of these injuries in healthcare facilities. Previous studies have revealed that WRIs are more likely to occur among health care workers who are female, young (Leigh JP, *etal*, 2008), working long hours, working in surgical or intensive care units, have

less working experience (Ilhan MN, et al, 2006) and are not involved in health and safety issues or not appropriately trained in procedures for risk control (Nsubuga FM, et al, 2005).

Wilkinson WE *et al*, 1992 conducted a retrospective study to examine the magnitude of the problem of work related health hazards affecting professional and non-professional employees of a state university health science centre and hospital. Among 9,668 employees 1,513 injury episodes had occurred during the 32 month study period. It was determined that the highest risk categories for both department and job were nursing, housekeeping, food service, and laboratory technicians. Injury rate for females (11.2 per 100 person years) was more than twice that of males (5.1). Injury rates declined from 11.6 per 100 person years at ages 25 to 39 to 3.8 at ages over 60. Puncture wounds (32.7%), mostly by needle-sticks, were the most frequently reported injury type, followed by strains and sprains (17.2%), lacerations (12.5%), and contusions (12.1%).

Health care workers (HCWs) who are exposed to needles in their clinical activities are at increased risk of acquiring needle stick injuries which may lead to serious or fatal infection with blood-borne pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV) or human immunodeficiency virus (HIV) (NIOSH, 1999).

Needle stick injuries are the commonest route by which blood borne viruses and/or infections such as HIV and hepatitis B and C viruses are transmitted from patients to health care workers. Such infections serve as high occupational risks and threats to health care workers, especially where basic rules of occupational safety and health are not implemented.

A study conducted in Iran concerning occupational exposures among healthcare workers revealed that, of 476 exposures, percutaneous injuries were the most common (59%). Among the cases with percutaneous injures, hollow-bore needles were accounted for having the highest proportion of injuries with 60%, followed by solid sharp objects (lancet and suture needles) with 36%, and bistories causing 4% of the injuries. Percutaneous injuries occurred while cleaning (15%), suturing (13.3%), recapping (9.5%) and doing venipuncture (8.8%). There was a significant association between the unit ward and the experience of injuries ($p <$

0.001). 108 injuries (23%) happened in emergent and urgent conditions, and in 52 cases (10%), an unexpected movement of patients during a procedure was reported as the main reason for injuries (Hadadi A *etal*, 2008).

The National Institute for Occupational Safety and Health (NIOSH), USA, defines needle stick injuries as injuries caused by objects such as hypodermic needles, blood collection needles, intravenous (IV) stylets and needles used to connect parts of IV delivery systems. Potential exposure is not limited to needle sticks alone because manipulation of other sharp instruments or mucous membrane exposure to infected body fluids can also result in transmission of infectious diseases (Ferguson TJ, 1992).

The risk of pathogen transmission from infected persons to non-immune persons through an injury with a sharp instrument has been estimated to be 6–30% for hepatitis B virus, 5–10% for hepatitis C virus, and 0.3% for HIV (Askarian M *etal*, 2002). The risk of contracting acute hepatitis C virus infection due to a needle prick injury is approximately 15% (WHO). It is estimated that the risk of contracting hepatitis B virus infection due to a needle prick injury is 100 times higher than that of contracting HIV.

Circumstances that lead to work related injuries; In a nine-month prospective study that was carried out in four hospitals to determine the number and circumstances of percutaneous injuries occurring during surgical procedures in 1990, reported 99 injuries during 95 (6.9%) of the 1382 procedures. Suture needles caused 76 (77%) of these 99 injuries. Three injuries (3%) each was caused by bones, scalpels and wire. Two (2%) of the injuries were caused by suture thread, and one (1%) each by a bone fragment, bone hook, orthopaedic pin, cannula, retractor, scissors, staple gun and trocar. The causes of four injuries were unknown. Two injuries were caused by suture needle placed on the surgical field while not in use. Seventy per cent of the injuries were related to suturing (Tokar JI, 1992).

Results in a in a six-month follow-up study to determine Incidence of blood-related work accidents among health workers shows that contact with patients' blood with ungloved hands,

blood splashes on the face and other parts of the body, needle pricks, cuts from drug ampoules and glove perforation during surgery were the major work-related accidents/injuries.

Preventive measures to work related injuries; Needle stick injuries can be prevented by applying universal precautions as a safety measure (Danchaivijitr S, *etal* 1995). In 1987, the Centers for Disease Control and Prevention (CDC) proposed universal precaution guidelines recommending routine barrier precautions for anticipated contact with blood or certain bodily fluids (CDC, 1987). Two years later, the guidelines were updated in which more specific recommendations were introduced, including precautions to be used during phlebotomy (CDC, 1989). The Occupational Safety and Health Administration (OSHA) published its Blood-Borne Pathogens Rule in 1991, which requires training of all workers at risk, implementation of universal precautions, and monitoring of compliance (US- Department of labor, 1991).

In practice, the implementation of Universal Precautions includes among others, interventions such as: Preventing two-handed recapping of needles, Safe collection and disposal of needles (hypodermic and suture) and sharps (scalpel blades, lancets, razors, scissors), with required puncture- and liquid- proof safety boxes in each patient care area, Using a safe system for health care waste management and disposal. Waste management requires, sharps boxes and other collection containers, storage space and containers for interim storage, final disposal options as well as personal protection equipments for waste handlers. www.injectionsafety.org.

The implementation of education, universal precautions, elimination of needle recapping, and use of sharps containers for safe disposal have reduced needle stick injuries by 80%, with additional reductions possible through the use of safer needle devices (CDC, 1997).

The safe handling and disposal of needles and other sharp instruments forms part of an overall strategy of clinical waste disposal to protect staff, patients and visitors from exposure to blood borne pathogens (*Health Services Advisory Committee, 1999*).

CHAPTER THREE

3. METHODOLOGY

3.1 Study Area

Iringa region is one of the 25 regions of Tanzania mainland with seven districts which are Iringa rural, Kilolo, Makete, Mufindi, Njombe, Ludewa, and Iringa urban. The estimated population of the region is 941,238 people as of 2012 national population statistics. It is part of Tanzania Mainland's southern highlands zone, which comprises of the regions of Iringa, Mbeya and Ruvuma. It is situated at latitude of 7.77°S and longitude of 35.69°E. To the north of the region are Singida and Dodoma regions. It borders Morogoro region in the east and Ruvuma region in the south. Its western borders are shared with Mbeya region and via Lake Nyasa the Republic of Malawi. The region has several healthcare facilities including 15 government and private owned hospitals. The magnitude of work related injuries among workers in the healthcare facilities of the region was unknown.

3.2 Study Design

This cross-sectional study to determine work related injuries and factors' influencing their occurrence among hospital workers was done in Iringa between December 2012 and March 2013. We used a quantitative approach in which we developed a semi-structured questionnaire consisting of questions inquiring for demographic characteristics, working conditions, implementation of universal precautions, and the occurrence of injuries in the previous twelve months. We assumed reporting on the occurrence of work related injury in the previous 12 months could minimize the possibility of recall bias.

3.3 Study population

The study included all hospital workers at risk of injury particularly from sharps, needles, chemicals, slips, or hit by objects. Workers in the Out-Patient Department, laboratory, medical, maternity and surgical wards, dental unit, theatre, Intensive Care Unit, housekeeping section constituted a study sample. We excluded workers in hospital who never come into

contact with patients or byproducts (blood and other body fluids) following patients care such as workers with administrative responsibilities, security personnel, cooking, registry, storekeeping etc.

3.4 Sample Size

We required a sample size of 300 hospital workers from the selected hospitals, which was obtained using the Kish and Lisle formula (1965) below:

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

We assumed that true value (Proportion of work related injury) will fall within 95% Confidence Interval with type one error of 5%, and Z score of 1.96. We assumed a prevalence of work related injuries of 22.4% from a study by Rahul S, *etal* (2010), at a tolerable error of 5%. We added a 10% of the sample to cover for non response.

$$\begin{aligned} .n \text{ (sample size)} &= \frac{(1.96^2 * 0.224(1-0.224))}{0.05^2} \\ &= 267 + (267 * 0.1) \\ &= 300 \end{aligned}$$

The minimum sample size of respondents to be interviewed was 300 hospital workers from selected hospitals of Iringa region.

3.5 Sampling Procedure

We derived the study sample from four hospitals out of sixteen hospitals of Iringa region. These hospitals were selected based on number of workers in each (i.e. the larger the size of the hospital the higher the chance of being selected). We therefore selected eligible study subjects from each hospital work sections by simple random sampling and included them in our study sample.

3.6 Data Collection and Procedures

We interviewed study subjects using a semi structured self administered questionnaire to obtain data regarding age, gender, job category, job experience, cadre, and frequency of work related injury twelve months preceding the study. The characteristics of the work related injuries was also solicited, including the type of injury and its cause, area of the body injured and the procedure or circumstances during which the injury occurred, work-section and time of shift injury occurred were also required. We translated the questionnaire into Swahili language and to maximize participation, the questionnaire length was limited.

We introduced three research assistants to the study mainly on the purpose of the study, and on the contents of the data collection tools. Prior to distribution of the questionnaire we conducted a pilot study with a selected group of hospital workers. We requested them to complete the questionnaire and returned them with comments. We produced final instrument following recommended changes obtained in the pilot questionnaire.

Control of data quality was done through review of data collected in the field (before we left the data collection area). Research team identified all incomplete and missing information and corrected them accordingly. All collected information on questionnaires was entered into SPSS data analysis software.

3.7 Study Variables

3.7.1 Dependent Variable

The outcome or dependent variable of this study was work related injury sustained by a hospital worker while performing his/her duty. We considered respondents to have had suffered work related injury if they self reported that they had one or more injury during twelve months period before the study.

3.7.2 Independent variables;

Relative to the outcome, we asked study participants to provide information on;

- Age, sex, and gender of study subjects
- Job categories of study subjects
- Compliance with safety measures
- Work experience in health care industry
- Type of injury suffered
- Time of shift injury occurred
- Hours worked per day
- Level of education
- Workers occupational health and safety trainings status;
- Periodic health/safety assessment/route causes analysis in their respective work units,
- Availability of guidelines on infection prevention and control.

3.8 Data Analysis and Presentation

Following completion of data collection exercise, we coded the data from questionnaires and entered them into SPSS software for analysis. We cleaned the data checking for missing data, outliers and unsound data. We performed a descriptive analysis to obtain frequency distributions of all the variables. In performing bi-variate analysis of the data, we used Chi-square test to establish statistical association between dependent variable and independent variables. P-values under 0.05 were considered to indicate statistical significance. A multiple logistic regression analysis was performed to explore factors relating to the occurrence of work related injuries among hospital workers. Explanatory variables included those which

were found to be significant during bivariate analysis. We presented study findings in text and tables. All the analyses were conducted with SPSS for windows version 16.0.

3.9 Ethical Clearance

We obtained an ethical clearance from MUHAS research Ethics committee. During implementation period, permission to conduct the research was approved by the Regional Medical Officer of Iringa region and other relevant authorities (District Medical Officers and Medical Officers In-charge) of the areas we visited. We provided the informed consent form to study subjects to perceive the information therein and sign on the form willingly. We assured them of confidentiality of information that they would be requested for. Code numbers were used instead of participants' names as a way to ensure confidentiality. All questions rose regarding the study or their participation were responded to accordingly. Study subjects were free to proceed or terminate their participation any time in the course of the study even when they had already agreed to participate and signed in the informed consent form.

3.10 Operational Definitions

A hospital workers in this study refers to individuals who perform their routine jobs in the emergency department, Out-Patient Department, laboratory, medical ward, maternal ward, dental unit, surgical ward, Theatre, Intensive Care Unit, biomedical waste management, cleaning/laundry,

Work Related Injury is a self reported injuries experienced by a hospital worker in the previous twelve months.

Injury is a prick with a needle or cut with a sharp object during use of the object for patient care, or during housekeeping and burn from chemicals.

Needle stick injuries are injuries caused by objects such as hypodermic needles, blood collection needles, intravenous (IV) stylets and needles used to connect parts of IV delivery systems (The National Institute for Occupational Safety and Health (NIOSH), USA).

A health hazard is a material substance or circumstance that poses a danger to human health (Asuzu MC, 1994)

Mechanical hazards refers to injuries in a healthcare sector as a result of frequent use of pointed and sharp instruments such as needles, scalpels and knives that expose the hospital workers to biological hazards or blood borne diseases.

Universal precaution refers the routine use of appropriate barriers and techniques to reduce the likelihood of exposure to blood, other body fluids and tissues that may contain blood borne pathogens (Gerberding *et al*, 1995). In practice, the implementation of Universal Precautions includes among others, interventions such as: Preventing two-handed recapping of needles, Safe collection and disposal of needles (hypodermic and suture) and sharps (scalpel blades, lancets, razors, scissors), with required puncture- and liquid- proof safety boxes in each patient care area, Using a safe system for health care waste management and disposal.

3.11 Study Limitation

This study had several limitations that need to be considered when interpreting the results;

The estimated rate of WRIs and their associated factors may be subject to reporting bias since we relied on the information we were given by study participants themselves than if we had reviewed records of injuries and ensure that the information comes from true cases of injuries.

Small sample size of some of the categories of participants might have resulted in large uncertainty intervals of their estimated association with an injury.

If we compare proportion of injuries between this study and other studies of WRIs within a period of three or six months, our estimate is far below. In this case the reporting of injury by HWs for the past twelve months might have been affected by recall bias because some HWs could not easily remember the incidence encountered in such a long period of time. In this context future studies may determine increased incident of WRIs if they restrict study of WRIs within past six months or three months.

CHAPTER FOUR

4. RESULTS

4.1 Demographic Characteristics

We interviewed 258 hospital workers from four hospitals in Iringa making a response rate of 86%. These hospitals were a regional hospital 36.8% (c95), Tosamaganga 19.8% (c59), Ilula 24.8 % (c64), and Mafinga 18.6% (c48). The mean age of study subjects was 33.9 years with a standard deviation of 9.8 years. The youngest subject was 19 years old and the oldest subject aged 58 years.

Majority of respondents were female workers who were estimated at 61.6% (c159) of all the subjects. The distribution of HWs by job category provides that nurses present the highest proportion 60.1 % (c155) of all subjects whereas medical officers presented the lowest proportion of 1.9% (c5). Regarding education 56.6% (c146) of all subjects have had attained post secondary education (i.e. certificate, diploma, or degree).

Table 1: Demographic characteristics of study subjects

Variable	Hospitals (n (%))				Total
	Tosamaganga	Regional	Ilula	Mafinga	
Sex					
Male	13(25.5)	35(36.8)	25(39.1)	26(54.2)	99(38.4)
Female	38(74.5)	60(63.2)	39(60.9)	22(45.8)	159(61.6)
Age					
< 28	9(17.6)	34(35.8)	15(23.4)	15(31.2)	73(28.3)
28-35	16(31.4)	38(40.0)	24(37.5)	14(29.2)	92(35.8)
36-43	12(23.5)	16(16.8)	16(25.0)	4(8.3)	48(18.6)
44+	14(27.5)	7(7.4)	9(14.1)	15(31.2)	45(17.4)
Education Level					
Primary/Secondary	29(56.9)	41(43.2)	24(37.5)	18(37.5)	112(43.4)
Post Secondary	22(43.1)	54(56.8)	40(62.5)	30(62.5)	146(56.6)
Cadre					
Medical Officer	1(2.0)	4(4.2)	0(0.0)	0(0.0)	5(1.9)
Assistant Medical Officer	1(2.0)	5(5.3)	8(12.5)	7(14.6)	21(8.1)
Nursing Officer	35(68.6)	64(67.4)	37(57.8)	19(36.6)	155(60.1)
Dental Personnel	1(2.0)	2(2.1)	4(6.2)	4(8.3)	11(4.3)
Laboratory Personnel	2(3.9)	6(6.3)	3(4.7)	4(8.3)	15(5.8)
House-keeper	11(21.6)	14(14.7)	12(18.8)	14(29.2)	51(19.8)
Work Experience					
<5 years	21(41.2)	59(62.1)	36(56.2)	27(56.2)	143(55.4)
5-9 years	6(11.8)	16(16.8)	10(15.6)	2(4.2)	34(13.2)
10-14 years	5(9.8)	6(6.3)	6(9.4)	4(8.3)	21(8.1)
15-19 years	4(7.8)	5(5.3)	4(6.2)	1(2.1)	14(5.4)
20+ years	15(9.8)	9(9.5)	8(12.5)	14(29.2)	46(17.8)

4.2 Work Condition of Study Participants

4.2.1 Hospital Workers Job Categories

The highest proportion of HWs we interviewed work in housekeeping department and contributed 20.2 % of the sample. The sample also consisted of workers from other hospital sections as presented in **table 2** and workers from psychiatric ward presented the lowest proportion (1.2 %) of study sample.

Table 2: Distribution of HWs by Area of Practice

Work Section	Frequency	Percent
Psychiatric ward	3	1.2
Intensive care unit	5	1.9
Dental unit	12	4.7
Laboratory	15	5.8
Theatre	25	9.7
Surgical ward	27	10.5
Out-patient Department	28	10.9
Medical ward	42	16.3
Maternity ward	49	19.0
Housekeeping unit	52	20.2
Total	258	100

4.2.2 Work Duration in Healthcare

As regards respondents' work duration in the healthcare industry, majority (66.3%, c171) had work experience of below 9 years.

Table 3: Distribution of HWs by work experience in Healthcare Industry

Cadre	Work Experience in Healthcare		
	< 9 years	9+ years	Total (%)
	N (%)	N (%)	
Medical Officer	5(2.9)	0(0)	5(1.9)
Assistant Medical Officer	9(5.3)	12(13.8)	21(8.1)
Nursing Officers	95(55.6)	60(69.0)	155(60.1)
Dental Personnel	10(5.8)	1(1.1)	11(4.3)
Laboratory Personnel	11(6.4)	4(4.6)	15(5.8)
House Keepers	41(24)	10(11.5)	51(19.8)
Total (%)	171(66.3)	87(33.7)	258(100)

4.2.3 Work under Supervision

In determination of the proportion of HWs, who work under supervision, we found that about 71.7% of respondents work unsupervised. The highest proportion was among dental personnel (90.9) and lowest among nursing officers (68.4%).

Table 4: Proportion of HWs Working Under Supervision

Job Category	Do You Work Under Supervision?		
	Yes (%)	No (%)	Total (%)
Medical Officer	1 (20)	4 (80)	5 (1.9)
Assistant Medical Officer	6 (28.6)	15 (71.4)	21 (8.1)
Nursing Officer	49 (31.6)	106 (68.4)	155 (60.1)
Dental Personnel	1 (9.1)	10 (90.9)	11 (4.3)
Laboratory Personnel	4 (26.7)	11 (73.3)	15 (5.8)
House keeper	12 (23.5)	39 (76.5)	51 (19.8)
Total (%)	73 (28.3)	185 (71.7)	258 (100)

4.2.4 Training on Health and Safety

Concerning health and safety training among HWs results of analysis shows that only 28.7% of respondents have had attended training on health and safety

Table 5: Proportion of Hospital Workers Trained on Health and Safety

Job Category	Trained on Health/safety		
	Yes (%)	No (%)	Total (%)
Medical Officer	0 (0.0)	5 (100)	5 (1.9)
Assistant Medical Officer	5 (23.8)	16 (76.2)	21 (8.1)
Nursing Officer	52 (33.5)	103 (66.5)	155 (60.1)
Dental Personnel	3 (27.3)	8 (72.7)	11 (4.3)
Laboratory Personnel	4 (26.7)	11 (73.3)	15 (5.8)
House keeper	10 (19.6)	41 (80.4)	51 (19.8)
Total (%)	74 (28.7)	184 (71.3)	258 (100)

4.3 Injury Experience among Hospital Workers

4.3.1 Injury Status among Hospital Workers

As regards injury experience among HWs, it was estimated that 27.9% (c72) of HWs had suffered at least an episode of injury in the past twelve months prior to the study. Of 72 workers who have had injuries, majority was the medical officers (80%) and the least were the laboratory personnel (20%). Job category of hospital workers has no effect on work related injury (P=0.099)

Table 6: Injury Experience by Area of Practice

Cadre	Injury Experience		
	Yes (%)	No (%)	Total (%)
Medical Officer	4 (80.0)	1 (20.0)	5 (1.9)
Assistant Medical Officer	8 (38.1)	13 (61.9)	21 (8.1)
Nursing Officer	39 (25.2)	116 (74.8)	155 (60.1)
Dental Personnel	4 (36.4)	7 (63.6)	11 (4.3)
Laboratory Personnel	3 (20.0)	12 (80.0)	15 (5.8)
House keeper	14 (27.5)	37 (72.5)	51 (19.8)
Total (%)	72 (27.9)	186 (72.1)	258 (100)

4.3.2 Distribution of Injuries by Hospital

Most of injuries (37.5%) were suffered by hospital workers from the regional hospital and the lowest proportion of injuries were experience by hospital workers from Mafinga hospital. However, there was no significant difference in injury experience between the hospitals. Regarding the overall injury experience among study participants, 58.3% experienced only one episode of injury as opposed to others who had experienced more than one injury twelve months before the study.

Table 7: Distribution of Injuries by Hospital

Hospital	Injury Experience		Total
	Yes (%)	No (%)	
Tosamaganga	16(22.2)	35(18.8)	51(19.8)
Regional Hosp	27(37.5)	68(36.6)	95(36.8)
Ilula	21(29.2)	43(23.1)	64(24.8)
Mfinga	8(11.1)	40(21.5)	48(18.6)
Total	186(100)	72(100)	258(100)

$\chi^2 = 4.097$; $P = 0.25$

4.3.3 Report of Injury Incidents

As regards reporting of injuries to a focal person at the hospital, more than half (51.4%) of injuries were reported

Table 8: Reporting Status of Work Related Injuries among HWs

Job category	Did you report the incidence?		
	Yes (%)	No (%)	Total (%)
Medical Officer	2 (50)	2 (50)	4 (5.6)
Assistant Medical Officer	2 (25)	6 (75)	8 (11.1)
Nursing Officer	23 (57.5)	17 (42.5)	39 (54.2)
Dental Personnel	1 (25)	3 (75)	4 (5.6)
Laboratory Personnel	2 (66.7)	1 (33.3)	3 (4.2)
House keeper	7 (53.8)	6 (46.2)	14 (19.4)
Total (%)	37 (51.4)	35 (48.6)	72 (100)

4.3.4 Form of Injury experienced by HWs

Regarding type of injury among HWs in the twelve months preceding the study shows that 72.2% of respondents encountered a needle stick injury. Other forms of injury are specified in **table 9**.

Table 9: Type of Injuries Suffered by HWs.

Type of Injury	Frequency	Percent
Needle Stick	52	72.2
Cut from Sharp Object	17	23.6
Burn	3	4.2
Total	72	100

4.3.4 Injury Circumstances among HWs

Of all 72 respondents who had ever experienced a work related injury, the highest proportion (41.7%) suffered the injury as a result of unexpected movement from patient being served. The lowest proportion (2.8%) of HWs had an encounter from a coworker who was holding a needle. Other injury incidents happened as presented in **table 10**.

Table 10: Circumstances that Subject HWs to Work Related Injuries

Injury Circumstance	Frequency	Percent
Unexpected movement from patient	30	41.7
Device left on cloths	16	22.2
Washing surgical instruments	8	11.1
Putting the device into a safety box	6	8.3
While obtaining device	4	5.6
Mixing washing chemicals	3	4.2
Waste segregation	3	4.2
From coworker holding the needle	2	2.8
Total	72	100

4.3.5 Mode of Needle stick and Sharp Injuries

Over half (51.4%) of respondents who got injured from a needle stick or cut by sharps had experienced work related injury during use. Only 11.4% suffered an injury before use of sharps or needles.

Table 11: Mode of Injuries from Needle Stick and Sharps

Action	Frequency	Percent
During use of device	36	51.4
Device left in an inappropriate place	16	22.9
After use of item	10	14.3
Before use of device	8	11.4
Total	70	100

4.4 Bivariate Analysis

Table 12: Analysis of various factors influencing work related injuries

Variable	Injury Status		Chi-square (χ^2)	P-Value
	Yes (%)	No (%)		
Age (Years)				
<35	52(72.2)	103(55.4)	6.142	0.013
35+	20(27.8)	83(44.6)		
Sex				
Male	27(38.0)	72(38.7)	0.032	0.858
Female	45(62.0)	114(61.3)		
Level of Education				
Primary/secondary	45(62.5)	101(54.3)	1.42	0.233
Post secondary	27(37.5)	85(45.7)		
Health/Safety Guidelines				
Available	36(50.0)	132(71.0)	10.047	0.002
Not Available	36(50.0)	54(29.0)		
Health/Safety Training				
Ever Attended	10(14.0)	64(34.4)	10.685	0.001
Never Attended	62(86.0)	122(65.6)		
Work under Supervision				
Yes	14(19.4)	59(31.7)	3.856	0.05
No	58(80.6)	127(68.3)		
Separate Waste Containers in Place				
Yes	59(82.0)	172(92.5)	6.141	0.013
No	13(18.0)	14(7.5)		
Containers Within Arm's Reach				
Yes	55(76.4)	159(85.5)	3.035	0.081
No	17(23.6)	27(14.5)		
Health and Safety Assessment				
Yes	22(30.6)	38(20.4)	2.982	0.084
No	50(69.4)	148(79.6)		
Waste Containers Always Available				
Yes	44(61.0)	142(76.3)	5.987	0.014
No	28(39.0)	44(23.7)		
Length of Shift (Hours)				
< 8	4(5.6)	29(15.6)	4.687	0.03
8+	68(94.4)	157(84.6)		

4.5 Multivariate Analysis

All factors which appeared to be associated with work related injuries in bivariate analysis were further analyzed using logistic regression. Availability of health and safety guidelines and training on health and safety were the major factors identified to be determinants of work related injuries among the HWs. The likelihood of injury experience decreased if a hospital worker was trained on health and safety (OR; 0.42, 95% CI; 0.19 – 0.91) or a hospital worker was provided with health and safety guidelines/IPC guidelines (OR; 0.52, 95% CI; 0.28 – 0.97).

Table 13: Multivariate analysis of factors influencing occurrence of work related injuries among hospital workers.

Variable	AOR	95% CI		P-Value
		Lower limit	Upper limit	
Age of HWs	1.36	0.66	2.83	0.41
Health and Safety Guidelines in place	<u>0.52</u>	<u>0.28</u>	<u>0.97</u>	<u>0.04</u>
Ever Attended Health/safety Training	<u>0.41</u>	<u>0.19</u>	<u>0.91</u>	<u>0.03</u>
Waste Containers Separated for different waste materials	0.61	0.24	1.56	0.30
Waste containers always available	0.63	0.33	1.22	0.17
Length of shift	2.32	0.78	6.86	0.13

CHAPTER FIVE

DISCUSSION

Results of analysis of this study confirm that more than quarter of study participants had encountered one or more episode(s) of work related injury within twelve months prior to the study. The proportion of injury is lower than findings from a study of epidemiology of needle stick and sharp injuries among health care workers in Nigerian hospitals by Momah and fellows which identified that 62.2% of them sustained their recent injury within the past twelve months.

Our study also presents that injuries were evenly distributed in the hospital work sections and there was not any association between WRIs and the work section. This was different from a study by (Hadadi A *etal*, 2008) with a statement that there was a significant association between the work section and experience of WRIs. This study also demonstrates that there was not strong relationship between WRIs and area of practice of hospital workers. Although more than half of WRIs was experienced by nurses, there was not a significant difference in injury experience between nurses and other hospital workers. It cannot be ruled out from this study that whether the incidence of WRIs has decreased or not due to lack of comparison data specifically in Iringa of previous studies regarding WRIs and their associated factors.

Despite the fact that female workers were the majority there was not a statistical association between work related injuries and sex of hospital employees ($P= 0.86$). This finding contradict with the literature indicating men are at higher risk for WRIs than women (CDC, 1998) or women are at higher risk of WRIs than men (Nancy I, *etal* 2002). More than half of hospital workers had experienced only one episode of injury during the past twelve months before the study. This finding does not compare with findings from a study of needle stick and sharps injuries among HCWs by Mayo K *etal* in 2006 in which only less than quarter (14.7%) had encountered one episode of injury.

If the incidents of WRIs among HWs are not reported the infection status of the patients will remain unknown and therefore difficult to prevent infections hospital workers might have

acquired. This study also demonstrates that the inadequate reporting of injuries to the hospital administration was common among hospital workers. In this context we have found that 48.6% of injuries are not reported to the hospital administration. Therefore, the inadequate reporting of injuries may complicate surveillance of WRIs and therefore lack of reliable data regarding work related injuries becomes a problem. Study of factors associated with blood exposure and percutaneous injuries among HCWs by Bradley N *et al* in 2003 reported that underreporting of injuries was estimated at 22% - 62%.

Our study confirmed that the major experienced incidents of work related injuries were those caused by a needle stick which accounted for more than half of the injuries. This finding is supported by a study by Manyele and fellows in 2008, and Wilkinson W.E and others in 1992 in which needle stick injuries accounted for more than half compared to other forms of injuries. Studies to assess occupational health and safety situation in the healthcare facilities in Tanzania also found that injuries were mostly due to needle pricks (Manyele, 2008, Gumodoka, 1993). Since the study revealed that WRIs more likely to be suffered among hospital workers in Iringa are pricks by needles, periodic trainings on safe injection and sharps handling need to be a priority.

This form of injury is important occupational hazard leading to blood borne infections such as Hepatitis B, hepatitis C, or HIV. This is supported by another study which provides that, the risk of pathogen transmission from infected persons to non-immune persons through an injury with a sharp instrument has been estimated to be 6–30% for hepatitis B virus, 5–10% for hepatitis C virus, and 0.3% for HIV (Askarian M *et al*, 2002). Such infections serve as high occupational risks and threats to health care workers, especially where basic rules of occupational safety and health are not effectively implemented.

Considering the occurrence of the injuries among HWs, there were two major circumstances of injuries identified in this study as referred to. Unexpected movement from patient was the most reported reason for injury as supported by a study by Hadadi and others in 2008. The second reason for WRI incidents was from a device left on cloths. This is an indication that there is a problem of mishandling of sharps and needles in the hospitals we studied.

We also found that large proportion (65.7%) of sharps and needle stick injuries happened during use and after use of the item. The finding implies a proportion of hospital workers with an elevated risk for disease infections from patients they serve. We also found that 22.9% of HWs experienced the injury from a device left at inappropriate place which is an indication that a certain proportion of used items with unknown infections affect hospital workers. Study of work related injuries from needles and sharps among health care workers by Guo YL and his fellows in 1999 presented that of all needles which stuck the HCWs, 54.8% had been used in patients. In the same study it was identified that 29.7% of sharps injuries occurred with items used in patients whose infection status was not known.

Lack of training and guidelines on health and safety among hospital workers was positively associated with work related injuries among hospital workers. These results confirm the need to train hospital workers and ensure that health and safety guidelines are available in hospital departments. Previous studies are supporting this finding that WRIs are more likely to occur among health care workers who are not involved in health and safety issues or not appropriately trained in procedures for risk control (Nsubuga FM, etal, 2005).

CHAPTER SIX

Conclusion and Recommendations

Work-related injuries especially needle-stick injuries were common among HCWs of the four hospitals we studied. The major form of work related injury mostly suffered by HWs was a result of needle stick. Lack of periodic trainings on health and safety, and lack of health and safety guidelines to HWs were factors identified to be associated with work related injuries among HWs in Iringa.

For the effective prevention of these injuries, health policy makers and hospital administrators should formulate strategies to improve the working conditions of hospital workers, discourage unsafe practice, and increase their adherence to universal precautions. Reducing the risk of WRIs through strengthened occupational health and safety management systems would eventually decrease the burden of disease on hospital workers from infections with blood-borne pathogens in the hospitals.

The determined magnitude of the WRIs also suggests a need for periodic trainings on health and safety among HWs to reduce the risk of injuries among them. Key aim of trainings is to increase awareness of the adverse effects of WRIs on their personal lives and work. This will be possible because trainings provide employees with strategies to prevent injuries they are prone to. Hospital administrations should ensure that health care workers attend seminars designed to enhance their awareness of the standard precautions and procedures, which seems to be not a present practice. Health and safety policies and procedures should be posted in the hospital work sections to remind workers on their responsibilities regarding health and safety.

The MHSW in collaboration with Hospital Management Teams and OSHA should establish a surveillance system of cases of work related injuries in each health facility. Reliable data about the burden of injuries among hospital workers will be possible if a simplified reporting system is in place, and hospital worker are encouraged to report incidents of injuries from their respective work sites.

References

1. Alamgir H, Yu S (2008) Epidemiology of occupational injury among cleaners in the healthcare sector; *Occup Med (Lond)*. 58(6):393-9
2. AN Ofili, MC Asuzu and OH Okojie' (2004) Incidence of blood-related work accidents among health workers in a government hospital in Benin City, Nigeria; *Journal of Medicine and Biomedical Research, Vol. 3, No. 1, pp.59-66*
3. Askarian M, Ghavanini AA (2002) Survey on adoption of measure to prevent nosocomial infection by anesthesia personnel. *East Med Health J*; 8:416–21.
4. Asuzu, MC (1994). *Occupational Health; a summary of introduction and outline of principles*. Ibadan: Africa link books. p7.
5. Camilleri AE, Murray S and Imrie CW (1991) Needle stick injury in surgeons: what is the incidence? *J R Coll Surg Edinb*; 36: 317.
6. Centers for Disease Control and Prevention (1997) Evaluation of safety devices for preventing percutaneous injuries among healthcare workers during phlebotomy procedures: *Minneapolis-St. Paul, New York City, and San Francisco. MMWR*; 46:21–3.
7. Ferguson TJ (1992) Needle stick injuries among health care professionals. *West J Med*; 156(4):409.
8. Gerberding JL, Lewis FR, Schechter WP (1995) Are universal precautions realistic? *Surg Clin North America*; 75(6): 1091–104.
9. Gumodoka B, Favot I, Berege ZA, Dolmans WM (1997) Occupations exposure to the risk of HIV infection among health-care workers in Mwanza region, United Republic of Tanzania. *Bull World Health Organ* 75:133–139.
10. Guo YL, Shiao J, Chuang YC and Huang KY (1999) Needle stick and sharp injuries among health care workers in Taiwan. *Epidemiol Infect*; 122(2): 259-265.
11. Hadadi A, Afhami S, Karbakhsh M, Esmailpour N (2008) Occupational exposure to body fluids among healthcare workers: a report from Iran. *Singapore Med J*; 49(6):492
12. Lamontagne F et al (2007) Role of safety-engineered devices in preventing needlestick injuries in 32 French hospitals. *Infection Control and Hospital Epidemiology*, 28:18–23.
13. Manyele SV, Ngonyani HA, Eliakimu E (2008) the status of Occupational safety among health service providers in hospitals in Tanzania. *Tanzan j. Health Rev*.10 (3):159-65

14. Marcus R. CDC co-operative needle-stick surveillance group (1988) Surveillance of health care workers exposed to blood infected with HIV. *N Engl J Med*; 319: 1118-1123.
15. Momah PH. (1992) The epidemiology of needle stick and sharp injuries among health workers in Nigerian hospitals. *Report of a project. Faculty of Public Health, National Postgraduate Medical College, 102.*
16. National Institute of Occupational Safety and Health (1999) Preventing needle stick injuries in health care settings. *Washington, DC: Department of Health and Human Services;*
17. Perry J, Jagger J. EPINet data report (2003) Injuries from phlebotomy needles. *Advances in Exposure Prevention, 6(4):43–45.*
18. Prüss-Üstün A, Rapiti E, Hutin Y (2003) Sharps injuries: global burden of disease from sharps injuries to health-care workers. *World Health Organization, Geneva. (WHO Environmental Burden of Disease Series).*
19. Rahul S et al (2010); Study of Prevalence and Response of Needle-stick Injuries among Health Care Workers in a Tertiary Hospital in Dehli, India; *Indian J of Community Medicine; 35(1);74-77.*
20. Tokar JI, Bell DM, Culver DH, Marcus R, Mendelson MH, et al (1992) Percutaneous injuries during surgical procedures. *JAMA; 267: 2866-2904.*
21. WHO. (1998) Monitoring the AIDS Pandemic; the Status and Trends of the HIV/AIDS Epidemics in the World; *Provisional Report, Geneva: Switzerland.; 17-18.*
22. Wilburn SE, Eijkemans G (2004) Preventing needlestick injuries among healthcare workers: WHO/ICN collaboration. *International Journal of Occupational and Environmental Health, 10:451–456.*
23. Wilkinson WE, Salazar MK, Uhl JE, Koepsell TD, DeRoos RL, Long RJ (1992) Occupational injuries: a study of health care workers at a northwestern health science center and teaching hospital. *AAOHN J. 40(6):287-93.*
24. Ilhan MN, Durukan E, Aras E, and Türkçüoğlu S, Aygün R: (2006) Long working hours increase the risk of sharp and needlestick injury in nurses: the need for new policy implication. *J Adv Nurs, 56(5):563-568.*
25. Nsubuga FM, Jaakkola MS: (2005) Needle sticks injuries among nurses in sub-Saharan Africa. *Trop Med Int Health, 10(8):773-781*
26. Leigh JP, Wiatrowski WJ, Gillen M, and Steenland NK (2008) Characteristics of persons and jobs with needlestick injuries in a national data set. *Am J Infect Control, 36(6):414-420*

27. Centers for Disease Control and Prevention (1987) *Recommendations for prevention of HIV transmission in health-care settings. MMWR Morb Mortal Wkly Rep; 36((Suppl 2)):1-18.*
28. Centers for Disease Control and Prevention (1989) *Guidelines for prevention of transmission of human immunodeficiency virus and hepatitis B virus to health-care and public-safety workers. MMWR Morb Mortal Wkly Rep; 38((Suppl 6)):1-37.*

Appendix 1: Informed Consent (English Version)

Consent form

Title: Work Related Injuries and Associated Factors among Hospital Workers, a Case of Iringa Region in Tanzania

My name is Godbless Lucas, a resident from Muhimbili University of Health and Allied Sciences. I am currently conducting a study titled “work related injuries and the associated risk factor among hospital worker here in Iringa region”.

Results from this study will be an important source of information to policy makers, hospital workers and other stakeholders on the burden of injuries and their determinants among hospital taskforce. The information will also raise awareness to hospital workers on how they should behave while at work to get rid or reduce the chances of injuries. The Ministry of Health and Social Welfare and Occupational Safety and Health Authority are expected to use the information to set up possible solutions about the problem.

We ask for your participation in the study because you are among the hospital workers and you are regarded as a group at risk of injuries as a result of your job. If you agree to participate in the study you will be interviewed on your previous injury status, your age, your job experience and other relevant information inherent in your current job in this hospital.

All information obtained from you will be treated as confidential and will be used only for the intended purposes of this research. The research team will compile a report that will contain information about all hospital workers interviewed while maintaining confidentiality. We do not expect any harm to you as a result of your participation in the study.

You have the right to participate or not to participate in the study without giving any reason for your decision. When you have decided to participate you are also free to terminate your participation at any time in the course of the study.

If you have any questions about this study you are free to contact, the principal investigator, Godbless Lucas (0766955779) or lucasgodbless@yahoo.com.

If you have any questions/concerns about your rights as a participant you may contact Prof Mushi, Chairman of MUHAS Research and Publications Committee. P.O.BOX 65001 Dar es Salaam. Telephone number: 2150302-6

If you agree to this interview, please sign this consent form.

I have read and understood the contents of the consent form and my questions have been answered adequately. I therefore consent for the interview regarding the study.

Signature of the interviewee Date

Signature of the interviewer Date

Appendix 2: Informed Consent (Swahili Version)

Fomu ya Ridhaa Kushiriki Katika Utafiti

Kichwa: Madhara Yatokanayo na Kazi Pamoja na Visababishi vya Madhara Hayo kwa Wafanyakazi wa Hospitali za Mkoa wa Iringa.

Naitwa Godbless Lucas, mtafiti kutoka chuo cha afya na sayansi shirikishi Muhimbili. Kwa sasa nafanya utafiti ili kutambua madhara yatokanayo na kazi pamoja na visababishi vya madhara hayo kwa wafanyakazi wa hospitali katika mkoa wa Iringa.

Matokeo ya utafiti huu yatakuwa ni rasilimali muhimu sana kwa watunga sera, wafanyakazi wa hospitali na wadau wengine kwa sababu matokeo haya yatatoa picha halisi juu ya ukubwa wa tatizo na sababu mbalimbali zinazopelekea tatizo hili kuwepo kwa wafanyakazi katika mazingira ya hospitali. Taarifa hizi zitaongeza uelewa wa wafanyakazi wenyewe juu ya jinsi gani wajikinge na madhara ya kuumia kazini na hatimaye kupunguza tatizo au kulimaliza kabisa. Wizara ya Afya na Ustawi wa Jamii na Mamlaka ya Usalama na Afya Mahala pa kazi wanatazamiwa kutumia matokeo haya kuandaa mikakati thabiti kwa ajili ya kudhibiti tatizo hili.

Tunaomba ushiriki wako katika utafiti huu maana wewe ni mmojawapo wa wafanyakazi wa hospitali ambao ni kundi linalotambuliwa kuwa katika hatari ya kuumia wakati ukiendelea na kazi katika mazingira ya hospitali. Ukikubali kushiriki utaulizwa maswali kuhusu hali ya kuumia hapa kazini kwa kipindi kilichopita. Utaulizwa pia kuhusu umri wako na muda ambao umekuwa ukifanya kazi pamoja na taarifa nyingine kuhusiana na kazi yako.

Taarifa zote utakazotoa zitakuwa siri na hazitatumika kwa matumizi mengine mbali na utafiti huu. Timu ya utafiti itachambua taarifa hizi na kutoa taarifa ambayo haitatoa siri yoyote kuhusu wewe kwa kuwa majina au taarifa inayomlenga mtu binafsi haitakusanywa katika utafiti huu.

Katika utafiti huu hatutegemei madhara yoyote kwa mhojiwa kwa kipindi chote cha utafiti au hata baada ya utafiti huu. Unao uhuru wa kushiriki katika utafiti huu au kutokushiriki pasipo kutoa sababu yoyote juu ya hatua utakayokuwa umechukua. Ukishakubali kushiriki katika utafiti huu na ukaona kwamba huwezi kuendelea unao uhuru wa kusitisha ushiriki wako muda wowote wa utafiti.

Kama utakuwa na swali lolote kuhusu utafiti huu unaweza kuwasiliana na kiongozi wa utafiti huu ambaye ni Godbless Lucas simu- 0766955779 au barua pepe- lucasgodbless@yahoo.com. Kama

utakuwa na swali juu ya haki yako kama mshiriki unaweza kuwasiliana na Prof Mushi, Mwenyekiti wa kamati ya utafiti ya chuo cha afya Muhimbili kwa anuani S.L.P 65001 Dar es Salaam. Simu ya mezani: 2150302-6

Kama umekubali kuhojiwa, tafadhali saini hapa:

Mimi, nimesoma na kuelewa kilichoelezwa kwenye fomu hii na maswali yangu yamejibiwa kiufasaha. Hivyo ninakubali kuhojiwa kwa ajili ya utafiti huu.

Sahihi ya mhojiwa Tarehe

Sahihi ya mhoji..... Tarehe.....

Appendix 3; Questionnaire (English version)**Questionnaire**

Title: Work related injuries and associated factors among hospital workers, a case of Iringa region in Tanzania

Questionnaire number:

Name of health facility:

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS		
Question number	Questions	Response
A1	How old are you? years
A2	Gender of respondent?	1. Male 2. Female
A3	What is your marital status?	1. Single 2. Married 3. Divorced/separated 4. Cohabiting
A4	What is your highest level of education?	1. Primary 2. Secondary 3. Certificate 4. Diploma 5. Degree
A5	What is your area of practice?	1. Medical officer

		<ol style="list-style-type: none"> 2. Assistant medical officer 3. Nursing officer 4. Dental personnel 5. Laboratory personnel 6. Housekeeper
SECTION B: WORK CONDITION		
B1	What is your current work section in this hospital?	<ol style="list-style-type: none"> 1. Theatre 2. Surgical ward 3. Medical ward 4. Maternity ward 5. Intensive care unit 6. Out-patient department 7. Laboratory 8. Psychiatric ward 9. Housekeeping unit
B2	For how long have you been working in the healthcare industry? years
B3	For how long have you been working in current section? years
B4	Do you work in shift?	<ol style="list-style-type: none"> 1. Yes 2. No
B5	If yes to B4, How many hours do you spend working per shift? hours
B6	How many staff is there in your work section? staff

B7	Have you ever attended any training concerning occupational health and safety?	<ol style="list-style-type: none"> 1. Yes 2. No
B8	Has there been any assessment of work related injuries at your work section in the past twelve months?	<ol style="list-style-type: none"> 1. Yes 2. No
SECTION C: INJURY STATUS		
C1	Have you ever suffered any injury while executing your daily activities in your current work section in the past twelve months?	<ol style="list-style-type: none"> 1. Yes 2. No
C2	If it is yes to C1, What type of injury did you experience?	<ol style="list-style-type: none"> 1. Needle prick 2. Cut from sharps 3. Burn from chemical 4. Slips/fall
C3	What were you doing when you got injured?	<ol style="list-style-type: none"> 1. Performing injection on patient 2. Connecting IV line 3. During infusion 4. Suturing 5. Cutting 6. Waste segregation 7. Cleaning 8. Others specify.....
C4	If you suffered an injury from a needle stick or a cut from sharp object, below are circumstances under which	<ol style="list-style-type: none"> 1. Before use of item

	you might have suffered the injury. <i>Could you please choose the circumstance that mostly applies to your case?</i>	<ol style="list-style-type: none"> 2. During use of item 3. Device left on inappropriate place 4. While putting the item into a disposal container 5. Others specify
C5	On what part of your body did you get injured during the incidence?	<ol style="list-style-type: none"> 1. Hand 2. Foot 3. Others specify
C6	Considering the length of your shift, at what moment of your shift did you suffer the injury?	<ol style="list-style-type: none"> 1. Early hours of shift 2. Late hours of shift
C7	How many episodes of injury you have encountered in your current work section?	<ol style="list-style-type: none"> 1. One 2. More than one
C8	Under what circumstances did the injury occurred?	<p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
C9	Is there a person you always report cases of work related injuries to in this hospital?	<ol style="list-style-type: none"> 1. Yes 2. No

C10	If yes to C9, following the occurrence of the injury, did you report it to the hospital administration?	1. Yes 2. No
C11	Were you working under supervision during the time of injury?	1. Yes 2. No
SECTION D: UNIVERSAL PRECAUTIONS		
D1	Are there containers for sharps disposal in service area?	1. Yes 2. No
D2	If yes, to D1, is it located at arms reach of a healthcare provider?	1. Yes 2. No
D3	Are there separate containers for disposal of different types of waste?	1. Yes 2. No
D4	If yes to D3, are they labeled to indicate type of waste material they contain?	1. Yes 2. No
D5	Are sharps containers readily available for the intended use?	1. Yes 2. No
D6	Are you aware of the Tanzania occupational health and safety act of 2003?	1. Yes 2. No
D7	If yes for D6, which provision in the act highlights workers' responsibilities on their health and safety in their work place?
D8	Are there guidelines of infection prevention and control in your work section?	1. Yes 2. No
D9	Are there appropriate personal protective gears that are required for your work?	1. Yes 2. No

D10	During the occurrence of the injury, were you wearing any protective gear?	1. Yes 2. No

Appendix 4; Questionnaire (Swahili version)**Dodoso**

Kichwa: Ajali za kuumia zitokanazo na kazi pamoja na visababishi vya madhara hayo kwa wafanyakazi wa hospitali katika mkoa wa Iringa.

Namba ya Dodoso

Jina la hospitali

NAMBA YA SWALI	SWALI KWA MHOJIWA	MAJIBU YA MHOJIWA
A: TAARIFA ZA MSINGI ZA MHOJIWA		
A1	Unao umri wa miaka mingapi?
A2	Jinsia ya mhojiwa	1. Mume 2. Mke
A3	Hali ya ndoa ya mhojiwa?	1. Hajaolewa/hajaoa 2. Ameolewa/ameoa 3. Wameachana 4. Wanaishi pamoja bila ndoa
A4	Umefikia kiwango gani cha juu cha elimu?	1. Elimu ya msingi 2. Elimu ya sekondari 3. Cheti 4. Stashahada 5. Shahada
A5	Unafanya kazi gani katika hospitali hii?	1. Daktari 2. Daktari msaidizi 3. Muuguzi 4. Mtaalam wa meno

		5. Fundi maabara 6. Mhudumu
B: HALI YA KAZI		
B1	Kitengo chako cha kazi kwa sasa katika hospitali hii ni kipi?	1. Chumba cha upasuaji 2. Wodi ya upasuaji 3. Wodi ya utabibu 4. Wodi ya wazazi 5. Wodi ya wagonjwa mahututi 6. Idara ya wagonjwa wan je 7. Maabara 8. Wodi ya wagonjwa wa akili 9. Kitengo cha usafi
B2	Ni kwa muda gani umekuwa ukifanya kazi katika utoaji wa huduma za afya?	Miaka
B3	Ni kwa muda gani sasa umekuwa ukifanya kazi katika kitengo ulichopo kwa sasa?	Miaka
B4	Unafanya kazi kwa kupokezana (shift)?	1. Ndiyo 2. Hapana
B5	Kama ndiyo kwa Q9, unafanya kazi kwa saa ngapi katika shift moja?	Saa
B6	Mpo wafanyakazi wa ngapi katika kitengo chako cha kazi?	Wafanyakazi
B7	Umewahi kuhudhuria mafunzo yoyote yanayohusau afya na usalama mahali pa kazi?	1. Ndiyo 2. Hapana
B8	Kwa kipindi cha miezi kumi na	1. Ndiyo

	mbili iliyopita, kuna tathmini yoyote ya afya na usalama imefanywa na wataalamu katika eneo lako la kazi?	2. Hapana
C: TAARIFA ZA KUUMIA WAKATI WA KAZI		
C1	Umewahi kuumia wakati unaendelea kufanya kazi yako hapa hospitali kwa kipindi cha miezi 12 iliyopita?	1. Ndiyo 2. Hapana
C2	Kama umejibu ndiyo kwa C1, ni ajali ya aina gani ulipata?	1. Nilichomwa na sindano 2. Nilikatwa na kifaa chenye ncha kali 3. Niliunguzwa na kemikali 4. Niliteleza/nilianguka
C3	Ulikuwa unafanya shughuli gani iliyopelekea wewe kuumia?	1. Nilikuwa namchoma mgonjwa sindano 2. Nilikuwa namwekea mgonjwa IV line 3. Nilipokuwa nachukua damu kutoka kwa mgonjwa 4. Wakati namshona mgonjwa 5. Wakati wa kukata 6. Nilipokuwa nachambua taka za hospitali 7. Wakati nafanya usafi 8. Zingine, fafana
C4	Kama ulipata ajali kwa kuchomwa na sindano au kukatwa na kifaa chenye ncha kali, vipengele	1. Kabla ya kukitumia kifaa kilichoniumiza 2. Wakati natumia kifaa

	vifuatavyo ni mazingira ambamo uliumia/ulipata ajali hiyo. <i>Tunaomba utwambie ni wakati gani ulipata ajali kulingana na mchanganuo wa hapa chini?</i>	<p>kilichoniumiza</p> <ol style="list-style-type: none"> 3. Kifaa kiliachwa sehemu isiyotakiwa 4. Baada ya kutumika kabla ya kutupwa 5. Nilipokuwa naweka kifaa kwenye kontena 6. Namna nyingine, elezea
C5	Ni sehemu gani ya mwili wako iliumia wakati umeata ajali?	<ol style="list-style-type: none"> 1. Mkono 2. Mguu 3. Nyingine, elezea
C6	Ukizangatia urefu wa shift yako, ni wakati gani katika shift ulipata kuumia?	<ol style="list-style-type: none"> 1. Saa za awali 2. Saa za mwisho
C7	Ni mara ngapi umepata ajali katika eneo lako la kazi?	<ol style="list-style-type: none"> 1. Mara moja 2. Zaidi ya mara moja
C8	Tunaomba uelezee mazingira ya ajali hiyo kwako?	<p>.....</p> <p>.....</p> <p>.....</p>
C9	Katika hospitali yenu yupo mtu maalum ambaye mnatoa taarifa kwake endapo mtu anaumia kazini?	<ol style="list-style-type: none"> 1. Ndiyo 2. Hapana
C10	Kama ndiyo kwa C9, Baada ya ajali kutokea, ulitoa taarifa yoyote kwa mamlaka husika?	<ol style="list-style-type: none"> 1. Ndiyo 2. Hapana
C11	Kabla ya kuumia yupo aliyekuwa anakusimamia katika kazi ulokuwa unafanya?	<ol style="list-style-type: none"> 1. Ndiyo 2. Hapana

D: TAHADHARI MUHIMU		
WAKATI WA KAZI		
D1	Zipo container za kuhifadhia vitu vyenye ncha kali baada ya matumizi? Chunguza	1. Ndiyo 2. Hapana
D2	Kama ndiyo kwa D1 , If yes, imewekwa sehemu ambayo mtoa huduma akinyoosha mkono ataifikia?	1. Ndiyo 2. Hapana
D3	Je, zipo container tofauti kwa aina tofautiza taka?	1. Ndiyo 2. Hapana
D4	Kama ndiyo kwa D3 , zimewekewa lebo kuonesha aina ya taka zilizopo ndani ya container?	1. Ndiyo 2. Hapana
D5	Je, hizo container za kuhifadhia taka zenye kukata zinapatikana muda wote hapa hospitali?	1. Ndiyo 2. Hapana
D6	Je, unaifahamu sheria ya afya na usalama mahali pa kazi ya mwaka 2003?	1. Ndiyo 2. Hapana
D7	Kama umejibu ndiyo kwa D6, ni kifungu gani katika sheria hiyo kinaeleza wajibu wa mfanyakazi juu ya afya na usalama mahali pa kazi?
D8	Je, katika eneo lako la kazi ipo miongozo ya jinsi ya afya na usalama wa mfanyakazi wakati	1. Ndiyo 2. Hapana

	akiwa kazini?	
D9	Je, katika kazi unayofanya, zipo zana (nguo, viatu, gloves, mask, au respirators) husika za kukukinga dhidi ya kuumia wakati wa kazi?	<ol style="list-style-type: none"> 1. Ndiyo 2. Hapana
D10	Wakati ulipoumia, ulikuwa umevaa nyenzo yoyote ya kuzuia kuumia?	<ol style="list-style-type: none"> 1. Ndiyo 2. Hapana