**KNOWLEDGE ON THE STANDARD PRECAUTION ON TUBERCULOSIS AMONG PRIMARY HEALTH CARE WORKERS OF BOSSO LGA OF NIGER STATE**

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**ABSTRACT**

This study investigates the role of public health workers in tuberculosis management and prevention. 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.

**CHAPTER ONE**

**INTRODUCTION**

**1.1 Background to the study**

Tuberculosis or TB is a common and often deadly infectious disease caused by various strains of Mycobacteria, usually Mycobacterium tuberculosis in humans. Tuberculosis usually attacks the lungs but can also affect other parts of the body. It is spread when the bacteria get into the air, and when people who have the disease cough, sneeze, or spit. A person can become infected with tuberculosis bacteria when he or she inhales minute particles of infected sputum from the air. People who are close to the infected person, are more likely to be infected when they breathe the bacteria into their lungs. Most infections in humans result in an asymptomatic, latent infection, and about one in ten latent infections eventually progresses to active disease, which, if left untreated, kills more than 50% of its victims. (Mims, 1993)

Persons with latent TB infection do not feel sick and do not have any symptoms, but usually have a positive reaction to the tuberculin skin test. They are infected with Mycobacterium

tuberculosis, but do not have active TB disease. Those with latent TB infection are not infectious

and cannot spread TB infection to others. However, persons with latent TB infection may develop active TB disease at some time in the future. About 10% of infected persons will develop active TB disease at some time in their lives, but the risk is considerably higher in the first two years of infection particularly for persons whose immune systems have been weakened by HIV infection. Persons with latent TB infection should be treated in good time, in order to prevent the infection from progressing to active disease. Those with active TB disease are considered infectious and can spread TB bacteria to others. The classic symptoms are a chronic cough with blood-tinged sputum, fever, night sweats, and weight loss. Infection of other organs causes a wide range of symptoms. Tuberculosis is diagnosed definitively by identifying the causative organism (Mycobacterium tuberculosis) for example in sputum or pus. When this is not possible, a probable - although sometimes inconclusive diagnosis may be made using imaging such as X-rays or scans and/or a tuberculin skin test (Mantoux test).Treatment is difficult and requires long courses of multiple antibiotics. Contacts are also screened and treated if necessary. Antibiotic resistance is a growing problem in (extensively) multi-drug-resistant tuberculosis. Prevention relies on screening programs and vaccination, usually with Bacillus Calmette-Guérin vaccine

With the discovery of chemotherapy in the 1940s and adoption of the standardized short course in the 1980s, it was believed that TB would decline globally. Although a declining trend was observed in most developed countries, this was not evident in many developing countries (Chadha, 2009). In developing countries; about 7% of all deaths are attributed to TB which is the most common cause of death from a single source of infection among adults. (Kaye et al., 1996).

The end TB Strategy target is to accelerate the annual decline of TB incidence rates from 2% in 2015 to 10% per year by 2025, WHO (2016). This strategy addresses the challenges facing many countries with high tuberculosis (TB) burden including Nigeria, which remains one of the worst TB affected countries in the world, Onyedum CC (2017). Evidence suggests that the TB prevalence and mortality rates in Nigeria were previous underestimated.Adamu AL (2017). Despite being ranked the 4th TB affected country in the world in 2009, it was estimated that 590,000 new TB cases were reported in 2015.WHO (2013). In order to stop the spread of TB in the country, the government of Nigeria has implemented various interventions aimed at early detection of TB and overall TB control.Pathmanathan I (2017). Although these initiatives contribute greatly to the management of TB, several studies carried out in Nigeria and other countries have presented TB related challenges. Kigozi G (2017), This includes patients’ related factors such as inadequate TB knowledge as well as perceptions and attitude towards treatment. Consistently, inadequate knowledge of TB treatment especially treatment duration has been associated with treatment interruption. Sub- optimal patients’ compliance is a practical implication of poor TB knowledge. In real terms, when patients observe improvement in their health arising from the effective use of TB-medications within few weeks of treatment at the DOT centres, they stop taking medication. Patients whose treatment is interrupted remain infectious for longer period. They are more likely to relapse or succumb to tuberculosis as a result of treatment failure, hence foster the emergence of drug-resistant tuberculosis.

**1.2 Statment of the Problem**

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 Nigeria were to ensure safe practices among health care workers, patients and families. This was disseminated in all the states 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 (Federal Ministry of Health, 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 the state where the current study was conducted, there was no available official data on students infected with TB. The TB coordinator of the school clinic indicated that this was so because the TB reporting format does not include the patients‘ occupation (personal communication). The researcher, a student has observed that some practices among students were contrary to the recommended standard guidelines and strategies on TB infection control despite the adoption and dissemination of TB infection prevention control in Nigeria two years ago. However, the question is what is the role of public health workers in tuberculosis management and prevention?.

**1.3 Objectives of the Study**

The main objective of the study was to assess the Knowledge on the standard precaution on tuberculosis among primary health care workers of Bosso LGA of Niger state. In line with this objective, the study considered the following specific objectives are to;

i. Assess the knowledge of public health workers on tuberculosis disease prevention and control in Bosso LGA of Niger state.

ii. Describe the practices employed by public health workers for the prevention of TB disease in Bosso LGA of Niger state.

iii. Identify challenges encountered by health care workers in implementation of the TB- IPC strategies in Bosso LGA of Niger state.

**1.4 Research Questions**

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

i. What knowledge do public health workers have regarding TB infection prevention and control strategies?

ii. What are the practices employed by public health workers in the Bosso LGA of Niger state in implementing infection prevention and control of TB?

iii. What are the challenges healthcare workers encounter in the implementation of TB infection prevention and control strategies?

**1.5 Hypothesis**

There is no significant association between gender and awareness and perception of tuberculosis.

**1.6 Significance of the Study**

This study is expected to pioneer research into the awareness and perception 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 Scope of the Study**

The study was limited to all public health workers Bosso LGA of Niger state. The variables to be studied include the prevalence of TB, according to sex and age and treatment outcome of patients within the period under review.

**1.8 Limitation Of The Study**

Like in every human endeavour, the researcher encountered slight constraints while carrying out the study. Insufficient funds tend to impede the efficiency of the researcher in sourcing for the relevant materials, literature, or information and in the process of data collection, which is why the researcher resorted to a limited choice of sample size. More so, the researcher simultaneously engaged in this study with other academic work. As a result, the amount of time spent on research will be reduced.

Moreover, the case study method utilized in the study posed some challenges to the investigator including the possibility of biases and poor judgment of issues. However, the investigator relied on respect for the general principles of procedures, justice, fairness, objectivity in observation and recording, and weighing of evidence to overcome the challenges.

**1.9 Operational Definition of Terms**

Prevalence of Tuberculosis:-This refers to the number of cases of tuberculosis.

Knowledge: Information the public health workers have on TB and its prevention measures. Practices: These are the activities and behaviours of public health workers towards prevention of TB at Bosso LGA of Niger state.

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**

This chapter presents a review of relevant literature on the prevalence of tuberculosis and awareness and perception under the following subheadings; conceptual review, theoretical review, empirical review and summary of literature review:

**2.1 Conceptual Review**

**2.1.1 Prevalence of Tuberculosis**

Prevalence refers to number of cases of a health disorder present (prevalent) in a population at a given time of survey, both old and new (Ogeneh, 2006). Tuberculosis prevalence refers to the number of cases of tuberculosis (TB) (all forms) in a population at a given point in time (sometimes referred to as point prevalence). It is expressed as the number of cases per 100,000 populations (WHO, 2006). Estimates include cases of pulmonary tuberculosis in people with HIV. Pulmonary tuberculosis is an infectious bacterial disease caused by mycobacterium tuberculosis which commonly affects the lungs. It is transmitted from person to person via droplets from the throat and lungs of people with the active respiratory disease (Corbett, 2003). In healthy people, infection with mycobacterium tuberculosis often causes no symptoms, since the person’s immune system acts to “wall off” the bacteria. The symptoms of active pulmonary tuberculosis are coughing, sometimes with sputum or blood, chest pains, weakness, weight loss, fever and night sweats. Pulmonary Tuberculosis can be treated with 6 month course of antibiotics (WHO, 2010).

The 30 member States of the European Union (EU) and European Economic Area (EEA) presents a peculiar and highly heterogeneous situation in terms of TB epidemiology and control. Three broad epidemiological areas are distinguished with the borders of the EU/EEA: low incidencecountries (below 20 notified cases per 100, 000 populations) with cases aggregating in vulnerable populations and only occasional increased notification rates.

Countries with moderate to high but declining notification rates and with a low proportion of multidrug-resistant (MDR) TB; and finally, countries with relatively high notification rates (over 100 notified cases per 100, 000) and high levels of MDR TB, but again with declining overall TB rates (WHO, 2008).

Attention to TB control in the EU and EEA has been raised in recent years through a number of initiatives, including the launching of a Framework action plan to fight tuberculosis in the EU (Fernandez, & Manissero, 2008). The World Health Organization set a target to detect at least 70% of the estimated infectious (smear-positive) cases, but in Delta State only 54% of this has been achieved which is not really encouraging (Tuberculosis referral Hospital Records, 2007)

**2.1.2 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.

**2.1.2.1 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

Sehulster et al (2003) suggest that factors specifically related to the healthcare environment are not common causes of nosocomial infections. However, consideration should be given to the prevention of infection with environmental pathogens, such as fungi (example, Aspergillus), bacteria (example, Legionella species), or viruses (example, varicella). In 2003, the Centre for Disease Control (CDC) and the Healthcare Infection Control Practices Advi- sory 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.

**2.1.3 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.

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.

**2.1.3.1 Knowledge of Tuberculosis (TB) Infection and Control**

Lonnroth 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, Drobniewski, 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 General Hospital as all these health workers interact with patients and clients directly and indirectly.

Empirical studies have also been conducted using public health workers in clinically related disciplines to examine TB infection prevention knowledge. A survey design was utilized to study a sample of 1480 public health workers 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).

**2.1.3.2 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 at 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, Uthaivoravit, 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, whiles (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 Heidelbery 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, Chrisholn, 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.

**2.2 Theoretical Framework**

**2.2.1 Management Model for Tuberculosis Control Activities**

The International Union Against Tuberculosis and Lungs Disease has played a pivotal role in the development of its model for the national tuberculosis programme, a model generally applicable for health service delivery in low-income countries, which has been demonstrated to be feasible and sustainable. The WHO as the basis of the Global Tuberculosis Programme has adopted this model described by the World Bank as highly cost-effective. Tuberculosis control programme may be considered to be a system with inputs, process, outputs and outcomes therefore figures I below illustrates a management model, which focuses on these four main aspects. Finally, a programme review is an important programme within the health services, therefore involvement of key persons from within the health services is important (World Bank, 2006).

> Input: refers to the resources provided by the government in the commitment for the implementation of the DOTS strategy and these includes.

- The availability of competent, well trained and well-resourced health workers for the effective management of all aspect of TB control at the facility level, state and local level.

- Facilities, equipment and tools essential for the management of TB

- Anti-TB drugs and a system for monitoring drug supply.

> Processes: For the purpose of this study, processes refer to all the system and activities undertaken to implement and support the implementation of TB treatment patient. This includes;

> Overseeing of TB treatment DOTS supporters – the average monthly reports made on activities of TB DOTS supporter, logistical support services in place to facilitate the supervision of DOTS supporters.

> Capacity to follow-up patients who default from treatment – health education and alternative follow-up recommendations when medications are refused or not tolerated.

> Supervisory visits – frequency of supervisory visits made to the health care facilities by the state TB control officer and to the DOTS supporter by the clinic staff.

Referral Systems between the health care facilities in the state- Existence of a system for patient referrals between health care facilities in the local government areas and the state hospitals.

**2.3 Review of Empirical Studies**

A lot of studies have been conducted on the prevalence of tuberculosis and treatment outcomes within Nigeria and globally. Ayles, Albertus, Nota, Sismandis, Tembwe, De- Haas, Muyoyelta, Beyers & Godfrey-Fausett (2009), referred to as ZAMSTAR Study Team studied prevalence of Tuberculosis, HIV and Respiratory Symptoms in two Zambian Communities: Implications for Tuberculosis Control in Era of HIV.A survey research design was used for the study. 8044 adults were sampled from 2 Sub-Districts (Wards) in Lusaka Province.

Questionnaires were used to screen for symptoms, respiratory samples were obtained for culture and oral secretions for HIV testing. 79 individuals were found to have mycobacterium tuberculosis in their sputum, giving an adjusted over all prevalence of tuberculosis of 870 per 100,000 (95% CI 570-1160 per 100,000). Of the 79 cases of prevalence mycobacterium tuberculosis, only 51(65%, 2 missing data) admitted to having any cough and of these 34 (67%) had been coughing for more than three weeks (definition for being TB suspect at a time this study and needing investigations for tuberculosis). Having a cough of such duration (<21days) was a risk factors for prevalent mycobacterium tuberculosis (Adj OR 3.07, 95% CI 1.62-5.81) but coughing for more than three weeks provided the strongest association with prevalent mycobacterium tuberculosis (Adj OR 12.72,95% CI 7.05-22-94). All other symptoms were associated with prevalent mycobacterium univariate analysis, but on multivariate analysis only fever remained significant in the final modern (Adj OR 2.04 95% CI 1.23-3.39). This study concluded that prevalence of tuberculosis is high in Zambia and that 36% of all prevalent tuberculosis in these communities is attributable to HIV.

Biadglegne, Anagaw, Debebe, Anagaw, Tesfaye, Tessema, Rodloff, and Sack (2013), carried out a Retrospective Study on the Outcomes of tuberculosis treatment in FelegeHiwot Referral Hospital, Northwest Ethiopia. According to World Health Organization (WHO), treatment outcome is an important indicator for tuberculosis (TB) prevention and control programme. A self-developed proforma was used to extract relevant information from the tuberculosis register. All the 756 patients registered from 2010 to 2012 were included in the study. Statistical package for social sciences (SPSS) software package version 16 for was used the analysis. They analyzed the records of 756 tuberculosis patients registered for treatment in the Referral Hospital from January,2010 to 2012. For categorical outcomes, they calculated relative risks from the proportions in each group and tested the differences using the Chi-square or the Fisher exact test. A p- value less than or equal to 0.05 was considered significant.Out of the756 TB patients, 331 (43.8%) were pulmonary tuberculosis (PTB) and 425(56.2%) were extra pulmonary tuberculosis (EPTB) cases. Among the study subjects, 191(25%) were Human Immunodeficiency Virus (HIV) seropositive. Of all the patients, treatment outcome was classified as successfully treated 193(26%), defaulted in 19(2.5%), died in 44(5.8%), treatment failed in 4(0.5%) and transferred out in 496 (68.6%) patients. The percentage of deaths and defaulters was higher in females than in males. Being an older age group (p=0.004), a rural resident (p=0.000) and EPTB patients (p=0.004) were associated with a lower treatment success rate, which are serious public health concerns that needs to be addressed urgently. Therefore,treatment plans that emphasize DOTS for at –risk patients have the greatest success in improving tuberculosis treatment outcome in the region. Urgent need for strengthening treatment outcome monitoring (TOM) to ensure effective programme implementation and case management system in the study area is strongly recommended.

In another study carried out by Chadha and Bhagi (2000), in new Delhi, on the treatment outcome in tuberculosis patient placed under direct observed treatment short course (DOTS), a cohort study of 639 subjects comprising of 432 males and 207 females . The patients were diagnosed and administered/standard regiments of anti-tuberculosis drug as prescribed under DOTS guidelines along with lesions of the radiological assessment.The study was carried out in one of the chest diseases clinics run by Municipal Corporation of Delhi. All the cases of tuberculosis diagnosed newly at the clinic during the period were included in the study to avoid bias. The patients were classified in three categories viz i, ii and iii as defined under National Tuberculosis and Leprosy Control Programme. The categories – wise break down of patients were: Category i: 280, Category ii: 104, and Category iii: 255, in all 639 cases. These included 17 cases of extra-pulmonary tuberculosis in Category iii. Social information such as age, sex, marital status, literacy level, occupational status, family history of tuberculosis, history of contact with tuberculosis patients and addiction to smoking was also recorded. The sputum of each patient was re-tested after two months and again after completion of treatment. The drugs were administered to patients by the health worker under his or her direct observation as prescribed under DOTS.

The initial radiological examination reports of 486 out of 639(70%), patient were available before the commencement of DOTS. Some of these patients brought x-ray films with them at the time of reporting to the clinic and others were subjected to radiological examination in the clinic. All the 486 patients were re subjected to radiological examination after the completion of prescribed treatment to ascertain the effect of DOTS on radiological lesions. The sputum conversion rate was 92.6% and 76.9% in category i and at the end of intensive phase, the cure rate was 91% and 73.3% in category ii patients respectively. Defaulter’s rate was 7.7%; Treatment failure rate was 1.6%; three fourth patients were asymptomatic and 95% had gain weight ranging from 1kg to 5kg. The radiological lesions showed significant improvement in 76.3% patients. The study shows that the implementation of the DOTS strategy is very important in the control of tuberculosis.

A retrospective study carried out by Bukhary and Alrajhi (2007) in Saudi Arabia on tuberculosis treatment outcome in tertiary care setting, the outcome of chemotherapy for pulmonary, and extra pulmonary and disseminated tuberculosis is not well documented in developing countries.

This study assessed tuberculosis treatment outcome, cure to treatment ratio and mortality among all types of tuberculosis patients in a tertiary care setting in Saudi Arabia. All cases diagnosed and treated for active mycobacterium tuberculosis infections between 1991 and 2000 were included retrospectively. Data collected included types of tuberculosis involvement, treatment outcome, relapse and comorbidities. Over a ten years period, 535 cases of tuberculosis were diagnosed and treated. Isolated tuberculosis was identified in 141 cases (26.4%), extra pulmonary tuberculosis in 339 cases (63.3%) and combined pulmonary and extra pulmonary disseminated involvement in 55 cases (10.3%). Comorbidities were noted in 277(52%) patients. Immunosuppression was in 181(34%) patients. The cure rate was 82%. The cure to treatment was 86% in extra pulmonary tuberculosis and 78% in pulmonary tuberculosis, and 65% in disseminated tuberculosis. Overall mortality was 18%. Disseminated Tuberculosis had the highest mortality (34.9%) followed by pulmonary (21.8%), then extra pulmonary tuberculosis (13.6%). 47% of all mortalities were directly related to tuberculosis. Relapse was documented in 14 out of 349 patients (4%) who had 24 months of follow up. The researcher thus concluded that despite tertiary care support, complicated tuberculosis carries a high mortality.

Early diagnosis and complete appropriate chemotherapy are essential for improved outcome.

Maimela (2009) studied “Evaluation of tuberculosis treatment outcomes and determinants of treatment failures in the Eastern Cape Province, 2003-2005. The study was descriptive and the methodology took cognizance of the main approach used globally to assess the performance and quality of tuberculosis control programmes. 152,336 records from the electronic TB register for the period of 2003 – 2005 were systematically reviewed and random sample design of 252 Primary Health Care facilities with probability proportional to size was used to collect information on health system related factors that contribute to treatment failures with emphasis to input, process, and output indicators for the TB control programme including proper implementation of DOTS strategies.

In conclusion, the finding of the study revealed that despite considerable efforts made by the National Tuberculosis Control Programme, little change was noted in treatment. Efforts to provide effective TB treatment using DOTS at District and facilities level in the province are constrained by failure of most districts to reach a 100% DOTS coverage. Patients are accurately diagnosed, recorded into the register, drug supply is regular and uninterrupted but there has been a slow increase in the proportion of patients cured and there are increased number of defaulter rate and patients with treatments outcomes which are not evaluated. An improved base of information is needed to assess the TB morbidity impact more accurately. Human resources are among the most important resources which were found lacking and health system managers have the responsibility and challenge of ensuring that maximum benefits is derived from these to maintain and expand health services.

Overall TB treatment outcomes in Eastern Cape Province didn’t reach the national targets for the period 2003 – 2005. A cure rate of 39.7% for new smear positive patients in 2005 was reported. Only Chris Hani District reaches its national target of 70% for smear conversion rate in 2005. The successful treatment outcomes were below 85% threshold suggested by the World Health Organisation. Cure rate reach 50% for the three-year study period. Defaulting from treatment remains a challenge for the TB control programme in the Eastern Cape Province. There has been an increasing number of patients with treatment outcome not evaluated in 2005 from 20.1% - 24.7% in new smear cases and in re-treatment smear positive cases, this increased from 21.2% to 27.3%.

Taura, Sale and Mohammed (2008), studied the prevalence of Tuberculosis in patients attending the Infectious Disease Hospital, Kano. A total of 80 patients were recruited for the study. The patients were given wide-capped containers cough-up their sputum. Blood samples of the patients were also collected for further analysis. The result of the research showed that out of the 80 patients sampled, 52 were diagnosed to be Acid-Fast bacilli Positive and 28 were Acid-Fast bacilli Negative.

61.5% and 38.5% prevalence were found in males and females patients respectively. The higher percentage prevalence in male patients could be attributed to the fact that males are more exposed to environmental hazard than females as reported by WHO 2000. The researchers also concluded that the prevalence of tuberculosis is high in the Infectious Disease Hospital, Kano with male who accounted for the highest percentage prevalence of 61.5%. The tuberculosis patients are also associated with various patternsof haematological indexes.

Akinola, Fatiregun, Abimbola, and Afolabi (2009) studied treatment outcomes among pulmonary tuberculosis patients at treatment centers in Ibadan, Nigeria. A longitudinal study design involving a cohort of sputum smear – positive pulmonary tuberculosis patient at initiation of therapy who were followed up to the end treatment at eight month. A total of 1,254 patients were followed up with a mean age of 35.0 + 3.3years.

The percentages of patients with treatment outcomes assessed in the study were as follows; cure (76.6%), failure (8.1%), default (6.6%), transferred out (4.8%) and death (1.9%). The cure rate varied significantly between treatment centers from 40 to 94.4% (p<0.05). The treatment centers located within the specialist health centers at Jericho and the University College Hospital, Ibadan at 50 and 75% cure rates respectively. The mean age of cured patient was 31.2 + 31.1 years, which was significantly lower than the mean age of those with poor treatment outcomes (36.7+3.5 years, P<0.05) males had a higher risk of poor treatment outcome (RR=1.8; 95% CI:1.02-1.94) than females. Also, patients with a poor knowledge of tuberculosis had a higher risk of having a poor treatment outcome (RR=1.35; 95% CI: 1.25 = 1.62) compare to those with good knowledge. The researchers concluded that variations in health center treatment outcomes and poor knowledge of tuberculosis among patients suggest that poor program implementation may be a major modifiable determinant of treatment outcomes in our environment.

In a similar study carried out by Nwene, (2004) on evaluation of treatment outcome in tuberculosis Directly Observed Treatment Short Course (DOTS) facilities in AnambraState (2004-2008). The methodology involves a cross sectional retrospective review of 980 TB patients treated in 6 out of 21 randomly selected Local Government Areas (LGA) of Anambra State. Of 980 TB patients evaluated, there are 563(57.4%) males, and 417(42.6) females. Of the total 980 patients, 942(96.1%) were pulmonary tuberculosis cases, 845(86.2%) were CAT 1 cases, 686(70%) are sputum smear positive while 686(70%) live in urban areas. TB treatment outcomes were cured 44.8%, treatment completed 37.9%, defaulted 8.8%, died 5.4%, failure 1.5%, transfer out 1.6% with treatment success rate of 82.7%. Of 481 patients that were screen for HIV, 133(27.7%) was HIV positive. Being female, age group 0-19 years, having pulmonary TB, being HIV positive, living in rural area, were associated with better TB treatment outcome. The researcher concluded that the treatment success rate of 82.7% was achieved in this study which is better than the Nigerianprogramme. However, these figures needs improvement to decrease mortality and morbidity associated with the disease. Higher treatment success rate was found in rural areas which supports the need and feasibility for expansion of TB DOT services to underserved rural communities.

**CHAPTER THREE**

**RESEARCH METHODOLOGY**

**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.Target Population**

The target population is the complete totality of all subjects (Polit & Hungler, 2003).The study population involved all the students and health workers such as doctors, nurses, laboratory and X-ray technologists, and health aides of the Bosso LGA of Niger state 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) Total sample size (n) = [459/ (1+459 (0.05)2]

= [459/ (1 + 459 x .0025)]

= [459/1 + 1.148]

= [459/2.148]

= 214

= 214

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.

**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 Research Instrument And Administration**

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.

**3.10 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.

**CHAPTER FOUR**

**PRESENTATION OF DATA AND ANALYSIS OF 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 Bosso LGA of Niger state, 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**

|  |  |  |
| --- | --- | --- |
| **Sex** | **Frequency** | **Percentage** |
| Male | 55 | 24 |
| Female | 174 | 76 |
| Total | 229 | 100 |

Source: Field Data, 2022

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **Participants** | **(n=229)** |  |
| 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 |
| **Total** |  | **229** |  | **100** |

Source: Field Data, 2022

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**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Participants** | **(n=229)** |  |
| Length of Practice  6 months -1 year | Frequency  26 |  | Percent  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 |
| **Total** | **229** |  | **100** |

Source: Field Data, 2022

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**

|  |  |  |
| --- | --- | --- |
| 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 |
| Total | 229 | 100 |

Source: Field Data, 2022

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.

**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**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variable  Knowledge | Min.  3 | Max.  20 | Mean  13.44 | Std Dev.  2.95 | df | t | Sig. |
| **Total** |  |  |  |  | **228** | **68.944** | **.000** |

Source: Field Data, 2022

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 | - | - | - | - | - |

Source: Field Data, 2022

Results in Table 4.7 shows that sex of the participant significantly correlates or influences [r (227) = -.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 (227) = .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 (227) = .016, p = .405]. Current ward where the participant works significantly correlates with knowledge of TB [r(227)= -.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 (227) = -.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.

**4.2.3 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 |
| **Total** | **229** | **100** |

Source: Field Data, 2022

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.

**4.2.6 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)

|  |  |  |
| --- | --- | --- |
| **Participants (n=229)** |  | |
| 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 |
| **Total** | **229** | **100** |

Source: Field Data, 2022

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.

**4.2.8 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, 2022

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**

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

|  |  |
| --- | --- |
| **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 9 | 3.9 |
| TB cases (D)  29 | 12.7 |
| Engaging civil society (E) |  |
| 80  All of the above | 34.9 |
| 34 | 14.8 |
| A,B,C,E  32 | 14.3 |
| A,C,D |  |
| **Total 229** | **100** |

Source: Field Data, 2022

Responses on administrative control measures in Ghana to prevent TB transmission among health care workers in Nigeria 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.

**4.2.12 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 174 providing patients and staff with a safe environment | 75.9 |  |
| Removing as many windows as to reduce cost 7 | 3.1 |  |
| **Total 229** | **100** |  |

Source: Fieldwork, 2022

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.

**4.3.4 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

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

Source: Field Data, 2022

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.

**CHAPTER FIVE**

**SUMMARY AND CONCLUSION**

**5.1. 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 Bosso LGA of Niger state.

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.

**5.2 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.

**5.2.1 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.

**5.2.2 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.

**5.2.3 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.

**5.3 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.

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