

**UNIVERSITY OF GHANA, LEGON  
COLLEGE OF HEALTH SCIENCES  
SCHOOL OF NURSING**

**ASSESSMENT OF TUBERCULOSIS INFECTION PREVENTION  
AND CONTROL PRACTICES AMONG HEALTHCARE WORKERS  
IN TEMA GENERAL HOSPITAL**

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**This dissertation is submitted to the University of Ghana, Legon  
in partial fulfillment of the requirement for the award  
of MSc nursing degree.**

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## DECLARATION

I, Agnes Codjoe , hereby declare that with the exception of references made to other people's work for which I have duly acknowledge and given credence , this dissertation is my original work. No material in this write up has been submitted for any other degree, neither has been submitted concurrently in candidature for any other degree or certificate.

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## DEDICATION

I dedicate this work to my husband, Anthony Kingston Codjoe, my lovely daughter, Brenda Benyiwa Codjoe and Emmanuella Ama Codjoe for support and encouragement.



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## ABSTRACT

This study investigates knowledge and practices of Tuberculosis infection prevention and control among health workers in Tema General Hospital. Two hundred and twenty nine (229) randomly selected (stratification) health workers were administered a 54-item questionnaire. The questionnaire comprised sections designed to provide relevant information of concern to the study such as knowledge of Tuberculosis infection prevention and control, practices and challenges. Results showed that health workers had fairly good knowledge of Tuberculosis infection prevention and control. This was significantly influenced by participants' sex, current ward of work and job title but not age and number of years of work. Practices used by the health workers were generally good and appropriate especially regular hand washing hygiene, education of Tuberculosis patients and use of information, education and communication materials. What was lacking was wearing of a N95(Non oil close fitted mask with 95% filter efficiency that protects from inhaling infectious droplet nuclei) and FFP2 (an oil and non oil aerosol mask or respirator with 94% filter efficiency that protects from inhaling infectious droplet nuclei) when working in high risk Tuberculosis areas, offering of surgical mask to Tuberculosis suspects or cases when they are in the hospital and separation of group suspected or confirmed Tuberculosis patients from other patients. Identified challenges included inadequate education/training programmes for health workers about Tuberculosis infection, prevention and control, improper ventilation due to overcrowding at the out patients department, lack of protective equipment (FFP2 or N95 masks, gloves), non availability of Tuberculosis wards for infected patients, stigmatization of staff working on Tuberculosis patients and poor resourced laboratory for Tuberculosis testing. It was concluded that health workers need to improve their knowledge on Tuberculosis infection prevention control whilst stakeholders institute measures geared to wards improvement of facility and logistic deficit.

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**LIST OF ACRONYMS/ABBREVIATIONS**

TB	Tuberculosis
MTB	Mycobacterium Tuberculosis
PTB	Pulmonary Tuberculosis
MDR	TB:-Multi Drug Resistant TB
XDR	TB:-Extensive Drug Resistant
LTB	Latent TB Infection
BCG	Bacillus Calmette Guèrin
DOTS	Directly Observed Treatment Short Course
IPC	Infection and Control Practices
HIV	Human Immunodeficiency Virus
MDG	Millennium Development Goals
SPSS	Statistical Package for Social Sciences
WHO	World Health Organisation
TST	Tuberculin Skin Test
IUALTD	International Union Against Tuberculosis and Lung Disease
MOH	Ministry of Health
MDG	Millennium Development Goal

IGRA	Interferon-Gamma Release Assay
CDC	Centre for Disease Control
PLHIV	People Living with HIV
N95	A non oil close fitted mask with 95% filter efficiency that protects from inhaling droplet nuclei
FFP2	An oil and non oil aerosol mask or respirator with 94% filter efficiency that protects from inhaling infectious droplet nuclei

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background to the study

Tuberculosis commonly referred to as TB is an ancient infectious disease that has caused more suffering and deaths than any other infectious disease and remains a public health problem worldwide (WHO, 2005). TB is mainly caused by *Mycobacterium tuberculosis* (MTB) and the main source of infection is untreated smear-positive Pulmonary Tuberculosis (PTB) patients discharging the bacilli. It mainly spreads by airborne route when the infectious patient expels droplets containing the bacilli. It is also transmitted by consumption of raw milk containing *Mycobacterium bovis* (Harries & Dye, 2006).

TB can affect any part of the body such as the spine, skin, brain, bone and often referred to as extra pulmonary tuberculosis but TB affecting the lungs is known as pulmonary tuberculosis (WHO, 2005). For the purpose of this study, the TB being discussed is pulmonary tuberculosis (PTB) due to its contagious nature. Pulmonary tuberculosis, like the common cold spreads through the air and when people cough, sneeze, talk or spit the infected persons propel the TB germs known as bacilli into the air. A person needs only to inhale a small number of these bacilli to be infected. A person can have active or inactive TB. Active TB (Tuberculosis disease) means that the bacteria are active in the body and the immune system is unable to stop them from causing illness. People with active TB can pass the bacteria on to any one they come into contact with through the air and if left untreated, each person with

active TB disease will infect an average between 10 to 15 people every year (WHO, 2003). TB has been a scourge of humanity throughout recorded history. Even today after the availability of effective drugs for more than half a century, it is a major cause of morbidity and mortality worldwide. One-third of the world's population is estimated to be infected with *Mycobacterium tuberculosis* infection. There were about 9.27 million new TB cases (including 4.1 million new smear-positive cases) and 1.3 million deaths from TB in 2008. There were about 11.1 million prevalent TB cases and half a million Multidrug-Resistant Tuberculosis (MDR-TB) cases (resistance at least to Isoniazid and Rifampicin) in the world ( , 2010). Ninety five percent (95 %) of TB cases and ninety eight percent (98%) of TB deaths occurred in developing countries (WHO, 2008).

Similarly, the prevalence of tuberculosis is on the increase globally and in 2009, the estimated number of TB cases was 14 million with 1.3 million deaths annually and Sub Saharan Africa region recorded the highest deaths. In South Africa the prevalence of TB infection is the highest in the world; 511cases/ 100,000 populations (WHO, 2010). A study conducted by Sandiso (2011) in Cape Town, South Africa among the general population revealed that in every third taxi, (a major means of mass transport system in South Africa) there is a TB patient. In sub Saharan Africa, Human Immune-Deficiency Virus (HIV) and TB have combined to fuel a sub epidemic Multi-Drug Resistant TB (MDR-TB) and Extensive Drug- Resistant TB (XDR-TB) outbreak and in South Africa this has been particularly widely covered (Gandhi, Moll, Sturm, Pawinski, Govender, Lalloo, Zeller, Andrews, & Friedland, 2006).

According to WHO's Global TB Report (2009), Ghana is not among the World Health Organization's (WHO's) 22 high-burden tuberculosis countries, yet the disease is a major health problem in the country as one untreated TB case can infect several people at a time. With an estimated 47,632 new TB cases in 2007, Ghana ranks 19th in Africa for the highest estimated number of new cases per year. Nine percent of the 7,786 TB patients registered in 2007 died before completing TB treatment. Also, over 46,000 new cases of tuberculosis are estimated annually (WHO, 2006). Although data on the disease is limited, it is also estimated that Ghana has about 123 smear positive cases per 100,000 population per year; thus, with an estimated population of 20 million, 25,000 smear positive pulmonary tuberculosis (PTB) cases are expected every year (National Tuberculosis Control Programme- NTP Ghana, 2006). So far in Ghana, 300 healthcare workers have been infected with TB disease (unpublished data NTP, 2011). In a retrospective study carried out from 2004 to 2011 to determine TB disease among healthcare workers, 62 were found to be infected ( unpublished data Public Health Unit, Korle-Bu Teaching Hospital, 2012 ) Additionally, four confirmed Multi Drug-Resistant (MDR-TB) cases have been reported in Ghana (WHO, 2010).

Through activities related to controlling TB, many healthcare workers come into contact with the disease. During the pre-antibiotic era (before 1944), TB caused a substantial morbidity and mortality among medical and nursing personnel (Sepkowitz, 1994). With the advent of effective antibiotic therapy and decreasing incidence in High-Income Countries (HIC), the TB risk declined, leading to complacency about nosocomial transmission of TB. In late 1980s, nosocomial outbreaks of Multidrug-Resistant (MDR) TB occurred, largely in

populations infected with the Human Immunodeficiency Virus (HIV) (Menzies, Joshi, & Pai, 2007). These outbreaks stimulated substantial investment in administrative, personal and engineering TB infection control measures in many hospitals in the HICs, leading to successful reductions in transmission (Wenger et al., 1995; Maloney et al., 1995; Fella et al., 1995; Blumberg et al. 1995). The United States' Centres for Diseases Control and Prevention (1994) for instance reported a 3.2-fold increase in risk of TB for healthcare workers as compared to the general population.

In the Low and Middle-Income Countries (LMIC), the risk of TB among healthcare workers (HCW) has received relatively limited scrutiny. Few studies have documented prevalence or incidence of nosocomial TB infection and/or disease in different settings since 1990 (International Union against Tuberculosis and Lung & WHO, 1995). Although the International Union against Tuberculosis and Lung Disease (IUATLD) and the World Health Organization (WHO) issued recommendations for infection control within health facilities, implementation of many of the recommended practices, such as engineering controls, are precluded by resource constraints. There is considerable interest in finding simple yet effective measures to prevent nosocomial transmission of TB in Health care settings. Hospitals with inadequate infection prevention and control practices (IPC) are risky environments for emergence and transmission of respiratory infectious diseases such as TB (Lau et al., 2002) and many multiple studies have documented the risk of TB transmission from patient to Health Care Workers (HCW) and from patient to patient in low, middle and high income resource settings (Joshi, Reingold, Menzies & Pai, 2006).

Health care workers (HCWs) in high burden countries have a higher risk of TB infection and disease as compared to the general population because of their exposure to large numbers of recognised and unrecognised smear positive pulmonary TB (Joshi et al., 2006). Cases are managed at the hospital and due to inadequate implementation of TB infection control, the estimated prevalence of latent TB infection (LTBI) among HCWs in low and middle income countries is 54% with an annual risk of TB infection ranging from 0.5 – 14.3% (Joshi, et al., 2006). Health care settings also provide an opportune environment for the spread of respiratory diseases or infections, where more proximity to coughing or sneezing patients can pose a risk of disease transmission. The potential for TB transmission can be more imminent in primary and emergency care setting where people first present to seek health care. Patients with respiratory illnesses congregate with other patients and companions in the waiting and clinical areas which are most often crowded. (Varia, Wilson, Salwal, Mc Geer, Gournis & Galanis, 2005)

In order to reduce TB infection and disease, many nations have employed various strategies or approaches to address the situation. The United Nations Millennium Development Goals (MDG) 6, target 8 relating to TB, “The Stop TB” Global plan, and the United States of America’s Presidential Emergency Plan for AIDS Relief (PEPFAR) in partnership, have targeted to reduce TB mortality and prevalence by half in 2015. Directly Observed Treatment Short Course (DOTS); an adherence enhancing and fundamental strategy have been implemented over the years in all TB centres with much success in TB control worldwide (WHO 2010).

According to WHO (2010) outbreaks have turned attention to the need to reduce TB transmission in health care settings. In 2009, WHO revised policy guidelines for TB infection control and some countries including Ghana developed country-specific national guidelines for implementation. The WHO policy guidelines on TB Infection Prevention and control (IPC) focused on healthcare facilities, congregate settings and households and provided guidance in implementing TB control activities. TB infection control is therefore a combination of measures aimed at minimizing the risk of TB transmission within populations. The foundations for TB infection control are early and rapid diagnoses and proper management of TB patients. Hence, TB infection control activities are divided into administrative/managerial, environmental and personal protective equipment (WHO 2009). The World Health Organisation thereby entreated all member countries including Ghana to institute these control measures to help reduce the spread of TB in healthcare settings.

In Ghana, infection prevention and control (IPC) policy, guidelines and protocols have been developed in line with WHO guidelines for TB control and disseminated in all health institutions throughout the country, however, their effectiveness were not verified by documented research. The ability to control nosocomial infections has further been neglected by non-conformity of most health workers to report cases among them.

## 1.2 Problem Statement

The World Health Organization (WHO) in 1993 declared TB a global emergency in recognition of its growing importance as a public health problem. In 2009, WHO revised TB Infection Prevention Control policy, guidelines and implementation strategies. The WHO stipulated guidelines adopted by Ghana were to ensure safe practices among health care workers, patients and families. This was disseminated in all the regions in 2010 to ensure that TB control strategies are implemented in all health institutions throughout the country including the ability to control nosocomial infections as part of quality health care service to the people (WHO, 2006). TB Infection Prevention Control is one of the major strategies to prevent and control TB disease in patients and healthcare workers (HCWs) in the health care setting (MOH, 2010). However, tuberculosis transmission among HCWs, patients and families is still a threat especially to nurses who have the closest and longest contact with patients than other care givers (Lopez, 2008).

In Ghana, so far, 300 healthcare workers have been infected with TB disease (unpublished data NTP, 2011). In addition, retrospective study from 2004 to 2011 to determine TB disease among healthcare workers indicates 62 were found to be infected (unpublished data Public Health Unit, Korle–Bu Teaching Hospital, 2012).

In Tema General Hospital where the current study was conducted, there was no available official data on health workers infected with TB. The TB coordinator of the hospital indicated that this was so because the TB reporting format does not include the patients' occupation (personal communication). The total number of TB cases reported in 2011 in the Tema

Metropolis, showed that the Tema General Hospital recorded the highest number of 117 (40%) out of 293 cases among eight TB centres (Metro Directorate Annual Report 2011).

Interactions with the TB coordinator of the Tema General Hospital also revealed a number of TB cases among some health care workers in spite of the persistent efforts being made to prevent and control the infection rate (personal communication). The researcher, an infection prevention expert with 10 years experience in working at the facility has observed that some practices among health care workers were contrary to the recommended standard guidelines and strategies on TB infection control despite the adoption and dissemination of TB infection prevention control in Ghana two years ago.

However, the question is what has Ministry of Health (MOH), Ghana done to remedy the situation?

### **1.3 Research Questions**

The current study therefore sets out to find answers to the following research questions:

- What knowledge do health care workers have regarding TB infection prevention and control strategies?
- What are the practices employed by health care workers in the Tema General Hospital in implementing infection prevention and control of TB?
- What are the challenges healthcare workers encounter in the implementation of TB infection prevention and control strategies?

#### **1.4 Purpose of the study**

The purpose of the study was to investigate the knowledge and practices of health care workers in the implementation of TB infection prevention and control strategies in the Tema General Hospital.

#### **1.5 Objectives of the Study**

The main objective of the study was to assess the knowledge base and practices for TB infection prevention and control among health care workers in a hospital setting. In line with this objective, the study considered the following specific objectives are to;

- Assess the knowledge of health care workers on tuberculosis infection prevention and control (IPC) in Tema General Hospital.
- Describe the practices employed by health care workers for the prevention of TB infection in Tema General Hospital.
- Identify challenges encountered by health care workers in implementation of the TB-IPC strategies in Tema General Hospital.

#### **1.6 Significance of the Study**

This study is expected to pioneer research into the prevention and control of TB and other respiratory infections in particular as well as nosocomial infections in general. It is also relevant to the intellectual community; the facts and information that come out of this study

provide useful knowledge for learning. It will further improve the steps in the practices that will be employed by health care workers to reduce the transmission of TB and other respiratory infections among health workers, clients, patients in hospitals and clinics. The findings of this research will also be useful to the hospital management in making decisions regarding TB and prevention of respiratory diseases in general.

This study is expected to set a pace to delineate the roles and responsibilities of all stakeholders at every level of the provision of health care. It is to provide guidance on which activities or measures are to be implemented at health facilities to prevent and control nosocomial TB transmission among health workers, patients and relatives.

### **1.7 Operational Definition of Terms**

**Knowledge:** Information the health care workers have on TB and its prevention measures.

**Practices:** These are the activities and behaviours of health workers towards prevention of TB at Tema General Hospital.

**Health care workers:** Trained Nurses, Laboratory Technologists and technicians, X-ray technicians and technologists, Doctors, Health Assistants/Health Aides

**Infection prevention:** the necessary actions or any precautionary measures taken to **stop** the invasion and multiplication of micro-organisms (TB bacilli) and transmission from one person to another.

**Infection control:** the necessary actions or any precautionary measures taken to **reduce** the invasion and multiplication of micro-organism (TB bacilli) and transmission from one person to another.

**Assessment:** to evaluate health workers on the subject of TB infection prevention and control practices.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0. Introduction

This chapter presents relevant empirical data on the topic under investigation. For the purpose of clarity, the literature is presented systematically under a number of themes: tuberculosis; etiology and epidemiology, nosocomial infections among patients and healthcare workers, sources of nosocomial transmission of tuberculosis (TB), TB risk among nurses and other health workers, TB prevention, control practices and strategies, knowledge of TB infections and control, challenges faced by health workers in the implementation of TB infection, prevention and control strategy. Summary, conclusion and research questions of the study are also presented. A conceptual framework has also been adopted for the study.

#### 2.1 Tuberculosis (TB): Etiology and Epidemiology

According to the Ministry of Health of Ethiopia (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 harbour 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 (Federal Ministry of Health of Ethiopia, 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 cavitations on chest radiograph, inappropriate or short duration of chemotherapy and administration of *Mycobacterium tuberculosis* procedures that can induce coughing or cause aerosolization (example, sputum induction).

Environmental factors that enhance the likelihood of transmission include: Exposure in relatively small enclosed spaces, inadequate local or general ventilation that results in insufficient dilution and/or removal of infectious droplet nuclei and recirculation of air containing infectious droplet nuclei. Characteristics of the persons exposed to *Mycobacterium tuberculosis* that may affect the risk for becoming infected are not as well defined. In general, persons who have been infected previously with *Mycobacterium tuberculosis* may be less susceptible to subsequent infection. However, reinfection can occur among previously infected persons, especially if they are severely immuno compromised. Vaccination with Bacille of Calmette and Guérin (BCG) probably does not affect the risk of infection rather; it decreases the risk for progressing from latent TB infection to active TB.

Finally, although it is well established that HIV infection increases the likelihood of progressing from latent TB infection to active TB, it is unknown whether HIV infection increases the risk for becoming infected if exposed to *Mycobacterium tuberculosis*.

WHO (2004) notes that, although TB affects many parts of the body, it mainly affects the lung. Its clinical presentation, therefore, depends on the site of infection, the organ affected and its severity. Patients with PTB present with pulmonary symptoms (like productive cough, haemoptysis, chest pain and shortness of breath), constitutional symptoms (like fever, poor appetite, weight loss, night sweats and anorexia) and other symptoms depending on the site of the infection. A significant understanding of the symptoms is important to inform the community about the symptoms to seek medical advice and to inform health workers in order

to increase the index of suspicion to easily pick suspects and detect tuberculosis cases presenting to health institutions. As such, early detection of the cases and prompt treatment are crucial for TB control.

The challenge however as identified by Liberato, de Albuquerque, Campelo and de Melo (2004) is that many TB diagnostic tests are available and that no single diagnostic test for TB exists that can be performed rapidly, simply, inexpensively, and accurately as a stand-alone-test. Thus, the diagnosis of active TB is a clinical exercise; and sputum microscopy remains the mainstay of diagnosis because of its availability, operational feasibility and ability to identify the highly infectious forms of TB, the smear-positive PTB cases (Liberato, de Albuquerque, Campelo & de Melo, 2004; WHO, 2004; CSA, 2005). In effect, the significance of TB diagnosis is high if it is complemented by prompt treatment. Otherwise, if not treated in the earliest five years, 50% of PTB cases die, 25% self-cure and 25% remain sick and infectious (Maher, Harries & Getahun, 2005). Maher, Harries and Getahun (2005) for instance identified that untreated smear-positive PTB patient can infect 10 - 15 people per year on average. The figures were however adjudged to more in Africa (WHO, 2005). Thus, treatment of TB is not only a matter of treating the individual patient, but also is an important public health intervention.

## **2.2 Nosocomial Infections among Health Care Workers and Patients**

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 Organisation (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.

### 2.2.1 Sources of Nosocomial Transmission of TB

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
- Increasing bacterial resistance

Schulster 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.

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 the population are infected.

### **2.3 'Risk of tuberculosis' among Nurses and Other Healthcare Workers**

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.

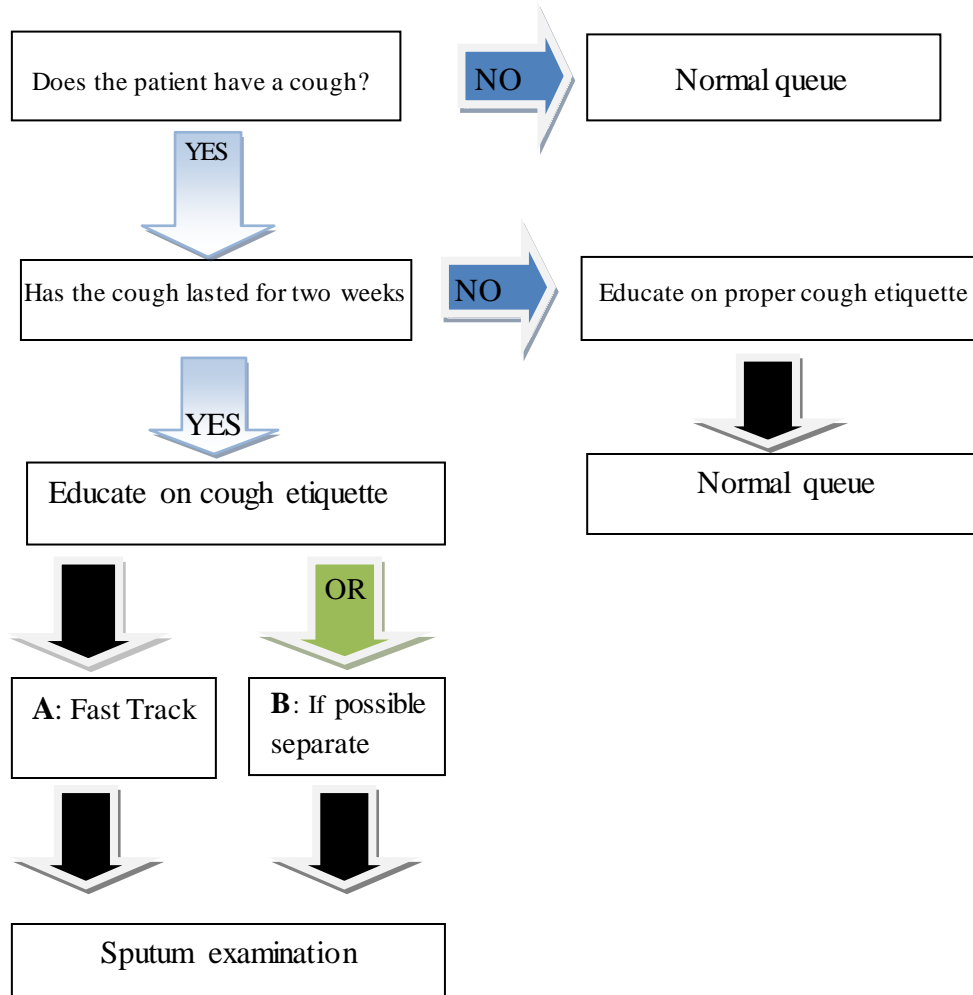
#### **2.4 Tuberculosis Prevention, Control Practices and Strategies**

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 hospital, 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, paediatrics, 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).

The Ministry of Health of Ghana (2010) hypothetical Triage procedure in relation to tuberculosis and airborne infection prevention and control was adopted for the study to help emphasize the importance of cough etiquette, expedited services or separation and sputum examination based on cough.

## 2.5 Conceptual Framework for Triage Procedure in Relation to Tuberculosis and Airborne Infection Prevention and Control



Source: adopted from Ministry of Health of Ghana (2010)

**Figure 1:** showing hypothetical triage procedure in relation to tuberculosis and airborne infection prevention and control.

Triage personnel should screen every patient entering the health facility with cough.

Other tools and examinations may be used; for example the TB screening questionnaire for People Living with HIV (PLHIV). It is widely believed that in most less developed countries, of all the recommended interventions, implementing administrative controls is likely to be the most feasible and effective strategy. These controls include early detection of patients with infectious TB, isolating or at least segregating those with infectious pulmonary TB from other patients, and rapidly initiating anti-TB treatment, supported by measures to improve adherence e.g., DOTS (WHO, 1999).

Many researchers also proposed the use of personal respiratory protection measures (example, N95 respirators). However, Biscotto (2005) opined that they probably also not be feasible because of the high cost. He was of the view that respirators may be relatively costly to implement and of limited effectiveness in high-incidence, resource-limited settings. The use of respirators may have a role in hospitals that manage MDR-TB, but more successful and affordable measures include improving natural ventilation through open windows and sunlight. The efficacy of UV germicidal lights is being evaluated in other low-income countries, and results of such studies are needed to determine their value in reducing nosocomial transmission. In developing TB infection control programme, crucial issues are educating healthcare workers about nosocomial TB and measures that can help prevent such transmission, educating patients on cough procedures, and using simple surgical masks on patients with infectious TB (especially if they are not segregated) who are coughing (Biscotto, 2005).

Periodic testing of healthcare workers for latent TB and treating those with latent infections who are at high risk for progression to active TB might be feasible in selected settings, particularly among trainees and junior staff (who seem to be disproportionately affected). Screening for latent TB infection with newer, blood-based Interferon- Gamma Release Assays (IGRAs) may not be feasible in most settings at this time. Although IGRAs have some advantages over Tuberculin Skin Test (TST), including increased specificity and the ability to discriminate between infection with *Mycobacterium tuberculosis* and *Mycobacterium bovis*, they have limited applicability in many resource-limited settings because of the high costs and the need for laboratory infrastructure (Pai et al., 2004). However, new data suggest that IGRAs hold promise for serial testing of healthcare workers and can overcome some of the limitations of serial tuberculin testing (Pai et al., 2006). A recent study in India showed that in a setting with intensive nosocomial exposure, healthcare workers had strong interferon-gamma responses that persistently stayed elevated even after treatment for latent infection (Pai et al., 2006). Persistence of infection or re-exposure might account for this phenomenon.

Evaluation of symptomatic healthcare workers for active TB is feasible and should be implemented routinely. In addition to the above measures, hospitals should make every effort to treat TB patients on an ambulatory basis (Singh, 2004). If hospitalization is required, every effort should be made to segregate potentially infectious patients from immune compromised patients, rapidly diagnose and initiate treatment, and discharge patients promptly with DOTS on an outpatient basis.

## **2.6 Knowledge of Tuberculosis (TB) Infection and Control**

Lonroth and Raviglione (2008) and W.H.O. (2008) argued that tuberculosis is a worldwide problem because every second a person is infected and every 10 seconds someone dies as a consequence of TB. In order to reduce the rate of transmission of TB among healthcare workers, it is important that healthcare workers have knowledge of TB infection and control practices. However, researchers have indicated that very little in terms of research is known about the prevalence of latent tuberculosis infection (LTBI) among healthcare workers (Schablon, Beckmann, Harling, Diel & Nienhaus, 2009). Accurate health educational efforts about infection and control should not overstate or over dramatize tuberculosis (Auer, Sarol, Tanner, & Weiss, 2000).

Furthermore, a report by Siegel, Rinehart, Jacson, Chiarello and HISPAC (2007) indicates that in American hospitals alone, healthcare-associated infections account for an estimated 1.7 million infections and 99,000 associated deaths each year. Of these infections, 32% of all healthcare-associated infections are urinary tract infections, 22% are surgical site infections, and 15% are pneumonia (lung infections) and 14% are bloodstream infections. They signify infections acquired during or associated with delivery of care in contrast to infections present or incubating at the time of the care delivery event. This report is significant as it suggests that healthcare workers are in danger of getting infected by diseases in the course of providing services to patients. Since TB is very infectious, health workers should endeavour to use TB preventive measures/strategies and should be encouraged in Ghanaian hospitals in order to reduce or eliminate TB infection among healthcare workers. In this direction,

education regarding the epidemiology and specific precautions pertaining to the prevention of infectious diseases (example TB) are needed. This is to ensure that Health workers are educated properly and understood their duties. Thus, written policies for infection control and prevention should be available, updated and enforced (British Columbia Centre for Disease, BCCD, 2004) policies on TB prevention.

Most of the studies about tuberculosis practices relating to prevention and control are foreign. For instance, a study involving healthcare workers reported a prevalence rate of latent tuberculosis infection of 7.2% among health workers in Germany. Specifically, health care workers younger than 30 years had the lowest prevalence rate (3.5%) and those in their 50s had the highest prevalence rate (22%). This higher prevalence could be due to a low immune resistance in the middle aged persons. This implies that the age of the worker has a bearing on tuberculosis infection such that the older the person the more vulnerable he or she is to tuberculosis in the health facility. In addition, physicians and nurses showed a higher prevalence rate of 10.8% to 4.5% compared to other professions (Schablan, Beckmann, Harling, Diel, & Nienhaus, 2009). This confirms that health workers are increasingly being exposed to and get infected with the tuberculosis bacteria. These studies are revealing the vulnerability of the healthcare worker to TB even in a developed country such as Germany. Considering the poor sanitation of Ghana where every place is dust laden and with polluted air even in the hospitals and wards, the healthcare worker in Ghana can be said to be more at risk of acquiring TB from their clients. Hence, the essence of the current study to assess the TB prevention control strategies put in place by health workers.

The increasing rate of tuberculosis among healthcare workers in general seems to suggest non adherence to control and prevention practices by health workers. In Ghana, there is no data on tuberculosis cases among healthcare workers. However, lack of knowledge of tuberculosis prevention strategies may contribute to a higher risk of nosocomial tuberculosis among healthcare workers (HCWs) in institutional settings in Ghana. Utilizing a community based participatory study approach, the views of physicians, nurses, laboratory staff and support staff in Russia were solicited regarding tuberculosis and infection control measures (Woith, Volchenkov & Larson, 2011).

In another related study by Dimitrova, Balabano, Atun, Drobniowski, Levicheva and Coker (2006), it was observed that, general knowledge on TB was low. Analysis of variance showed a significant knowledge difference by job category. Physicians scored significantly higher than nurses, laboratory staff and support staff. Nurses and laboratory staff on the other hand scored significantly higher than support staff. Despite these differences, it was observed that there was still a big knowledge gap or deficit in infection control by healthcare workers.

Researchers have indicated that due to the limited knowledge of TB infection control practices, healthcare workers (HCWs) have expressed serious concerns about the dangers they are exposed to in the various health facilities regarding TB infection.

In particular, Watkins, et al (2004) indicated that HCWs reported feeling inadequately prepared for their role in tuberculosis (TB) control strategies and that they had not received specific TB training. Similarly, HCWs in Gambia indicated that they have limited knowledge about signs and symptoms of TB (Eastwood, 2002).

Other researchers have also emphasized that, infection control practices of TB in health facilities is very low. To determine infection control knowledge, a group of dental workers and nurses at a Jordanian University Teaching Centre were sampled and their views solicited. The questionnaire was used to gather data in this study. The data showed that, nurses and health workers in the Jordanian University Teaching Centre were knowledgeable about TB infection control. Specifically, all the nurses and health workers reported higher frequency of washing hands after removing gloves than wearing them but only 30% said they routinely use the mask (Qudeimat, Farrar & Owais, 2006). The outcome of this study was limited to Jordanian University Teaching Centre and therefore cannot be generalized to other settings. Also, the sample was not broad as it did not include medical doctors and laboratory staff who usually handle sputum of smears of patients. Findings showed that some healthcare workers do not use practice control measures of TB infections such as the use of masks.

Other studies have explored the connection between qualification and experience of health workers and knowledge of infection control measures. In a study involving nurses in Super Specialty Teaching Institute in India, it was found that, the majority of nurses (73.1%) had adequate knowledge of TB infection control measures. However, nurses with higher professional qualification were found to have more knowledge of infection control measures than those with lower professional qualification. But the number of years one had worked as a nurse (that is experience) was not associated significantly with the level of knowledge of infection control measures. Specifically, nurses with over 10 years' experience demonstrated low knowledge of infection control measures than newly recruited nurses (Aarti, Swapna &

Shakti, 2001). This study also demonstrated the knowledge gap among nursing staff in hospitals despite their increasing exposure to TB patients in hospitals. Though the majority of nurses showed increased knowledge, about 30% did not have knowledge of TB infection control measures. Like other studies, this study sampled the views of nurses without considering other health professionals such as doctors, laboratory staff amongst others. The present study thus will sample doctors, nurses, laboratory technologists, X-ray and health aides from the Tema General Hospital as all these health workers interact with patients and clients directly and indirectly.

Empirical studies have also been conducted using students in clinically related disciplines to examine TB infection prevention knowledge. A survey design was utilized to study a sample of 1480 students studying clinically related courses. The sample selected had cared for TB patients before and at least 90% of them had attended at least a lecture on TB infection prevention. The results showed that, 56.3% knew that TB is transmitted from person to person through aerosols but 32.3% also expressed the view that they did not know the correct method for administering tuberculin test to clients (Jackson, Harriby, Hoffman & Catanzaro, 2005).

In a similar study involving medical students of Birmingham Medical School, researchers sought to find out how many medical students knew about TB infection control measures and procedures. Data were collected using a semi-structured questionnaire. It was revealed that, 64% of the sample was aware of hand hygiene while 5% indicated that they had not been taught about hand hygiene as a control measure. Twelve percent of the students also stressed

that, they got to know of hand hygiene through informal teaching. It was also observed that more than half of the students lacked knowledge of the use of alcoholic hand gel (58%) as a hand sanitizer whilst and 35% also lacked knowledge of the use of gloves (Mann & Wood, 2006).

## **2.7 Practices of TB Infection Prevention and Control**

Most researchers have reported that no specific TB infection-control programmes were being used in health-care facilities. Harries et al. (2002) evaluated the impact of multiple administrative control measures which were implemented in 40 district and mission hospitals in Malawi, following adoption of infection-control guidelines. The data were collected by interviewing HCWs and by screening the TB registers at these facilities. The study revealed that the infection-control guidelines were not uniformly implemented, and the median compliance with various measures was 76% (range 3% to 100%).

The introduction of multiple administrative, personal, and engineering controls in a single hospital in Thailand (Roth, Garrett, Laserson et al., 2004) resulted in a significant drop in the annual incidence of LTBI in HCWs from 9.3% to 2.2%. However, the incidence of TB disease in HCWs showed no significant increase (from 179 to 252 per 100,000) 1–2 year after initiation of these control measures.

In another study in Brazil (Yanai, Limpakarnjanarat, Uthairavit, Mastro, Morr et al., (2003), in a cross-sectional tuberculin survey determined the baseline LTBI prevalence in four hospitals. Hospital A initiated administrative controls and provided N95 respirators for

all HCWs required to enter a TB-isolation room. Hospital B had initiated administrative controls before the baseline TST testing and, at the onset of the study, had introduced N95 respirators and had begun construction of negative-pressure isolation rooms. Hospitals C and D had no TB-control measures in place throughout the study. Baseline TST positivity was significantly different in the four hospitals (46.7%, 69.6%, 65.8%, and 62.2% in hospitals A, B, C, and D, respectively). After 1 year, the incidence of LTBI (in initially tuberculin-negative workers) was significantly lower in hospitals A and B, which had implemented multiple infection-control measures, compared with the other two hospitals.

In a case-control study by Jelip, Mathew, Yusin et al. (2004), reported that HCWs with TB disease were 5.9 times more likely to have poor knowledge about TB transmission, and 4.3 times more likely to be unaware of the need for respiratory protection. In a study among medical students (Teixeira, Menzies, Comstock et al., 2005), although 90% were aware of the risk of TB transmission, only 46% reported the use of personal-protection measures. In a study from Thailand (Luksamijarukul, Supapvanit, Loosereewanich, & Aiumlaor, 2004), although 97% of HCWs were aware of TB infection-control policies, only 52% used personal-protection measures (e.g., respirators), and only 72% implemented respiratory isolation for TB cases. Failure to use personal protection was associated with a 2.6-fold (95% CI 1.06 to 6.64) increased risk of TB disease in HCWs (Harries, Nyirenda, Banerjee, Boeree & Salaniponi, 1999). This implies that, the use of personal control measures vary from country to country. This is shown by the different statistical figures recorded. However, not

every health worker use personal control measures indicating that some are still exposed to the dangers of getting infected with TB.

Qualitative studies have also been carried out to examine TB infection control and prevention. Using qualitative and phenomenology approach, researchers used a semi-structured interview and a quota sample of 20 nurses in a Cape Town Hospital, South Africa. Content analysis of the qualitative data showed that there were no designated TB wards and ventilation was poor. It was also observed that standard operating procedures for TB infection control were lacking; TB patients and suspected patients were not subjected to IPC measures (Dagmar, Frederick & Shadeen, 2010).

In another major study, Wayne et al, (2005) found that health care workers adherence to Centre for Disease Control (CDC) recommended respiratory infection Control practices in primary Care Clinic and emergency departments of five Medical Centres in King Country, findings showed that regardless of occupation, participants offered masks to coughing patients; however medical practitioners were generally least knowledgeable about separation of ILI patients in a private examination room as compared to nurses and nurses aides. It was also revealed that, participants practised hand hygiene before touching patients (91%), before and immediately after removing disposable gloves (81%). About 50% of medical practitioners and nurses practised hand hygiene after taking pulse or blood pressure. Finally, 77% of the sample indicated that in their facility there are clear written procedures on what to do, and what infection control actions to take when an undiagnosed patient arrives with symptoms of respiratory infection.

Studies in Eritrea suggest that health workers routinely wash their hands after contact with blood, body fluids or contaminated items. Thirty percent (30%) were found to wash their hands thoroughly by rubbing between fingers and around nails while 70% used gloves in between patient contact ( Rigbe, Almedom, Hagos, Albin & Gutungi, 2005).

Scholars have acknowledged that TB is a major occupational risk for healthcare workers and trainees of healthcare systems. In particular, latent TB infection and TB disease is a major source of concern (Pai et al, 2005, Rae et al, 2004, Gopinath et al, 2004, Chadha et al, 2005). This observation suggests the need to examine the situation of healthcare workers in research. In a study, 726 health workers were recruited. They comprised physicians in training, attending physicians and nurses. The study was conducted in Sevagram Medical Hospital, India using Tuberculin Skin Test (TST), a whole blood interferon Gamma Release Assay (IGRA) to determine infection among health workers. Test results using TST found 50 percent to be positive while IGRA results recorded nearly 70 percent positives through direct contacts with sputum smear-positive TB patients. In terms of the sample used, physicians in training were the highly exposed group, followed by attending physicians and then nurses. Increasing age and duration of employment were risk factors for latent TB infection (Pai et al, 2005, Rae et al, 2004, Gopinath et al, 2004, Chadha et al, 2005). The testing instruments used in this study suggested that the number of healthcare workers exposed or infected may be higher than the recorded number given the different percentages recorded by the test instruments. Also, the findings in this study cannot be generalized to other settings because infection control practices differ from country to country though there are standard

procedures for all health facilities across the globe. Enforcement procedures, challenges faced by hospitals in terms of logistics and training given to workers all make this finding limited to the Indian setting. The need to explore the situation in Ghana is imperative as it will uncover the situation among health professionals regarding control practices and challenges.

A retrospective review of health care workers, who underwent anti TB treatment in a tertiary care hospital in Vellore, identified 125 healthcare workers who had been treated for active TB between 1992 and 2001. The annual incidence of pulmonary TB was 0.35-1.80 per 1,000 persons during the period and annual incidence of extra pulmonary TB was 0.34-1.57 per 1,000. However, Chadha et al. (2005) in their study argued that these rates might have been underestimated because only health workers who underwent TB treatment were counted and a case control study in the same hospital showed that low body mass index and employment in medical wards were risk factors for TB disease among health workers. This study relates only to the infection rate among workers but did not indicate whether they adhered to infection practices and still got infected. Also, the data used for the study was secondary and might not give an accurate idea of the current trends regarding infection.

A quantitative study conducted in Nigeria showed that, there was no full compliance by Nigerian health workers of infection control practices. Specifically, Sofola and Savage (2003), reported that out of the 146 sample recruited, the majority (70.6%) said they always wore gloves when treating patients while (29.4%) said they sometimes did so, (45.9%) said they wore facemasks, while (52.7%) indicated that they sometimes wore them and (1.4%) said they never wore them. Sterilization was performed using a combination of methods

including autoclaving (84.1%), chemicals (29.7%) and others such as boiling (19.3%) and dry heat (17.5%). In line with the above data, it is clear that total adherence to infection control is still a major problem for health workers.

Qudeimat et al. (2006) conducted a study concerning the practices of infection prevention, 100% of dental workers including nurses studied reported routine wearing of gloves. The dental nurses assessed also reported higher frequency of washing hands after removing the gloves than before wearing them. Routine mask use was also statistically low among nurses (30%). However, Ignatavicius, Workman and Mishler (1995) advanced that thorough and constant hand washing significantly prevented transmission of pathogens. In addition, the use of antimicrobial agents, bathing and grooming for client and nurse, observance of sanitation in infectious disease form the pivot in any infection prevention strategy.

Some researchers noted that, hand washing compliance was significantly low in a medical intensive care unit and a general medical ward with 728 beds in a tertiary care facility in Virginia. Hand washing before and after care for TB patients was 9 percent and 22 percent respectively (Bischoff, Reynolds, Sessler, Edmond & Wenzel, 2001). The research findings showed that, hand washing was not taken seriously before attending to TB patients but quiet high after care. Healthcare workers observe infection control measures immediately after contact with patients and less likely before.

In another study conducted in Heidelberg University Hospital, a 1600 bed teaching hospital, Wendt, Knautz and Von Baum (2004) found that, hand hygiene was predominantly achieved through the use of the hand rubs. High rates of hand rub use were observed among health care

workers [Hand rubs were used in 1,115, (52.2%) of 2,138 observation]. Sixty-two and half percent (62.5%) nurses were reported to significantly use hand rubs more frequently than physicians did (51.3%) after contact with patients. However, close of half of health workers per the findings did not observe infection control practices regarding hand hygiene.

These results were similar to that observed by Meengs, Giles, Chisholm, Cordell and Nelson (1994) when the hand washing frequency was assessed in an emergency department in the Methodist Hospital emergency department of Indiana. In this study, hand washing occurred in 50.4% of total contacts. Nurses washed after 58.2% of 142 contacts and physicians washed 35.8% of 263 contacts. This implied that nurses had a higher hand washing frequency than the physicians. However the number of years of clinical experience was not significantly related to hand washing frequency. Soap and water were used in most instances of hand washing while only a few cases were observed when alcohol preparation was used.

A research carried out by Saloojee and Steenhoff (2000) on the health professional's role in preventing nosocomial infections demonstrated that, the infection control compliance among health professionals was very poor. The hands were seen by many of the professionals as the commonest vehicles by which microorganisms are transmitted between patients. In spite of this, the study of the nurses' practices revealed that, the hands were only cleaned after 30% of patient contacts and after 50% of activities that were likely to result in heavy contamination. The use of gowns and masks were also reported to be very low. Among those who wash their hands, alcohol hand disinfection and soap hand washing were the methods employed.

Preventing nosocomial infection: improving compliance with standard precautions in an Indonesian teaching hospital a study by Duerink, Farida, Nagelkerke and Van den Braek (2005) revealed that compliance with hand hygiene was 46% in an internal medicine ward and 22% in a paediatric ward studied. Twenty percent (20%) of health professionals recapped needles after use while few workers used gown and gloves.

## **2.8 Challenges Faced by Health Care Workers in the Implementation of Tuberculosis-Infection Prevention Control**

Akyol (2007) Sofola and Savage (2003) explained that, health workers are faced with various occupational risks as far as TB infection is concern. Though there are standard procedures to follow to avoid being infected, a number of challenges ranging from lack of logistics, human resource and other work related factors have been cited. Non-adherence to control practices by health professionals has been attributed to non-availability of required resource materials such as masks, gloves, disinfectants amongst others. Thus, the need to ensure availability of TB control materials in order to manage TB patients is necessary.

In addition, increasing workload of healthcare workers has been found to lead to non-compliance of hand hygiene practices. This is probably due to lack of human resource in health facilities to handle increasing number of cases. A South African based study revealed that adherence to hand washing practices as part of control practices would improve compliance by 92% and hence significant reduction in infection rate among health

professionals. Poor hand washing practices has also been caused by lack of decontamination agents (Saloojee & Steehoff, 2000).

In Jackson's (1999) view, understaffing is a major inhibiting factor. Junior and temporary staff work without supervision because of lack of manpower especially experienced ones to ensure as well as enforce infection control practices. This partly contributes to increasing rates of infection among health professionals especially junior staff. The literature suggests that, junior and temporary workers' lack of experience and probably knowledge is a major risk factor for all healthcare workers.

In a survey conducted in Eritrea to find out about compliance of infection control practices among healthcare workers, it was observed that, there was low compliance due to factors such as inadequate and inconveniently located sinks, inadequate hand towels, water, quality soap and hand lotions or lubricants for use after hand washing and lack of time. Also, 51 percent of respondents indicated that they preferred to wear gloves but did not change them in between contacts due to scarcity because the gloves protected them and not their patients (Rigbe et al., 2005). Furthermore, improper gloving has been cited as a reason for poor hand hygiene because contaminated gloves must be removed in accordance with infection control measures. Non-adherence will lead to infection spread as there is high risk of microbial transmission (Girou, Chai, Brun-Buisson, 2004).

## **2.9. Summary and Conclusion**

From the literature reviewed, many studies both quantitative and qualitative have explored how tuberculosis has become a major occupational risk for health workers in contemporary times to the extent that more and more health workers are now becoming patients rather than specialists to attend to such patients. This situation has prompted research into the area. However, a review of literature show that very little research in the area has been done in Africa despite the increasing cases of TB in Africa and Ghana in particular. It is clear from the literature reviewed so far that, the majority of the studies have been conducted in the Western countries but generalization might not help uncover the situation in Ghana. Also, most of the studies were limited to recommended TB infection prevention practices such as hand washing before and after contact with patients, wearing of gloves and face masking. Also, environmental related control measures, administrative and other measures recommended by the World Health Organization (WHO) have not been covered in these studies. The present study will bring to light the situation in Ghana to fill the gaps identified in the literature.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.0 Introduction**

This chapter deals with the research methodology that was adopted for the study. It covers the research design, description of the research setting; study population, sampling and sample size, sampling technique, data gathering tools, data gathering procedure, validity and reliability, ethical considerations, data analysis, strengths and limitations to data collection were also presented.

#### **3.1. Research design**

Research design describes how a study is conducted to maximize control over factors that could interfere with the desired outcome of a study (Burns & Grove, 2005). A research design is therefore the overall plan for obtaining answers to the research questions being studied (Polit & Beck, 2008). This research is quantitative in nature and the aim is to make correct predictions, as Worrall (2000) contends, one reason that quantitative research enjoys widespread heightened respect in the discipline “lies in the predictive advantages this method of inquiry possesses. Indeed, the ability to make correct predictions is one of the more outstanding characteristics of quantitative methodology. The majority of studies conducted in the area have utilized the quantitative strategy because quantitative data are objective (Bowling 2005). An exploratory cross-sectional survey design was used. This method was chosen as data was collected on a study population at a particular point in time. It was also a

descriptive study because the variables of interest were described, (Polit & Beck 2008). The goal of the research was to assess TB infection prevention and control practices among healthcare workers. It seeks to solicit views and opinions from respondents regarding the implementation strategies/measures and therefore the appropriateness of such a design. It was therefore appropriate to use the exploratory research design to achieve the objectives of the research.

### **3.2. Research Setting**

The study was carried out at the Tema General Hospital in the Tema Metropolis. The entire metropolis has an estimated population of 379, 175 according to population census (Ghana Statistical Service, 2010). However, the current study focused on health workers in the following job categories: Nurses, Doctors, X-Ray, Laboratory, Pharmacy, and Health Assistants/Health Aides. The total population of these health workers stands at 459 comprising: Nurses (n=347), Doctors (n=51), X-Ray (n=2), Laboratory (n=16), Pharmacy (n=10) and Ward Assistants/Health Aides (n=33).

The metropolis lies at the South Eastern part of the Greater Accra region and it is bordered to the East by Dangbe East and West Districts, and to the North by Ashaiman Municipality and to the West, the Greater Accra Metropolis and the South, the Atlantic Ocean where Ghana's biggest commercial harbour is located. The metropolis has many heavy industrial activities such as Tema Oil Refinery (TOR), Volta Aluminum Company (VALCO).

Tema General Hospital is the largest public health institution in the Tema metropolis. The hospital was constructed in 1954 by J.W Harrow and Sons Limited and was handed over to government of Ghana in 1962. It is the major referral point for all clinics, maternity homes and other hospitals both public and private in the metropolis. Due to the surrounding road network and commercial nature of the metropolis, the hospital is one of the busiest health facilities in the metropolis. The catchment area includes the entire Tema metropolis. It has satellite towns and villages such as Lashibi, Sakumono, Afenya, Prampram and Dawenya. It also serves as a training facility for students from medical school, nursing and other allied health institutions. In addition it provides internship for house officers, physician assistants, nursing and other newly qualified staff.

Tema General Hospital (TGH) has a bed capacity of 282, with a staff strength of 784 made up of 51 doctors and dentists, 347 nurses, 16 laboratory technical and technologist, 10 pharmacists, a number of administrators, biostatisticians and other categories of staff. The average out-patient attendance daily is estimated as 468 with an average daily admission of 55. It has 14 departments and centres. These are Obstetrics and Gynaecology, Surgery, Radiology as well as Paediatrics, and Physiotherapy. The others are laboratory, Eye, Ear, Nose and Throat clinics, HIV counselling unit and Chest clinic. The mission of the hospital is to provide quality primary and secondary healthcare, teaching and outreach services.

### **3.3. Target Population**

The target population is the complete totality of all subjects (Polit & Hungler, 2003). The study population involved health workers such as doctors, nurses, laboratory and X-ray technologists, and health aides of the Tema General Hospital who have come into contact with TB patients at their various wards and units. This population provided a rich and broad data for analysis. It also helped the researchers to identify which category of health workers lack knowledge of TB infection control practices, do not adhere to such practices and also challenges per unit or department as a way of assessing the implementation of the TB prevention and control strategies in the Hospital.

### **3.4. Sample Size**

Sample size is the subset of the population under study. The sample size in this study constituted health workers from the following categories such as nurses, doctors, health assistants/ health aides, laboratory and Pharmacy staff of the hospital. Sample size calculation was used to determine the participants of the study. In addition, the study participants were selected based on the set criteria below;

- Should have worked in the hospital for more than 6 months at the time of the study.
- Should demonstrate that they were willing to participate
- Should be 18 years and above

This means that, health workers (doctors, nurses, laboratory and X-ray technologists, health assistants/health aides and pharmacists/pharmacy technicians) who did not meet the above criteria were not allowed to participate in the study.

### 3.4.1 Sample Size Determination

Yamane's formula (Israel, 2006) was used to determine the sample size in this study. Determination of sample size was based on the estimated population size (n=459). The formula is stated below.

$$n = [N / 1 + N (e)^2]$$

n – The sample size

N- The population size

e- The desired level of precision or level of acceptable error = 0.05)

$$\begin{aligned} \text{Total sample size (n)} &= [459 / (1 + 459 (0.05)^2)] = [459 / (1 + 459 \times .0025)] \\ &= [459 / 1 + 1.148] \\ &= [459 / 2.148] \\ &= 214 \\ &= 214 \end{aligned}$$

Based on the above, the appropriate sample size for the study is 214. However, to deal with uncompleted questionnaires and non-return of questionnaires, additional 10% (n=214) sample was added. Thus, the expected total sample size was 235.

To determine the required sample size for each job category, a constant proportion was obtained and used to determine the percentage that was selected from each category. For instance, the constant proportion is  $[235/459= 0.512]$ . This constant proportion (0.512) was multiplied by the number of persons in each job category to obtain the expected sample size for each category. Finally, the sample size for each category was used to obtain the percentage of persons that was selected from each category. The table below presents the sample size for each of the job categories in the study.

**Table 3.1: Sample Size that was selected from each Job Category**

<i>Job</i>	<i>Total</i>	<i>constant</i>	<i>Sample Size</i>	<i>Percent (%)</i>
<i>Categories</i>	<i>Number</i>	<i>proportion</i>	<i>Required</i>	<i>from each Group</i>
Nurses	347	0.512	178	75.7
Doctors	51	0.512	26	11.1
X – Ray	2	0.512	1	0.4
Laboratory	16	0.512	8	3.4
Pharmacy	10	0.512	5	2.1
Ward Assistants	33	0.512	17	7.2
	<b>459</b>		<b>235</b>	<b>100.00</b>

Source: Field Data, 2012

### **3.5 Sampling Technique**

Simple random sampling technique was used to select 235 eligible health care workers for the period of data collection. This was to ensure that each participant had a known, non-zero chance of being selected, Blair (2009). In this study the participants were in the job categories that were already in the strata which made it more representative. During the process of sampling, the names of the participants in each of the strata were written on a piece of paper and were put into a box and were shuffled. The names were then picked randomly from the box to form the sample in a series of draws. The aim was to ensure that each respondent had an equal chance of being selected.

### **3.6 Data Gathering Tool**

The instrument for data collection was a questionnaire which was developed to collect data from the respondents on specific variables.

A questionnaire was used to generate information from the study participants to achieve the set objectives for the study. The questionnaire was designed to elicit the following information;

Section A: Demographic data

Section B: Knowledge about TB infection and control- Knowledge questions consisted of 13 multiple choices and seven 'true' or false questions on major domains of TB infection prevention and control strategies and general knowledge on TB. In all there were ten (10) questions on administrative strategies namely questions; 2, 5, 8, 9, 12, 13,15,18,19 and 20.

Three (3) questions were on environmental strategies namely questions; 3,4,17. Three (3) questions 6, 10, 11 were on personal protective equipments and four (4) questions were on general knowledge on TB namely questions; 1,7,14 and 16. Any correct answer given scored one (1) and a wrong answer scored zero (0). An average score of 15 or more answered questions were knowledgeable and below less knowledgeable.

Section C: Practices for preventing TB infection- Questions on the TB prevention and control practices were asked using 4 and 5 point Likert scale range.

Section D: Challenges in implementing TB prevention strategies.

The questions were both closed and opened-ended. Closed-ended allows participants options to choose from whilst the opened-ended generates a lot of ideas or views from the participants. A copy of questionnaire specifying the broad areas is presented in (Appendix C).

A self administered questionnaire was used to enable participants to answer the questionnaires; this was because of the perceived high literacy among them.

### **3.7. Data Gathering Procedure**

Permission to collect data was obtained from the Medical Director of the Tema General Hospital via a permission letter from School of Nursing, University of Ghana, Legon. On the field the researcher introduced herself to the ward/unit in charges and explained the purpose of the study before the recruitment of participants. Participants were given information sheets (Appendix A) to read and those who consented to participate were given consent forms (Appendix B) to sign before the administration of the questionnaire. The researcher spent

approximately four weeks to complete the data collection and this was from (Monday to Friday) each week. A maximum of 12 questionnaires were delivered by hand each day to the participants when they were less busy from their routine work schedules. The researcher continued administering the questionnaires until all the recruited participants were exhausted. All the data was collected by the principal investigator. The data collected each day was checked and cleaned manually for completeness, clarity and consistency and was entered into the data analysis software Statistical Package for the Social Sciences (SPSS) version 16 the same day to prevent loss of information.

### **3.8. Validity and Reliability**

According to Golafshani (2003) validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In order to ensure validity in this study items on the data gathering sheets were taken from a standardised questionnaire that addressed the research questions of the study. The tool was adopted from (Nakashima, Likpe, Emerson, Miller 2007) who did an assessment on TB infection prevention and control in outpatient settings among health care workers and health facilities. The tool had been used in eight clinics in Zambia and many other countries. Joppe (2000) defined reliability as the extent to which results are consistent overtime and an accurate representation of the total population under study. Reliability was ensured by documenting all procedures that were carried out in the development and conducting of the study so that future researchers could replicate it. The data collection instrument was pretested at La

General Hospital using 20 health care workers with similar characteristics who have worked for more than six months. Based on the findings of the pilot study, some concepts and statements were rephrased. The length of the questionnaire was also reduced from 62 to 55 questions before finalisation. The pretesting helped the researcher to clarify the tool, and to ensure research adequacy and freedom from bias, ambiguity and logical flow of the items on the sheet. The aim was to enable participants in the study to understand the questions better.

### **3.9. Ethical Considerations**

An introductory letter for permission to conduct the study was obtained from School of Nursing to the Medical Director in charge of Tema General Hospital as well as heads of wards/units. Written informed consent was also sought from participants prior to administration of the questionnaires. Staff were ensured of confidentiality of the nature of data that was collected, right to withdraw from the study at any time and the fact that refusal to participate and withdrawal would not affect the employment status of the hospital. Anonymity was assured by not requesting the names of participants but rather the use of numbers (codes). General information on the consent form was included such as the purpose of the study, objectives, specific expectation regarding participation and potential cost and benefits. The participants were assured of their protection and the information received was not exposed to others with the exception of the principal investigator and supervisors of the study.

### **3.10 Data Analysis**

Data analysis is the process of analyzing all the information and evaluating the relevant information that can be helpful in better decision making (Sivia & Skilling, 2006). The answered questionnaires retrieved were edited and checked for inconsistencies. After that they were coded and analysed using the SPSS version 16. The statistical tools used for the analysis and presentations of the data were frequency tables, charts and where necessary, one variable Chi square test was used to determine differences in the frequencies of various responses. The Pearsons' correlation coefficient was used to test the correlation between variables whilst t test was used to determine significant differences between groups where the data was either interval or ratio.

### **3.11 Limitations**

Data for this study was gathered with a self report questionnaire which has its own weaknesses such as proneness to social desirability and issues of participant dishonesty. An observational study would have offered the researcher the opportunity to see and record practices of TB infection prevention and control rather than depending on self report by the respondents. Further, the study concentrated on health workers in Tema General Hospital. Consequently findings cannot be generalized to health workers in other health facilities in Ghana.

## **CHAPTER FOUR**

### **FINDINGS**

#### **4.0 Introduction**

The findings of this study are presented in this chapter in the form of tables and graphs. The findings are presented under four main subheadings comprising the demographic background of participants (health workers), level of knowledge of TB infection prevention control measures, practices for preventing tuberculosis infection and the challenges faced by the health workers in their implementation of TB prevention measures. The chapter ends with the statistical interpretation of the hypothesis tested.

#### **4.1 DEMOGRAPHIC BACKGROUND OF PARTICIPANTS**

This section presents the socio-demographic characteristics of the respondents. The variables that were considered included sex, length of work at Tema General Hospital, current ward/unit of work and job title of participants.

#### 4.1.1 Sex of Participants

Gender equality in any study is very important to give a true representation of both male and females, therefore both sexes were allowed to take part in this study to give equal representation. The study analysis was based on 229 health workers out of 235 because 6 respondents did not complete the questionnaires appropriately. Their distribution is presented in Table 4.1.

**Table 4.1: Sex Distribution of Participants**

<b>Participants (n=229)</b>		
<b>Sex</b>	<b>Frequency</b>	<b>Percent</b>
Male	55	24
Female	174	76
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

Results in Table 4.1 shows that a significant proportion of the sample 76 % (n=174) were females, whilst 24% (n=55) were males.

#### 4.1.2 Age Distribution of the Participants

Age is considered another important socio-demographic variable. It is believed that age influences people's opinions and attitudes about issues, therefore, the age of participants was considered in this study. Table 4.2 presents the age distribution of the participants.

**Table 4.2: Age Distribution of Participants**

<b>Participants (n=229)</b>		
Age	Frequency	Percent
20-25	18	7.9
26-31	29	12.7
32-37	67	29.2
38-43	84	36.7
44-49	13	5.6
50+	18	7.9
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

The distribution in Table 4.2 indicates that the majority of respondents 37% (n=84) were between the ages of 38-43, this was followed by 29 % (n=67) participants who were between the ages of 32-37 13% (n=29) participants were also between the ages of 26-31, then, 8% (n= 18) participants who were between the 20-25 and 50+ age brackets respectively, also 6% (n=13) were between 44-49 age group.

### 4.1.3 Length of Practice in the Hospital

Another variable that was taken into consideration was participants' lengths of stay at the hospital, this was considered because an individual's length of stay in any particular area be it work or residence makes the person acquire some level of knowledge or becomes more abreast with the terrain of the area and will be able to make a meaningful contribution concerning the issue when the need arises. Participants reported on how long they have been working in the Hospital. Their responses are presented in Table 4.3.

**Table 4.3: Work Experience of Participants**

<b>Participants (n=229)</b>		
<b>Length of Practice</b>	<b>Frequency</b>	<b>Percent</b>
6 months -1 year	26	11.4
2-5 years	14	6.1
6-9 years	31	13.5
10-13 years	96	41.9
14 years and above	62	27.1
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

With reference to Table 4.3 a greater proportion of the participants 42% (n=96) had worked at the Hospital for 10-13 years, this was followed by 27 % (n=62) who had also worked for 14 years and above, 14% (n=31) had 6-9 years experience, 6% (n=14) had worked for 2-5

years. The least months/years of work experience in the hospital were those who had spent between 6 months to one year working in the hospital and that constituted 11% (n=26).

#### 4.1.4 Current Ward/Unit of work

The ward/unit of practice of the participants is an important variable in the study, the outcome of this is presented in Table 4.4.

**Table 4.4: Ward/Unit of Practice of Participants**

<b>Participants (n=229)</b>		
Ward/Unit of Practice	Frequency	Percent
Outpatient department	62	27.1
Male medical ward	48	21.0
Female medical ward	36	15.7
Chest clinic	4	1.7
Fevers unit	18	7.9
Children's ward	22	9.6
HIV/AIDS counselling unit	9	3.9
Laboratory unit	8	3.5
X-ray unit	1	0.4
Pharmacy unit	5	2.2
Other (eye, ENT, ANC)	16	7.0
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

As presented in Table 4.4, a significant difference exists between the number of participants from the various wards/units. The majority of the participants 27% (n= 62) worked at the OPD, male medical ward 48(21%), female medical ward 36(15.7%) and Children's ward 22(9.6%). Wards/units where the least number of participants were selected from included the X- ray unit 1(0.4%), chest clinic 4(1.7%), pharmacy unit 5(2.2%), laboratory unit 8(3.5%), HIV/AIDS counselling unit 9(3.9%), other units (Eye, Ear, Nose and Throat, Antenatal Clinic) 16(7.0%) and fevers unit 18(7.9%).

#### 4.1.5 Job Title of Participants

The current job title of health workers were reported in this study. Results on this are presented in Table 4.5.

**Table 4.5: Job Title of Participants**

<b>Participants (n=229)</b>		
<b>Job Title</b>	<b>Frequency</b>	<b>Percent</b>
Medical doctor	24	10.5
Professional nurse	129	56.3
Enrolled nurse	45	19.7
Laboratory technologist	8	3.5
X-ray technologist	1	0.4
Health assistant/health aide	17	7.4
Pharmacy technician	3	1.3
Pharmacist	2	0.9
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

Results in Table 4.5 indicate that a significant proportion of participants 56 % (n=129) were professional nurses, 20% (n=45) were enrolled nurses, this was followed by 10.5% (n=24) who were medical doctors. 7% (n=17) were also health assistants/health aides, 3.5% (n=8) constituted laboratory technologist, 1.3% (n=3) were pharmacy technicians. The least sampled in this study were pharmacist 0.9% (n=2) and x-ray technologist who constituted 0.4% (n=1) respectively. This result is an indication that almost all the health workers were allowed the opportunity to take part in this survey and that their views and opinions would be considered representative.

#### 4.2 LEVEL OF KNOWLEDGE OF TB INFECTION PREVENTION AND CONTROL MEASURES

Participants' level of knowledge on TB infection prevention and control measures was also assessed and the results obtained on this are presented in Table 4.6.

**Table 4.6: Level of Knowledge of TB Prevention and Control Measures**

Participants (n=229)							
Variable	Min.	Max.	Mean	Std Dev.	df	t	Sig.
Knowledge	3	20	13.44	2.95			
<b>Total</b>					<b>228</b>	<b>68.944</b>	<b>.000</b>

Source: Field Data, 2012

Results in Table 4.6, revealed that the minimum score of knowledge of TB recorded by the participants was out of a maximum score of 20. Mean knowledge of TB score was 13.44 with a standard deviation of 2.95. One sample t test analysis (and the skewness of the data = -.481) indicated that participants expressed significantly fair/moderate knowledge of TB prevention and control measures [ $t_{(228)} = 68.944$ ,  $p = .000$ ]. Thus participants' knowledge of TB prevention and control measures was generally fair/moderate (neither high nor low).

Demographic variables that influence participants' knowledge of TB infection prevention and control measures were also determined by correlating demographic variables and knowledge. Relevant information on this is presented in Table 4.7

**Table 4.7: Correlation between Demographic Variables and Knowledge of TB Infection Prevention and Control Measures**

Participants (n=229)					
Variable	Sex.	Age	Tenure	Current Ward	Job title.
Knowledge	-.131*	.021	.016	-.138*	-.180*
Sex	-	.196*	.167*	.018	-.040
Age	-	-	.638*	-.020	-.151*
Tenure	-	-	-	-.040	-.113*
Current Ward	-	-	-	-	.119*
Job title	-	-	-	-	-

\*significant at .05

Source: Field Data, 2012

Results in Table 4.7 shows that sex of the participant significantly correlates or influences [r<sub>(227)</sub> = -.131, p = .024] the knowledge of TB infection prevention and control measures. Female participants' demonstrated higher knowledge compared to their male counterparts. The correlation between participants' age and knowledge of TB was not significant though positive [r<sub>(227)</sub> = .021, p = .427]. The link between number of years of work (tenure) and knowledge of TB was also not significant though this is also positive [r<sub>(227)</sub> = .016, p = .405]. Current ward where the participant works significantly correlates with knowledge of TB [r<sub>(227)</sub> = -.138, p = .022]. Participants working in OPD, male and female medical wards, chest clinic, fevers unit and children's ward showed higher knowledge of TB as opposed to their counterparts in HIV/AIDS counselling unit, laboratory unit, X-ray unit, pharmacy unit and other units. Results in Table 4.7 further revealed that the job title of participants significantly correlates/influences their knowledge of TB [r<sub>(227)</sub> = -.180, p = .003]. Medical doctors, professional and enrolled nurses and laboratory technologists demonstrated higher knowledge of TB than X-ray technologists, health assistants/aide, pharmacists and pharmacy technicians.

#### 4.2.1 Knowledge of the Mode of Spread of TB

On participants' knowledge of how TB is spread, the following result was obtained.

**Table 4.8: Knowledge on Mode of Spread of TB**

Participants (n=229)					
Means of Spread	Frequency	Percent	df	$\chi^2$	Sig
If uninfected person comes into contact with the blood of a person containing the TB bacilli	10	4.4			
When TB bacilli droplets become suspended in the air and someone breaths in the TB bacilli	189	82.5			
A person infected with TB can spread the bacteria through physical contact	17	7.4			
When an infected person prepares food and introduces the TB germs into the food	13	5.7			
<b>Total</b>	<b>229</b>	<b>100</b>	<b>3</b>	<b>404.694</b>	<b>.000</b>

Source: Field Data, 2012

As regards the mode of spread of TB, a significant majority of participants 83% (n=189) had the idea about the spread of TB bacilli, whilst a substantial proportion of the sample 18% (n=40) had incorrect pieces of information regarding the spread of TB [ $\chi^2_{(3)} = 404.694$ , p = .000].

#### 4.2.2 Implementation of Administrative Control Measures by Participants

Participants also enumerated administrative control measures for TB infection prevention and control that should be implemented by a hospital staff. Relevant information on this is presented in Table 4.9.

**Table 4.9: Administrative TB Infection Prevention and Control Measures for Implementation**

<b>Participants (n=229)</b>					
Means of Spread	Frequency	Percent	df	$\chi^2$	Sig
Prompt identification and separation of coughing patients from others (A)	20	8.7			
Promoting cough etiquette (B)	55	24.0			
'Fast tracking' patients suspected of TB infection for prompt diagnosis and treatment	17	7.4			
All the above	125	54.6			
A and B only	12	5.2			
<b>Total</b>	<b>229</b>	<b>100</b>	<b>4</b>	<b>247.447</b>	<b>.000</b>

Source: Fieldwork Data, 2012

As regards administrative control measures which constitute the top most priority among other measures for the prevention and control of TB spread, more than half of the sample 55% (n= 125) knew the correct measures to be undertaken as a preparation for TB prevention and control. A substantial proportion 45% (n=104) had no knowledge about strategic administrative measures.

### 4.2.3 The Requirement of an Examination or Treatment Room for TB Patients

Participants' knowledge of requirements of TB examination or treatment room was assessed.

Results on this are presented in Table 4.10.

**Table 4.10: Knowledge on Requirements of TB Examination or Treatment Room**

Participants (n=229)		
Requirements	Frequency	Percent
Air exhaust directly to the outside	40	17.5
Ventilation solely by air condition	141	61.6
Placement of the patients nearest the window or fan exhausting the air	16	7.0
Adequate ventilation	32	13.9
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

Concerning the requirements of an examination or treatment room for TB patients, participants demonstrated a good knowledge of the requirements of TB treatment room. More than half 62% (n=141) had correct responses, 38.4% (n=88) had incorrect responses.

### 4.2.4 An Easy and Low-Cost Way to Reduce Infections of TB

Participants were asked to indicate the easy and low-cost way to reduce the number of infections by TB droplets in the air and their responses are presented in Table 4.11.

**Table 4.11: An Easy and Low-Cost Way to Reduce Infections of TB Droplets in the Air**

<b>Participants (n=229)</b>		
<b>Ways</b>	<b>Frequency</b>	<b>Percent</b>
Use natural ventilation by opening windows and doors and maximizing cross ventilation	169	73.8
Provide respirators or N95 masks to all staff	19	8.3
Install a mechanical ventilation system	25	10.9
Wash hands with soap and water before and after every patient contact	16	7.0
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

Participants' knowledge about the easy and low-cost way to reduce the number of infections TB droplets in the air was sought. A good sizeable proportion 74% (n=169) responding appropriately, whilst, 26% (n=60) responded inappropriately.

#### **4.2.5 Participants Knowledge on Cough Etiquette**

Knowledge on cough etiquette was also assessed and the relevant information on this is presented in Table 4.12.

**Table 4.12: Cough Etiquette**

<b>Participants (n=229)</b>		
<b>Cough Etiquette</b>	<b>Frequency</b>	<b>Percent</b>
When someone says “excuse me” after coughing in public	25	10.9
Should be required of all patients, but not necessary for health workers	18	7.9
Include covering your mouth and sneezes with handkerchiefs, tissue, or upper arm	163	71.2
All the above	23	10.0
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

Participants’ score on their knowledge on cough etiquettes have also been demonstrated with the majority 71% (n=163) responding appropriately and a substantial 29% (n=66) had incorrect pieces of information about cough etiquettes.

#### **4.2.6 Conditions of Particulate Respirators**

Participants’ knowledge on the use of particulate respirators or N-95 are presented in Table 4.13.

**Table 4.13: Participants Knowledge on the use of Particulate Respirators (N-95 or FFP2)**

<b>Participants (n=229)</b>		
Uses of N-95/FFP2	Frequency	Percent
Used for all TB patients or persons suspected of TB in the hospital	48	21.2
Worn by staff when conducting a bronchoscopy Procedure or other high risk procedures for patients with TB, or XDR TB	135	61.1
Required of all staff when they are infected with any infectious disease to prevent transmissions to patients	28	11.3
Worn by patients when sitting outside to prevent TB droplets from spreading throughout the town	18	6.4
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

As depicted in Table 4.13, participants' knowledge with regards to the use of particulate respirators showed that more than half of participants in TB control stands at 61% (n=135) knew the appropriate responses, whilst 35%(n=94) gave inappropriate responses.

#### **4.2.7 Persons with High Risk of TB Exposure and Infection**

In the area of the kind of persons with high risk of TB exposure and infection, the following results were obtained.

**Table 4.14: Persons with High Risk of TB Exposure and Infection**

<b>Participants (n=229)</b>		
<b>Groups at Risk</b>	<b>Frequency</b>	<b>Percent</b>
Those that live in crowded, poorly ventilated settings where TB is common	55	24.0
Persons who are immune compromised, such as HIV/AIDS patients	82	35.8
Those with medical conditions such as renal failure, cancer, or diabetes	16	7.0
All of the above	76	33.2
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

As regards to participants' knowledge on persons with high risk of TB exposure and infection, a substantial proportion 33% (n=76) had the right information and reported all the major people at risk. The majority 67% (n=153) rather indicated specific groups of people at risk instead of combining them.

#### 4.2.8 The Most Effective Intervention for TB Control

Participants also reported the most effective intervention for TB control and the results on this are presented in Table 4.15.

**Table 4.15: Effective Intervention for TB Control**

Participants (n=229)		
Effective Intervention	Frequency	Percent
BCG re-vaccination (A)	30	13.1
Chemoprophylaxis (B)	15	6.5
Early detection of TB patients (C)	29	12.7
Appropriate treatment of TB patients (D)	17	7.4
Both C and D	138	60.3
Total	229	100

Source: Field Data, 2012

In the area of effective intervention for TB control, more than half 60% ( n=138) had appropriate responses. The rest 40% (n=91) however, had incorrect responses.

#### 4.2.9 Administrative Control Measures in Ghana

Participants were asked to indicate the administrative control measures in Ghana that prevent TB transmission. The outcome is presented in Table 4.16.

**Table 4.16: Administrative Control Measures in Ghana**

Participants (n=229)		
Effective Intervention	Frequency	Percent
Promptly identifying infectious cases (A)	21	9.2
Mandatory quarantine of suspected cases (B)	11	4.8
Separation of coughers (C)	13	5.7
Setting up quick turnaround times at health care settings for TB cases (D)	9	3.9
Engaging civil society (E)	29	12.7
All of the above	80	34.9
A,B,C,E	34	14.8
A,C,D	32	14.3
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

Responses on administrative control measures in Ghana to prevent TB transmission among health care workers in Ghana showed that a small proportion 14% (n= 32) had their information correct. A high proportion of 86% (n=86) had divergent information which were incorrect.

#### 4.2.10 Who Uses Surgical Masks in TB Transmission Environment

Participants' knowledge on who uses surgical masks in an environment where TB transmission is a risk is depicted in Table 4.17.

**Table 4.17: Participants' Knowledge on Who uses Surgical Mask in TB Transmission Environment**

Participants (n=229)		
Who Uses Surgical Mask	Frequency	Percent
Doctors	16	7.0
Nurses	20	8.7
Coughing patient	27	11.8
Visitors	11	4.8
Administrators	27	11.8
All of the above	128	55.9
Total	229	100

Source: Field Data, 2012

Participants' knowledge on personnel who use surgical masks in TB transmission environment revealed that a small proportion 12% (n= 27) reported the right personnel. A high proportion 88% (n=202) cited inappropriate personnel. This fact attests that the majority of health workers sampled in this survey could not have done the right thing if they were asked to advise people on the use of masks.

#### 4.2.11 The Class of Respirator Acceptable for the Health Care Worker in a Smear – Positive Settings

Participants were also required to indicate the class of respirators that were acceptable for the health care workers working in settings with smear- positive patients and the information on this is presented in Table 4.18.

**Table 4.18: Class of Respirators for Participants in Smear Positive Setting**

<b>Participants (n=229)</b>		
<b>Respirator</b>	<b>Frequency</b>	<b>Percent</b>
FFP1	7	3.1
FFP2/N-95	198	86.5
FFP3	10	4.3
FFP4	14	6.1
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Fieldwork, 2012

A significant proportion of participants, 87% (n=198) demonstrated that they were knowledgeable about the class of respirators for health care workers in smear positive settings. The rest of the respondents 13% (n=31) did not know the appropriate respirator.

#### 4.2.12 Interventions Used by Health Facility Designs to Prevent TB Infection

Participants were required to indicate intervention health facilities design to prevent TB infection. This is presented in Table 4.19.

**Table 4.19: Interventions for Health Facilities Design to Prevent TB Infection**

Participants (n=229)		
Intervention	Frequency	Percent
The least costly way to improve ventilation	24	10.5
Providing as many rooms as possible to place patients	24	10.5
Improving ventilation, reducing overcrowding and providing patients and staff with a safe environment	174	75.9
Removing as many windows as to reduce cost	7	3.1
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Fieldwork, 2012

Approximately 76% (n=174) of participants had correct information about health facility designs to prevent TB infection in their hospital, whilst 24% (n= 55) had poor knowledge about TB facility design.

#### 4.2.13 Recommended Strategies to Address TB Transmission.

Some of the recommended strategies to address TB transmission in health care facilities as reported by participants are presented in Table 4.20.

**Table 4.20: Participants Recommended Strategies to Address TB Transmission in Health Care Facilities**

Participants (n=229)		
Recommended Strategies	Frequency	Percent
Improving natural ventilation (A)	12	5.2
Preventing overcrowding in waiting areas and hallways (B)	25	10.9
Having patients show proof of BCG vaccination (C)	17	7.5
All of the above	47	20.5
A and B only	128	55.9
Total	229	100

Source: Fieldwork, 2012

In search of the recommended strategies to address TB transmission in health care facilities, about half of the participants 56 % (n=128) recommended improving natural ventilation and preventing overcrowding in waiting areas and hall ways. The rest 44% (n=101) indicated other strategies which were not appropriate.

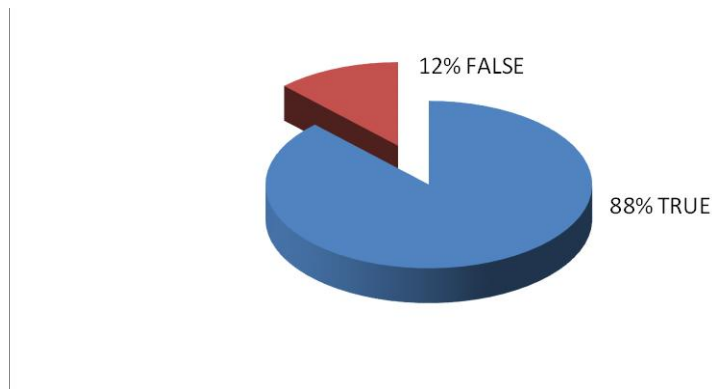
### Participants' Responses to 'True or False' Sentences

The survey further sought participants' knowledge about TB infection prevention and control measures, using 'true or false' responses to questions.

#### 4.2.14 Healthcare Workers' Opinion on TB as the Leading Cause of Death in People with HIV/AIDS

Participants were asked to indicate whether TB is the leading cause of death in people with HIV/AIDS and the results on this are depicted in Figure 4.2.

**Figure 4.2: Participants' Knowledge on TB as the Leading Cause of Death in People with HIV/AIDS**



Source: Field Data, 2012

Figure 4.2 shows that 88% of participants reported appropriately that TB is the leading cause of death in people with HIV/AIDS. However, 12% had their responses incorrect.

#### 4.2.15 Health Care Workers' Opinion on the fact that the Greatest Risk for TB Spread in a Health Care Setting is by Non Recognition and Treatment of Coughing Patients

Participants were asked to indicate whether it was true or false that the greatest risk for TB spread in health care setting is by coughing patients who have not been recognized as having TB and hence are not receiving treatment. Their responses are presented in Table 4.21.

**Table 4.21: Participants' Responses about the Greatest Risk for TB Spread in a Health Care Setting**

Participants (n=229)		
Response	Frequency	Percent
True	202	88.2
False	27	11.8
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data 2012

A significant proportion of 88% (n=202) had correct knowledge compared to those with incorrect knowledge who constituted 12% (n=27) of participants.

#### 4.2.16 Participants' Opinion about Their Control of TB Transmission

Participant's perception their ability to prevent TB transmission in clinics and hospitals was assessed and their responses are presented in Table 4.22.

**Table 4.22: Participants Perception of their Ability to Prevent TB**

<b>Participants (n=229)</b>		
<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
True	50	21.8
False	179	78.2
<b>Total</b>	<b>229</b>	<b>100</b>

Source Field Data 2012

Most participants disagreed with the assertion that health workers can do little to prevent TB transmission in hospitals and clinics. Those who disagreed constituted 78% (n= 179), whilst only 22% (n=50) agreed.

#### 4.2.17 Areas with Minimal Ventilation should be used for Sputum Collection

Participants were also assessed on their opinion on the claim that areas with minimal ventilation should be used for sputum collection because they safely contain the TB droplets.

Relevant information on this is presented in Table 4.23.

**Table: 4.23 Participants' Opinion on Use of Small Areas with Minimal Ventilation for Sputum Collection**

<b>Participants (n=229)</b>		
<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
True	75	32.8
False	154	67.2
<b>Total</b>	<b>229</b>	<b>100</b>

Source field work 2012

About 67% (n=154) correctly rejected the idea that small areas with minimal ventilation should be used for sputum collection because they safely contain TB droplets. Only 33% (n=75) accepted the idea as correct.

#### 4.2.18. The Value of the Infection Control Person

Participants were asked about the valuable contributions that the infection control person provides to his /her facility and patients. Questions concerning leadership, adherence to transmission prevention efforts and development of policies and procedures that result in minimizing or eliminating transmission of pathogens to patients and staff were highlighted. Their responses are shown in Table 4.24.

**Table 4.24. Participants' View on the Value of the Infection Control Person**

Participants (n=229)		
Response	Frequency	Percent
True	214	93.4
False	15	6.6
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

A significant proportion of participants, 93% (214) noted that the infection control person can provide leadership and other policies that minimize TB transmission. However, 7% (n=15) thought otherwise.

#### 4.2.19 Participants' Confirmation of Ministry of Health Recommendation of Screening of TB among People Living with HIV

Participants' awareness about the Ministry of Health's recommendation on screening of TB among people living with HIV at the time of enrolment and at each encounter thereafter was also measured and their responses are indicated in Table 4.25.

**Table 4.25: Participant's Confirmation of Ministry of Health Recommendation for TB Screening**

Participants (n=229)		
Response	Frequency	Percent
True	198	86.5
False	31	13.5
<b>Total</b>	<b>229</b>	<b>100</b>

Source field Data, 2012

Regarding the Ministry of Health's recommendation of TB screening, 87% of the sample (n= 198) admitted, whilst 14% (n= 31) did not.

#### 4.2.20 Managerial Control Measures for TB Infection

Participants' views on the assertion that managerial control measures for TB infection control included instituting screening of health care workers on TB was also assessed. Relevant information on this is indicated in Table 4.26.

**Table 4.26: Participants' Views on Managerial Control for TB Infection**

<b>Participants (n=229)</b>		
<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
True	176	76.9
False	53	23.1
<b>Total</b>	<b>229</b>	<b>100</b>

Source Field Data, 2012

Most participants admitted that one of the managerial control measures for TB control is by screening health care workers. Those who admitted this constituted 77% (n=176) of the sample. The rest, 23% (n=53) however, disagreed with this statement.

#### 4.3.0 PRACTICES OF PREVENTING TUBERCULOSIS INFECTION

This section looks at participants view on TB infection prevention and control through experience, professional education, in service training/short courses and mentor/preceptor relationships. The study sought to find out the extent to which participants value these types of preparation. Their responses are presented in Table 4:27.

**Table 4.27: Participants' View on Factors Influencing Practices of TB Infection Prevention and Control**

Factor	Participants (n=229)					
	Extremely Valuable	Very Valuable	Moderately Valuable	Somewhat Valuable	Not Valuable	Not Applicable
Experience	87	79	41	16	6	0
Professional Education	111	64	33	11	8	2
In-service training/short course	100	39	34	21	33	2
Mentorship	88	45	35	23	37	1
<b>Total</b>						

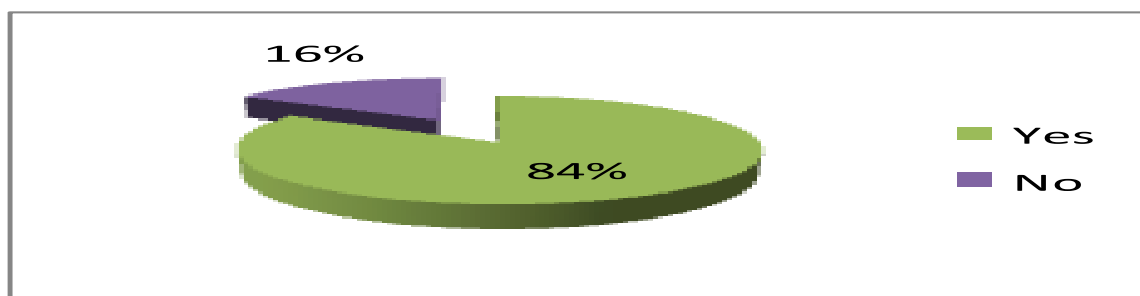
Source: Field Data, 2012

With reference to Table 4.27, a significant proportion of participants reported that professional education (111) and experiences (87) were extremely valuable followed by in-service training (100) and mentorship (88) respectively.

#### 4.3.1 Attendance at TB Infection Prevention Training during the Last 3 Years

Participants were asked to state whether they had attended any TB infection prevention and control training programmes in the past three years.

**Figure 4.3: Distribution for Training Attendance**



Source: Field Data, 2012

Participants' attendance at any TB infection prevention training programme in the past three years showed a significant proportion, 84% had attended such programmes; only 16% had not attended such programmes in the past three years.

#### 4.3.2 Usefulness of TB Infection Prevention and Control Training Programme

A sizeable number (211) of participants attended training programmes on TB infection prevention and control. They were required to indicate the usefulness of such programmes and findings showed that 62% (n=131) reported the programme they attended was extremely useful. Approximately less than half 38% (n=82) had divergent views that the programme was very, moderately, somewhat and not useful. It must, however, be noted that the above distribution is for only those who attended the training programme.

### **4.3.3 Comments on Strengths and Weaknesses of TB Infection Control Training Programmes**

The strengths and weaknesses of the TB infection control training programmes were also assessed; participants were therefore asked to mention the strengths and weaknesses of the programmes they had attended. The following are their views and opinions.

(a) Strengths of the training programmes attended:

- The training helped the health workers to know the need to encourage patients to complete their TB treatments.
- It has helped the health workers to be more informed as to how best they can protect themselves from being infected with TB.
- Health workers were able to learn new things e.g. giving treatments to clients at no cost, overlooking of defaulters.
- The programme has helped the health worker in managing TB patients, their families, as well as the environment.

(b) Weaknesses of the training programmes attended:

- The programme did not deal effectively with the issue of stigmatisation of TB.
- Lack of financial resources to organise a well publicised and resourced training programme, apparent lack of interest by hospital directors/superintendents and administrators in issues related to TB.
- The programme was time constrained

Participants' practice of TB infection prevention and control and factors that influence this was also assessed. Results on practices are presented in Table 4.30.

**Table 4.28: Level of TB Infection Prevention and Control Practices**

<b>Participants (n=229)</b>							
Variable	Min.	Max.	Mean	Std Dev.	df	T	Sig.
Practice	20	95	59.58	10.13			
<b>Total</b>					<b>228</b>	<b>88.958</b>	<b>.000</b>

Source: Field Data, 2012

Results in Table 4.28, revealed that participants' TB infection prevention and control practices were significantly good [ $t_{(228)} = 88.958, p = .000$ ]. This is because they recorded mean score of practice of 59.58 out a total maximum score of 95 on the various practices. Findings further showed that some demographic factors influence the practices. Relevant information on this is presented in Table 4.29.

**Table 4.29. Correlation between Demographic Variables and Practices on TB Infection Prevention and Control**

Participants (n=229)					
Variable	Sex.	Age	Tenure	Current Ward	Job title.
Practice	-.007	.109*	.029	-.118*	-.203*
Sex	-	.191*	.163*	.016	-.048
Age	-	-	.548*	-.026	-.157*
Tenure	-	-	-	-.040	-.123*
Current Ward	-	-	-	-	.125*
Job title	-	-	-	-	-

\*Significant at 0.05

Source: Field Data, 2012

Results in Table 4.29, revealed that sex had no significant influence on TB infection prevention and control practices [ $r_{(227)} = -.007$ ,  $p = .456$ ]. Thus male and female health workers exhibited similar practices regarding TB infection prevention and control. Age however, had a significant positive correlation with practice [ $r_{(227)} = .109$ ,  $p = .050$ ]. Thus older health workers were engaged in better practices towards TB infection prevention and control. Number of years of work did not correlate significantly with practice however, current ward of work and job title correlate significantly and negatively with practice.

#### 4.3.4 Practices of Prevention and Control of TB

Participants were asked to indicate how often the following statements applied to them and the outcome is presented in Table 4.30.

**Table 4.30 TB Prevention Practices**

<b>Participants (n=229)</b>				
<b>Statement</b>	<b>N</b>	<b>Mean</b>	<b>Std Error</b>	<b>Std Deviation</b>
I educate suspected TB patients to wash their hands	229	4.45	.04564	.69069
I practice hand hygiene anytime I come into contact with patients respiratory secretions	229	4.43	.04251	.64322
I use information, education and communication materials such as posters to educate and patients awareness on TB	229	4.43	.04295	.65001
I separate or fast track patients who are identified as TB suspects from other patients	229	4.42	.03912	.59203
I educate coughing patients to apply cough etiquette (cover mouth, nose with mask)	229	4.35	.05078	.76845
I wear N95/FFP2 mask when working in high risk TB areas	229	1.82	.03740	.56589
I offered surgical mask to TB suspects or cases when they were in the hospital	229	1.74	.05015	.75889
In the wards I separate or group suspected or confirmed TB patients from other patients	229	1.55	.06644	1.00537
In my workplace I have access to resources to prevent TB infection such as hand hygiene items, surgical mask and N95	229	1.49	.03589	.54306
<b>Total</b>				

Source: Field Data, 2012

Though practices of TB infection prevention and control were good, a few specific practices were not regularly used. Results in Table 4.30 revealed that wearing of N-95/FFP2 when working in high risk TB areas, offering surgical mask to TB patients, separating suspected or confirmed TB patients from other patients, and having access to resources to prevent TB infection were not part of the practices of the health workers on regular basis. However, the participants reported that they often undertook the following practices; educated suspected TB patients, practised hand hygiene, used information materials, separated TB patients from other patients and educated coughing patients. These assertions were reported with mean scores of 4.45, 4.43, 4.3, 4.42 and 4.35 respectively.

#### **4.3.5 Practices of TB Prevention and Control**

Participants were also required to indicate their agreement or disagreement with certain assertions regarding practices of TB infection prevention and control. Results on this are presented in Table 4.31.

**Table 4.31: Practices of TB Prevention**

<b>Participants (n=229)</b>				
Statement	n	Mean	Std Error	Std Deviation
Patients visual alerts such as posters advising patient to inform staff if they have respiratory systems	229	4.476	.04655	.70437
My knowledge of TB and how to prevent its transmission to staff and patients is adequate for my current level of practice	229	4.427	.04289	.64909
It is important to minimize the time TB suspects spend around other patients in the outpatient department	229	4.37	.04783	.72381
The windows in my facility are opened for maximum cross ventilation	229	4.21	.04879	.7321
Propelling fans example (ceiling fans) and air-conditioners are most often used in my facility than natural cross ventilation	229	3.00	.00875	.13245
Sputum microscopy is done in designated area rather than in the main laboratory	229	3.00	.01751	.26491
Ceiling fans are functioning cleaned and in good condition all the time	229	1.73	.03884	.58771
The reference materials supplied in my facility is adequate to maintain my competence with regards to the applications of TB infection control	229	1.62	.04542	.68730
In my workplace, the doors are opened daily for maximum cross ventilation	229	1.46	.04692	.71000
Patients with active TB are most often not admitted to the same ward with other patients	229	1.27	.03336	.50486

Source: Field Data, 2012

Mean score of 3 and above implied that participants agree it is a good practice and vice versa. The results in Table 4.29 indicate that, the following are the good practices adopted in the health facility; the use of patient visual alerts like posters, ensured that the health workers had adequate knowledge in TB prevention to staff and patient, minimizing the time that TB suspects spent with patients in the outpatient department and opening windows for maximum cross ventilation. This was reported with mean scores of 4.47, 4.42, 4.37 and 4.21 respectively. The respondents were neutral to the following practices; the use of fans and air conditioners instead of natural ventilation and doing sputum microscopy in a designated area rather than in the main laboratory. These were reported with a mean score of 3 for both of the practices. Also the following bad practices were reported; ceiling fans not being cleaned, the inadequate supply of reference material in the facilities with regards to the applications of TB infection control, doors not being regularly opened for maximum cross ventilation and lastly patients with active TB most often admitted to the same ward with other patients. These bad practices were reported with mean scores of 1.73, 1.62, 1.46 and 1.27.

The correlation between knowledge and practice of TB infection prevention and control was also assessed. The results on this are presented in Table 4.32

**Table 4.32: Correlation between Knowledge and Practice of TB Infection Prevention and Control**

<b>Participants (n=229)</b>					
<b>Variables</b>	<b>M</b>	<b>SD</b>	<b>df</b>	<b>r</b>	<b>Sig</b>
Knowledge	13.44	2.95			
Practice	59.58	10.13			
<b>Total</b>			<b>227</b>	<b>.147</b>	<b>.013</b>

Source: Field Data, 2012

Results in Table 4.32, revealed that a significant positive correlation exists between knowledge of TB infection prevention and control and practice of TB infection prevention and control [ $r_{(227)} = .147$ ,  $p = .013$ ]. This implies that participants with higher knowledge on TB infection prevention and control engaged in better practices of TB infection prevention and control.

#### 4.4 Challenges to the Implementation of TB Infection Prevention and Control Strategies.

This section looks at some of the challenges participants encounter in their implementation of TB infection prevention and control. These challenges are listed as follows:

**Table 4.33 Challenges Encountered by Participants**

<b>Participants (n=229)</b>		
<b>Challenges</b>	<b>Frequency</b>	<b>Percent</b>
Inadequate education / training programmes for health workers about TB infection, prevention and control.	45	19.5
Overcrowding at the OPD leading to improper ventilation	25	10.9
Lack of protective equipment. e.g., FFP2 or N-95 masks, gloves	55	24.0
No TB wards for infected patients, hence they mix up with other patients. This increases the rate of infection	35	15.3
Lack of supervision from the superiors to enable smooth running of the facility coupled with too much workload on staff	24	10.4
Lack of means of transport for follow up on TB patients receiving treatments	10	4.4
Stigmatisation from staff members of staff working on TB patients	11	4.8
Poor resourced lab for TB testing, apparent over centralisation of TB control programmes, human and material resource distribution, active staff not resourced to work	24	10.5
<b>Total</b>	<b>229</b>	<b>100</b>

Source: Field Data, 2012

The challenges encountered by participants in their practice of TB infection prevention and control in Table 4.33 shows that approximately 24% (n=50) reported about the inability of the hospital to provide protective equipment e.g. FFP2 or N-95 masks and gloves for health workers. More than half 78% (n=174) mentioned other challenges that confront them in the hospital.

#### **4.4.1 Participants' Suggestions to Mitigate Challenges in the Implementation of Tuberculosis Infection Prevention Control in the Hospital**

In the light of the prevailing challenges being faced by participants in the various areas at the Hospital, the following suggestions were made to address the problems:

- Separate wards to be provided for TB infected patients from other patients.
- In-service training for both old and new staff should be organized frequently to enable health workers to become more abreast with preventive strategies.
- Improve ventilation and reduce overcrowding and provide patients and staff with a safe environment.
- More protective equipment must be provided to health care workers

## CHAPTER FIVE

### DISCUSSION

#### 5.0 Introduction

This study was conducted to investigate the knowledge and practices of health care workers in the implementation of TB infection prevention and control in the Tema General Hospital. The study collected information on four main sections comprising the demographic characteristics of health care workers, knowledge of health workers concerning TB infection prevention control measures, practices for preventing tuberculosis infection and the challenges faced by these workers in their implementation of the prevention and control programme.

The chapter ends with the implication of the findings of the study to the Nursing profession and recommendations of the study. Data was obtained from two hundred and twenty nine (229) health workers who met the inclusion criteria and consented to participate in this study. The findings are discussed in relation to previous literature using the three specific objectives of the study which were to:

- Assess the knowledge of participants on tuberculosis infection prevention and control (IPC) in Tema General Hospital.
- Describe the practices employed by participants for the prevention of TB infection in Tema General Hospital.
- Identify challenges encountered by participants in implementation of the TB-IPC strategies in Tema General Hospital.

### **5.1 Demographic Information of Health Workers**

The study sampled more females 76.0% compared to males. This is to be expected and characteristics of nurses. Nurses form close to 65% of the overall population of most hospitals and about 90% of all nurses are females. This may have accounted for the higher proportion of nurses in this study. The highest age group sampled was those in the 38-43 age brackets accounting for 36.7%. This shows that participants in this study were relatively young.

On number of years of work, almost half 41.9% have worked for 10-13 years. The distribution of the various wards/and units of participants were reported in this study. They were distributed across various wards and units. However, the majority 27.1% had worked in the outpatients' department (O.P.D).

The current job titles of health care workers were also investigated in this study. The distributions indicated that an average proportion of professional nurses 56% were the highest sampled in the study. There were quite a few doctors 10% who could help in the implementation of the prevention and control of TB in this study. In spite of the fact that doctors do not have ample time to educate patients on certain aspects of prevention and control, they do so anytime they had the opportunity.

Synthesizing the demographic background of the participants, the researcher is of the view that the sample consisted of relatively young health workers who had worked for an appreciable number of years with the required experience to share regarding TB infection prevention and control. Furthermore, most of them were professionals and enrolled female

nurses working at the OPD which also showed that they had had the opportunity to have contact with most patients thereby enabling them to contribute immensely to the current study. The rich demographic background was also correlated with the major issues of the study (knowledge and practice) in order to determine whether they play a role or have an influence.

## **5.2 Knowledge about TB Infection and Control Measures**

This study investigated the knowledge level of respondents in relation to the prevention and control of TB. The knowledge of an individual has direct impact on his ability to practice what he knows. The domains used to investigate the knowledge of participants were administrative strategies, environmental strategies, use of personal protective equipment and general knowledge on TB. Findings revealed that general knowledge was fairly/moderately good since participants scored a mean score of 13.44 out of a maximum knowledge score of 20. The majority of the respondents in this study, 72% were somehow knowledgeable in TB infection control measures.

The moderate knowledge of TB infection prevention and control as a finding of the current study supports the findings of Qudeimat, Farrar and Owais (2006) at the Jordanian University Teaching Centre whose data revealed that nurses and health workers were knowledgeable about TB infection control. It also supports the findings of Aarti, et. al (2001) who in a study involving nurses in Super Specialty Teaching Institute in India, found that, the majority of nurses (73.1%) had adequate knowledge of TB infection control measures.

The consistency between the findings of the current study and that of Qudeimat, et.al (2006) and Aarti, et. al (2001) could be accounted for by a number of reasons. For instance, TB is one of the leading causes of death among HIV/AIDS patients and AIDS is a major problem for the world irrespective of country and continent. It is therefore logical that there is a similarity in the knowledge level of health workers in Jordan and Ghana on TB infection prevention and control.

The findings were however, divergent from the findings of Eastwood (2002) who observed that healthcare workers in Gambia have limited knowledge about signs and symptoms of TB. It also differs from the findings of Dimitrova, et. al (2006) who reported that general knowledge of TB infection prevention and control was low. The divergent findings demonstrate the need for additional investigation into healthcare workers' knowledge of not only signs and symptoms of TB but general knowledge of TB and its infection prevention and control. This is because though findings of the current study revealed that general knowledge was fairly good, 45% of the participants were not knowledgeable in the action used in administrative control measures in Ghana.

Some demographic variables of participants had significant influence on knowledge of TB infection prevention and control. Sex of the participants significantly influenced the knowledge of the health worker resulting in female workers demonstrating higher knowledge of TB infection prevention and control compared to their male counterparts. This observation is as a result of the fact that nurses are mostly responsible for health talks at the O.P.D and

are often seen giving health talks on prevention and control of most conditions. Therefore the high proportion of female nurses in this study may have contributed to the higher level of knowledge on TB prevention and control by the female nurses than their male counterparts.

Current ward/unit of work also correlated significantly with knowledge of TB infection prevention and control. Health workers working in OPD, Male and Female medical wards, Chest clinic, Fevers unit and Children's ward showed higher knowledge of TB as opposed to their counterparts in HIV/AIDS counseling unit, laboratory unit, X-ray unit, pharmacy unit and other units. Demonstration of more knowledge by nurses at the OPD than any other ward/unit may be due to the fact that often, the first point of contact of patients to health workers where most of the education programmes are held is at the OPD. Nurses at the O.P.D are required to impart knowledge on prevention and control measures each day before clinic starts. Nurses in the O.PD are therefore knowledgeable in most areas of prevention and control programmes. This is evident in the findings of the current study.

It was also observed that job title/category significantly influenced the knowledge on TB infection prevention and control. Medical doctors, professional and enrolled nurses and laboratory technologists demonstrated higher knowledge of TB than X-ray technologists, health assistants/aide, pharmacists and pharmacy technicians. This observation is in line with the findings of Dimitrova, et. al (2006) who found a significant knowledge difference by job category. Physicians scored significantly higher than nurses, laboratory staff and support staff. Nurses and laboratory staff on the other hand scored significantly higher than support

staff. This also supports the findings of Aarti, Swapna and Shakti (2001) that nurses with higher professional qualification were found to have more knowledge of infection control measures than those with lesser professional qualification.

Number of years of work correlated positively with knowledge of TB infection prevention and control however, this was not significant. This observation supports the findings of Aarti, et. al (2001) who found that the number of years as a nurse (i.e. experience) was not associated significantly with level of knowledge of infection control measures. Specifically, nurses with over 10 years' experience demonstrated low knowledge of infection control measures than newly recruited nurses.

The age of the health worker had no significant influence on knowledge though the correlation was positive (older workers demonstrating higher knowledge). Unlike the situation where one would have thought that the relatively young participants may have positively impacted on the general knowledge of participants since they are believed to have the passion to learn new ways of improving nursing practice compared to the older generation, the opposite was the case. Older participants demonstrated higher knowledge though the difference was not significant. This demonstrates the knowledge gap among younger healthcare workers despite their increasing exposure to TB patients in hospitals.

Finally, the findings also revealed that a significant positive correlation existed between knowledge of TB infection prevention and control and practice. The positive link between

knowledge and practice may be due to TB infection prevention and control policy which requires that every health facility nationwide adhere to certain practices. Health workers adopted the following as good practices in their health facility; the use of patient visual alerts like posters, ensuring that the health workers had adequate knowledge on TB prevention. Thus this signals that knowledge and practice are interrelated where those who know put into practice what they know.

### **5.3 Practice of Prevention and Control of TB infection**

Findings revealed that participants usually prepared themselves for TB infection prevention and control through experience, professional education, in service training/short course and mentor/preceptor relationships. The participants reported that professional education and experience were more valuable respectively. In-service training and mentor/ preceptor were rated as less valuable. In service training has been a source of rich knowledge in the past when it was done quite often; presently it is done once a year or once in two years. This might have impacted on its value as a source of preparation. Mentor/Preceptor was also considered the least valuable source of information. Mentorship is not well understood in most parts of the nation and as such most people do not mentor others. It is therefore not surprising most participants did not view it as a valuable source of preparation. On the other hand, experience could be a rich source of preparation and it was unusual for participants to have chosen professional education over it. This study's findings are in line with those of

Aarti, et. al (2001) who revealed the connection between qualification and experience of health workers and knowledge of infection control measures.

The findings showed that generally, participants engaged in appropriate practices geared towards TB infection prevention and control (mean practice score of 59.58 out of a maximum of 95). This was also evident in the participants' report on the frequency of certain preventive strategies in practice. They often undertook the following practices; educated suspected TB patients, practiced hand hygiene, used information materials, separated TB patients from other patients and educate coughing patients. The use of these practices, especially hand hygiene is in support with the recommendation by Centres for Disease Control and Prevention (CDC) and the World Health Organization (WHO), NGOs and other professional societies that proper hand washing is the single most important preventive measure. It also supports the findings of Qudeimat, Ferrá and Owais (2006) that all the nurses and health workers reported higher frequency of washing hands after removing gloves than wearing them.

Use of hand hygiene practices observed by this study contradicts findings of other researchers. For instance, it was argued that increasing workload of healthcare workers have been found to lead to non-compliance of hand hygiene practices. A South African study revealed that adherence to hand washing practices as part of control practices would improve compliance by 92% and hence significant reduction in infection rate among health professionals. Poor hand washing practices have also been caused by lack of decontamination

agents (Saloojee & Steehoff, 2000). In addition, in a study in Eritrea to find out compliance of infection control practices among healthcare workers, it was observed that, there was low compliance due to factors such as lack of adequate and conveniently located sinks, adequate hand towels, water, quality soap and hand lotions or lubricants for use after hand washing and lack of time.

In spite of the generally good TB infection prevention and control practices by participants, some equally good practices were not adhered to. Findings showed that wearing of N95/FFP2 mask by health workers, offering of surgical mask to TB suspects, separating TB suspects from other patients and access to TB prevention resources were rarely done which supports the observation by Qudeimat, et. al (2006) that only 30% of nurses said they routinely used the mask. Availability of logistics and facilities is one critical factor that can greatly influence the strict adherence to TB infection prevention and control by health workers. There is the need to investigate availability and adherence to TB infection prevention and control practices.

#### **5.4 Challenges faced by Participants in Preventing and Controlling TB**

In spite of the existence of fairly good knowledge of TB infection prevention and control of the majority of participants as well as good practices geared towards TB infection prevention control, there existed some challenges as the majority of participants approximately 22% (n=50) reported about the inability of the hospital to provide protective equipment such as

FFP2 or N-95 masks and gloves for health workers as a major challenge. The observation of these challenges supports the observation of Akyol (2007), Sofola and Savage (2003) who explained that, health workers are faced with various occupational risk as far as TB infection is concerned. Though there are standard procedures to follow to avoid being infected, a number of challenges ranging from lack of logistics, human resource and other work related factors have been cited. Non-adherence to control practices by health professionals has been attributed to non-availability of required resource materials such as masks, gloves, disinfectants amongst others. Thus, the need to ensure availability of TB control materials in order to manage TB patients is necessary.

Findings further revealed that more than half 78% (n=174) mentioned other challenges that confronted them in the hospital as they tried to adhere to TB infection prevention and control measures. These challenges included the lack of TB wards for infected patients; hence they mixed up with other patients. This increases the rate of infection, inadequate education / training programmes for health workers about TB infection, prevention and control, overcrowding at the OPD which makes for improper ventilation, lack of supervision from the superiors to enable smooth running of the facility couple with too much workload on staff, poorly resourced laboratory for TB testing, apparent over centralization of TB control programmes, human and material resource distribution, active staff not resourced to work, lack of means of transport for follow up on TB patients receiving treatments and stigmatization by staff members of staff working on TB patients. These challenges negatively affect the practices of TB infection prevention and control and consequently results in non-

adherence and compliance with TB infection prevention and control practices. This poses danger for both patients and health workers as argued by Girou, Chai and Brun-Buisson (2004), that non-adherence will lead to infection spread as there is high risk of microbial transmission.

In order to avert any danger of infection spread as a result of the above challenges, participants made various suggestions. These included the need for the provision of separate wards for TB infected patients from other patients, organization of in-service training for both old and new staff frequently to enable health workers to become more abreast with preventive strategies, improvement of ventilation and reduction of overcrowding and providing patients and staff with a safe environment and provision of more protective equipment for health care workers.

## CHAPTER SIX

### SUMMARY AND CONCLUSION

#### 6.1. Summary

This chapter outlines the summary and conclusion, implications of findings and suggestions and recommendations of the research. The study was on the assessment of tuberculosis infection prevention and control practices among health care workers in Tema General Hospital.

Findings of this study pointed out that knowledge about TB infection prevention and control is fairly/moderately good. Demographic variables such as sex, current ward of work and job title had a significant influence on participants' knowledge of TB infection prevention and control. Age of participants and number of years of work did not have any significant influence on participants' knowledge. Findings further showed that participants engaged in appropriate practices of TB infection prevention and control. Practices were significantly influenced by participants' age, current ward of work and job title but not sex and number of years of work. Professional education, experience, in-service training/short course and mentorship played valuable roles in the preparedness for TB infection prevention and control. Though knowledge and practices of TB infection prevention and control were fairly good, they were not without challenges such as overcrowding at the OPD leading to improper ventilation, no TB wards for infected patients, lack of protective equipment (FFP2 or N-95 masks, gloves) among others. Suggestions were made by participants geared towards

addressing some of these challenges. These findings have certain implications which are considered below.

## **6.2 Implications for nursing**

Implications of the findings for nursing derived from this study are reported in four main areas of nursing: management, research, education and practice.

### **6.2.1 Nursing management**

Challenges enumerated by participants in this study such as overcrowding at the OPD which leads to improper ventilation, no TB wards for infected patients, lack of protective equipment (FFP2 or N-95 masks, gloves) imply that much cannot be achieved in the implementation of TB infection prevention and control unless Nursing administrators and managers develop and implement policies directed towards addressing these challenges. Further, participants considered in-service training as valuable in the preparation towards TB infection prevention and control. Short courses relevant to the subject area must be organized regularly to ensure that best practice is ensured. Supervision of nurses in this area must be done to ensure strict adherence to policies.

### **6.2.2 Nursing Research**

The current research points out that though knowledge was fairly good, more needs to be done in unearthing health workers knowledge of TB infection prevention and control. The

use of observational method which would ensure researchers observing practices rather than the use of questionnaire is paramount. Nurses must be encouraged to pursue research areas pertaining to TB prevention and control to enhance and enrich the existing literature based upon which policies would be formulated and implemented in order to improve TB infection prevention and control. There is the need for more research in this area to throw more light on health workers knowledge of TB infection prevention and control in the whole country.

### **6.2.3 Nursing Education**

Professional education was considered the most valuable factor in the preparation for TB infection prevention and control. This is an indirect call for the inclusion of this in the curriculum of nursing training especially professional nursing training. This will ensure that professional nurses are well equipped in this area. Further, knowledge of TB infection prevention and control was fairly good which also imply that more education and training is needed.

### **6.2.4 Nursing Practice**

Literature reveals that the rate of nosocomial infections has been a challenge for infection control programmes in many countries. Challenges encountered and mentioned by participants especially regarding lack of protective equipment (FFP2 or N-95 masks, gloves) is a pointer to the possibility of high rate of nosocomial infections. Health workers must be monitored, supervised and encouraged to work professionally so as to prevent this.

### 6.3 Suggestions and Recommendations

- Regular and frequent in-service training and short courses must be organized to equip and improve the knowledge of health workers on TB infection prevention and control.
- Provision of adequate logistics to ensure smooth working environment for the health workers is recommended.
- Health workers directly linked to TB prevention and control must be trained in educating and helping patients to adhere to the protocols.
- There is the need for the expansion of health facilities in order to ensure separation of suspected and infected TB patients from other patients to reduce the rate of inaction.
- Research needs to be conducted on adherence and compliance to TB infection prevention and control in all health facilities in the country.

## References

- Aarti, V., Swapna, N.W. & Sharti, G. (2001). Knowledge and practices of nursing staff towards infection control measures in tertiary care hospital. *American Journal of infection control*, 13(2), 2001-12.
- Auer, C., Sarol, J., Tanner, M., & Weiss, M. (2000). *Health seeking and perceived causes of tuberculosis among patients in Manila, Phillipines*. *Tropical Medicine and International Health*, 5648-656.
- Biscotto, C.R, Pedroso ER, Starling CE, Roth VR (2005). Evaluation of N95 respirator use as a tuberculosis control measure in a resource-limited setting. *Into J Tuber Lung Dis*. 2005; 9:545–9.
- British Columbia Centre for Disease Control [BCCD]. (2004). *Guidelines for infection prevention and control in the physician's office*. Retrieved November 20, 2007, from control in practice office.
- Boyce, J.M., Pettlet, D. (2004). Guidelines for hand hygiene in health care settings: recommendations of the health care infection control practices advisory, philadephi
- Burke, J.P. (2003). Infection Control - A Problem for Patient Safety. *N Engl J Med*. 348(7):651-656
- Burns, S.N & Grove S.K. (2005). *The practice of nursing research: conduct critique and utilization* (5<sup>th</sup> edition), Texas: Lippincott.
- Campelo, A.R., Demlo. H.R. (2004) .Rapid alternative methods for detection of rifampicin resistance in mycobacterium tuberculosis. *Journal of antimicrobial chemotherapy*, 3: 89-94.
- Chadha, V.K., Kumar, P., & Jagannatha, P.S. (2005). Average annual risk of tuberculosis infection in India. *International Journal of Tuberculosis Lung Disease* 9: 116–118.
- Centers for Disease Control and Prevention. (1985) *Immunization of health-care workers: recommendations of the Advisory Committee on Immunization Practices (ACIP) and the Hospital Infection Control Practice Advisory Committee (HICPAC)*. MMWR. 46(RR18):1-42.

- Conner, M. & Sparks, P. (1995) *The Theory of Planned Behaviour and Health Behaviours*, in Predicting Health Behaviour (Conner, M. & Norman, P. eds.). Buckingham: Open University Press.
- Dagmar, S., Frederick, M., & Shaheen, M. (2011). Tuberculosis infection prevention and control experiences of South African nurses – a phenomenological study. *Biomedical Centre Public Health*, 11:262, 1471-2458.
- Danchaivijitre, S., Supchutikul, A., Waitayapiches, S., & Kachintorn, K. (2005). Quality of nosocomial infection control in Thailand. Thailand: *Journal of Medical Association of Thailand*, 88(Sup, 10), 145-149.
- Department of Health (2006). The Health Act 2006: Code of practice for the prevention and control of health care associated infections. London: Department of Health. Retrieved March, 10, 2008.
- Dimitrova, B., Balabanova, D., Atun, R., Drobniewski, F., Levicheva, V., & Coker, R. (2006). Health Services providers' perceptions of barriers to Tuberculosis care in Russia. *Health Policy and Planning*, 21 (4): 265-74.
- Drobniewski, F., Balabanova, Y., Nikolayevsky, V., Ruddy, M., Kuznetsov, S., Zakharova, S, et al. (2006) .Drug-resistant tuberculosis, clinical virulence, and the dominance of the Beijing strain family in Russia. *JAMA*. 2005;293:2726–31.
- Eastwood, S. (2002). A gender-focused qualitative study of barriers to accessing tuberculosis treatment in the Gambia, West Africa: Medical Research Council, the Gambia.
- Federal Ministry of Health of Ethiopia (2006). *HIV/AIDS Prevention and Control Office: AIDS in Ethiopia*. Sixth report. Addis Ababa. Ethiopia: MOH: 1-52.
- Ghandhi. N.R., Moll, A., Sturn, A.W., Pawinski, R., Govender, T., Lallou, U., Zeller, K., Andrews, J. & Friedland, G. (2006). Extensively drug resistant tuberculosis as a cause of death in patients co-infected with tuberculosis and HIV in rural area of South Africa.
- Girou, E., Chai, S.H., Oppein, F., Legrand, P., Ducellier D. Cizeau, F. & Brun-Buisson, (2004). Misuse of gloves: The foundation for poor compliance with hand hygiene and potential for microbial transmission. *Journal of Hospital Infection*, 57(2), 162-9.

- Gopinath, K.G., Siddique, S., Kirubakaran, H., Shanmugam, A., & Mathai, E. (2004). Tuberculosis among healthcare workers in a tertiary-care hospital in South India. *Journal of Hospital Infection*, 57: 339–342.
- Haviland, C., Kelly, W., & Steed, C. (2005). Monitoring of compliance with infection control practices at a 710 bed tertiary facility. *American Journal of Infection Control*, 33(5): 42-43.
- Harries, A. & Dye, C. (2006): Tuberculosis. *Annals of Tropical Medicine and Parasitology* 100(5):415-431.
- Harries, A.D., Hargreaves, N.J., Gausi, F., Kwanjana, J.H., & Salaniponi, F.M. (2002). Preventing tuberculosis among health workers in Malawi. *Bull World Health Organ* 80: 526–531.
- Harries, A.D., Nyirenda, T.E., Banerjee, A., Boeree, M.J., & Salaniponi, F.M. (1999). Tuberculosis in health care workers in Malawi. *Trans R Soc Trop Med Hyg* 93: 32–35.
- Harries, A., Maher, D. & Graham, S. (2004), TB/HIV: A *Clinical Manual*. 2<sup>nd</sup> edition. WHO/HTM/ TB/2004.329. Geneva. Switzerland. WHO 2004:1-210.
- Israel, G.D. (2006). *Determining sample size*. Retrieved November 5, 2007 from <http://edis.ifas.ufl.edu/PD006>.
- Jackson, M., Harriby, S., Hoffman, H. & Cantanzaro, A. (2005). A survey of health professionals' students for knowledge attitudes and confidence about tuberculosis. *BMC Public Health* 7:219doi:10. 1186.
- Jelip, J., Mathew, G.G., & Yusin, Y. (2004). Risk factors of tuberculosis among health care workers in Sabah, Malaysia. *Tuberculosis (Edinb)* 84: 19–23.
- Ji, G., Yin, H., & Chen, Y. (2005). Prevalence of and risk factors for non-compliance with glove utilization and hand hygiene among obstetrics and gynecology workers in rural China. *Journal of Hospital Infection*. 55(3): 241-253.
- Joshi, R., Reingold, A.L., Menzies, D. & Pai, M. (2006) .*Tuberculosis among health-care workers in low- and middle-income countries: a systematic review*. PLoS Med 3: e494.

- Joint Commission on Accreditation of Healthcare Organizations. (2007). *Hospital/critical access hospital national patient safety goals*.
- Kristi, F.J., Howard, W., Susan, B.E., & Bradly, N. (2004). Critical incidents of non-adherence with standard precautions guidelines among community hospital-based health care workers. *Journal of General Internal Medicine*, 19(7): 726-731.
- Korle-Bu Teaching Hospital, Public Health Unit Survey Report, (2012). 'A survey of health workers' in Korle-Bu Teaching Hospital on Tuberculosis disease'. Unpublished data
- Lau, Y.L., Thomas, L., Samuel, Y., Brain, J., Klo, K., Lim, W .L. L., Tam, C. M., Patrick, L. I., Tse, H. Y., Lin, C. K., & Chan, K. B. (2002). *Recommendations on the treatment of latent TB infections in HIV positive persons in Hong Kong*.
- Liberato, I.R., de Albuquerque Mde, F., Campelo, A.R. & de Melo, H.R. (2004). Characteristics of pulmonary tuberculosis in HIV seropositive and seronegative patients in a
- Liefooghe, R., Michiels, N., Habib, S., Moran, M., & De Muynck, A. (1995). Perception and Social consequences of Tuberculosis: A focus group study of Tuberculosis patients in Sialkot, Pakistan. *Social Science Medicine*, 41(12) 1685-1692.
- Lonroth, K., & Raviglione, M. (2008). Global epidemiology of tuberculosis: prospects for control. *Seminal Respiratory Critical Care Medicine* 29: 481.
- Lopez, L.K.O., Teles, S.A., Souza, A.C.S., Rabahi, M.F. & Tiptle, A.F.U. (2008) Tuberculosis risk among Nursing Professional from Central Brazil. *American Journal of Infection Control*, 36 (2), 148-151.
- Luksamijarulkul, P., Supapvanit, C., Loosereewanich, P., & Aiumlaor, P. (2004). Risk assessment towards tuberculosis among hospital personnel: Administrative control, risk exposure, use of protective barriers and microbial air quality. *Southeast Asian Journal of Tropical Medicine Public Health*, 35: 1005–1011.
- Maher, D., Harries, A., & Getahun, H. (2005). Tuberculosis and HIV interaction in sub-Saharan Africa: impact on patients and programmes; implications for policies. *Tropical Medicine and International Health*, 10:734-742.
- Menzies, D., Joshi, R., & Pai, M. (2007). Risk of tuberculosis infection and disease associated with health care settings. *Int JTuberc Lung Dis*, 11:593-605.

- Messemer, P., Jones, S., Moore, J., Taggart, B., Parchmont, Y., Holloman, F., & Quintero, L. (1998). Knowledge, perceptions and practices of nurses towards HIV/AIDS patients diagnosed with TB. *Journal of Continuing Nursing Education*, 29 (3) 117-25.
- Ministry of Health (2006). *National Tuberculosis Programme Annual report* Ghana Health Service
- Ministry of Health of Ghana (2010). Standard Operating procedure for TB and Airborne infection prevention and control in Ghana.
- Ministry of Health of Ethiopia (2004). Tuberculosis and Leprosy Prevention and Control Programme Manual. 2nd edition. Addis Ababa. Ethiopia: MOH
- Mishra, P., Holme-Hansen, E., Sabroe, S., & Kafle, K. (2006). Adherence is associated with the quality of professional - patient interaction in DOTS. *Patient Education and Counselling*, 63(1-2): 29-37.
- Morbidity and Mortality weekly report (1994). Guidelines for preventing the transmission of Mycobacterium tuberculosis in health care facilities, 43:361-366
- Moro, M., Desi, D., Lelli, B., Nicoli, A., Cajilotti, C., & Falcone, F. (2005). Barriers to effective Tuberculosis control: A qualitative study. *International Journal of Tuberculosis and Lung disease*, 9 (12) 1355-60.
- Municipal health directory (2011). *Annual Report on Tuberculosis*.
- Murray, J.F. (1995). "International Union against Tuberculosis and Lung & WHO: Its contribution to world lung health". *American Journal of Respiratory and Critical Care Medicine*. Vol. 151, No. 6, pp. 1697-9.
- National Tuberculosis Control Programme Annual Report, (2011). *Annual Report on Tuberculosis*. Unpublished data
- Nunn P., Williams B., Floyd K., Dye C., Elzinga G., Raviglione M. (2005). Tuberculosis control in the era of HIV. Stop TB Department, World Health Organization, Via Appia 27, CH-1211, Geneva 12, Switzerland. *Nat Rev* 2005 Oct; 5 (10):819-26

- Pai, M., Gokhale, K., & Joshi, R. (2005). Mycobacterium tuberculosis infection in health care workers in rural India—Comparison of a whole-blood interferon gamma assay with tuberculin skin testing. *JAMA*, 293: 2746–2750.
- Polit, D.F. & Hungler, B.P. (2003). *Nursing Research, Principles and Methods, Appraisal and Utilization* (7<sup>th</sup> ed.) Philadelphia, Lippincott.
- Prasad, R., Nautiyal, R.G., Mukherji, P.K., Jain, A., Singh, K. & Ahuja, R.C. (2003) . Diagnostic evaluation of pulmonary tuberculosis: what do doctors of modern medicine do in India? *Int J Tuberc Lung Dis.*;7:52–7.
- Rangan, S. (2003).The public-private mix in India’s Revised National Tuberculosis Control Programme—an update. *J Indian Med Assoc.*; 101:161–3.
- Rao, K.G., Aggarwal, A.N., & Behera, D. (2004). Tuberculosis among physicians in training. *International Journal of Tuberculosis and Lung Disease*, 8(11):1392–1394.
- Rigbe, S., Almedom, A.M., Hagos, G., Albin, S. & Mutungi, A. (2005). Promotion of handwashing as a measure of quality of care and prevention of hospital-acquired Infections in Eritrea. The Keren study. *African Health Science*, vol. 5(1): 45-49.
- Roth, V.R., Garrett, D.O., & Laserson, K.F. (2005). A multicenter evaluation of tuberculin skin test positivity and conversion among health care workers in Brazilian hospitals. *International Journal of Tuberculosis Lung Disease* 9: 1335–1342.
- Quansah, M.G., Larson, E., & Cronin, W.A. (1993). Obstetric infection Control developing country. *Journal of Obstetric, Gynaecologic and Neonatal Nursing*, 22(2),137-144.
- Sandiso, P. (2011). “*In every third taxi, someone has TB*”. West Cape News Agency, Cape Town. South Africa.
- Saloojee, H & Steenhoff, A. (2000). The health professional’s role in preventing nosocomia infections. *Postgrad Medicine Journal*, 77:16-19.
- Sepkowitz, K.A. (1994). Tuberculosis and the health care worker: a historical perspective. *Ann Intern Med.*, 120:71–9.
- Schablon, A., Beckmann, G., Harling, M., Diel, R., & Nienhaus, A. (2009). Prevalence of latent tuberculosis infection among health care workers in a hospital for pulmonary diseases. *Journal of Occupational Medicine and Toxicology*, 4(1): 1745-6673.

- Sehulster, L. & Chinn, R.Y. (2003). *Guidelines for environmental infection control in health-care facilities*. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC) MMWR. Jun 6; 52(RR10):1-42.
- Siegel, J.D., Rinehart, E., Jacson, M., Chiarello, L., & HISPAC. (2007). *Guidelines for Isolation Precautions: Prevention Transmission of Infections agents in Health Care Settings*. Atlanta: CDC.
- Singh, A.A., Frieden, T.R., Khatri, G.R. & Garg, R. (2004). A survey of tuberculosis hospitals in India. *Int J Tuberc Lung Dis*, 8:1255–9.
- Sofola, D.F. & Savage, T.E. (2003). A review of nosocomial infections of Nigerian health Workers: problems and strategies for improvement. *Journal of Nigerian Infection Control Association*, 1(1), 14-20
- Stein, A.D., Makarawo, T.P. & Ahmad, M.F. (2003). A survey of doctors' and nurses' knowledge, attitudes and compliance with infection control guidelines in Birmingham teaching hospitals. *Journal of Hospital Infection*, 54(1): 68-73.
- Teixeira, E.G., Menzies D. & Comstock, G.W. (2005) "Latent tuberculosis infection among undergraduate medical students in Rio de Janeiro State, Brazil. *International Journal of Tuberculosis Lung Disease*" 9: 841–847.
- Varia, M., Wilson, S., Sarwal, S., McGeer, A., Gournis, E., Galanis, E., et al. (2005). Investigation of a nosocomial outbreak of severe acute respiratory Syndrome (SARS) in Toronto, Canada. *CMAJ*; 169:285-91.
- Watkins, R., Rouse, C., & Plant, A. (2004). Tuberculosis treatment in Bali: A Qualitative study of clinic staff perceptions. *International Journal of Tuberculosis and Lung Disease*, 8(2) 218.
- Wendt, C., Knautz, D. & von Baum, H. (2004). Differences in hand hygiene behavior related to the contamination risk of healthcare activities in different groups of healthcare workers. *Infection Control Hospital Epidemiol*, 25(30), 203-6.
- Wenger, at al . (1995). *Tuberculosis in the workplace: Committee on Regulating Occupational Exposure to Tuberculosis*. Division of Health Promotion and Disease Prevention Institute of Medicine National Academ Press

- Weinstein, R. (2004). *Hospital-acquired infections*. In: Kasper DL, Braunwald E, Fauci AS, Hauser SL, Longo DL, Jameson JL, Isselbacher KJ, eds. *Harrison's Principles of Internal Medicine*. 16th ed. New York: McGraw Hill;
- World Health Organization (2010). *Global Tuberculosis Control*. WHO/HTM/TB/2010. 7 Geneva.
- World Health Organization (2009). *Global TB Control Report*, Geneva.
- World Health Organization (2009). Policy on TB infection control in health-care facilities, congregate settings and households. Geneva: World Health Organization.
- World Health Organization. (2008). *Global tuberculosis control*. WHO/HTM/TB/2008.393. Geneva: World Health Organization.
- World Health Organization, (2008). *WHO Policy on Tuberculosis Infection Control in health – care facilities, congregates settings and households*. Geneva; World Health Organization.
- World Health Organization Report, (2006): *Global Tuberculosis Control, Surveillance Planning & Financing*. Geneva 2006 (WHO/ HTM/ TB/ 2006. 362)
- World Health Organization Report, (2003). *Annual Report on Tuberculosis*. Geneva: W.H.O
- World Health Organization (2002). *Prevention of Hospital-Acquired Infections*. A Practical Guide, 2nd ed. Geneva: WHO Press;
- World Health Organization (2005). Global tuberculosis control. Surveillance, planning, financing. WHO Report 2005. Geneva:
- Worrall, J.L. (2000). In defence of the “quantoids”: More on the reasons for the quantitative emphasis in criminal justice education and research. *Journal of Criminal Justice Education*, 11 (2), 353-360.58
- Yanai H., Limpakarnjanarat K., Uthairavit W., Mastro, T.D. & Mori, T. (2003). “Risk of Mycobacterium tuberculosis infection and disease among health care workers, Chiang Rai, Thailand. *International Journal of Tuberculosis Lung Disease*”, 7: 36–45.

## QUESTIONNAIRE

Dear participants,

This study aims at assessing pulmonary tuberculosis (TB) infection prevention and control measures that health care workers employ to reduce TB transmission to them and others. The questions will require approximately 30-40 minutes completing. The findings of this research will contribute to improving the measures that health workers will employ to minimize the spread of TB in health care settings.

Thank you.

### **SECTION A: DEMOGRAPHIC INFORMATION**

Please kindly provide answers to the under listed questions. Respond to the items by **ticking (√)** or **writing** in the spaces provided.

1. **Sex** (a) male ( ) (b) Female ( )
  
2. **Age bracket:**  
(a) 20 – 25 years ( ) (b) 26 – 31 years ( ) (c) 32 – 37 years ( ) (d) 38 – 43 years ( )  
(e) 44 – 49 years ( ) (f) 50 years and above ( )
  
3. **How long have you been working in the Tema General Hospital**  
(a) 6 months – 1 year ( ) (b) 2 years – 5 years ( ) (c) 6 years – 9 years ( )  
(d) 10 years – 13 years ( ) (e) 14 years and above ( )
  
4. **Current ward/unit of work: please indicate the ward/unit you work**  
(a) Outpatient Department ( ) (b) Male Medical Ward ( ) (c) Chest Clinic ( )  
(d) Fevers Unit ( ) (e) Children's Ward ( ) (f) HIV/AIDS counseling unit ( )  
(g) Laboratory unit ( ) (h) X-ray unit ( ) (i) Pharmacy unit ( )  
(j) Others (please specify).....

**5. Job Title**

- (a) Medical doctor ( )      (b) Professional nurse ( )      (c) Enrolled nurse ( )  
(d) Laboratory Technologist ( )      (e) X-ray technologist ( )  
(f) Health assistant / Health Aide ( ) (g) Pharmacy technician ( ) (h) Pharmacist ( )

**SECTION B: KNOWLEDGE ABOUT TB INFECTION PREVENTION AND CONTROL MEASURES**

Please specify your knowledge about tuberculosis infection control. Each question requires one answer. Please answer by **ticking** (√) appropriate response.

1. Which of the following best describes how TB is spread?
  - (a) If uninfected person comes into contact with the blood of a person containing the TB bacilli.
  - (b) When TB bacilli droplets become suspended in the air and someone breaths in the TB bacilli.
  - (c) A person infected with TB can spread the bacteria through physical contact.
  - (d) When an infected person prepares food and introduces the TB germs into the food.
  
2. Hospital staff should implement which of the following administrative control measures for TB infection prevention and control? Tick as many as applicable.
  - (a) Prompt identification and separation of coughing patients from others.
  - (b) Promoting cough etiquette
  - (c) "fast tracking" patients suspected of TB infection for prompt diagnosis and treatment
  - (d) All the above
  - (e) A and B only
  
3. The examination or treatment room for patients whom you suspect may have TB should have all of the following excepts:
  - (a) Air exhaust directly to the outside
  - (b) Ventilation solely by air condition
  - (c) The placement of the patients nearest the window or fan exhausting the air.
  - (d) Adequate ventilation
  
4. An easy and low-cost way to reduce the number of infectious TB droplets in the air is to:
  - (a) Use natural ventilation by opening windows and doors and maximizing cross-ventilation
  - (b) Provide respirators or N95 masks to all staff
  - (c) Install a mechanical ventilation system
  - (d) Wash hands with soap and water before and after every patient contact

5. Cough etiquette:
  - (a) Is when someone says "excuse me" after coughing in public
  - (b) Should be required of all patients, but not necessary for healthcare workers
  - (c) Include covering your coughs and sneezes with handkerchief, tissue, or upper arm
  - (d) All of the above
  
6. If particulate respirators (also known as N-95 or FFP2 masks) are available in your hospital, they should be:
  - (a) Used for all TB patients or persons suspected of TB in the hospital
  - (b) Worn by staff when conducting a bronchoscopy procedure or other high risk procedure for a patient with TB, MDR TB, or XDR TB.
  - (c) Required for all staff when they are infected with any infectious disease to prevent transmission to patients.
  - (d) Worn by patient when sitting outside to prevent TB droplet from spreading throughout the town.
  
7. Persons who have a high risk of TB exposure and infection include: Tick as many as applicable.
  - (a) Those that live in crowded, poorly ventilated setting where TB is common
  - (b) Persons who are immunocompromised, such as HIV/AIDS patients
  - (c) Those with medical conditions such as renal failure, cancer, or diabetes
  - (d) All of the above
  
8. What is the most effective intervention for TB control?
  - (a) BCG re-vaccination
  - (b) Chemoprophylaxis
  - (c) Early detection of TB patients
  - (d) Appropriate treatment of TB patients
  - (e) Both C and D
  
9. Administrative control measures in Ghana prevents TB transmission by the following actions:
  - (a) Promptly identifying infectious cases
  - (b) Mandatory quarantine of suspected cases
  - (c) Separation of coughers
  - (d) Setting up quick turnaround times at health care settings for TB cases
  - (e) Engaging civil society
  - (f) All of the above

(g) A, B, C, E

(h) A, C, D

10. In an environment where TB transmission is a risk, surgical mask should be used by:
- (a) Doctors
  - (b) Nurses
  - (c) Coughing patients
  - (d) Visitors
  - (e) Administrators
  - (f) All the above
11. What class of respirator is acceptable for the Health Care Workers (HCW) working in a setting with smear-positive patients?
- (a) FFP1
  - (b) FFP2 or N-95
  - (c) FFP3
  - (d) FFP4
12. What are some of the recommended strategies to address TB transmission in healthcare facilities?
- (a) Improving natural ventilation
  - (b) Preventing overcrowding in waiting areas and hallways
  - (c) Having patients show proof of BCG vaccination
  - (d) All of the above
  - (e) A and B only
13. Good health facility designs to prevent TB infection uses intervention that are directed toward:
- (a) The least costly way to improve ventilation
  - (b) Providing as many rooms as possible to place patients
  - (c) Improving ventilation, reducing overcrowding and providing patients and staff with a safe environment
  - (d) Removing as many windows as possible to reduce cost

**Please indicate by ticking (✓) whether the following sentences are true/ false.**

14. TB is the leading cause of death in people with HIV/AIDS.
- (a) True
  - (b) False

15. In healthcare setting, the greatest risk for TB spread is by coughing patients who have not been recognized as having TB and are not receiving treatment.
- (a) True
  - (b) false
16. TB is such an infectious disease that health workers can do little to prevent transmission of TB in clinics and hospitals
- (a) True
  - (b) False
17. Small area with minimal ventilation should be used for sputum collection because they safely contain the TB droplets
- (a) True
  - (b) False
18. The value that the infection control person provides to his/her facility and patients are to provide leadership, adherence to transmission prevention efforts and to develop policies and procedures that result in minimizing or eliminating transmission of pathogens to patients and staff.
- (a) True
  - (b) False
19. Ministry of Health recommends screening of TB among people living with HIV at the time of enrollment and at each encounter thereafter
- (a) True
  - (b) False
20. Managerial control measures for TB infection control include instituting screening of health care workers on TB.
- (a) True
  - (b) False

### SECTION C: PRACTICES FOR PREVENTING TUBERCULOSIS INFECTION

This section gathers information relating specifically to your practice with regards to tuberculosis infection prevention and control (including training you have received, administrative and environmental controls as well as personal protective equipment)

**C.1** Please indicate by **ticking (✓)** from options below how valuable the following have been to your preparation for TB infection prevention and control.

ITEM	EXTREMELY VALUABLE	VERY VALUABLE	MODERATELY VALUABLE	SOMEWHAT VALUABLE	NOT VALUABLE	N/A.
(a) Experience						
(b) professional Education						
(c) In-service training or short course						
(d) Mentor/preceptor						

**C.2 a** Have you attended tuberculosis infection prevention training programme for the past 3 years.

Yes

No

**C2.b** If yes, please indicate its usefulness

.....

Training Programme and Provider	Extremely useful	Very useful	Moderately useful	Somewhat useful	Not useful	N/A.

**C.3** If you have ever been given training on TB infection control please comment on the strength and weaknesses of the tuberculosis infection prevention and control training programme.

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**C.4** Please indicate **how often** the following statements apply to you. Please tick (✓) one response in the table provided below.

Statement	Always	Sometimes	Rarely	Never	N/A
(a) I use information, education and communication (IEC) materials such as posters to educate and increase patients awareness on TB					
(b) I educate coughing patients to apply cough etiquette (cover mouth, nose with mask, tissue, handkerchief or coughing into arms)					
(c) I separate or "fast track" patients who are identified as TB suspects from other patients in waiting areas.					
(d) In the wards I separate or group suspected or confirmed TB patients from other patients					
(e) I educate suspected TB patients to wash their hands anytime they produce respiratory secretions.					
(f) I wear N95/FFP2 mask when working in high risk TB areas example( direct observed therapy short course (DOTS) room, TB microscopy room, TB wards)					
(g) I offered surgical mask to TB suspects or cases when they are in the hospital.					
(h) I practice hand hygiene anytime I come into contact with patients with respiratory secretions or carry out other procedures.					
(i) In my workplace I have access to resources to prevent TB infection such as hand hygiene items, surgical mask and N95.					

**C.5** Please indicate the extent to which you **agree or disagree** with the following statements below. Tick (✓) your responses in the table below. One response for each item is appropriate.

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(a) My knowledge of TB and how to prevent its transmission to staff and patients is adequate for my current level of practice.					
(b) Patients visual alerts example Posters advising patient to inform staff if they have respiratory symptoms are available at all vantage points in my facility					
(c) It is important to minimize the time TB suspects spend around other patients in the outpatient department or anti-retroviral(ART) therapy clinic waiting areas					
(d) The reference materials supplied in my facility is adequate to maintain my competence with regards to the applications of TB infection control.					
(e) The windows in my facility are opened daily for maximum cross ventilation.					
(f) In my workplace, the doors are opened for maximum cross ventilation					
(g) Sputum microscopy is done in designated area rather than in the main laboratory.					
(h) Patients with active TB are most often admitted to the same ward with other patients.					
(i) Propelling fans example (Ceiling fans) and air-conditioners are most often used in my facility than natural cross ventilation					
(j) Ceiling fans are functioning, cleaned and in good condition all the time.					

**SECTION D – CHALLENGES**

1. What are some of the challenges you encounter in the implementation of TB infection prevention and control strategies or measures in your facility in the following?

a. Administrative control strategies/measures:

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b. Environmental control strategies/measures:

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c. Personal protective equipment:

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d) Please discuss further any issues, concerns or suggestions you may have regarding the implementation of tuberculosis infection prevention control in Tema General Hospital.....

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**Thank you for your participation**

## APPENDIX C

### QUESTIONNAIRE

Dear participant,

This study aims at assessing pulmonary tuberculosis (TB) infection prevention and control measures that health care workers employ to reduce TB transmission among themselves, clients and the community as a whole. The questions will require approximately 30-40 minutes completing. The findings of this research will contribute to improving the measures that healthcare workers will employ to minimize the spread of TB in health care settings.

Thank you.

#### SECTION A: DEMOGRAPHIC INFORMATION

Please kindly provide answers to the under listed questions. Respond to the items by **ticking (√)** or **writing** in the spaces provided.

1. **Sex** (a) male ( ) (b) Female ( )

2. **Age bracket:**

(a) 20 – 25 years ( ) (b) 26 – 31 years ( ) (c) 32 – 37 years ( ) (d) 38 – 43 years ( )  
(e) 44 – 49 years ( ) (f) 50 years and above ( )

3. **How long have you been working in the Tema General Hospital**

(a) 6 months – 1 year ( ) (b) 2 years – 5 years ( ) (c) 6 years – 9 years ( )  
(d) 10 years – 13 years ( ) (e) 14 years and above ( )

4. **Current ward/unit of work: please indicate the ward/unit you work**

(a) Outpatient Department ( ) (b) Male Medical Ward ( ) (c) Female Medical Ward ( )  
(d) Chest Clinic ( ) (e) Fevers Unit ( ) (f) Children's Ward ( ) (g) HIV/AIDS counseling  
unit ( ) (h) Laboratory unit ( ) (i) X-ray unit ( ) (j) Pharmacy unit ( )  
(k) Others (please specify).....

**5. Job Title**

- (a) Medical doctor ( )      (b) Professional nurse ( )      (c) Enrolled nurse ( )  
(d) Laboratory Technologist ( )      (e) X-ray technologist ( )  
(f) Health assistant / Health Aide ( ) (g) Pharmacy technician ( ) (h) Pharmacist ( )

**SECTION B: KNOWLEDGE ABOUT TB INFECTION PREVENTION AND CONTROL MEASURES**

Please specify your knowledge about tuberculosis infection control. Each question requires one answer. Please answer by **ticking (√)** appropriate response.

1. Which of the following best describes how TB is spread?
  - (a) If uninfected person comes into contact with the blood of a person containing the TB bacilli.
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  - (c) A person infected with TB can spread the bacteria through physical contact.
  - (d) When an infected person prepares food and introduces the TB germs into the food.
  
2. Hospital staff should implement which of the following administrative control measures for TB infection prevention and control? Tick as many as applicable.
  - (a) Prompt identification and separation of coughing patients from others.
  - (b) Promoting cough etiquette
  - (c) "fast tracking" patients suspected of TB infection for prompt diagnosis and treatment
  - (d) All the above
  - (e) A and B only
  
3. The examination or treatment room for patients whom you suspect may have TB should have all of the following excepts:
  - (a) Air exhaust directly to the outside
  - (b) Ventilation solely by air condition

- (c) The placement of the patients nearest the window or fan exhausting the air.
  - (d) Adequate ventilation
4. An easy and low-cost way to reduce the number of infectious TB droplets in the air is to:
- (a) Use natural ventilation by opening windows and doors and maximizing cross-ventilation
  - (b) Provide respirators or N95 masks to all staff
  - (c) Install a mechanical ventilation system
  - (d) Wash hands with soap and water before and after every patient contact
5. Cough etiquette:
- (a) Is when someone says “excuse me” after coughing in public
  - (b) Should be required of all patients, but not necessary for healthcare workers
  - (c) Include covering your coughs and sneezes with handkerchief, tissue, or upper arm
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6. If particulate respirators (also known as N-95 or FFP2 masks) are available in your hospital, they should be:
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  - (b) Worn by staff when conducting a bronchoscopy procedure or other high risk procedure for a patient with TB, MDR TB, or XDR TB.
  - (c) Required for all staff when they are infected with any infectious disease to prevent transmission to patients.
  - (d) Worn by patient when sitting outside to prevent TB droplet from spreading throughout the town.

7. Persons who have a high risk of TB exposure and infection include: Tick as many as applicable.
- (a) Those that live in crowded, poorly ventilated setting where TB is common
  - (b) Persons who are immunocompromised, such as HIV/AIDS patients
  - (c) Those with medical conditions such as renal failure, cancer, or diabetes
  - (d) All of the above
8. What is the most effective intervention for TB control?
- (a) BCG re-vaccination
  - (b) Chemoprophylaxis
  - (c) Early detection of TB patients
  - (d) Appropriate treatment of TB patients
  - (e) Both C and D
9. Administrative control measures in Ghana prevents TB transmission by the following actions:
- (a) Promptly identifying infectious cases
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  - (c) Separation of coughers
  - (d) Setting up quick turnaround times at health care settings for TB cases
  - (e) Engaging civil society
  - (f) All of the above
  - (g) A, B, C, E
  - (h) A, C, D
10. In an environment where TB transmission is a risk, surgical mask should be used by:
- (a) Doctors

- (b) Nurses
  - (c) Coughing patients
  - (d) Visitors
  - (e) Administrators
  - (f) All the above
11. What class of respirator is acceptable for the Health Care Workers (HCW) working in a setting with smear-positive patients?
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  - (b) FFP2 or N-95
  - (c) FFP3
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12. What are some of the recommended strategies to address TB transmission in healthcare facilities?
- (a) Improving natural ventilation
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  - (c) Having patients show proof of BCG vaccination
  - (d) All of the above
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13. Good health facility designs to prevent TB infection uses intervention that are directed toward:
- (a) The least costly way to improve ventilation
  - (b) Providing as many rooms as possible to place patients
  - (c) Improving ventilation, reducing overcrowding and providing patients and staff with a safe environment
  - (d) Removing as many windows as possible to reduce cost

Please indicate by ticking (✓) whether the following sentences are true/ false.

14. TB is the leading cause of death in people with HIV/AIDS.

(a) True

(b) False

15. In healthcare setting, the greatest risk for TB spread is by coughing patients who have not been recognized as having TB and are not receiving treatment.

(a) True

(b) false

16. TB is such an infectious disease that health workers can do little to prevent transmission of TB in clinics and hospitals

(a) True

(b) False

17. Small area with minimal ventilation should be used for sputum collection because they safely contain the TB droplets

(a) True

(b) False

18. The value that the infection control person provides to his/her facility and patients are to provide leadership, adherence to transmission prevention efforts and to develop policies and procedures that result in minimizing or eliminating transmission of pathogens to patients and staff.

(a) True

(b) False

19. Ministry of Health recommends screening of TB among people living with HIV at the time of enrollment and at each encounter thereafter

(a) True

(b) False

20. Managerial control measures for TB infection control include instituting screening of health care workers on TB.

(a) True (b) False

### SECTION C: PRACTICES FOR PREVENTING TUBERCULOSIS INFECTION

This section gathers information relating specifically to your practice with regards to tuberculosis infection prevention and control (including training you have received, administrative and environmental controls as well as personal protective equipment)

**C.1** Please indicate by **ticking (v)** from options below how valuable the following have been to your preparation for TB infection prevention and control.

ITEM	EXTREMELY VALUABLE	VERY VALUABLE	MODERATELY VALUABLE	SOMEWHAT VALUABLE	NOT VALUABLE	N/A
------	-----------------------	------------------	------------------------	----------------------	-----------------	-----

(a) Experience

(b) professional  
Education

(c) In-service training  
or short course

(d) Mentor/preceptor

**C.2a** Have you attended tuberculosis infection prevention training programme for the past 3 years.

Yes

No

**C2.b** If yes, please indicate its **usefulness**

.....

**Extremely  
useful**

**Very useful**

**Moderately  
useful**

**Somewhat  
useful**

**Not useful**

**C.3** If you have ever been given training on TB infection control please comment on the strengths and weaknesses of the tuberculosis infection prevention and control training programme.

.....  
.....  
.....

**C.4** Please indicate **how often** the following statements apply to you. Please **tick (v)** one response in the table provided below.

<b>Statement</b>	<b>Always</b>	<b>Sometimes</b>	<b>Rarely</b>	<b>Never</b>
(a) I use information, education and communication (IEC) materials such as posters to educate and increase patients				

awareness on TB

(b) I educate coughing patients to apply cough etiquette (cover mouth, nose with mask, tissue, handkerchief or coughing into arms)

(c) I separate or “fast track” patients who are identified as TB suspects from other patients in waiting areas.

(d) In the wards I separate or group suspected or confirmed TB patients from other patients

(e) I educate suspected TB patients to wash their hands anytime they produce respiratory secretions.

(f) I wear N95/FFP2 mask when working in high risk TB areas example(direct observed therapy short course (DOTS) room,TB microscopy room, TB wards)

(g) I offered surgical mask to TB suspects or cases when they are in the hospital.

(h) I practice hand hygiene anytime I come into contact with patients with respiratory secretions or carry out other procedures.

(i) In my workplace I have access to resources to prevent TB infection such as hand hygiene items, surgical mask and N95.

**C.5** Please indicate the extent to which you **agree or disagree** with the following statements below. **Tick (✓)** your responses in the table below. One response for each item is appropriate.

<b>Statement</b>	<b>Strongly Agree</b>	<b>Agree</b>	<b>Neutral</b>	<b>Disagree</b>	<b>Strongly Disagree</b>
a. (a) My knowledge of TB and how to prevent its transmission to staff and patients is adequate for my current level of practice.					
b. (b) Patients visual alerts example Posters advising patient to inform staff if they have respiratory symptoms are available at all vantage points in my facility					
c. (c) It is important to minimize the time TB suspects spend around other patients in the outpatient department or anti-retroviral(ART) therapy clinic waiting areas					
d. (d) The reference materials supplied in my facility is adequate to maintain my competence with regards to the applications of TB infection control.					
e. (e) The windows in my facility are opened daily for maximum cross ventilation.					
f. (f) In my workplace, the doors are opened for maximum cross ventilation					
g. (g) Sputum microscopy is done indesignated area rather than in the main laboratory.					
h. (h) Patients with active TB are most often admitted to the					



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b) Please discuss further any issues, concerns or suggestions you may have regarding the implementation of tuberculosis infection prevention control in Tema General Hospital.....

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**Thank you for your participation**

## APPENDIX A

### PARTICIPANT INFORMATION SHEET

**STUDY TITLE:** ASSESSMENT OF TUBERCULOSIS INFECTION PREVENTION AND CONTROL PRACTICES AMONG HEALTHCARE WORKERS IN TEMA GENERAL HOSPITAL

Dear participant, my name is Agnes Codjoe and I am an MSC student at the School of Nursing, University of Ghana Legon. This study is to help healthcare professionals on ways of minimizing TB infection transmission among themselves and others. The study aims at determining the knowledge and practices of healthcare workers in the Tema General Hospital on tuberculosis infection control strategies. The duration of the study is from 4<sup>th</sup> May to 4<sup>th</sup> June 2012. Cross section of staff who work in various wards/units of the hospital where patients interact will be selected to participate in the study. The information obtained from this study will be used to improve tuberculosis infection control practices and thus reduce the possible transmission of tuberculosis infection to staff, clients and visitors in the facility.

If you agree to participate in this study, you may be required to answer some questionnaires about what you know about tuberculosis, practices or measures that you employ to prevent tuberculosis transmission to staff and clients and challenges you might encounter during the implementation of these measures. You may spend about 30-40 minutes to answer the questionnaires. Participating in this study is entirely voluntary. You have the right to refuse to participate and this will not affect you. You also have the right to stop the interview at anytime and I will only require that you let me know anytime you feel like going out of the study.

There are no direct benefits or risks in participating. You will not be paid or compensated for your participation. However, the information that will be obtained will help us/you re-organize services to improve the quality of care with regards to TB infection control practices in the facility and beyond, and thus, help to reduce the spread of TB infection to staff and patients.

All the information collected from you will be treated in strict confidence and will be used for academic purposes only. You will not be identified by name in any dissemination reports or publications resulting from this study.

Permission has been obtained from the Medical Director of the Tema General Hospital to conduct this study.

Do you have any questions for me regarding this study?

If you have any further questions regarding this study you may contact me on telephone number 0243161974 and my supervisors;

NAME: DR PRUDENCE MWINI-NYALEDZIGBOR – Telephone number 0274131004

NAME: DR KWASI ADDO – Telephone number 0243334869

**APPENDIX B****INFORMED CONSENT FORM FOR THE RESEARCH PARTICIPANTS**

I have been informed about the purpose, procedure, potential risks and benefits of this study. I have had the opportunity to ask questions and any question asked has been answered to my satisfaction. I know that I can refuse to participate in this study without any loss of benefit to which I would have otherwise been entitled. I understand that if I agree to participate I can withdraw my consent at anytime without losing any benefits or services to which I am entitled. I understand that any information collected will be treated confidentially; I freely agree to participate in this study.

Signature.....

Date.....

**TO BE READ AND SIGNED BY THE INTERVIEWER**

I have adequately informed the participant and I certify that the purpose, procedures, potential risks and benefits associated with have been explained to the above individual to the best of my ability.

Name of interviewer.....

Signature.....

Date.....