DETERMINANTS INFLUENCING PREVENTION AND CONTROL OF HEALTH-CARE ASSOCIATED TUBERCULOSIS INFECTION: A CASE STUDY OF HEALTH FACILITIES IN LIRA DISTRICT

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DECLARATION

I, MALI RICHARD, hereby declare that to the best of my knowledge, the information in this dissertation titled 'Determinants Influencing Prevention and Control of Health-Care Associated Tuberculosis Infection: A Case Study of Health Facilities in Lira District' is original and a result of my own effort. The research work has not been published or tendered to any university or institution of higher learning for any award.

Signed: ……

MALI RICHARD

Date: …….

APPROVAL

This is to certify that Mali Richard's dissertation titled, 'Determinants Influencing Prevention and Control of Health-Care Associated Tuberculosis Infection: A Case Study of Health Facilities in Lira District' was done under my supervision and is ready for submission with my approval.

Supervisor, Mrs. ……..

Signed: ……..

Date: …….

DEDICATION

This dissertation is wholly dedicated to my wife & family without whose support and encouragement, completion of the program would not have been possible.

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LIST OF ABBREVIATIONS/ACRONYMS

HCWs	Health-Care Workers
TB	Tuberculosis
CDC	Center for Disease Control
HIV	Human immunodeficiency virus
MDR	Multidrug-resistant
US	United State
LTBI	Latent TB infection
MDR-TB	Multidrug resistant – Tuberculosis
IPC	Infection prevention and control
MoH	Ministry of Health
PPE	Personal Protective Equipment
WHO	World Health Organization
AFB	Acid-fast bacilli
GPs	General practitioners
CDC	Centre for Disease Control and Prevention
JCAHO	Joint Commission on Accreditation of Healthcare Organizations

HICPAC	Healthcare Infection Control Practices Advisory Committee
USA	United States of America
CDC/ATS	Centre for Disease Control /American Thoracic Society
DOT	Direct observation of therapy
TST	Tuberculin skin test
CSSD	Central sterile services department
SA	South Africa
KII	Key informants interviews
RRH	Regional Referral Hospital
DHO	District Health Officer
SPSS	Statistical Package for Social Scientists
IHSU	International Health Science University
HDREC	Higher degree research and ethics committee
TB IPC	Tuberculosis – Infection Prevention and Control
UVGI	Ultraviolet Germicidal Irradiation

ABSTRACT

Transmission of tuberculosis (TB) in health care settings to both patients and health care workers (HCWs) has been reported from virtually every country of the world, regardless of local TB incidence. This study set out with a general objective of establishing the determinants influencing prevention and control of Tuberculosis infection among health care workers in health facilities in Lira District in Northern Uganda. Specifically, the study set out to establish the level of knowledge of health care workers pertaining to prevention and control of TB infection when managing TB patients in health facilities in Lira District; examine the practices of the health care workers in regard to TB infection prevention and control when managing TB patients in health facilities in Lira District; and to determine the health facility factors influencing prevention and control of TB infection in health facilities in Lira District. This was with a view to provide data about the level of knowledge and practices currently being used by HCWs. This may be useful in awareness creation to avoid further spread of TB.

The study adopted a cross-sectional research design in which HCWs within HC IIIs, IVs, and the Regional Referral Hospital of Lira district participated in providing data for the study. The sample of 138 health care workers who were conveniently sampled were used to provide information through completion of structured questionnaires, face to face interviews on the determinants influencing prevention and control of health-care associated TB infection in Lira District.

The study found out that the level of knowledge of the health care workers about prevention and control of TB infection was relatively high. However, it was found out

that their knowledge was low in regard to the National guidelines for prevention and control of TB infection. The study further found out that most health workers utilize the practices that prevent and control TB infection although there were several factors health facility factors that influence utilization of the practices thereby negatively influencing the prevention and control of TB infection.

The study concluded that health care workers in health facilities in Lira District have a high level of knowledge pertaining to prevention and control of TB infection. That the health -care workers have low level of knowledge with respect to the national TB prevention guidelines and policy. The health care workers in health facilities in Lira District use the recommended practices although these are hindered by the health facility factors such as shortage of gloves, N95 respirators, curtains and patient beds.

The study recommended among others that the Ministry of Health and that of Local Government should provide adequate facilities to ensure standards of management of TB patients. These should include some equipment like gloves, N95 respirators, curtains and patient beds. The study further recommended that the health department in local governments should ensure continuous training of health care workers particularly with respect to national TB guidelines and the policy relating to TB patients in health facilities. Health care administrators should ensure proper design of safety cabinets, patient isolation and nose covering that have been found not strictly observed by health care workers.

OPERATIONAL DEFINATIONS

Administrative Controls

Refers to the standard treatment plans for people with suspected or confirmed TB aim to reduce the exposure of HCWs to people with TB

Environmental Controls

Refers to the use of special isolation rooms aim to prevent the spread and to reduce the concentration of infectious droplets in the air.

Personal Protective Equipment (PPE) Controls

Refers to the use of personal respirators for nursing staff aim to reduce the risk of infection when exposure to *M. tuberculosis* is unavoidably high

CHAPTER ONE: INTRODUCTION

1.0 Introduction

Healthcare-associated tuberculosis has become one of the major occupational hazard for Health care workers (HCWs), thus increasing the burden of disease. This study was conducted to establish the determinants influencing prevention and control of health-care associated tuberculosis infection in health facilities of Lira district - Northern Uganda. This chapter introduces the study by presenting the; background to the study, statement of the problem, objectives of the study, research questions, significance of the study, and the conceptual framework.

1.1 Background to the study

Globally, the incidence of tuberculosis (TB) is generally low, however, exposure to people with unsuspected active respiratory TB disease followed by transmission of *m. tuberculosis* does occur in healthcare settings (Joshi, Reingold, Menzies and Pai, 2006).

Within the African continent, the risk of transmission of *M. tuberculosis* from individuals with TB to other patients and to health professionals (HPs) has been recognized for many years. This risk is high in health facilities especially in many low- and middle-income countries in Africa (Joshi, Reingold, Menzies and Pai, 2010).

Tuberculosis (TB) transmission occurs through droplet nuclei aerosolized by patients with infectious pulmonary TB and inhaled by other persons. When an individual with pulmonary TB coughs, sneezes, or speaks, respiratory droplets containing viable

Mycobacterium tuberculosis bacteria are aerosolized. A susceptible host can inhale these droplets and become infected. Transmission is most likely to occur from unrecognized or inappropriately treated TB. TB began to be recognized as an occupational hazard in the 1950s (Sepkowitz, 1994); since then, effective infection control measures have been implemented to reduce the risk for nosocomial TB (Jensen et al, 2005). The risk for transmission varies by setting, occupational group, local prevalence of TB, patient population, and effectiveness of TB infection control measures (Menzies et al, 2007). In 1994, CDC published the Guidelines for Preventing the Transmission of Mycobacterium tuberculosis in Health Care Facilities (CDC, 1994).

Transmission of tuberculosis (TB) in health care settings to both patients and health care workers (HCWs) has been reported from virtually every country of the world, regardless of local TB incidence. The TB infection-control measures recommended by CDC in 1994 have been implemented widely in health-care facilities worldwide (Institute of Medicine, 2001). As a result, a decrease occurred in some countries such as the USA. A review by Seidler et al., (2005) showed that, among HCWs in high-income countries, the overall incidence of TB disease in the general population and native born HCWs was less than 10/100 000 per year. In high-income countries such as the US, guidelines are in place to minimize the transmission of TB in health-care facilities. These include; Administrative controls which are for example, standard treatment plans for people with suspected or confirmed TB aim to reduce the exposure of HCWs to people with TB. Then Environmental controls such as the use of special isolation rooms aim to prevent the spread and to reduce the concentration of infectious droplets in the air. Finally,

respiratory-protection controls that include personal respirators for nursing staff aim to reduce the risk of infection when exposure to *M. tuberculosis* is unavoidably high. Together, these three pillars of control have reduced the incidence of TB in HCWs in high-income countries.

More than 90% of the world's cases of TB occur in developing countries where the risk of transmission of *Mycobacterium tuberculosis* from patients to health-care workers (HCWs) is a neglected problem in many low and middle-income countries. Despite the general decline in TB rates in recent years, a marked geographic variation in TB case rates persists, which means that HCWs in different areas face different risks (Institute of Medicine, 2001). Joshi et al., (2006) summarized evidence on the incidence and prevalence of latent TB infection (LTBI) and disease among HCWs in low- and middle-income countries. In their review of 51 studies the authors found that the prevalence of LTBI among HCWs was on 55% (CI = 33–79), the estimates of the annual risk of LTBI ranged from 0.5 to 14.3%, and the annual incidence of TB disease ranged from 69 to 5780 per 100 000. Several other studies (Al-Maniri et al, 2008; Vandan et al, 2009; Kiefer et al, 2009; Loveday et al, 2008; Naidoo et al, 2007; Moloi, 2003) around the world have indicated that HCWs do not always exhibit sufficient knowledge, positive attitudes, and acceptable practices regarding preventing and treating MDR-TB.

The prevalence of MDR-TB among HCWs in Uganda was about 40% (Kayanja et al., 2005) and Iran 2% (Golchin and Rostami, 2005). Poor implementation of infection control measures, along with the effects of the HIV epidemic on TB, and the emergence of multidrug-resistant (MDR) strains resulted in the reemergence of hospital-based

transmission of TB and MDR TB in the early 1990s (Sepkowitz, 1994). Hence, it is upon this background that this study sought to establish determinants influencing prevention and control of health-care associated tuberculosis infection within health facilities in Lira district.

1.2 Statement of the Problem

Health care workers are inevitably among the high risk groups of persons exposed to TB due to frequent interaction with patients with undiagnosed and potentially contagious TB. Whenever there is a possibility of exposure, implementation of infection prevention and control (IPC) practices is critical. There are three broad categories constituting a set of TB infection control measures namely; Administrative (work practices), Environmental, and Personal protective equipment (MoH, 2014). These measures operate at different points in the TB transmission process. The three categories of TB infection control measures complement each other and where feasible should as much as possible be used as a combination.

Whereas there is a general assumption that HCWs know about MDR-TB and its implications, several studies however, have found that HCWs do not always exhibit sufficient knowledge, positive attitudes, and acceptable practices regarding preventing and treating MDR-TB (Naidoo et al, 2007). There is scanty information on the situation in Lira District in Northern Uganda. According to Greenaway et al, (2002) lapses in infection control practices including delays in the diagnosis of treatment of persons with infectious TB disease are part of the discrepancies. In Uganda, it has been reported that

the knowledge and practice on TB infection control among health professionals in health care settings and congregate settings such as prisons is very low (MoH, 2014). Yet knowledge and practice of HCWs regarding TB infection control requires and complements the implementation of core interventions in TB control and strengthening of health systems (MoH, 2014). Besides, it has been reported that most health facilities lack resources to prevent nosocomial transmission of TB.

Failure to implement infection prevention and control measures will lead to increased disease severity for the patients and a greater likelihood of transmission to family members and others in the community. Including resurgence of TB thus increased prevalence of TB disease and human immunodeficiency virus. This has prompted the researcher to establish the determinants influencing prevention and control of health-care associated tuberculosis infection.

1.3 Objectives of the study

1.3.1 General objective

To establish the determinants influencing prevention and control of health-care associated tuberculosis infection in health facilities of Lira District - northern Uganda.

1.3.2 Specific objectives

i. To assess the level of knowledge of HCWs regarding TB infection prevention and control when managing TB patients in health facilities of Lira District.
ii. To examine practices by HCWs in regard to TB infection prevention and control when managing TB patients in health facilities of Lira District.

iii. To determine the Health Facility factors influencing prevention and control of TB infection in health facilities of Lira District.

1.5. Research questions

i. What is the level of knowledge of HCWs regarding TB infection prevention and control when managing TB patients in health facilities of Lira District?
ii. What practices have been adopted by HCWs in regard to TB infection prevention and control when managing TB patients in health facilities of Lira District?
iii. What Health Facility factors are influencing prevention and control of TB infection in health facilities of Lira District?

1.6. Significance of the Study

The study findings will be useful to several stakeholders in health care services. For instance;

To managers of health care institutions, the results may provide data about the level of knowledge and practices currently being used by HCWs. This may be useful in awareness creation to avoid further spread of TB.

To health care administrators, the results could be useful in guiding management staff, including health care workers in dealing with TB cases while at the same time protecting themselves against infection.

To the HCWs, the results may be useful in ensuring personal safety since each one has personal responsibility for his/her health.

To academicians, the results could be a basis for further research on TB especially in low-income countries like Uganda.

1.7. Conceptual framework

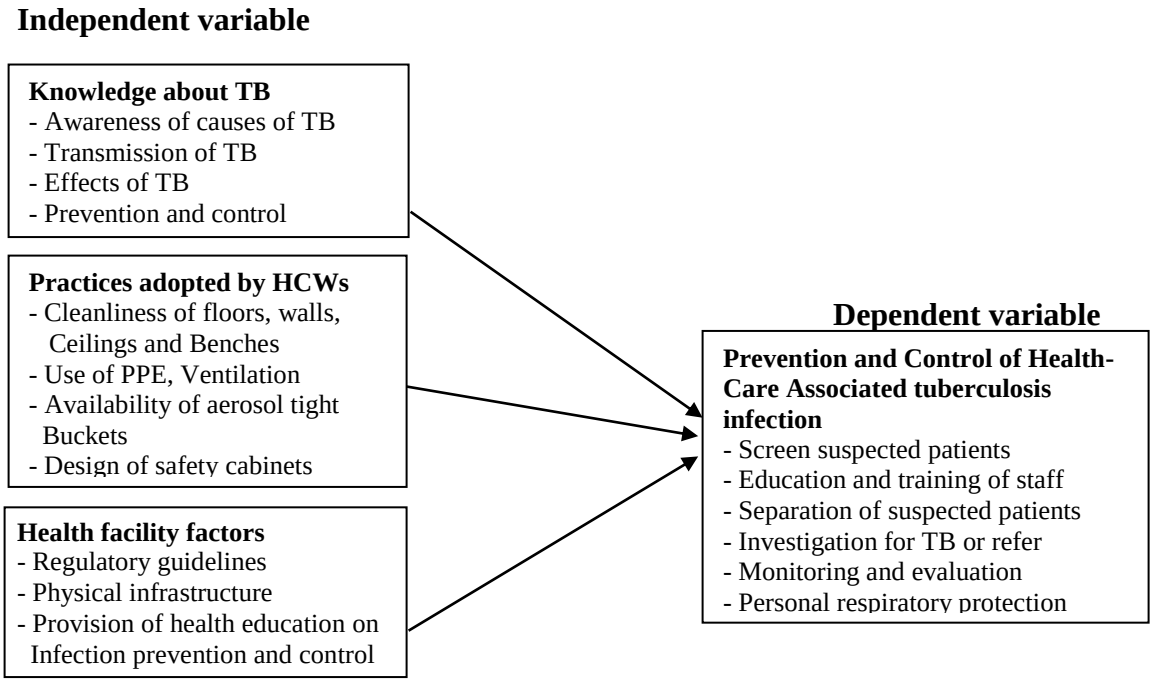

Figure 1.1: Conceptual framework

Source: Adopted from WHO (2010)

From Figure 1.1, it can be noted that the independent variable in this study constituted of the knowledge of HCWs pertaining to TB infection in terms of what it is, what causes it, the signs and symptoms of TB including treatment and management. On the other hand, the independent variable also focused on the practices adopted by the HCWs in the various health centers in the area of study. The dependent variable focused on the control and prevention of Hospital-Based TB infection. However, from the theoretical frameworks in chapter two, it is evident that there are other factors that could be at play in the transmission of TB and other diseases. These have not been highlighted in this conceptual framework but have been taken care of in the theoretical underpinning for this study.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

The chapter aimed at providing relevant literature review relating to the knowledge and practices adopted by HCWs in the control and prevention of TB in health facilities. This included but not limited to information in publications, research studies, recent journal articles, statistics and related reports on TB control and prevention especially among HCWs.

2.1 Theoretical Review

A number of theories have been considered in this study. Below is a brief explanation about the theories that underpinned the study.

The Germ Theory

The Germ Theory states that some diseases are caused by micro-organisms. These small organisms, too small to see without magnification, invade humans, animals, and other living hosts. Their growth and reproduction within their hosts can cause a disease. "Germ" may refer to not just a bacterium but to any type of microorganisms, especially one which causes disease, such as protist, fungus, virus or viroid. Microorganisms that cause disease are called pathogens, and the diseases they cause are called infectious disease. Even when a pathogen is the principal cause of a disease, environmental and hereditary factors often influence the severity of the disease, and whether a particular host individual becomes infected when exposed to the pathogen. This implies that for one to become infected with TB, he/she has to be exposed to the causative agent which is the *M.*

tuberculosis. So, according to the Germ Theory, there is one specific cause of every disease. This refers to the one to one relationship between the causative agent and the disease.

The Epidemiological Triangle

According to the Epidemiological Triangle Theory, every one exposed to disease agent does not necessarily contract the disease. This means that it is not only the causative agent that is responsible for the infection but there are other factors that may be related to man and the environment that contribute to the infection of a given disease. In other words, there are three factors that need to be considered i.e. the Host, the environment and the causative agent; thus forming a triangle. This theory can be used to explain the transmission of TB because, while many people are exposed to the bacterium, not all of them often develop the signs and symptoms of the disease meaning that there other factors that need to be considered.

The Multi-Factorial Causation Theory

The epidemiological Theory is not applicable to non-infectious and chronic diseases like coronary artery diseases because it has many causes or multiple factors. The Multi-Factorial Theory helps to understand and explain the various associated causative factors, which suggests preventive and plan measures to control the disease.

The Socio-Environmental Theory

The Socio-Environment Theory is not so much about the causes of the disease but rather more about the factors that make and keep people healthy. The theory is composed of four major categories of factors: human biology, lifestyle, environment and health

system. All these factors influence health status either positively or negatively. This implies that the health status of the HCWs in the various health centers around the world is dependent on their human biology, lifestyle, environment especially that in which they work and the health system in place. This means when studying the knowledge and practices of HCWs it is important that issues relating to the four factors need to be considered.

2.2 Knowledge of HCWs Regarding Prevention and Control of Health Care Associated TB Infection

According to the Ministry of Health of Uganda (MoH, 2002) Tuberculosis (TB) is an infectious disease that is caused by a bacterium called Mycobacterium tuberculosis. The disease was called "consumption" in the past because of the way it would consume from within anyone who became infected. According to Med lexicon's medical dictionary, tuberculosis is a specific disease caused by infection with Mycobacterium tuberculosis, the tubercle bacillus, which can affect almost any tissue or organ of the body, the most common site of the disease being the lungs. Harries, Maher and Graham (2004) contend that, the risk of infection depends on the susceptibility of the host, the extent of the exposure and the degree of infectiousness of the index case. When an individual inhales the infectious aerosols, the bacilli lodge into the alveoli where they multiply and form a primary lesion. Under normal conditions, in most of the cases, the immune system either clears the bacilli or arrests the growth of the bacilli within the primary lesion in which case the host is said to harbor latent TB infection (LTBI). However, in 5 - 10% of the cases, the bacilli overwhelm the immune system resulting in a primary TB within a few

months to years. In the rest, post-primary TB occurs when re-infection occurs or the LTBI is reactivated. Naturally, the immune system forms scar tissue or fibrosis around the TB bacteria and this helps fight the infection and prevents the disease from spreading throughout the body and to other people. If the body's immune system is unable to fight TB or if the bacteria break through the scar tissue, the disease returns to an active state with pneumonia and damage to kidneys, bones, and the meninges that line the spinal cord and brain.

The lifetime risk of developing active TB is 5 - 10 % according to a study by Harries and Dye (2006). Other studies however revealed that it could be higher because of the underlying conditions (like human immunodeficiency virus (HIV) infection, diabetes and other medical conditions that suppress immunity) and poor socioeconomic status (MoH, 2006). Consequently, TB has been classified as either being latent or active. Latent TB occurs when the bacteria are present in the body, but this state is inactive and presents no symptoms. Latent TB is also not contagious. Active TB on the other hand is contagious and is the condition that can make you sick with symptoms (WHO, 2008).

The Morbidity and Mortality Weekly Report (1994) asserts that in general, persons who become infected with Mycobacterium tuberculosis have approximately a 10% risk for developing active TB during their lifetimes. This risk is greatest during the first 2 years after infection. Immuno-compromised persons have a greater risk for the progression of latent TB infection to active TB disease; HIV infection is the strongest known risk factor for this progression. Persons with latent TB infection who become co -infected with HIV have approximately an 8% – 10% risk per year for developing active TB. HIV-infected

persons who are already severely immunosuppressed and who become newly infected with Mycobacterium tuberculosis have an even greater risk for developing active TB. The probability that a person who is exposed to Mycobacterium tuberculosis will become infected depends primarily on the concentration of infectious droplet nuclei in the air and the duration of exposure. Characteristics of the TB patient that enhance transmission include: disease in the lungs, airways, or larynx, presence of cough or other forceful expiratory measures, presence of acid-fast bacilli (AFB) in the sputum, failure of the patient to cover the mouth and nose when coughing or sneezing, presence of cavitation's on chest radiograph, inappropriate or short duration of chemotherapy and administration of Mycobacterium tuberculosis procedures that can induce coughing or cause aerosolizing (example, sputum induction).

Studies from varied settings indicate that the level of knowledge about TB is influenced by many factors including their areas of work, whether public or private sector. A study conducted in Oman, showed that general practitioners (GPs), particularly those working in the private sector, appear to have low suspicion and poor knowledge of TB in the areas of diagnosis, treatment, follow-ups and contact screening (Al-Maniri et al, 2008). The findings in this study are in agreement with a similar study done in India to assess the doctors' knowledge of TB management, where it was found that although the doctors working in the public sector have better knowledge of TB than the doctors working in the private sector, they all need to be trained for better diagnosis and treatment of TB (Vandan et al, 2009). Also, a Peruvian study to assess the knowledge and attitudes of health care providers such as doctors and nurses, showed knowledge gaps which include

identification of patients at high risk for TB, assessment for treatment outcome and consequences of treatment failure (Kiefer et al, 2009).

According to WHO (2002) nosocomial infection is one of the leading causes of death and increased morbidity for hospitalized patients. Nosocomial infections have traditionally referred to infections that develop during hospitalization and so have also been known as hospital-acquired infections. As health care increasingly expands beyond hospitals into outpatient settings, nursing homes, long-term care facilities, and even home care settings, the more appropriate term has become healthcare-acquired infection. As health care has evolved, lowering the rate of nosocomial infections has been a challenge for infection control programmes. Advances in medical treatments have led to more patients with decreased immune function or chronic disease. The increase in these patients, coupled with a shift in health care to the outpatient setting, yields a hospital population that is both more susceptible to infection and more vulnerable once infected. The increased use of invasive devices and procedures has also contributed to higher rates of infection (WHO, 2002; Weinstein 2004, Burke, 2003). Of particular danger are the several resistant strains of bacteria that have developed through their natural course of adaptation and the overuse of antibiotics.

Nearly 70% of nosocomial infections are caused by drug-resistant strains of bacteria (Burke, 2003). Burke (2003) and Boyce et al (2004) added that evidence-based guidelines exist for the prevention and control of nosocomial infections, and the guidelines address a wide range of issues from architectural design of hospitals to hand hygiene. These guidelines have been established primarily by the Centre for Disease Control and

Prevention (CDC) and the World Health Organization (WHO), as well as infection-related organizations and other professional societies. Proper hand washing is the single most important preventive measure, yet compliance rates among healthcare workers have ranged from 16% to 81%. Heightened awareness of this guideline and others, as well as ways to promote adherence, are necessary.

The Joint Commission on Accreditation of Health Care Organization (2007) further explained that reducing the risk of healthcare-associated infections is one of the National Patient Safety Goals developed by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO). Reflecting the expansion of nosocomial infections beyond the hospital, this goal is included in the JCAHO safety goals developed for a variety of settings in addition to hospitals, including ambulatory care/office-based surgery, long-term care, and assisted living settings.

The Centre for Disease Control (1985) on the efficacy of nosocomial infection control showed beyond doubt that increase in surveillance activities is able to directly bring down the rates of nosocomial infections. It is well known that nosocomial infections are most prevalent in certain high risk areas such as the intensive care renal dialysis and organ transplant units, burns ward, cancer ward, operation theatres, post-operation theatres, postoperative ward nursery and the geriatric ward. Therefore, all methods aimed at containing hospital infections should be primarily focused in these high risk areas.

According to WHO (2002) in general, the sources of nosocomial infections can be categorized as being related to environmental factors (air, water, architecture), patient-

related factors (age, degree of illness/immune status, length of hospital stay), and iatrogenic factors (surgery and invasive procedures, devices and equipment, and antibiotic use). Taken together, these sources have a substantial impact on the increasing incidence of nosocomial infections, as WHO further notes that the rate of nosocomial infections will continue to rise as a result of four factors: crowded hospital conditions; increasing number of people with compromised immune systems; new microorganisms, and increasing bacterial resistance.

Sehulster et al (2003) suggest that factors specifically related to the healthcare environment are not common causes of nosocomial infections. However, consideration should be given to the prevention of infection with environmental pathogens, such as fungi (example, Aspergillus), bacteria (example, Legionella species), or viruses (example, varicella). In 2003, the Centre for Disease Control (CDC) and the Healthcare Infection Control Practices Advisory Committee (HICPAC) revised the guideline related to environmental factors for infection. The report provides clear recommendations for infection control measures according to several environment-related categories, including air (normal ventilation and filtration, as well as handling during construction or repair), water (water supply systems, ice machines, hydrotherapy tanks and pools), and environmental services (laundry, housekeeping). WHO (2002) share in this opinion but added that several factors may facilitate nosocomial infection transmission in hospitals, although their relative importance in facilitating transmission is unknown. The overwhelming number of TB patients and repeated exposures to smear-positive TB patients are likely to be critical factors. Arguably, TB patients are considered excellent

teaching material especially those with pulmonary TB who are likely to exhibit signs during a lung exam. As a result they may be used as test materials by medical trainees. Many countries, after an initial classroom based programme in medical sciences, trainees begin their clinical rotations especially at the most part of their final years.

During this phase of their training, emphasis is placed on physical examination. Evaluation of the respiratory system, for example, is invariably included in licensure examinations. However, repeated exposure of trainees is particularly worrisome, given the lack of TB infection control measures at most healthcare facilities in Africa. According to Pai et al. (2006), this fact may explain the high incidence of infection among health workers in India. Their trainees spend considerable time eliciting physical signs in such patients, which results in repeated exposure to patients with infectious TB during trainees' first clinical rotations. Delays in diagnosis and initiation of treatment and failure to separate or isolate patients with smear-positive TB from other patients also contribute to transmission risk. Many studies have shown that diagnostic delays are common, and private practitioners, in particular, tend to underuse sputum microscopy, thereby increasing the probability of missing infectious TB patients (Prasad, Nautiyal, Mukherji, Jain, Singh & Ahuja, 2003; Uplekar, Juvekar, Morankar, Rangan & Nunn, 1998; Rajeswari, Chandrasekaran, Suhadev, Sivasubramaniam, Sudha & Renu, 2002). Unnecessary or prolonged hospitalization of TB patients who could have been treated on an ambulatory basis might also contribute to high exposure levels in hospitals.

A related study conducted to assess the level of knowledge and reported practices regarding tuberculosis among health staff at basic health facilities in a rural district in

Vietnam shows that health staff knowledge of theoretical aspects was better than knowledge related to patient management and even the staff members who had attended TB training courses had inadequate TB inadequate particularly in the area of TB control (Hoa et al., 2005). Also a study carried out in a rural district of Sindh in Pakistan investigating the knowledge, attitude and practices of private practitioners regarding TB management reported similar results; they reported that private practitioners lacked knowledge in TB diagnosis and management. Only 14% of them advised sputum microscopy solely for pulmonary TB diagnosis; while over 40% PPs did not prescribe TB treatment regimen according to TB-DOTS category (Ahmed et al., 2009). The above findings are also in agreement with the results of a Croatian study conducted to investigate TB knowledge among general practitioners (GPs) and paediatricians in Split and Dalmatian County. This study showed gaps in the knowledge among physicians surveyed (Savicević, 2009). However the above findings were in a sharp contrast to the findings from a study conducted in 250 primary health centers throughout Iraq where 95.5% of the 500 health care workers who participated in the study had good knowledge about TB and this was significantly associated with age and job duration (Hashim et al., 2003).

A study conducted by Yu et al, (2002) at the St. Luke's Medical Center in Philippines over a period of one month to evaluate the physicians' knowledge, attitudes, and practices and their approach in the diagnosis and management of pulmonary tuberculosis, found gaps in the professionals interviewed. For instance, when faced with TB, 57.5% stated that they will add 2 drugs to the regimen and re-evaluate; while 15% said that they will

add just one drug. A study conducted in Rio de Janeiro showed that only 61/142 (43%) of HCWs who participated in the study were aware of the morbidity and mortality related to TB. These knowledge gaps are a huge problem in Africa too. Loveday et al (2008) reported that inadequate knowledge and understanding by clinicians of effective TB diagnosis and treatment actually led to an increase in TB. Other findings similar were partly identified in another study conducted in South Africa, where it was stated that lack of training of HCWs, resulted in poor knowledge about TB, particularly concerning its causation, mode and duration of treatment (Naidoo et al, 2007).

2.3 Practices adopted by HCWs in regard to TB prevention and control

The practices implemented by HCWs in order to prevent cross-infection as well as prescribing practices vary from settings to settings. With regard to prescribing practices, the following studies illustrate the issues. A study conducted in USA to evaluate prescribing practices for the treatment of TB in Virginia showed that private practitioners were less compliant with the Centre for Disease Control/American Thoracic Society (CDC/ATS) guidelines than their counterparts working in the public sector (Richardson, 2000). The above finding was corroborated by a similar study that was conducted in Britain on mechanisms and management of MDR-TB. It showed that recent outbreaks of MDR-TB were due to bad clinical practices and therefore advocated for good clinical practices to minimize the impact of MDR-TB in the HIV era (Harward et al., 1995).

A study conducted at basic health facilities in Vietnam among the health staff showed that the competency related to patient management of tuberculosis patients was low (Hoa et al., 2005) and this was similar to the findings from a study conducted in a rural setting

in Shandong Province of centers in Iraq, which showed that 38.2% of the 500 health care workers recruited into the study, handled suspected TB cases correctly (Hashim et al., 2003). However a study report by Gai et al., (2008) showed that the practices of some of village doctors were inappropriate. Finally, a study conducted by Ahmed et al, (2009) reported there was a gross lack of good practices regarding TB management through DOTS among the private practitioners in a rural district Sindh in Pakistan.

With regard to personal protective equipment, a Belgian study done to assess the TB prevention practices showed that only 24% of the personnel wore masks adequate for filtering 1 micron size particles. It was also identified in the same study that the precautionary measures taken to prevent transmission of TB were not sufficient (Ronveaux et al., 1997). A study conducted in Rio de Jainero showed that corrective protective bio-safety norms were reported in only 40% of HCWs surveyed (Oliviera et al, 1993). The finding on the protective bio-safety norms among the HCWs in Rio de Janeiro was in agreement with the finding in another study conducted in South Africa where it was found that the HCWs have poor access to TB/MDR-TB information which includes the procedures that protect them from TB infection, and also poor management systems for nurses involved in TB treatment (Moloi, 2003).

Several factors might prolong infectiousness of TB patients and thereby facilitate nosocomial transmission. Poor adherence to treatment, lack of continuous drug supply, use of suboptimal treatment regimens, lack of adequate treatment support (e.g., direct observation of therapy-DOT), and insufficient treatment duration have been reported particularly in the private sector (Uplekar, Juvekar, Morankar, Rangan & Nunn, 1998;

Rangan, 2003). Few hospitals in low income countries have established infection control procedures. Hospitals, especially publicly owned facilities, tend to be crowded, poorly ventilated, and have limited or no facilities for respiratory isolation. Most respiratory care procedures (including sputum collection) are routinely carried out in a general ward setting, rather than in respiratory isolation rooms. Further, few of these hospitals offer routine screening programs to detect and treat TB among healthcare workers (Prasad, 2002).

In some high burdened countries, surveys have identified gaps in knowledge and awareness about TB in healthcare workers (Uplekar, 1998; Singla, Sharma & Jain 1998). A study by Prasad (2002) of 213 nurses showed that only 67% reported Mycobacterium tuberculosis as the causative organism, and only 22% reported sputum microscopy as the most appropriate way to diagnose TB. In another survey by Singla, Sharma and Jain (1998), only 12% of 204 private practitioners reported ordering sputum smears for a patient with suspected TB. For treating TB, 187 physicians used 102 different regimens. Other surveys have reported similar findings (Prasad, 2002, 2003; Uplekar, 1991, 1998). Finally, according to Sheikh, Rangan, Deshmukh, Dholakia and Porter (2005) and Padmapriyadarsini and Swaminathan (2005), healthcare workers may believe that they cannot avoid nosocomial infection, which results in resigned acceptance on their part. They suggested that healthcare workers may not view latent TB infection as a problem, hence may rarely be treated, even in high-risk groups such as household contacts and HIV infected patients. The health workers' resigned acceptance of latent TB may even be facilitated in high burdened TB countries or where majority of populations are infected.

The problem of tuberculosis among nurses has been known to be an important one for several years. Boudreau et al. (1997) compared health workers who provide direct care (exposed) to those who did not provide direct care (unexposed) to TB patients in a 4-year retrospective cohort study at a large metropolitan hospital where multidrug resistant TB had occurred. They therefore reported of a 4-year high risk of Mycobacterium tuberculosis infection among health workers who provides direct care (exposed) 14.5% for TB patients than those who did not provide direct care (unexposed) 1.4%. Cuhadaroglu et al., (2002) confirmed Boudreau et al (1997) work and proposed post graduate education and prevention programs as a means of reducing TB infection.

Lopes et al (2008) also demonstrated the risk of TB among nursing professionals from a central Brazilian hospital. One hundred and twenty-eight (128) health professionals from an infectious disease referral hospital were interviewed and underwent a 2-step tuberculin skin test (TST). The results of the study showed that, TST positivity was detected in 69.5% of nursing professionals. They also identified length of professional activity and previous direct contact with TB sputum smear-positive patients to be associated with tuberculin Mycobacterium tuberculosis positivity. In view of these findings, they highlighted the importance of infection in health care workers especially nurses who are in direct contact with TB patients and suggested proper infection control measures to prevent this infection in health care facilities.

2.4 Health Facilities Factors Influencing Prevention and Control of TB Infection

Control measures seek to protect potential sites of infection, interrupt routes of transmission, boost host defenses and discourage selection of hospital strains of

organisms (Padmapriyadarsini et al, 2005). In the health facilities such as in hospitals, the first step in setting up a viable infection control programme is to set up an infection control committee, which is an essential administrative requirement for effective control of nosocomial infections. The infection control committee should be made up of senior administrative staff, i.e. the Chief Medical Director, the infection control doctor, who is often a clinical microbiologist, an epidemiologist or a physician/surgeon with interest in infectious diseases whose opinion is respected, an infection control nurse, heads of clinical departments or their representatives (surgery, medicine, pediatrics, obstetrics and gynaecology etc.), representative of nursing staff, pharmacy, engineering and central sterile services department (CSSD). Other co-opted members include representatives from catering department, operating theatre, medical supplies and purchasing (Sheikh, Rangan, Deshmukh & Dholakia, 2005; Padmapriyadarsini & Swaminathan, 2005).

The infection control committee should then give authority to infection control policies, and ensure implementation. Beyond the foregoing, many agreed that effective TB infection control in healthcare settings depends on early identification, isolating infected persons, and rapidly and effectively treating persons with TB. In all healthcare settings, a basic TB infection control program should be implemented, as recommended by WHO and other agencies. WHO also recommends developing an infection control plan, educating healthcare workers and patients, improving sputum collection practices, performing triage and evaluation of suspected TB patients in outpatient settings, and reducing exposure in the laboratory (WHO, 1997; Blumberg, 2004).

Internationally, TB-IPC is based on a three-level hierarchy of controls, including administrative, environmental, and respiratory protection (Jensen, Lambert, Iademarco and Ridzon, 2005). The magnitude of the local TB burden, exacerbated by limited financial and human resources at public healthcare facility level, challenges the applicability and impedes the implementation of international guidelines. Failure to prevent and control TB control worldwide has caused a shift in perspective; it is no longer considered a mere technical bio-medical intervention (Lienhardt and Ogden, 2004). This applies to IPC practices at both hospital and community level. Effective TB-IPC requires adherence to measures which should be regarded as a chain of responsibilities, involving healthcare staff and decision-makers, as well as patients, and society (Chaulet, 1990).

Several recent studies have looked at non-biological influences on TB control, from the point of view of the patient (Edginton, Sekatane and Goldstein, 2002; Naidoo, Dick and Cooper, 2009), community (Dick, Clarke, van Zyl and Daniels, 2007) and health care providers (Dimitrova, Balabanova, Atun, Drobniewski, Levicheva and Coker, 2006) and Moro, Resi, Lelli, Nicoli, Gagliotti and Falcone, 2005). Nurses play a central TB-IPC role in detecting the disease, providing and coordinating appropriate treatment, and assuring emotional support (Chalco Wu, Mestanza, Muñoz, Llaro, Guerra, Palacios, Furin, Shin and Sapag, 2006), but it seems a neglected area of research in high TB burden countries. There is a lack of information concerning the realities faced by nurses in implementing TB-IPC measures. The absence of nurses' voices constrains the quality and quantity of human resources for TB control and care (Ghebrehiwet, 2006). As a result,

health systems in a number of countries are weak and ineffective in meeting the growing need for TB control services (Ghebrehiwet, 2006). One study in SA reported nurses' lack of awareness of beliefs and attitudes about TB harbored by communities they serve, nor of their behavior concerning illness (Edginton, et al., 2002).

According to WHO (2009), overcrowding, living in poorly ventilated dwellings and being in close contact with an infected individual are some of the risk factors to acquiring TB infection. When one is infected, poor nutrition and immune-suppression predispose an individual to developing active TB disease. Occupational exposure to *Mycobacterium tuberculosis* constitutes a potential health hazard for HCWs worldwide. Recent reports from developing countries have shown that HCWs caring for patients with infectious TB are at high risk of acquiring *M. tuberculosis* infection and disease.

With the emergence of XDR strains of TB, there is growing concern about nosocomial transmission and there is a need to protect HCWs from TB. The risk of transmission of *Mycobacterium tuberculosis* from patients with TB to other patients and HCWs has been recognized for many years (Pai, Kalantri, Aggarwal, Menzies and Blumberg, 2006). The level of risk varies by patient population and effectiveness of TB infection control measures. The risk is higher in places where large numbers of infectious TB patients are being treated, who are not rapidly diagnosed, isolated and treated, particularly in the absence of other infection control measures such as respiratory protection (CDC, 2005). The World Health Organization (WHO) has proposed practical and low-cost interventions to reduce nosocomial transmission in settings where resources are limited

(WHO, 2005). These recommendations emphasize prompt diagnosis and rapid treatment of TB rather than expensive technologies, such as isolation rooms and respirators.

Most developed countries implement TB infection control programmes to reduce the risk of nosocomial transmission (Menzies, Fanning, Yuan and Fitzgerald, 2014). However; such control programmes are not routinely implemented in underdeveloped countries. Most healthcare facilities in these countries lack the resources to prevent nosocomial transmission of TB (Joshi, Reingold, Menzies and Pai, 2006). The primary focus of national TB programmes in high-prevalence, low income countries is to expand basic DOTS services and the nosocomial transmission is ignored, but several factors illustrate that nosocomial TB must be addressed, even in such areas. First, nosocomial transmission is of concern because it affects not only patients who are exposed but also the healthcare workforce, which could adversely affect healthcare services over time. Secondly, transmission of TB can have serious consequences, particularly with drug-resistant TB. Several outbreaks in the developed countries demonstrated the role that hospitals can play as focal points of MDR-TB transmission. Therefore, interventions to reduce nosocomial transmission of TB are useful and cost-effective preventive measures to control TB, including XDR and MDR-TB, particularly in tertiary care settings. The HCWs need to be concerned about their personal protection against TB infections especially while at work.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter presents the detailed methodology of how the study was carried out by specifying the; study design, area of study, study population, sample size determination, sampling processes, study variables, sources of data, data collection tools and techniques, data analysis procedure, quality control issues, ethical considerations, limitations of the study and plan for dissemination of results.

3.1 Study design

A cross-sectional design was adopted in the collection of data, to establish the determinants influencing prevention and control of health-care associated TB infection in health facilities of Lira District. This design was selected because data were collected at a one-point time without plans of making any other follow ups at later times. These involved adopting mixed methods of data collection, whereby in quantitative data structured questionnaires were used while for qualitative data Key Informants interviews (KII) were held.

3.2 Study area

Lira District is located in Lango sub-region in Northern Uganda and is bordered by the districts of Pader and Otuke in the North and North East, Alebtong in the East, Dokolo in the South and Apac in the West. Lira District which was formed in 1974 from the then Lango District is occupied by the Lango ethnic group with its sister districts Apac , Oyam, Otuke, Alebtong, Amolatar, Kole and Dokolo also mainly occupied by the Lango

ethnic group. Physically, the district lies between: Latitudes 1º21'N, 2º42"N; Longitudes 32^0 51"E, 34^0 15"E. Lira District has got 24 functional health units of different grades. In terms of content scope, the study focused on the working practices used by healthcare workers and the work environment in the health facilities.

3.3 Study population

The study population comprised of the 14 public health facilities in Lira district and the 218 HCWs within those health facilities who were often directly in contact with TB patients while in the health centers.

3.3.1 Inclusion criteria

All HC IIIs, IVs, and the Regional Referral Hospital of Lira district along with the health workers directly in contact with TB patients were studied; staffs that were found on duty were sampled.

3.3.2 Exclusion criteria

Health Centre IIs since they do not have laboratories and do not admit TB patients. The study also excluded health workers that are not directly in contact with TB patients. And were not found on duty at the time of data collection

3.4 Sample size determination

The sample size constituting of health facilities and HCWs within those facilities was determined using the Krejcie and Morgan (1970) sampling frame. In accordance with **D.W. Morgan, 1970 Table** (see Appendix F) the sample size was as shown below.

Table 3.1: Breakdown of the Population and Sample size of study

Category	Population	Sample size	Sampling Method
Health Facilities (HF)	14	14	Purposive sampling
Health Care Workers (HCWs)	218	138	Convenient sampling

Thus, the sample size of the study comprised of **14 health facilities and 138 HCWs** in those health facilities.

3.5 Sampling procedure

The 14 Health facilities were purposively selected because the 14 which included HC III, IVs and the Regional Hospital had facilities for dealing with TB cases. This implied that the HCWs that work with TB patients were at risk of TB infection. The sampling of HCWs in all the Health facilities (HC IIIs, IVs and the Regional Referral Hospital) were conveniently selected to avoid disruption of work as some of the HCWs were occupied with duties at the time of data collection. However, focuses were on those who were in direct contact with potential TB patients.

3.6 Study variables

The study was guide by the following variables:

3.6.1 Dependent variable

The dependent variable of the study was **Prevention and Control Measures of Health-Care Associated tuberculosis infection.** This focused on the control and prevention measures of Hospital-Based TB infection such as; **s**creening suspected patients, education

and training of staff, separation of suspected patients, investigation for TB or refer, monitoring and evaluation; and ensuring personal respiratory protection.

3.6.2 Independent variables

The independent variables in this study constituted:

a) **Knowledge of HCWs about TB infection** in terms of what causes it and the management measures of its prevention and control.

b) **Practices adopted by HCWs to** prevent and control **TB** infection entailed; cleanliness of floors, walls, ceilings and Benches, as well as use of PPE, Ventilation Availability of aerosol tight Buckets, Design of safety cabinets

c) **Health facility factors influencing TB** infection prevention and control such as; Regulatory guidelines, Physical infrastructure, Provision of health education on infection prevention and control measures

3.7 Sources of data

The primary sources of data were the HCWs of whom 14 constituted the Key Informants. The secondary source of information was through the researcher's observations and records at the health facilities.

3.8 Data collection tools

The researcher employed the following data collection tools: structured self-administered questionnaires, Key Informant Interview guides and observational checklists.

3.9 Data collection techniques

Self-administered questionnaires were used to collect data from the HCWs in the health centers under study, key informant interviews were held with the HC in-charge, and observations guided by observational checklists.

3.10 Data analysis procedure

After data collection, data was entered into the Statistical Package for Social Scientists (SPSS version 20) computer software. The data analysis was done at three different levels namely; Univariate, bivariate and multivariate data analysis framework.

The Univariate data analysis framework entailed obtaining the frequencies and percentages associated with each of the variables in the model. The attributes and responses that are associated with each of the variables in the model were summarized using frequency tables. The percentages associated with each of the responses were obtained as proportions of the overall frequencies.

Under this analysis framework, each of the independent variables was compared with the dependent variable in order to obtain the association / relationships between them. Since the independent and dependent variables in the model were measured at a nominal and ordinal scale, the chi-square tool was utilized to obtain the associations between the each of the independent and dependent variables. The P-values obtained from the chi-square were then used to test for the significance of the parameters obtained from the variables and variable attributes.

Multivariate data analysis

Under the multivariate analysis framework, all the variables and variable attributes obtained from the bivariate analysis were further analyzed using a multivariate model. This analysis was intended to obtain the causal associations between each of these significant independent variables (variable attributes) with the dependent variables. This

analysis also entailed use of a logistic regression model in order to obtain the odds ratios. Similar to the bivariate analysis, the P-values obtained from the chi-square were used to test for the significance of the parameters obtained from the variables and variable attributes.

3.11 Quality control issues

The researcher designed the data collection tools (questionnaire and interview guide) in consultation with the supervisor in order to ensure validity of the items in the tools. Selection of research assistants (Health worker trainee interns) was then made, followed by their training on data collection techniques and ethical issues in research. The tools were pre-tested for validity and reliability in Amudat HC IV. After the pre-testing, the tools were adjusted accordingly. For all the data collected the researcher check for completeness for every questionnaire before leaving the facility.

3.12 Ethical considerations

Approval of the proposal was obtained from IHSU Institute of Public Health and Management. Permission was then sought from the District Health Office of Lira to carry out the study. A clear explanation on the purpose of the study was made to all the study participants before their consent to participate in the study is sought. Consent was obtained from the interviewees and participants' Names did not appear on the questionnaire to ensure confidentiality. The study was conducted following the approval by the Higher Degree Research and Ethics Committee (HDREC) of IHSU.

3.14 Limitations of the study

Data for this study was collected with a self-administered questionnaire which has its own weaknesses such as proneness to social desirability and issues of participant dishonesty. An observational study offered the researcher the opportunity to see and record practices of TB infection prevention and control rather than depending on self-administered by the respondents. Further, the study concentrated on health workers in Lira District which is only a small part of Uganda. Consequently findings cannot be generalized to health workers in all other health facilities in Uganda.

3.15 Plan for dissemination

The results of the study will be disseminated to Institute of Public Health and Management of International Health Science University and a copy will be placed in the university library.

To be most effective, dissemination strategies must be incorporated into the earliest planning stages of a research study. In fact, the most successful dissemination processes are typically designed prior to the start of a project. In this study, the dissemination plan will constitute the following key parts:

i. Goal: Awareness creation about the determinants influencing prevention and control of healthcare associated TB infection in health facilities in Uganda.
ii. Audience: Health care workers in Uganda's health facilities and members of the community.
iii. Medium: holding a dissemination workshop particularly in Lira District where the data will have been collected; and publication in journals and through the internet.

iv. Execution: the dissemination will be done immediately after approval of the thesis. The dissemination will be done by the researcher in collaboration with colleagues and health officials in Lira District.

v. The researcher also hopes to publish the manuscript of this book on line

CHAPTER FOUR: PRESENTATION OF FINDINGS

4.0 Introduction

This chapter presents the analyzed data of the study findings in accordance with the objectives. In its introductory section, the chapter presents the general information of responses and the demographic findings of all who completed the structured questionnaires used for data collection in the study.

4.1 General information about the respondents

The demographic characteristic information of respondents who completed the questionnaires was collected and duly analyzed to understand the nature of respondents that participated in the study.

The following sub-sections present the general information about the respondents with reference to category of health facility, gender, age and work experience.

Table 1: General information about respondents of the study

Variables	Categories	Frequency(n)	Percentage (%)
Category of health worker	Nurse	89.0	64.5
	Medical Assistant	10.0	7.2
	Doctor	3.0	2.2
	Health Officer	4.0	2.9
	Other	32.0	23.2
	Total	138.0	100.0
Gender	Female	81.0	58.7
	Male	57.0	41.3
	Total	138.0	100.0
Age	10-19	13.0	9.4
	20-29	48.0	34.8
	30-39	66.0	47.8
	40-49	11.0	8.0
	Total	138.0	100.0
Work Experience	1-3	36.0	26.1
	4-6	49.0	35.5
	7-9	41.0	29.7
	10-14	8.0	5.8
	15-20	4.0	2.9
	Total	138.0	100.0

Source: Primary data (2016)

From Table 1: It was found out that 58.7% of the respondents were females while 41.3% of them were males. This implies that more females participated in this study than their male counterparts. This provided a true reflection of the proportions of the populations in health facilities. There are often more females than males implying that the data provided was representative of the population.

Furthermore, it was found out that 9.4% of the respondents who completed the questionnaires were between the ages of 10-19 while 34.8% of them were in the age bracket of 20-29 years. However, 47.8% of the respondents were in the age bracket of 30-39 years with another 8.0% between the ages of 40- 49 years old. This implies that majority of the respondents were above 30 years of age meaning they were mature enough to understand what they were doing and this provides assurance that the data provided by these can be relied on as valid data.

Table 1 reveals that the respondents used in this study included all levels of health workers. Majority (64.5%) of them were nurses which is always true of staff in health facilities. The results further indicate that 7.2% of them were medical assistants with 2.2% of them doctors. There were also 2.9% of them who were health officers and at least 23.2% belonged to other categories of staff. This implies that all categories of staff in the health facilities provided information making the results to be comprehensive.

The results in Table 1 showed that 26.1% of the respondents who completed the questionnaires had work experience of 1-3 years, while 35.5% of them had work experience of 4-6 years. 29.7% of the respondents had a work experience of 7-9 years while 5.8% had an experience of 10-14 years and 2.9% had worked for between 15-20 years in health facilities. This implies that majority of the respondents had at least worked for between 4-10 years.

4.2. Knowledge of HCWs regarding TB Infection Prevention and Control

Objective one of the study sought to establish the level of knowledge of HCWs regarding TB infection prevention and control when managing TB patients in health facilities of Lira District.

Table 2: Knowledge of HCW regarding on TB infection prevention and control

Variables	Categories	Frequency(n)	Percentage (%)
Tuberculosis is contagious	Strongly agree	80	58
	Agree	42	30
	Disagree	14	10
	Undecided	2	1
	Total	138	100.0
Are you aware about the cause of Tuberculosis?	Yes	123	89
	No	15	11
	Total	138	100
Do you usually have many diagnosed TB patients at your workplace?	Yes	117	84.8
	No	21	15.2
	Total	138	100.0
What protective devices are in place and used on the wards?	Gloves, Dust mask, Respirators	105	76.1
	others	33	23.9
	Total	138	100.0
If the patient is transferred are there any protective measures for suspected or confirmed cases?	Yes	109	78.9
	No	29	21.0
	Total	138	100.0
Do you have precautions concerns treating or working with TB patients?	Yes	91	65.9
	No	47	34.1
	Total	138	100.0
Did you participate in any TB training or workshop in the past two years?	Yes	50	36.2
	No	88	63.8
	Total	138	100
Do you have sufficient access to information about TB care, protective measure and other TB related subjects to confidently manage patients?	Yes	108	78.3
	N0	30	21.7
	Total	138	100
Have you read the national TB guidelines for health workers	Yes	78	56.5
	N0	60	43.5
	Total	138	100
Do you have the policy for dealing with TB patients in Your hospital	Yes	68	49.3
	N0	70	50.7
	Total	138	100

Source: Primary data (2016)

Table 2: reveals that majority (88% i.e. 58 + 30) of the respondents had clear knowledge about the cause of tuberculosis while 10% of them indicated that they had no clear knowledge of the cause of tuberculosis. Generally, it was found out that majority of the respondents had knowledge about the cause of tuberculosis. This implies that the data they provided can the taken to be authentic.

Further analysis of the results on issues of level of knowledge about tuberculosis by the respondent staff has been summarized in Table 2 above.

Table 2 also revealed that 89% of the respondents acknowledged that they were aware about the cause of TB while only 65.9% of them acknowledged that they usually deal with diagnosed TB patients at their workplaces.

On the other hand, 76.1% of the respondents acknowledged that there were protective devices in place for use when dealing with cases of TB.

Only 62.3% of the respondents acknowledged that there were protective measures for suspected or confirmed cases. This means that some of the respondents indicated that there are no protective measures at times. This definitely poses a risk for the health workers at the health facilities.

Table 2 further indicated that 71.8% of the respondents acknowledged that they had precautionary concerns when treating or working with TB patients.

Yet 64% of them indicated that they had not participated in any TB training or workshop in the past two years. This means that they had not updated themselves of the knowledge and procedures of dealing with TB patients which makes them vulnerable to TB infection.

Furthermore, while 72% of the respondents acknowledged that they had sufficient access to information about TB care, protective measure and other TB related subjects, 22% of them indicated that they did not have any access to such information. This means that 22% of the health workers remain vulnerable to TB infection because they do not have the necessary information that would protect them from TB infection and control. Finally, the findings in Table 2 further revealed that while 46% of the respondents acknowledged that they knew the national TB guidelines, 43% of them indicated that they did not know the national TB guidelines.

Only 35% of the respondents acknowledged that they knew the policy for dealing with TB patients in hospital, whereas 51% indicated that they did not know the policy for dealing with TB patients.

Results collected through face to face interviews indicated that some facilities do training while others do not. For example one of the respondents said;

> *"I have appropriate knowledge about TB and TB management. For instance when a patient is admitted, I give out bed rest at the ward to relocate them from other patients in the ward by taking them to TB ward. Then the patient is put in an isolated room that is well ventilated, encouraged not to share utensils like cups, educated on coughing habits. If the case is complicated, I refer to regional referral hospital because there is an isolation ward for TB patients."*

In another interview, another respondent said;

"I do have appropriate knowledge about TB, because I have been handling and managing TB patients for some time now. The patients should first be tested under serious examination. For suspicion cases, you isolate the patient waiting for testing and normally in OPD. I also extend psychosocial services to family members who have to assist TB patients. This is because most family members of TB patients are ever not willing to come to the health center for health education. Patients fear their TB status and fear to be screen for HIV status because they think it will be disclosure to the community members."

Hover, in another interview, one respondents expressed challenges they encounter when carrying out trainings and providing psychosocial support to family members. He said;

"Trainings and provision of psychosocial support services is quite challenging. For instance, there is a challenge in that family members are not cooperative for they do not want people to know their poverty and above all; it is mostly associated with HIV. There is still stigma in some places with people with TB. At the same time, the family members are not coordinated and they do not want people to know about their problem. Lastly, the family members have little time to visit health center instead they have time for their leisure and garden."

In all, it was found out that the health care workers have reasonable knowledge about TB and its management and also try their best amidst varying challenges.

4.3 Practices by HCWs in relation to TB Infection Prevention and Control

Objective two of the study sought to establish the practices used by HCWs in regard to TB infection prevention and control when managing TB patients in health facilities.

4.3.1 Practices in Wards / Health Facilities

Table 3: Practices adopted by HCWs in the Ward / Health Facility

Variables	Categories	Frequency(n)	Percentage (%)
How often should non-staff be restricted from laboratory entry	Sometimes	37	26.8
	Always	101	73.2
	Total	138	100
How often must cleanliness of the floors, walls, ceilings, benches be maintained?	Sometimes	28	20.3
	Always	110	79.7
	Total	138	100
How often must aerosol tight buckets in the health facility be utilized?	Sometimes	24	9.7
	Always	100	80.6
	Total	124	100.0
How often should contact of sputum be avoided and handling of sputum be done with care?	Sometimes	40	29.0
	Always	98	71.0
	Total	138	100
How often should the design of laboratory safety cabinets meet the required standards for safety?	Sometimes	56	40.6
	Always	82	59.4
	Total	138	100
How often should TB patient Isolation be done in the Health Facility?	Sometimes	66	47.8
	Always	72	52.2
	Total	138	100
How often should nose covering by health worker be strictly observed when in contact with TB patients?	Sometimes	45	32.6
	Always	93	67.4
	Total	138	100

Source: Primary data (2016)

From Table 3, it was found out that 73.2% of the respondents indicated that there should always be laboratory entry restriction whereas 26.8% indicated that sometimes there should be laboratory entry restriction.

Furthermore, 79.7% of the respondents indicated that cleanliness of floors, walls, ceilings and benches should always be maintained and ventilation be well observed in the wards / health facilities.

Similarly, 80.6% of the respondents indicated that aerosol tight buckets in the health facility should always be available while only 9.7% of them indicated that the aerosol buckets should sometimes be available.

Another 71.0% of the respondents indicated that handling of samples should always be done with care as 29.0% of them indicated that it should sometimes be done with care. However, a substantial proportion (40.6%) of the respondents indicated that the design of safety cabinets should always meet the standards whereas 47.8% of them indicated that the designs should sometimes meet the standards. Yet another 32.6% of them indicated that nose covering sometimes be covered.

Table 4: Bivariate analysis of practices in the ward/health care facility and TB contagiousness

	Is TB a contagious disease (YES/NO)	
Variable Item	**Chi-Square**	**P-value**
There should be laboratory restriction	2.600	.957
Cleanliness of the floors, walls, ceilings and benches	7.544	.479
There is availability of aerosol tight buckets in the health facility	2.358	.968
Handling of samples is done with care	9.243	.0322*
Design of safety cabinets meets the standards	12.768	.120
Patient Isolation is often done in this facility	19.020	.015*
Nose covering is strictly observed	11.585	.0271*

Source: Primary data (2016)

Table 4 compares the practices in the ward/health care facility and Knowledge of HCW regarding TB prevention using a bivariate model obtained from the logistic model. The results indicate that there is a very significant relationship between *Handling of samples is done with care* and overall contagious of TB (Chi = 9.243; P-Value = 0.322). Further analysis also indicates that there exists a very significant relationship between patient isolation and overall contagious of TB (Chi = 11.585; P-value = 0.271).

Table 5: Use of Personal Protection Equipment in Wards/Health Facilities

Variables	Categories	Frequency(n)	Percentage (%)
Particulate respirator	Never Used	30	22
	Sometimes Used	74	54
	Always Used	34	24
	Total	138	100
Perforate respirator	Never Used	30	22
	Sometimes Used	88	64
	Always Used	20	14
	Total	138	100
Dust/Fume/Mist Masks	Never Used	44	32
	Sometimes Used	44	32
	Always Used	50	36
	Total	138	100
Full face piece negative- pressure respirator	Never Used	93	67
	Sometimes Used	41	30
	Always Used	4	3
	Total	138	100
Powered air purifying respirators	Never Used	119	86
	Sometimes Used	17	12
	Always Used	2	1
	Total	138	100
Positive pressure airline respirators	Never Used	115	83
	Sometimes Used	17	12
	Always Used	6	4
	Total	138	100
Supplied air-respirator with a hood	Never Used	108	78
	Sometimes Used	20	14
	Always Used	10	7
	Total	138	100

Source: Primary data (2016)

As far as use of personal protection equipment was concerned, data in Table 5 showed that only 24% of the respondents indicated that they always used particulate respirator while 54% indicated that they sometimes used the particulate respirator, however 22% of HCW indicated that they never use it at all.

Similarly, 22% of the respondents indicated that they never used the perforate respirator while 64% of them indicated that they sometimes used it.

The results in Table 5 further showed that majority of the respondents never used Full face piece negative- pressure respirator (67%), Powered air purifying respirators (86%), Positive pressure airline respirators (83%) and Supplied air-respirator with a hood (78%). This means that majority of the health workers do not use the personal protection equipment which leaves them vulnerable to TB infection.

Table 6: Bivariate analysis of use of personal protection Equipment and TB contagiousness

	Is TB a contagious disease (YES/NO)	
Variable Items	**Chi-Square**	**P-value**
Particulate respirator	7.349	.689
Perforate respirator	11.345	**.023***
Dust/Fume/Mist Masks	15.104	**.047***
Full face piece negative- pressure respirator	3.917	.865
Powered air purifying respirators	0.990	.911
Positive pressure airline respirators	0.001	0.9876
Supplied air-respirator with a hood	2.017	.987

Source: Primary data (2016)

The results indicate that the individual's do not think that the personal protection serious relationship with the TB contagiousness. Nevertheless, the results show that the use of

perforate respirators has got a significant positive relationship with TB contagiousness (Chi = 11.345, P-value = 0.023). Furthermore, the use of Dust/Fume/Mist Masks also has a significant positive relationship with overall TB contagiousness (Chi = 15.104, P-value = 0.047).

Findings collected through face to face interviews was also found to be in line with these findings. For instance one of the respondents said;

> *"I have personally gained a lot of information on personal protection through several training organized by the UPDF. I have sufficient access to information about TB care, protective measure and other TB related subjects to confidently manage patients. I now know the steps to be taken while assessing for TB, consisting for 2 weeks or more and persistent fever, weight loss , more than 3 weeks, night sweats for more than 3 weeks for adults and poor weight gain for children less than 5 years. When a patient is suspected to be having TB, HIV test is a must and when found positive the patient is initiated on Art. When HIV is negative and TB sputum is positive the patient is initiated on TB drugs RHZ/E."*

4.3.3 Administrative Practices / Measures

Table 7 presents the respondents' views on the administrative practices / measures in the health facilities under study.

Table 7: Administrative Practices/Measures in Health Facilities

Variables	Categories	Frequency(n)	Percentage (%)
How often is appropriate collection of sputum emphasized?	Sometimes	30	22
	Not at all	14	10
	Always	94	68
	Total	138	100
How often is screening of suspicious TB patients done in the waiting Area?	Sometimes	25	18
	Not at all	13	9
	Always	100	72
	Total	138	100
How often is prioritizing TB suspects for prompt service encouraged?	Sometimes	18	13
	Not at all	15	11
	Always	105	76
	Total	138	100
How often is screening TB Patients for HIV done?	Sometimes	31	22
	Always	107	78
	Total	138	100
How often is TB infection control education provided in this facility?	Sometimes	48	35
	Always	90	65
	Total	138	100
How often is action taken if a patient with TB is admitted?	Sometimes	85	62
	Not at all	28	20
	Always	25	18
		138	100
How often is action taken different when there is only suspicion of TB?	Sometimes	39	28
	Not at all	89	64
	Always	10	7
	Total	138	100

Source: Primary data (2016)

As far as administrative practices or measures were concerned, the results in Table 7 revealed that majority of respondents indicated that appropriate collection of sputum is always emphasized (68%), screening of suspicious TB patients in Waiting Area is always done (72%); prioritizing TB suspects for prompt service is always encouraged (76%), screening TB patients for HIV is always done (78%), and TB infection control education is always provided in the facility (65%). This means that administratively, a lot of effort has been done to ensure prevention of TB infections for health care workers at the health facilities.

Table 8: Bivariate analysis of Administrative practices/measures and TB contagiousness

Variable items	Is TB a contagious disease (YES/NO)	
	Chi-Square	**P-Value**
Appropriate collection of sputum is emphasized	16.512	.002*
Screening of suspicious TB patients in Waiting Area is done	10.843	.028*
Prioritizing TB suspects for prompt service should be encouraged	6.175	.541
Screening Tb Patients for HIV is done	2.362	.8670
TB infection control education is regularly provided in this facility	4.401	.6354
If a patient with TB is admitted what action is taken	14.455	.006*
Is action different when there is only suspicion of a TB	4.046	.0811*

Source: Primary data (2016)

Results in table 8 indicates that there is a very significant relationship between collection of sputum and overall TB contagiousness (Chi = 16.512; P -value = 0.002). Furthermore, Screening of suspicious TB patients in Waiting Area is done has got a very positive relationship with TB contagiousness (Chi = 10.843; P-value = 0.028). Further analysis also shows that taking of action after admission of TB patient has a positive relationship with overall TB contagiousness (Chi = 14.455; P-value = 0.006).

4.3.4 Environmental control measures

Table 9 presents respondents' views on the environmental control measures adopted by the health facilities in Lira District.

Table 9: Respondents' Views on Environmental Control Measures

Variables	Categories	Frequency(n)	Percentage (%)
I always ensure that the windows and doors of the wards are open	No	24	17.4
	Yes	114	83.0
	Total	138	100
This health facility makes use of mechanical air moving equipment that circulates air in a building	No	90	65
	Yes	48	35
	Total	138	100
In this health facility, the waiting area for TB patients is open to the environment	No	53	38
	Yes	85	61
	Total	138	100
There are fans in all diagnostic rooms (Laboratory, radiology) in this health facility	No	103	75
	Yes	35	26
	Total	138	100
There are mechanical exhaust systems that pump clean air from outside into the room and then remove the contaminated air from a room to the outside	No	108	78
	Yes	30	22
	Total	138	100
There are closed recirculation filtration systems, which take room air, filter it to remove infectious TB germs, and then bring it back into the room	No	106	77
	Yes	32	24
	Total	138	100
We use ultraviolet germicidal irradiation (UVGI) to break down microorganisms in high risk areas like wards and laboratories	No	94	68
	Yes	44	32
	Total	138	100
Isolation of Patients, use of separate TB ward is done in this facility	No	90	65
	Yes	48	35
	Total	138	100

Source: Primary data (2016)

Table 9 presents the respondents' views on the environmental control measures in the health facilities under study. On issues of environmental control measures, the data in Table 9 revealed that 79.0% of the respondents agreed that they always ensure that the windows and doors of the wards are open. However, the results indicated that majority

respondents disagreed that the other environmental measures are being implemented in their health facilities. These include; health facility making use of mechanical air moving equipment that circulates air in a building (65%); use of fans in all diagnostic rooms (laboratory, radiology) in the health facility (75%), use of mechanical exhaust systems that pump clean air from outside into the room and then remove the contaminated air from a room to the outside (78%), use of closed recirculation filtration systems, (77%); use of ultraviolet germicidal irradiation (UVGI) to break down microorganisms in high risk areas like wards and laboratories (68%); and isolation of Patients, use of separate TB ward is done in this facility (65%). This means that health facilities are not managing the environment effectively thereby exposing the health care workers to TB infection.

Table 10: Bivariate analysis of Environmental control measures and TB contagiousness

Effect	Is TB a contagious disease? (YES/NO)	
	Chi-Square	**P-value**
I always ensure that the windows and doors of the wards are open	12.249	.140
This health facility makes use of mechanical air moving equipment that circulates air in a building	13.883	.308
In this health facility, the waiting room for TB patients is in an open	6.628	.00578*
There are fans in all diagnostic rooms (Laboratory, radiology) in this health facility	16.330	.177
There are mechanical exhaust systems that pump clean air from outside into the room and then remove the contaminated air from a room to the outside	12.689	.123
There are closed recirculation filtration systems, which take room air, filter it to remove infectious TB germs, and then bring it back into the room	9.675	.289
We use ultraviolet germicidal irradiation (UVGI) to break down microorganisms in high risk areas like wards and laboratories	7.837	.450
Isolation of Patients, use of separate TB ward is done in this facility	19.890	**.011****

Source: Primary data (2016)

The results also indicate that regarding the environment factors, isolation of the TB patients through the use of separate TB wards has a very significant relationship with overall contagiousness of TB (Chi = 19.89; P-value = 0.011). Furthermore, the results indicate that there is strong and significant relationship between the waiting rooms designed for suspected TB patients and their knowledge of TB (Chi = 6.628, P-value = 0.00578).

4.4 Health Facility Factors Influencing Prevention and Control of TB Infection

Table 11: Health Facility Factors Influencing Prevention and Control of TB Infection

Variables	Categories	Frequency(n)	Percentage (%)
In this health facility the wards are overcrowded with patients infected with TB	No	29	23
	Yes	109	77
	Total	138	100
In this health facility wards are poorly ventilated	No	48	39
	Yes	90	61
	Total	138	100
Patients infected with TB are poorly screened in this facility	No	72	58
	Yes	66	42
	Total	138	100
There are no surgical masks for healthcare workers	No	32	26
	Yes	106	74
	Total	138	100
The health facility does not have N95 respirators	No	46	26
	Yes	92	74
	Total	138	100
There are no curtains around the patient's beds	No	22	18
	Yes	116	82
	Total	138	100
Isolation of Patients is not Possible in this Health facility	No	20	16
	Yes	118	84
	Total	138	100
There are no spacemen contains for patients to collect their sputum after coughing	No	31	25
	Yes	107	75
	Total	138	100
We do not have gloves for use while working with patient infected with TB	No	109	88
	Yes	15	12
	Total	124	100
The wards are poorly aerated	No	44	32
	Yes	94	68
	Total	138	100

Source: Primary data (2016)

Findings collected through the structured questionnaire was analyzed using the SPSS and is presented in Table 11 above. As far as the health facility factors influencing prevention and control of TB infection are concerned, the results in Table 11 showed that 77% of the respondents agreed that health facility the wards are overcrowded with patients infected with TB while only 23% of them disagreed. Another 58% of them disagreed that patients

infected with TB are poorly screened in this facility as only 42% of them agreed. Furthermore, 88% of the respondents disagreed that they do not have gloves for use while working with patient infected with TB as 12% of them agreed. The implication is that in some health facilities, it is likely that the gloves are lacking but not across the board. However, at least 74% of the respondents agreed that the health facility do not have N95 respirators. This again falls short of prevention and control measures and exposes a significant proportion of health workers to TB infection. The results also showed that 75% of the respondents agreed that there are no facilities for patients to collect their sputum after coughing. Generally, only few respondents disagreed that the health facility factors are not a challenge. This was found to be in line with data collected through face to face interviews where one of the respondents said;

> *"There are several challenges in these health facilities and these sometimes make our work difficult. For instance, there are sometimes stock out of anti TB drugs and yet there is need for the patients to consistently take the drugs. On the other hand some patients do not want to take drugs claiming that they are difficult to take; such patients find difficulty in following instructions on treatment during their first week of drugs taking."*

Table 12: Health facility factors influencing prevention and control on Knowledge of HCW regarding TB prevention

Variable item	Is TB a contagious disease? (YES/NO)	
	Chi-Square	P-value
In this health facility the wards are overcrowded with patients infected with TB	4.952	.413
In this health facility wards are poorly ventilated	1.352	.853
Patients infected with TB are poorly screened in this facility	4.407	.116
There are no surgical masks for healthcare workers	.580	.965
The health facility does not have N95 respirators	5.817	.0146*
There are no curtains around the patient's beds	3.059	.548
Isolation of Patients is not Possible in this Health facility	3.141	.535
There are no facilities for patients to collect their sputum after coughing	2.913	.572
We do not have gloves for use while working with patient infected with TB	10.033	.0240*

Source: Primary data (2016)

Further analysis was conducted to study health facility factors influencing prevention and control on Knowledge of HCW. The analysis indicates the most significant factor leading to the spread of TB among the health workers is that some of them do not use gloves while treating the TB patients (Chi = 10.033; P-value = 0.0240). Additionally, the results show that there exists strong relationship between the use of N95 respirators and overall knowledge of TB (Chi = 5.817, P-value = 0.0146).

Table 13: Multivariate analysis of the significant factors from the bivariate analysis

Variable Item	Category	Is TB a contagious disease (YES/NO)	
		Odds ratio	P-value
Handling of samples is done with care			0.089
	Agree	7.987	
Patient Isolation is often done in this facility			**.015***
	Agree	7.57	
Nose covering is strictly observed			0.0678
	Agree	2.3	
Appropriate collection of sputum is emphasized			**.002***
	Agree	8.94	
Screening of suspicious TB patients in Waiting Area is done			0.067
	Agree	0.674	
If a patient with TB is admitted what action is taken			**.006***
	Agree	6.786	
Is action different when there is only suspicion of a TB			0.0811
	Agree	2.12	

Source: Primary data (2016)

The results of the odds ratio show that there exists a very significant relationship between patient isolation and knowledge of prevention. For instance, the respondents that reported that patient isolation is done often were 7.57 times more than those that do not do so (OR = 7.57, P-value = 0.015). The analysis also indicates that appropriate collection of sputum has a strong relationship with knowledge of TB. Those that agree to it were 8.94 times those that agreed (OR = 8.94, P-value = 0.002). It was also observed from the results that the patients that agreed that proper action is taken were 6.786 times more than those that disagreed (OR = 6.786, P – value = 0.006).

CHAPTER FIVE: DISCUSSION OF FINDINGS

5.0. Introduction

This chapter presents the discussion of the findings of the study in accordance with the objectives of the study. In its introductory section, the chapter presents the discussions on the general information of responses and the demographic findings of all who completed the structured questionnaires used for data collection in the study.

5.1. Discussion

From the demographic findings presented in chapter four it means that the respondents had sufficient experience and thus, information about TB treatment and control. Therefore, it means the information they provided can be relied on for making concise conclusions about the study. Furthermore, the results indicated that more health workers were vulnerable as compared to those who are not vulnerable to TB infection, prevention and control. These findings are in agreement with Harries, Maher and Graham (2004) who found out that, the risk of infection depends on the susceptibility of the host, the extent of the exposure and the degree of infectiousness of the index case. This implies that some substantial proportion of the health workers do not observe the design, procedures and directions set to ensure prevention of infection. This leaves such health workers vulnerable to TB infection as a result of not ensuring set practices. These results are in agreement with a study conducted in Oman by Al-Maniri et al, (2008) that showed that general practitioners (GPs), particularly those working in the private sector, appear to have low suspicion and poor knowledge of TB in the areas of diagnosis, treatment, follow-ups and contact screening (Al-Maniri et al, 2008). The findings in this study are

further in agreement with a similar study done in India to assess the doctors' knowledge of TB management, where it was found that although the doctors working in the public sector have better knowledge of TB than the doctors working in the private sector, they all need to be trained for better diagnosis and treatment of TB (Vandan et al, 2009). Also, a Peruvian study to assess the knowledge and attitudes of health care providers such as doctors and nurses, showed knowledge gaps which include identification of patients at high risk for TB, assessment for treatment outcome and consequences of treatment failure (Kiefer et al, 2009).

Health workers in various health facilities need to know that according to WHO (2002) nosocomial infection is one of the leading causes of death and increased morbidity for hospitalized patients. They therefore, have to strictly observe nose covering. Nosocomial infections have traditionally referred to infections that develop during hospitalization and so have also been known as hospital-acquired infections. As health care increasingly expands beyond hospitals into outpatient settings, nursing homes, long-term care facilities, and even home care settings, the more appropriate term has become healthcare-acquired infection.

The findings of this study were in agreement with findings by the Centre for Disease Control (1985) that the efficacy of nosocomial infection control showed beyond doubt that increase in surveillance activities is able to directly bring down the rates of nosocomial infections. This means those who do not use the personal protection equipment end up being at high risk of infection. It is well known that nosocomial infections are most prevalent in certain high risk areas such as the intensive care renal

dialysis and organ transplant units, burns ward, cancer ward, operation theatres, post-operation theatres, postoperative ward nursery and the geriatric ward. Therefore, all methods aimed at containing hospital infections should be primarily focused in these high risk areas.

These results were also found to be in agreement with Sehulster et al (2003) who suggested that factors specifically related to the healthcare environment can be administratively handled. The results have shown that administration in the various health facilities is doing its best. However, consideration should be given to the prevention of infection with environmental pathogens, such as fungi (example, Aspergillus), bacteria (example, Legionella species), or viruses (example, varicella). In 2003, the Centre for Disease Control (CDC) and the Healthcare Infection Control Practices Advisory Committee (HICPAC) revised the guideline related to environmental factors for infection. The report provides clear recommendations for infection control measures according to several environment-related categories, including air (normal ventilation and filtration, as well as handling during construction or repair), water (water supply systems, ice machines, hydrotherapy tanks and pools), and environmental services (laundry, housekeeping). WHO (2002) share in this opinion but added that several factors may facilitate nosocomial infection transmission in hospitals.

The study also sought to establish whether respondents had clear knowledge if a patient with TB is admitted and what action is taken and when. The results from their responses showed that majority (62%) of the respondents had the knowledge of what to do and when if a patient with TB was admitted. This implies that the health workers are

knowledgeable and this reduces on their risk of TB infection. Furthermore, the study established that in case of suspicion, only 28% of the respondents had knowledge of what to do but majority (64% indicated that they did not have clear knowledge. This leaves many of the health workers at risk if TB infection. This was also found to be in agreement with WHO (2002) results that indicated that many health workers are often in dilemma in cases of suspicion leading to an overwhelming number of TB patients and repeated exposures to smear-positive TB patients are likely to be critical factors.

Concerning environmental factors, the study found out the results were in agreement with Pai et al. (2006) who found out that exposure to risky environment, is a danger to many health workers. Accordingly, this may explain the high incidence of infection among health workers in India. In an effort to create awareness, their trainees spend considerable time eliciting physical signs in such patients, which results in repeated exposure to patients with infectious TB during trainees' first clinical rotations. Delays in diagnosis and initiation of treatment and failure to separate or isolate patients with smear-positive TB from other patients also contribute to transmission risk.

These results were also in agreement with Blumberg (2004) who noted that health facility administrators should exercise authority to infection control policies, and ensure implementation. Beyond the foregoing, many agreed that effective TB infection control in healthcare settings depends on early identification, isolating infected persons, and rapidly and effectively treating persons with TB. In all healthcare settings, a basic TB infection control program should be implemented, as recommended by WHO and other agencies. WHO also recommends developing an infection control plan, educating

healthcare workers and patients, improving sputum collection practices, performing triage and evaluation of suspected TB patients in outpatient settings, and reducing exposure in the laboratory (WHO, 1997; Blumberg, 2004).

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.0. Introduction

This chapter presents the conclusions arising from the findings presented and discussed in chapter five and the corresponding recommendations about TB prevention and control in health facilities in Uganda.

6.1. Conclusions

The study hereby concludes that;

i. The level of knowledge of HCWs regarding TB infection prevention and control when managing TB patients in health facilities is high for some aspects like cause, diagnosis, protection and concerns when treating TB patients; but their knowledge is low with respect to national TB guidelines and the policy relating to TB patients in health facilities.

ii. The practices that have been adopted by HCWs in regard to TB infection prevention and control when managing TB patients in health facilities include laboratory restriction, cleanliness, use of aerosol tight bucket, handling samples with care, except for weaknesses in design of safety cabinets, patient isolation and nose covering that are not strictly observed.

iii. The Health Facility factors that influence prevention and control of TB infection in health facilities include shortage of some equipment like gloves, N95 respirators, curtains and patient beds.

6.2. Recommendations

The study proposes the following recommendations;

i. The health department in local governments should ensure continuous training of health care workers particularly with respect to national TB guidelines and the policy relating to TB patients in health facilities.

ii. Health care administrators should ensure proper design of safety cabinets, patient isolation and nose covering that have been found not strictly observed by health care workers.

iii. Ministry of health and local governments should provide adequate facilities to ensure standards of management of TB patients. These should include some equipment like gloves, N95 respirators, curtains and patient beds which were found to be in short supply.

6.3. Recommendation for further Research

This study did not seek to establish the effect of the various factors on the prevention and control of TB in health facilities. Therefore, further research should consider establishing the effect that the various factors herein identified on the prevention and control of TB in health facilities in Uganda.

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APPENDICES

APPENDIX A: PARTICIPANT INFORMATION SHEET AND CONSENT FORM

I am **Mali Richard**, a student of International Health Sciences University undertaking a Research project to examine the determinants of prevention and control of health care associated TB infection in Health facilities of Lira District. This research is purely for academic purposes as a partial requirement that will lead to the award of Masters of Public Health.

I am requesting that you participate in this study whereby your participation will be through the completion of this questionnaire.

All information provided will be confidentially kept and will not be used for any other purpose except for academic purposes and nobody will be penalized or denied any service for refusing to participate or withdrawing from participation at any point.

You will only participate in the study following a voluntary consent by ticking in the boxes below.

Do you consent to participate? YES ☐ NO ☐

APPENDIX B: QUESTIONNAIRE FOR HEALTH CARE WORKERS

Instruction:

You are kindly requested to complete the questionnaire as honestly as possible. Write in bold or tick where appropriate.

SECTION A: General information about respondents

1. Category of health worker *(tick the appropriate option)*
   1. Nurse 2. Medical Assistant 3. Doctor 4. Health Officer
   5. Other (specify) ----------

2. Gender: *(tick the appropriate option)*
   1. Female 2. Male

3. Age (*In complete years*)_____

4. Work Experience in terms of years ----------

SECTION B: Knowledge of HCW regarding TB infection prevention and control

Please tick the most appropriate answer to the following items

5. Tuberculosis is contagious

(a) Strongly agree

(b) Agree

(c) Undecided

(d) Disagree

(e) Strongly disagree

6. Are you aware about the cause of Tuberculosis?

……..

7. Do you usually deal with diagnosed TB patients at your workplace?

……

8. What protective device are in place and used on the wards:……..

9. If the patient is transferred - are there any protective measures for suspected or confirmed cases?

……

10. Do you have concerns treating or working with TB patients? *If yes, why?*

……

11. Did you participate in any TB-training or -workshop in the past two years? *If yes, what?*

……

12. Do you have sufficient access to information about TB-care, protective measures and other TB-related subjects to confidently manage patients? *If yes, from whom, how?*

……

13. Do you know the national TB-guidelines for health workers? *Explain.*

……

14. Do you know the policy for dealing with TB patients in your hospital? *Explain.*

……

SECTION C: Practices adopted by HCW regarding TB infection prevention and control

Please indicate whether you Disagree (1), you are Not Sure (2) or you Agree (3) to the following statements.

I – Practices in the Ward/Health facility

S/No	Item	Disagree (1)	Not Sure (2)	Agree (3)
1	There should is laboratory restriction			

2	Cleanliness of the floors, walls, ceilings and benches Ventilation is well observed			
3	There is availability of aerosol tight Buckets in the health facility			
4	Handling of samples is done with care			
5	Design of safety cabinets meets the standards			
6	Patient isolation is often done in this facility			
7	Nose covering is strictly observed in this facility			

II – Use of Personal Protection Equipment in the Ward/Health facility

Please indicate; Never used (1), Sometimes used (2) or Always used (3) the extent to which you use each of the following equipment for personal protection.

S/No	Use of Personal Protection Equipment (PPE)	Never Used (1)	Sometimes Used (2)	Always Used (3)
1.	Particulate respirator			
2.	Perforate respirator			
3.	Dust/fume/ mist masks			
4.	Full face piece negative-pressure respirator			
5.	Powered air-purifying respirators			
6.	Positive pressure airline respirators			
7.	Supplied-air respirator with a hood			

III – Administrative Practices/measures

S/No	Item	Disagree (1)	Not Sure (2)	Agree (3)
1.	Appropriate collection of sputum is emphasized			

2.	Screening of suspicious TB patients in waiting areas is done			
3.	Prioritizing TB suspects for prompt service should has been encouraged			
4.	Screening TB patients for HIV is done			
5.	TB infection control education is regularly provided in this facility			

6. *If a patient with TB is admitted - what action is taken and when?*

……

7. *Is action different when there is only suspicion of a TB?*

……

IV - Environmental control measures

S/No	Item	Disagree (1)	Not Sure (2)	Agree (3)
1.	I always ensure that the windows and doors of the ward are open			
2.	This health facility makes use of mechanical air-moving equipment that circulates air in a building			
3.	In this health facility, the waiting area for TB patients open to the environment			
4.	There are fans in all diagnostic rooms (Laboratory, radiology) in this health facility			
5.	There are mechanical exhaust systems that pump clean air from outside into the room and then remove the contaminated air from a room to the outside			
6.	There are closed recirculation filtration systems, which take room air, filter it to remove infectious TB germs, and then bring it back into the room			
7.	We use Ultraviolet germicidal irradiation (UVGI) to break down microorganisms in high risk areas like wards and laboratories			

8.	Isolation of patients, use of separate TB ward is done in this facility			

SECTION D: Health Facility Factors Influencing Prevention and Control of TB Infection

S/No	Item	Disagree (1)	Not Sure (2)	Agree (3)
1.	In this health facility the wards are overcrowded with patients infected with TB			
2.	In this health facility wards are poorly ventilated.			
3.	Patients infected with TB are poorly screened in this facility			
4.	There are no surgical masks for health care workers			
5.	The health facility does not have N95-respirators			
6.	We do not have gloves for use while working with patient infected with TB			
7.	There are no curtains around the patients' beds			
8.	Isolation of patients is not possible in this health facility			
9.	There are no facilities for patients to collect their sputum after coughing			
10.	The wards are poorly aerated.			

Thank you for participating in this study

END

Appendix D: Key Informant Interview Guide

I am Mali Richard, a student at the IHS undertaking a study to examine the determinants influencing prevention and control of health care associated TB infection in Lira District that will lead to the award of the Masters of Public Health from International Health Sciences University.

Your participation will be through the completion of this questionnaire.

Any information provided will be confidential and will not be used for any other purpose except for academic purposes and nobody will be penalized or denied any service for refusing to participate or withdrawing from participation at any point. You will only participate in the study following a voluntary consent by ticking in the boxes below.

Do you consent to participate? YES ☐ NO ☐

In-depth Interview for Key Informants

On the knowledge and practices of health care workers regarding hospital-based TB infection control and prevention in Uganda: a case study of Lira District

1. Do you usually deal with diagnosed TB patients at your workplace?
2. What protective device are in place and used on the wards:
• Surgical masks
• N95-respirators
• Gloves
• Curtains around beds
• Isolation of patients
3. If a patient with TB is admitted - what action is taken and when?
4. Is action different when there is only suspicion of a TB?

5. If the patient is transferred - are there any protective measures for suspected or confirmed cases?
If yes, what are they? If no, why not?
6. Which of these tasks in TB management do you find difficult to do?
• Education on TB for patients and family- *If yes, why?*
• Psycho-social counseling - *If yes, why?*
• Training of family members - *If yes, why?*
• DOTS treatment - *If yes, why?*
• Managing TB and co-infections - *If yes, why?*
• Caring for TB-patients in hospital - *If yes, why?*
• Supervision of health workers - *If yes, why?*
• TB-risk prone procedures - *If yes, why?*
• *Other tasks not mentioned - Which? Why?*
7. Are you afraid of acquiring TB at work? - *If yes, why, if no, why?*
8. Do you have concerns treating or working with TB patients? *If yes, why?*
9. Do you have concerns treating or working with TB patients with AIDS? *If yes, why?*
10. How do you feel when these patients are on treatment for more than a week? Explain.
11. Could you imagine referring a patient to a traditional healer for TB treatment, if requested by the patient? *Explain.*
12. Could you imagine referring a patient to a traditional healer as a therapist for DOTS, if requested by the patient? *Explain.*
13. Are there local beliefs that may influence TB-patients not to come to the hospital?
If yes: what are they?
14. Are there local beliefs that may influence TB-patients not to take TB-medication regularly?
If yes: what are they?
15. Did you participate in any TB-training or -workshop in the past two years? *If yes, what?*
16. Do you have sufficient access to information about TB-care, protective measures and other TB-related subjects to confidently manage patients? *If yes, from whom, how?*
17. Do you know the national TB-guidelines for health workers? *Explain.*
18. Do you know the policy for dealing with TB patients in your hospital? *Explain.*

19. Do you feel positive about the CPD-system (continuous professional development) that is already in place for doctors being applied for nursing staff as well in future? *Why?*

Thank you for participating in this study

END

Appendix E: Observation Checklist

This checklist was used to ascertain issues concerning Health facilities where TB patients are managed and treated.

Items to be observed

1. Size of wards and isolation rooms in the wards
2. Availability and number of beds for patients
3. Ventilation of the wards.
4. Presence of curtains around patients' beds
5. Equipment for sputum collection
6. Availability of gloves
7. Availability of surgical masks
8. Availability of N95-respirators
9. Availability of containers for disposable materials
10. General cleanliness in the wards
11. Any other items as may unfold during the data collection process.

END

Appendix F: Sample Size Determination Using Krejcie and Morgan, 1970 Table for determining sample size for finite population

Table 3.1

Table for Determining Sample Size of a Known Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384

Note: N is Population Size; S is Sample Size *Source: Krejcie & Morgan, 1970*

IHSU INTERNATIONAL HEALTH SCIENCES UNIVERSITY
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PART OF INTERNATIONAL MEDICAL GROUP

making a difference in health care

e-Learning Department

Kampala, On the 29th/ September/ 2016

The
District Health Officer
Lira, District
.....

Dear Sir/Madam,

RE: ASSISTANCE FOR RESEARCH

DISTRICT HEALTH OFFICER 19 OCT 2016 P.O. BOX 71 LIRA - UGANDA

Noted. Incharges Health facilities this is Department Study. Kindly assist researcher obtain relevant information 19/10/2016

This is to introduce to you Mali Richard, Reg No **2013-MPH-RL-FEB-028** a student of this University. As part of the requirements for the award of a Master's Degree of Public Health of this University, the student is required to carry out field research for submission of a Research Dissertation. **Mali** would like to carry out research on issues related to:

Determinants of Prevention and Control of Healthcare associated Tuberculosis infection: A case study of Health facilities in Lira District.

I kindly request you to render this student any assistance necessary for his research.

I, and indeed the entire University are thanking you in anticipation for the assistance you will render to the student.

Sincerely Yours,

Mr. John Bosco ALEGE
Dean, IPHM

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