PERCEPTIONS OF HEALTH CARE WORKERS REGARDING RISK OF EXPOSURE TO INFECTION IN TUBERCULOSIS UNITS AT A SELECTED HOSPITAL IN THE VHEMBE DISTRICT, SOUTH AFRICA

By

F.G. MBARA

14005757

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Supervisor: DR. N.S. Mashau

Co-Supervisor: Dr. T. Tshitangano

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DECLARATION

I, **Fhatuwani Godfrey Mbara**, hereby declare that the mini-dissertation titled: ***"Perceptions of Health Care Workers regarding risk of exposure to infection in tuberculosis units at a selected hospital in the Vhembe district, South Africa"*** submitted by me, has not been submitted previously for a degree at this or any other university, that it is my own work in design and in execution and that all reference material contained therein has been duly acknowledged.

Dr. F.G. Mbara

Signature: …… Date: ……..

DEDICATION

This is a special dedication to my lovely children, Juju, Rinae and Alwande

ACKNOWLEDGEMENTS

I would like to thank Dr. N. Mashau and Dr. T. Tshitangano for guiding me through to the end of this research, I owe then my success.

I would like to thank my wife and children for their understanding from the beginning until now; you endured a hard time of loneliness just for this project. Thank you and I really appreciated the spirit.

To my friends Mr Hope Vhiga and Nicolas Govo, I salute your dedication with constructive criticism; the journey would have not been easy without your hands.

I would like to thank my parents for their unwavering encouragement to take my studies to the next level.

I express my tender appreciation to health care workers (TB units) at the selected hospital; I also thank the Department of Health for giving me permission to carry out this study.

I would like to thank all friends and relatives who indirectly contributed to the success of this study.

Lastly, I would like to thank God for this gift. To God be the glory!

ABSTRACT

Health Care Workers (HCWs) in tuberculosis (TB) units spend most of their time with TB infected patients. This increases their risk of contracting the tuberculosis disease from their work environment. The purpose of this study was to explore the perceptions of healthcare workers' risk of exposure to TB infections in TB units at a selected hospital in the Vhembe district of South Africa. The study employed a qualitative approach using an exploratory and descriptive research design. An exploratory design was used to explore the perceptions of HCWs regarding their risk of exposure to tuberculosis whilst performing their duties in the tuberculosis units at the selected hospital. A descriptive design was used to describe the explored perceptions of HCWs regarding their risk of exposure to tuberculosis. Purposive sampling was used to select the hospital and the HCWs who work in Tuberculosis units. A semi-structured interview guide was used to carry out face to face interviews with the participants. Data saturation occurred after interviewing 11 participants. Thematic analysis was used to analyse data and the following themes emerged: perceived susceptibility of healthcare workers to TB infection, perceived severity of TB infection, perceived preventative action towards TB infection and the challenges faced by healthcare workers in TB units. The perceptions of HCWs regarding TB infection requires immediate enforcement of the Occupational Health Act to ensure that institutions of healthcare adhere to prescribed conditions of occupational health. The challenges faced by HCWs need to be addressed so that they can freely execute their duties without fear of contracting TB.

Keywords: Healthcare workers, Hospital, Infection, Risk, Tuberculosis unit

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LIST OF ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ART	Anti-Retroviral Treatment
CDCP	Centre for Disease Control and Prevention
CXR	Chest x-ray
HCWs	Healthcare Workers
HIV	Human Immune Deficiency Virus
HRM&D	Human Resources Management and Development
IPT	Isoniazid Prevention Therapy
IUATLD	International Union against Tuberculosis and Lung Disease
LTBI	Latent Tuberculosis Infection
MDR-TB	Multidrug resistant tuberculosis
MTB	Mycobacterium tuberculosis
QFT	QuantiFERON Tuberculosis
SANDoH	South African National Department of Health
TB	Tuberculosis
TST	T-Spot Tuberculosis
UVGI	Ultraviolet germicidal Irradiation
WHO	World Health Organization
XDR-TB	Extensively Drug-resistant Tuberculosis

CHAPTER 1: INTRODUCTION

1.1 Background to the Study

Tuberculosis (TB) remains a significant health concern globally and it is regarded as one of the highest burden communicable diseases. According to the World Health Organization (WHO) (2013), of every 100 hospitalised patients at any given time, seven in developed, and 10 in developing countries, will acquire at least one infection in a healthcare setting such as TB. Lee, Kang, Kim, Cho, Moon and Suk (2010) emphasise that the prevalence of Latent Tuberculosis Infection (LTBI) appears to be higher in Health Care Workers (HCWs) with a high risk of exposure in TB-related departments compared to those with a lower risk of exposure.

HCWs are at high risk of acquiring LTBI and active TB. A study conducted by Baussano, Nunn, Williams, Pivetta, Bugiani and Scano (2011) suggests that HCWs are at an approximately 2 to 5-fold increased risk of latent TB infection than the general population globally. The authors conclude that infection control measures, coupled with early diagnosis of latent TB infection and prompt treatment of active TB, are required. In Hamburg, for example, a study carried by WHO in 2012 shows that the proportion of occupation-related TB in healthcare workers was 80% (WHO, 2012).

According to WHO (2012), in the Netherlands 28 out of 67 (43%) HCWs with active TB, contracted it from patients. In the same study it was further revealed that the main reason for transmission was belated diagnosis of index cases, especially among older patients. In San Francisco, fingerprinting performed on 1,852 patients showed that thirty-one patients (1.2% of the total) were healthcare workers and occupationally related TB was confirmed in ten (32%) of the 31 healthcare workers (WHO, 2013). LTBI prevalence among HCWs in Germany is considerably lower than in France or Portugal (10%, 19% and 33%), respectively (WHO, 2011; 2012).

A study conducted by Costa, Silva, Ferreira and Nienhaus (2011) reveals that out of 5,524 HCWs in Portugal, about 55.2% of the tested population had a positive T-Spot Tuberculosis (TST). Within the total population of HCWs, physicians were second least likely to have a positive TST, but most likely to have active TB.

A study conducted in South Africa by Sissolak, Marais and Mehtar (2011) reveals that nurses were concerned about the risk of contracting TB from patients. In the same study it was revealed that nurses received protection when the TB routine was applied, meaning that high-risk patients were isolated. In cases where high-risk patients were not isolated, the nurses feared for their own health. Furthermore, the findings of a study conducted in nine provinces of South Africa by Bramford and Taljaard (2010) reveal that most non-specialised hospitals in South Africa have no effective TB infection control programme in place, which suggests that there is an ongoing substantial risk of the nosocomial transmission of TB in public hospitals in SA. Thus, in the light of the high burden of TB, substantial risk of transmission and ineffective preventative measures at healthcare settings, HCWs in high TB prevalence areas are inadvertently and inevitably exposed to TB due to their constant interaction with patients with undiagnosed, untreated and potentially contagious TB in healthcare settings. Another study conducted in South Africa by Tshitangano (2014) reveals that health care workers in South Africa's public hospitals still implement ineffective TB control measures.

Nienhaus (2012) notes the healthcare setting in South Africa as a place where the TB burden has been a continuing issue. Hospitals and clinics are well recognized as areas of potential TB transmission. The transmission of TB can be in many forms, for example, patient to worker, worker to worker, or worker to patient.

Another South African study found that, although HCWs often have a heightened awareness of TB in others, they tend to have a low perception of self-risk (Von Delft, 2015). While illness and death are the potential risks of working in TB wards, a study by Martie et al., (2016) concludes that HIV was the major risk of TB rather than nosocomial infections among HCWs in TB wards. This resonates with Matotle, Spiegel, Yass and Ngubeni (2017) argument that South Africa has the highest number of people living with HIV/AIDS in the world, and since AIDS patients are extremely vulnerable to TB, it means that HCWs in South Africa are at risk of contracting the disease. Verkujl and Middlekoop (2016) found that South African HCWs who knew colleagues who had contracted and/or died from TB were more aware of and concerned about exposure to TB. These individuals were not only less motivated to work in high-risk areas, but also more likely to give up working as HCWs.

According to Tshitangano (2016), in the Limpopo Province, the average TB rate was 6.5% in 2010, with a death rate of 8.5% which was above the national rate, making the province the second highest in TB related death rates, when compared to the other eight provinces of South Africa. Furthermore, the study shows that new cases increased from 11 897 in 2010, to 22 158 in 2011. Such an alarming increase of new cases calls for serious interventions at local and provincial level. In addition, this suggests that there is an on-going substantial risk of hospital TB transmissions. Given this prevalence rate, TB remains a significant occupational health hazard for HCWs at many South African hospitals which treat TB. Consequently, HCWs, especially in a country where HIV prevalence is among the highest worldwide, are at increased risks of occupational exposure to TB.

1.2 Statement of the problem

There is an alarming increase of TB transmission cases in healthcare settings, yet the perceptions of HCWs regarding their risk of infection with TB at selected hospital remains unknown. The selected hospital serves as a referral hospital for all newly diagnosed active TB and MDR-TB cases in the Vhembe District of the Limpopo Province, as such, the chances of HCWs acquiring TB in workplace are high. The researcher has observed that the selected hospital has an old and poor infrastructure with no proper ventilation. This has prompted the researcher to explore the perceptions of HCWs in TB units at the selected hospital regarding their risk of TB infection at their workplace. A descriptive exploratory research design was used to distill the problem and draw conclusions on perceptions of HCWs regarding their risk of acquiring TB infection.

1.3 Rationale of the study

Various studies have been carried out on TB. Tshitangano (2014) did an evaluation of the conceptual model for effective TB control in rural hospitals in the Vhembe district. She also carried out research on the existence of health services delay in TB diagnosis and treatment at rural hospitals in the Vhembe district. As revealed by the above study, little has been written focusing on the perceptions of HCWs regarding risks of exposure to infection in TB units, yet they have direct contact with TB patients daily.

1.4 Purpose

The aim of this study was to investigate the perceptions of HCWs regarding risk of acquiring TB infections in TB units at a selected hospital in the Vhembe District, South Africa.

1.5 Objectives

The objectives of the study were to:

- Explore the susceptibility of TB infection on HCWs working in TB units.
- Explore the perceptions of HCWs on the severity of TB infections in TB units.
- Describe the benefits of preventative action towards TB in TB units.
- Explore the challenges facing compliance to TB preventative practices in TB units.

1.6 Significance of the Study

The results of the study could contribute to improvements in HCWs practices through in-depth understanding of their experiences in TB units. Policy makers may revisit the existing policies and make improvements regarding infection control standards regarding TB. The Department of Health in Limpopo may be able to improve where there are gaps which compromise TB control measures, especially about infrastructure and facilities. The study premised on perceptions of HCWs on the risks to exposure on nosocomial disease at a rural hospital. Such information is vital when crafting health awareness programmes that are meant to eradicate challenges faced by HCWs.

1.7 Theoretical Framework

Various models are used to understand a phenomenon under investigation in the health sector. This study was guided by the Health Belief Model (HBM). This theoretical framework lays out the main ideas and strategies used to understand perceptions of HCWs in TB units regarding their risk of TB infections at a selected hospital in the Vhembe District.

Health Belief Model (HBM)

The HBM gained currency in the 1950s when social psychologists in the United States used it to explain why few people were participating in programmes to prevent and detect disease. In the nursing field, HBM is applied in issues to deal with HCWs' compliance and preventative health care practices.

HBM is applicable to the current study because it aims to understand the perceptions of the HCWs on their risk to acquiring TB at the workplace. The individual HCWs' vulnerability to acquiring TB

at the selected hospital needs to be established as well. Finally, the research will show the benefits of observing preventative measures at the selected hospital. All the above components are key to the HBM and they will be applied in the current study.

1.8 Definition of concepts

1.8.1 Perceptions

A perception is a particular way of understanding or thinking about something. Normally people differ on how they see and understand things (Raviglione and Sulis, 2015). In this study, perception refers to different ways HCWs understand the factors regarding risk of TB infection at their workplace.

1.8.2 Hospital

A hospital refers to an institution that provides nursing care for sick or injured people. Hospitals also provide medical care and surgery-based treatment for patients (Brophy, 2015). Typical departments within the hospital include administration, nursing, medicine, dietary, pharmacy and laboratory. Hospitals have wards where patients are admitted according to their ailments, sex and age. In this study the hospital is referred to the selected setting where patients with different diseases including those diagnosed with MDR-TB are referred for admission and treatment.

1.8.3 Risk

A risk is defined as the possibility that something unpleasant or dangerous might happen. When someone is at risk, it means something bad or dangerous can happen to them (Tshitangano, 2014). In this study, HCWs in TB units are thought to be at risk of acquiring TB infection because they interact more with TB patients.

1.8.4 Infection (s)

Dudeck et al., (2008) define infections acquired in healthcare settings, also called nosocomial or hospital infections, as infections that affect patients and staff, with lack of evidence that the infection was present or incubating at the time of entry into the healthcare setting. In this study, the meaning of infection is twofold, in relation to both the process of getting TB bacteria and to a disease that is caused by a bacterium.

1.8.5 Tuberculosis (TB) is an infection caused by the *Tubercle bacillus* or *Mycobacterium tuberculosis* which is transmitted via airborne particles called droplets nuclei. TB is a potentially fatal contagious disease that can affect almost any part of the body but is mainly an infection of

the lungs. Although TB can be treated, cured, and prevented if persons at risk take certain drugs. However, scientists have never come close to wiping it out. TB is one of the diseases that have caused a lot of distressing illness for centuries claiming so many lives (WHO, 2009).

1.8.6 Healthcare Workers (HCWs)

According to WHO (2010), healthcare workers are men and women who make healthcare happen. They include nurses and midwives, pharmacists, physicians, dentists, doctors and other Healthcare Professionals. For the purpose of this study, HCWs are all the nurses who work in TB units at the selected hospital.

1.8.7 TB Unit

A TB unit is a place within the hospital where all people who have been diagnosed with TB infection are admitted and treated (WHO, 2013). In this study, a TB unit refers to a ward within a general hospital with patients who have been diagnosed with TB and MDR-TB.

1.9 Dissertation outline

Chapter 1: Is an introductory chapter which outlined the background to the study, a statement of the problem, the significance of the study, the purpose of the study, the research objectives, and the rationale of the study, the theoretical framework and definitions of concepts used in the study.

Chapter 2: Literature review is a detailed review of previous ideas and studies that were previously carried out in the same line of study. Reviewing literature is important to strengthen emerging ideas and identifying knowledge gaps.

Chapter 3: Research methodology, outlines strategies, and procedures used to achieve research objectives. Essential aspects of research methodology include research design

Chapter 4: Presentation and interpretation of results. This chapter contains the study findings which are discussed accordingly.

Chapter 5: Summary, recommendations and conclusion. The chapter contains an introduction, summary of research findings, general recommendations and further research, and lastly, the conclusion.

1.10 Chapter summary

The chapter gave an expose of the main components of the study. It outlined the research topic titled: Perceptions of HCWs regarding risk of exposure to tuberculosis infections in tuberculosis units within a selected hospital of the Vhembe District, South Africa. Other sections include the background of the study, a statement of the problem, the main purpose of the study, the research objectives, the significance of the study, the rational of the study, the theoretical framework, definitions of concepts and the dissertation outline. The next chapter contains a review of literature on perceptions of HCWs regarding their risk of exposure to acquiring TB infection.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section reviews literature related to the study. The prevalence of TB at a global level is reviewed and the review narrows down to South Africa and the Limpopo province. The section also provides a review of literature on TB among HCWs, existing safety measures in TB wards and barriers to the effectiveness of the measures.

2.2 Prevalence of TB Infections among HCWs: Global Context

Globally, the prevalence of TB among HCWs is a serious issue. According to Menzies, Joshi and Pai (2007), TB infection among HCWs was considered a less serious challenge since the advent of antibiotic therapy. However, unprecedented outbreaks of the disease in healthcare settings stimulated concerns about risks of exposure to TB infection of HCWs (Fennelly and Iseman, 1999). A study carried out by Menzies et al., (2007) reveals that HCWs in low- to medium-income countries and high-income countries are exposed to the risk of TB infection through their role of caring for TB patients. Wells, Apleker and Pai (2015) contend that HCWs in Asia are highly exposed to the risk of contracting TB, which is regarded as a public health risk in the continent. Jensen, Lambert, Michael and Ridzon (2005) argue that with super-power countries, such as the United States of America experience a prevalence of TB among HCWs. Hence, guidelines have been developed for preventing TB transmission in health care settings in response to the widespread TB infection among USA HCWs (WHO, 2005). Von Delft, Dramowski, Sifumba, Mosidi, Ting, von Delft and Zumla (2016) contend that WHO estimates show that 480 000 people (of which 40% were HCWs) were infected with TB in 2014, with an increasing prevalence in Eastern Europe, Asia, and Southern Africa. There is no doubt that HCWs are among the majority of people surviving with TB infections.

There is evidence that TB infection contributes to high morbidity and mortality in low income countries (Martie, Van der Walt, Margot, Dorman, Pan, Yenokyan and Farley, 2016). The majority of such countries are found in Africa, where studies show that TB claims many lives (Rutanga, Lowrance, Oeltmann, Mutembayire, Willis, Uwizeye, Hinda, Bassirou, Gutreuter, Gasan, 2015). In a cross sectional survey carried out in Kigali, Rwanda, it was found that TB was more prevalent among HCWs (62%) than School Workers (SWs) (39%) (Rutanga et al., 2015). WHO (2012)

estimates that the majority of TB infection among HCWs occurs in those who are directly exposed to and working in TB units, compared to other sections of a health care center (Menzies et al., 2014; Wahab, Abdullah, Abdullah, Jaafar, Noor, Mohammed, Tharakan, Bhasker and Pando, 2016). In sub-Saharan Africa, Brouwer, Coelho, das Dores Mosse and van Leth (2014) report that HCWs in Mozambique were also susceptible to TB infection.

According to WHO (2012), TB infection is more prevalent in SA compared to other sub-Saharan countries. SA accounted for the largest share (45%) of people living with HIV who received TB preventive treatment for LTBI in 2015, followed by Malawi, Mozambique and Kenya (Global TB Report (GTBR), 2016). Statistics from The Global TB Report (2016) revealed that in 2015, there was an estimated 10.4 million new TB cases worldwide, of which 5.9 million (56%) were men, 3.5 million (34%) women and 1.0 million (10%) children. The country is estimated to lose thirty percent of its HCWs due to TB related cases (Matlala et al., 2017). Tudor et al., (2016) contend that HCWs are exposed to hazardous occupational risk of contracting TB at their workplace. It is estimated that HCWs have a 2- to 3-fold increased risk of developing tuberculosis compared with the general population (WHO, 2012; Tudor et al., 2016). Such a high risk requires appropriate measures and methods that bring understanding to this phenomenon. Matlala et al., (2017) add that the extent to which HCWs are affected with TB raises concerns about the entire working environment in health care institutions.

2.3 Susceptibility of HCWs to acquiring TB infection

Farhanah, Sarimah, Jafri Malin, Hasnan Siti Suraiya and Wan Mohd Zahiruddin (2016) contend that certain work locations such as inpatient TB facilities, laboratories and internal medicine and emergency facilities, as well as individuals who fit into various occupational categories such as radiology technicians, patient attendants, nurses, ward attendants, paramedics and clinical officers are all associated with a higher risk of active TB disease. Both Costa et al., (2011) and Brouwer et al., (2015) claim that HCWs are in the higher risk group of TB infection due to inadequate ventilation of working spaces and procedures involving contaminated aerosols, which favour transmission from an active disease, in the hospital setting. Farhanah et al., (2016) opines that HWCs' exposure to TB will increase as the number of patients seeking TB treatment at health facilities increases, concomitant with the re-emergence of TB cases due to a high influx of immigrants from high TB burden countries.

Farhanah et al., (2016) posit that a HCW who is sitting in proximity to an individual infected with TB has about four times greater the risk of acquiring TB infection compared to other HCWs whose contact with TB patients is minimal. Farhanah et al., (2016) add that the risk of contracting TB infection varies according to occupational groups. The classification reveals that HCWs deployed in TB units have high chances of acquiring TB infection. Therefore, targeting HCWs in TB units with effective and efficient control measures helps to reduce risks of acquiring TB among HCWs at the workplace.

2.4 A Review of Existing Safety Measures in TB Wards

A study conducted in Australia by Bednarsh et al., (2015) to identify the external influences on infection control, reveal that clear concise, understandable and usable measures are needed to minimise HCWs' confusion. This suggests that TB infection control guidelines must be enforced at hospitals of the Vhembe district (Tshitangano, 2015). Further studies in the USA by Chughtai et al., (2015) which were conducted to propose elements of idealised future states and systems for infection prevention, revealed the need for clear guiding principle, which suggested a need for clear TB infection control guidelines based on national and international TB policies.
In South Africa, TB control frameworks have been in place, and these include:

- The South African national TB control programme practical guidelines (2004);
- The management of drug-resistant TB policy guidelines (2012);
- National TB management guidelines (2009);
- Guidelines for tuberculosis preventive therapy among HIV infected individuals in South Africa (2010);
- The national infection prevention and control policy for TB, MDR-TB and XDR-TB part 1 and 2 (2007); and
- Multi-drug resistant tuberculosis – policy framework on decentralised and deinstitutionalised management for South Africa (2011).

The above guidelines also emphasise that TB transmission can be reduced by taking simple measures, such as spending as little time as possible with TB patients in health-care facilities, including clinics, and this can be achieved by, for example, reducing diagnostic delays (WHO, 2010). Furthermore, the WHO (2010) stresses that placing potentially infectious TB patients in

waiting areas with other patients, especially those who are immune-compromised – for example, HIV/AIDS patients or babies – poses an increased risk of TB being transmitted.

Health workers should ensure that quality clinical care is provided to infectious patients, and that the time spent with such patients in areas that are overcrowded or poorly ventilated is minimized. This involves reducing the turnaround time for sputum testing. There is also a need to provide a package of prevention and care interventions for health workers (WHO, 2010).

Environmental control measures are dependent on infrastructural design, the use of ventilation, and irradiation, which all require capital investment. However, simpler effective methods have been proposed based on adequate ventilation through the opening of windows (WHO, 2012). Furthermore, adequate ventilation in health-care facilities is essential for preventing transmission of airborne infections, and is strongly recommended for controlling the spread of TB. Any ventilation system must be monitored and maintained on a regular schedule. The use of ultraviolet germicidal irradiation (UVGI) fixtures, at least when adequate ventilation cannot be achieved is also encouraged. The choice of environmental controls is intimately related to building design, construction, renovation and use, which in turn must be tailored to local climatic and socioeconomic conditions (WHO, 2012). This is challenging, especially in countries where weather conditions are harsh, with winters that can record temperatures below zero degrees. This could possibly contribute to some HCWs not opening windows for ventilation and keeping doors closed, explaining, to a degree, the low compliance reported with these IPC practices (Bhebhe et al., 2014).

Personal protective equipment (particulate respirators) should be used together with administrative and environmental controls in situations where there is an increased risk of transmission. HCWs may gain additional protection from TB through the use of particulate respirators that meet or exceed the N95[1] standards set by the Centers for Disease Control and Prevention (CDCP). In particular, HCWs should use particulate respirators during high-risk aerosol-generating procedures associated with high risk of TB transmission (e.g. bronchoscopy, intubation, sputum induction procedures, aspiration of respiratory secretions, and autopsy or lung surgery with high-speed devices), and when providing care to infectious MDR-TB and XDR-TB patients or people suspected of having infectious MDR-TB and XDR-TB.

Another method that has been used to prevent the transmission of TB among HCWs is screening. In many countries, TB screening is performed through risk assessment, and HCWs who have regular contact with infectious patients are screened at different intervals (e.g. annually or biannually). Other HCWs, such as those who have been exposed accidentally via unprotected contact with infectious patients, may be screened urgently as well (Nienhaus, 2012). Pre-employment and regular, ongoing screening for TB infection of doctors, nurses, custodial staff, and other health professionals help institutions monitor potential for occupational TB exposure and prevent nosocomial infection through early detection of infectious HCWs and/or chemoprevention of HCWs identified as having latent TB infection. Implementation of targeted TB screening in groups with higher risk of exposure, such as HCWs, early diagnosis of patients contributes significantly to effective TB control (Nienhaus, 2012).

2.5 Barriers to the Effectiveness of Control Measures

Financial problems pose a threat to the effective implementation of TB preventative measures at workplaces. National TB programmes (NTPs) in low-income countries continue to rely on international donors for almost 90% of their financing (Global TB Report, 2016). In South Africa, Zelnick et al., (2013) found that barriers to the successful implementation of TB control measures usually fall into three categories, namely: HCWs' distrust of TB control efforts, and disproportionate focus on personal protections. The study found that managers of health facilities lacked resources to adopt policies set at the national health system level, thereby passing the burden of TB infection control implementation and oversight to individual HCWs, who themselves often lack support, adequate knowledge, and training in TB control (Zelnick et al., 2013).

Another South African study found that barriers to successful implementation of TB infection control included the non-proactive use of respirators, overstretched HCWs who lacked time to implement TB infection control, lack of shared responsibility for TBIC among HCWs, inadequate training, and poor ventilation in health facilities (Adeleke, 2012). The same study found that successful implementation of TB infection control depended on the availability of resources, effective facility leadership on TB infection control supervision of HCWs, fear of transmission, and regular screening of HCWs for TB.

In Nigeria, Kuyinu et al., (2016) reported similar findings, noting that TB infection control typically failed due to weak managerial support, lack of funding, inadequate human resources,

stigmatisation against TB, and inadequate infrastructure to provide a suitable space for treating people with TB away from the rest of the facility population. However, Courtwright and Turner (2010) comment that stigma surrounding TB can lead to delayed health care seeking and poor treatment outcomes. The convergence of HIV and TB epidemics in many low-resource settings has served to create a form of overlapping, dual stigma between the diseases (Dafrary, 2012). In areas of high TB and HIV prevalence, it is often impossible to disentangle the two forms of stigma (Cremers et al., 2015). This informs the current study, given that South Africa is among the leading countries with regards to cases of HIV/AIDS worldwide.

2.6 Summary

The review of literature above gave a detailed account of susceptibility of HCWs in TB units to contracting TB infection from a global, African and South African context. It was shown that HCWs worldwide are at a risk of contracting TB infections, but South Africa has a high prevalence of TB infections among HCWs compared to its sub-Saharan counterparts. The review of literature from a global scale to localised settings shows that HCWs have various perceptions regarding their risk of acquiring TB infections. However, the literature lacks clarity on perceptions of HCWs regarding their risk of acquiring TB infections particularly in SA. As reviewed in the literature, there are benefits of applying preventative measures to control TB infection among HCWs in TB units. It is not clear whether the accelerated infections emanate from negligence of HCWs or they remain administrative shortfalls. Such knowledge gaps found in this literature review evoke the eagerness to carry out the study at a selected rural hospital in the Vhembe District in South Africa. The next chapter outlines the methodology used to carry out the study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Study Design

This was a qualitative study which used a descriptive and explorative approach. A descriptive approach describes the problem at hand as it is told by the research participants. This was effective because a solution to the problem is attained when those who are affected tell their story. Thus, in this study, HCWs in TB units at the selected hospital in the Vhembe district described the nature and severity of the problems they face in TB units so that proper interventions are suggested. Obtaining perceptions of HCWs about risks regarding their exposure to TB infections required an exploratory approach because the area has not previously been studied and the perceptions of HCWs do not give a one size fits all explanation. The factors leading HCWs to be vulnerable to TB at the work place are complex and therefore call for an exploratory approach. The exploratory approach was flexible, and this gave the researcher room to probe in grey areas of interest which were vital to addressing the study objectives.

3.2 Study Setting

The research was carried out at a selected hospital in the Vhembe District as shown in Figure 1. There are eight public hospitals in this municipality with one hospital serving as a specialized psychiatric hospital. The selected hospital serves as a referral hospital for all diagnosed active TB and MDR-TB cases in the Vhembe District. It has 22 beds in the TB ward, with 2 isolation beds.

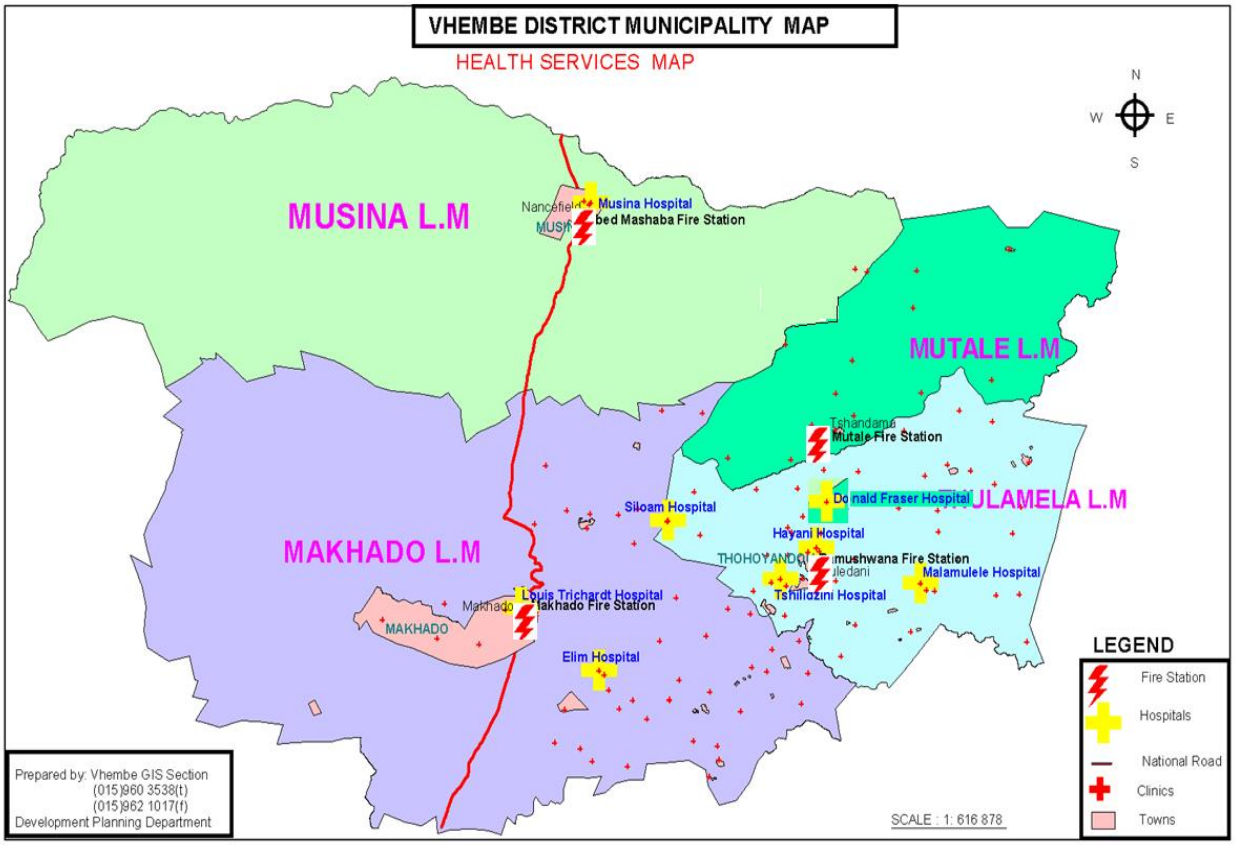

Figure 1: Distribution of Hospitals in the Vhembe District (UNIVEN, GIS, 2012)

3.3 Study population

In this study, population refers to individuals who possess specific characteristics which the research problem is concerned with (De Vos, Strydom, Fouché and Delpot, 2011). The target population for this study comprised of all nurses working in TB units at a selected hospital. The selected hospital comprises of 17 nurses working in the TB units.

3.4 Sampling method

For the purpose of this study, purposive sampling method was adopted to select the research participants. Purposive sampling is the selections of individuals who will best help the researcher understand the research problem and questions because they have experienced the phenomena under investigation (Creswell, 2014). The sample included HCWs working in TB units because

they have experienced the incidence of TB infection by themselves or with colleagues. The sample size was 11 participants, determined by data saturation.

3.4.1 Inclusion criteria

The Inclusion criteria were as follows:

- Nurses of all categories
- They must be working or have worked in a TB Unit
- They must be at the selected hospital.

3.5. Data Collection

Data was collected using face-to-face interviews. Participants who consented to being interviewed were briefed on the questions prior to the interview in order to have time to consider their responses. It was also explained to them that the interview schedule is a guide for the interview and the questions were not limited to the ones prepared, as the researcher required further clarity, based on the responses of the participants. This helped to expand the interview in order to obtain meaningful and unbiased data. The researcher conducted individual interviews with nurses who work in the TB ward. The interviews were done in a secluded room to ensure privacy. Nurses were interviewed during lunch breaks and according to their availability. Allowance was made to interview one nurse at a time to make sure that the work in the ward was not disturbed. Interviews were conducted in English, but participants were not limited in terms of language and those who were comfortable with Tshivenda were free to use it. Nonverbal cues were recorded on field notes and they assisted the researcher to cross-reference during data interpretation and analysis. Permission to use filed notes was requested from participants. An audio tape was used to record the communication for cross referencing when analyzing the data. The researcher was involved in the interviews with each participant during data collection for about 30-45 minutes. Data collection ended after data saturation which occurred after interviewing 11 participants, since there was no more new information coming from participants.

3.6 Data Management and Analysis

Data analysis took place simultaneously with data collection. Daily, the researcher listened to the audio tape and transcribed verbatim data from the participant. Data analysis was done on

interview transcripts based on Ross-Jones and Longhurst's six-phase thematic analysis approach, as cited in Phiri (2012:39). The steps followed were:

Phase 1: Familiarising with data

This stage involves transcribing raw data. Some data collected using Tshivenda (especially in areas that needed clarity), were translated to English to derive a common understanding of issues discussed. The researcher read and re-read the data to become familiar with it and obtain in-depth understanding.

Phase 2: Generating Initial Codes

Data segments were coded for as many features as possible by the researcher. Once all the data were coded, data were collated by code. Final transcripts were revised, and all segments of data were systematically arranged.

Phase 3: Search for Themes

Recurring codes were produced, and related codes were gathered into potential themes. All data relevant to each theme were then collated.

Phase 4: Review Themes

Data relating to each potential theme is considered in relation to other themes. The validity of themes was considered in relation to the entire data set.

Phase 5: Define and Name Themes

A detailed analysis was conducted on each theme by organising data into a coherent account, with narrative. Constructs were given to each theme for the written account.

Phase 6: Produce the Report

The final analysis of themes was conducted and presented in the report as research findings.

3.7 Measures to ensure trustworthiness

In carrying out this qualitative study, it was crucial to ensure that data and findings represent the truth about perceptions of HCWs' risk to exposure of TB infection at a selected hospital. Measures to ensure trustworthiness such as credibility, dependability, conformability and transferability were ensured in this study (Creswell, 2014).

3.7.1 Credibility

In this study, creditability was ensured through sequential and concurrent application of techniques that monitor and evaluate the trustworthiness of participants' responses during and after data collection process. Prior to initiating an interview session, the researcher explained the research topic to each participant and the purpose of the study. It was outlined that the study was important not only for academic purposes, but that the results would influence certain changes regarding the challenges faced by HCWs in the whole country. The reason for such an explanation was that the researcher was a former employee at the selected hospital, so participants were likely to be influenced by his occupational status. Achieving credibility is an important aspect in research, because the findings are expected to be a true reflection of reality (Lincoln and Guba, 1985). The following techniques were applied to establish confidence in credible results:

Prolonged engagement in the field: The interviews were scheduled for one on one interface, thus one participant per session. The researcher visited the selected hospital for duration of two weeks. This was also influenced by work schedules of participants because the interviews were carried out during tea and lunch breaks. Constant visitation on the site instilled confidence in participants hence they were eager to add value and making their voices count to the best of their knowledge. The researcher spent about 30-45 minutes with each participant during data collection.

Persistent Observation: During interviews, the researcher used field notes to capture non-verbal cues observed. Non-verbal communication observed included but not limited to slapping of fist (emphasis) and rising of eyebrows (surprise/ agreement) and they were captured as field notes. Creswell (2014) argue that persistent observations of participants' especially non-verbal communication portray a good measure of trustworthiness in a conversation. By so doing, the researcher ensured that discussions remained within the confines of time allocated while addressing relevant issues. However, participants were allowed to provide full explanations regarding their understating of the problem without interruption. With the aid of a tape recorder, explanations provided in mother tongue were also captured and translated later. Irrelevant and repetitive ideas were screened during data analysis process.

Triangulation: In this study, triangulation was achieved through the use of observation, field notes and audio recording to ensure congruency of responses in relation to the reality. In this way data was deemed reliable and trustworthy. Brink, Vander Walt and van Rensburg (2012)

contend that the use of triangulation during and after data collection improves the credibility of data, as well as the results.

3.7.2. Conformability

The researcher conducted audit trials to ensure that research procedures and results were free from bias. This involved analysis of raw data and drawing up conclusions. This was appropriate because it guarded the researcher against imposing his ideas to control for accuracy, relevance and obtaining meaningful results. Field notes which were rich in non-verbal communication captured helped to identify characteristics and elements which were relevant to the perceptions of HCWs regarding their risk to acquiring TB infection at the selected hospital.

3.7.3. Dependability

An exploratory and descriptive research design was used to carry out this study. During interviews, the researcher allowed participants to lead in providing information with little interference. In this way the researcher was able to learn from participants rather than controlling them. With expert guidance from the supervisor, the researcher made use of field notes and literature to ensure that the findings were consistent when replicated with the same subjects or similar context.

3.7.4 Transferability

The researcher ensured that all processes of carrying out the study were clearly stated. These included explaining the sampling method and sample size used. In this study eleven participants were purposefully selected to participate in the study. An exploratory descriptive research design which made use of a semi-structured interview guide was used to during face to face interviews. The supervisor assisted with screening of results and ensuring that the data was relevant and fulfilled the purpose of the study. Consensus was researched through discussions with the supervisor and an independent colleague to strengthen the rigor of results.

3.8. Ethical Considerations

According to Miller and Brewer (2003), ethics in social research is about creating a mutually respectful, win-win relationship in which participants are pleased to respond frankly. The researcher followed the following ethical guidelines throughout the research process:

- **Ethical clearance**

The application for ethical clearance was submitted to the University of Venda Higher Degrees Committee (UHDC) Ethics Committee, for approval. The ethical clearance certificate was sought from the University of Venda Ethics Committee. This was issued after all the requirements of ethical considerations were observed and deemed satisfactory to carry out a research. Obtaining the ethical clearance certificate paved way for initiating the data collection process.

- **Permission to conduct the study**

Permission to conduct research was granted by the Department of Health in the Limpopo Province. The researcher proceeded with the research process after obtaining a letter of approval to conduct research from the Department of Health. Written permission to conduct the study from the selected hospital was obtained. Engaging the aforementioned authorities paved the way for community entry (in this regard the health care workers' workplace). Furthermore, permission to conduct the study was also obtained from the unit manager.

- **Informed Consent**

Obtaining informed consent implies that all possible or adequate information on the goals of the investigation be communicated to the participants before engagement (William, 2006). Participants were allowed to read an information leaflet which informed them about the research aim, objectives and risks. The information was clear on how the participants' information was treated and kept. Participants volunteered to take part in the research process. Miller and Brewer (2003) argue that voluntary consent is the central norm governing the relationship between the researcher and the research participants. In this regard, the free will of participants was respected. Participants were allowed to exercise their freedom to withdraw from the study at any time, but participants remained until data collection was completed. Consent forms were signed prior to the interviews, as a 'contract' which explicitly laid out conditions of participation (Miller and Brewer, 2003).

- **Confidentiality**

Confidentiality deals with the protection of information as provided by the participants. Sensitive and personal information were protected and were made not available to anyone other than the researcher and supervisors. Data collected from participants was kept under secure conditions at all times. Interviews were done in a separate and confidential room within the TB ward.

- **Anonymity**

It is good research conduct that participant's data must not be associated immediately and obviously with the name or any other identifier. As such, the right of the respondents to provide information on the basis of anonymity was observed. Anonymity in this case means that no one, including the researcher, would identify the participant with certain information. In this study, pseudonyms were used in circumstances where participants agreed to give anonymous information. In addition, there was no space on the interview guide that asked for true names of participants.

- **Privacy**

Privacy entails that face to face interviews were between the interviewer and interviewee. The interview took place in a secluded room to make sure that only the interviewer and the interviewee interact. Wards were avoided as interview areas and special arrangement was made with the hospital administrator to avail a room for the interviews.

- **Protection of participants from any harm**

HCWs are employed by the Department of Health and as such, measures were taken to ensure that the information they provided during interviews were not disclosed to anyone except the researcher. Assurance was given that such information would not cause any harm to the interviewee and such measures as anonymity and confidentiality were closely observed. During and after the research process, the information given did not harm HCWs and their employer.

3.9 Limitations of Study

Given the nature of the work of HCWs, scheduling meetings and recruiting them as participants in the study was not easy. However, good rapport with the participants made it much easier to initiate and complete the data collection process. The selected hospital is a referral hospital in the Vhembe District, therefore the findings may not be generalised when making decisions on TB control for the whole country.

3.10 Summary

The chapter provided an expose of processes and procedures followed to achieve objectives of the study. A qualitative methodology which employed an exploratory descriptive research design was used to unravel perceptions of HCWs regarding their risk associated with their exposure to acquiring TB infection at DFH in the Vhembe District, South Africa. The population comprised of HCWs working in TB units at DFH. Eleven purposively selected HCWs participated in the study. Data was collected using an interview guide, and analysed using thematic content analysis method. Measures of trustworthiness and ethical considerations were adequately explained in this chapter.

CHAPTER 4

PRESENTATION AND DISCUSSION OF REULTS

4.1 Introduction

Following the methodology outlined in the proceeding chapter, perceptions of HCWs regarding the occupational risk of exposure to acquiring TB infections while working in TB units at DFH in the Vhembe District in South Africa are presented in this chapter. Eleven HCWs who work in TB wards at the selected hospital participated in the study. Data was analysed using thematic analysis which creates codes and arranges the responses in themes. The first section presents the demographic details of respondents. Thematic presentation of perceptions of HCWs regarding their risk of exposure to acquiring TB infections in TB units at the selected hospital is sequentially presented thereafter. It was found that HCWs at the hospital were aware of health risks associated with TB, and the challenges faced by HCWs working in TB units were also unravelled. The findings also indicated that several measures were put in place to ensure that HCWs are protected from acquiring nosocomial TB infection. A brief discussion of the results follows each section of the study findings.

4.2 Demographic background of participants

Nine (82%) of health care workers who participated in this study were females and two (18%) were males. Most female health workers were adults aged 36-59 years. Of the two male workers, one was aged 32 years with nine years of service and the other one was aged 50 with 30 years of service. All female participants had served in the TB ward for period less than 10 years. The average years of service for female participants were 2.8 years. Most of them were within their first years of practising. Demographic details of participants are presented in Table 4.1. However, results show that most of them completed tertiary education prior their employment by the Department of Health as nurses. Ten general nurses were interviewed and one Sister in Charge. All participants were working in TB Wards at the hospital. The distribution of age, gender and period of service signify that indeed, HCWs at DFH are exposed to risks of acquiring TB infection at their workplace.

Table 1: Demographic details of participants

Age distribution	**Frequency**	**Percentage %**
30-35	1	1
36-65	10	99
Gender		
Male	2	18
Female	9	82
Categories		
Registered nurses Enrolled nurses Nursing assistant	4 4 2	91
TB unit manager	1	9
Average number of years in service	2.3 years	

4.3 Perception of health risks in tuberculosis units

Perceptions of health risks regarding TB infection among HCWs in health care units at the selected hospital were explored. The results are presented according to themes. The following table shows themes used to frame the results.

Table 2: Summary of themes and results

Number	Theme	Results
1	Susceptibility of health care workers to TB infection when working in TB units.	Health care workers were aware that they are vulnerable to TB infection. They had nothing to do because it is the nature of their work.
2	Severity of TB infections in healthcare settings.	TB related fatalities of HCWs at the selected hospital were present and such deaths affected the performance of other health care workers.
3	Benefits of preventative action towards TB in TB units.	Benefits of implementing preventative measures were identified. However, health care workers were reluctant to implement them.
4	Challenges faced by HCWs in TB units.	Numerous challenges including lack of adequate infrastructure, overcrowding of TB patients and non-adherence to occupational health and safety standards contribute were identified during interviews.

4.4 Susceptibility of Health Care Workers to TB infection in TB units

Susceptibility of HCWs to health risk refers to compromising situations which expose HCWs to an infection. In this study perceptions of HCWs regarding the risk of TB infection were investigated. HWCs interact with TB patients on a daily basis and they may end up acquiring this nosocomial infection. HCWs were aware of such risks in light of their working environment. Initially HCWs expressed major concerns about their own safety. However, results showed that there are still concerns even though safety measures are implemented. One of participants mentioned that:

> *I think here you will find that you are staying with a person who has not started treatment. Then you stay with him or her for a long time you may end up being infected because there is overthrowing of TB germs. The bacteria spread rapidly and easily so you find that we become susceptible to TB infection under such circumstances.* (Participant 8)

> *I was scared because as I knew that TB is a disease that is highly infectious. I get the information about the severity of TB infection in radios and community around here. With this I don't feel comfortable because the way I see it ummm…!! TB is a disease that some of us get through smoke inhalation and some inherit it. When I come here I saw it was different because most people come here and they are very sick and in most cases they are scary even if I am a nurse…..Hmmm.* (Participant 4)

Another participant commented on the N95 masks which are used by HCWs to protect themselves from inhaling TB bacilli when serving TB patients:

> *Hmmm yes it was not easy when the Matron allocated me to work in the TB ward. So when I came here the Matron told us that there are N95 masks so don't be afraid and she demonstrated to us on how to wear them……" Therefore I don't feel protected with the mask because I am not wearing correct size but I try to fit them according to Matron's instructions. The masks we are given are not fit tested here at the hospital, they just give us any size….Like here it is very hot, I used to have difficulties in breathing when wearing the mask so I end up removing it and take a breath, that is why I say I am not safe.* (Participant 3)

The study results showed that HCWs deployed in TB units feel susceptible to contracting TB infection. This is so because they stay with TB patients for a long time, thus increasing their exposure to acquiring TB infection. They still fear for their lives because they know that TB is infectious. However, some perceptions showed that some HCWs lack understanding of causes of TB infection especially when they mention inheritance of TB infections. Mirtskhulava et al., (2016) argue that the susceptibility of HCWs to TB infection is influenced by their behaviour. Using the Human Behaviour Model (HBM) as adopted in this study, they contend that individuals conduct an internal assessment of the net benefits of changing their behaviour, and decide whether or not to act. This implies that HCWs are able to make decisions that reduce their vulnerability to acquiring TB infection such as using N95 masks, regardless of the time they spend working with TB patients. Matotle et al., (2017) emphasise that HCWs need appropriate education and knowledge about the nature of diseases they are exposed to. A study carried out in Georgia (USA), indicated that HCWs particularly students deployed in TB units are more susceptible to TB infection, hence they need enough training before they attend to TB patients (Mirtskhulava et al., 2016).

The results show that HCWs at the hospital perceived that their susceptibility to health care risk is exacerbated by the use of inappropriate sizes of N95 masks. Zungu and Matotle (2016) argue that the use of appropriate sizes of masks is important for hygiene and protection purposes. However, there is a general consensus that the sole purpose of the mask is achieved when it is correctly used (Matotle et al., 2017). For example, some participants mentioned that they try to comply with instructions, even if they are not of the correct size. In addition, Brouwer et al., (2016) argue that the unavailability of appropriate materials or equipment increases the vulnerability of HCWs in acquiring TB infections. In a similar study, Brouwer et al., (2016) report that other factors, such as the conditions of consultation and waiting rooms in some facilities, were of inadequate space, and not all windows could open.

According to Zungu and Matotle (2016), HCWs in South African health care facilities work in environments with a high density of TB patients, due to the dual burden of TB and HIV/AIDS in the population, exposing them to acquiring TB. They argue that regardless of knowledge on surging TB incidences and the possibilities of TB transmission to both HCWs and patients, they still remain vulnerable to the diseases. It is acknowledged that there is still inadequate implementation of infection protective initiatives, such as N95 masks (Matotle, 2016; Tshitangano, 2016).

According to both Menzies et al., (1995) and Zungu and Matotle (2016), the risk of occupationally acquired TB is substantially higher in HCWs when the source of exposure are patients. Furthermore, it declines drastically in patients on effective TB treatment as effective TB treatment reduces the infectious period of TB patients. Van Custem et al., (2016) prove that the magnitude of the risk varies with the setting, occupational group, and prevalence of TB in the community, patient population, and effectiveness of TB ICMs. Similar results were also found in Uganda and Nigeria regarding the exposure of HCWs stationed in TB units (WHO, 2015). In a study that used interview guides to obtain perceptions of participants, Sulis and Raviglione (2016) conclude that HCWs in TB units are more likely to acquire TB compared to health workers in other departments. On a similar premise, the Centre for Disease Control and Prevention (2005) comment that personal health status and environmental factors contribute largely to the progression of acquiring TB infection among HCWs. It can be concluded that HCWs at the selected hospital are aware of their susceptibility to acquiring TB infection; hence they were afraid in the first place to work in the TB wards.

4.5. Severity of TB infections in healthcare settings

The results exhibit primary evidence of severity of TB infections among TB patients. HCWs contend that TB infections graduate through stages of severity. Participants perceived that TB infections are more severe when patients default on their treatment to become MDR or XDR. Staff perceived that the severity is also influenced by other factors such as defaulting on HIV treatments. If HCWs are not properly protected or do not take necessary precautionary measures when attending patients, chances are high that they will contract TB. Participants stated:

> *I say TB can be cured if patient can take treatment according to Doctor's prescription. It is easy for people to be cured but in most cases we see that people default treatment then after that then it becomes MDR or XDR. This is the most severe stage of TB infection and it cannot be cured. If people comply with prescriptions it becomes easy. However, if people default on other infections such as HIV and take TB treatment alone there is no improvement.* (Participant 6)

> *I am at risk, because like I alluded….we admit MDR patient here and we have one cubicle and we used to admit two, in cases we have a male and female patients at the same time we take the male patient to another ward and when I go there to take care of the patient, I am at high risk because I am not able to take absolute care of all patients. Other issue is lack of medication to treat patients. That increases the severity risks and TB infections.* (Participant 3)

> *TB is dangerous, why? Because we see all people who are infected with TB become weak, it also affects the respiratory organ which is dangerous. So I treat TB patients because it is a requirement but if opportunities arise I may not prefer to work in TB wards"….. "Here there are cases that we treat and I know that it a dangerous and infectious….. As nurses we know that the department carry out x-rays for us but this does not prevent us from being infected by MDR and we are scared about that.* (Participant 2)

Participants shared sentiments that they treat conditions such as MDR and XRD which are supposed to be transferred to Modimolle (a special TB curing unit in the Limpopo province). This implies that they deal with severe TB conditions which exacerbate their risk of acquiring TB infections. Zungu and Matotle (2016) concur that HCWs in TB units are severely exposed to TB risks. HCWs at the selected hospital were afraid of acquiring TB under such compromising conditions. Although the Department carries out x-rays, participants felt that the process does protect them from acquiring TB infections due to the severity of infections they are exposed to. HCWs in TB units at the selected hospital are afraid to effectively carry-out their duties because they are afraid to treat extreme TB conditions which compromise their health. The SA health report (2016) states that HCWs carry out their duties in dangerous conditions because of various reasons which include lack of standardised infrastructure and professional personnel. This

resonates with the perceptions of HCWs raised at the selected hospital that severe TB infections are not properly accommodated because of a lack of sufficient cubicles and the situation is more difficult when TB patients of different sexes are to be admitted at the same time.

4.6 Preventative action towards TB in TB units

Tuberculosis infections in staff members can be a nosocomial disease which needs care and the institution of preventative measures. The results of the current study indicate that HCWs are aware of preventative measures that need to be implemented to prevent TB infection. They contend that implementing preventative measures creates a healthy working environment which does not compromise their interaction with patients. The perceived benefits vary according to the availability of hospital materials such as N95 masks. Implementing TB preventative measures also helps to reduce the level of infection among TB patients. The study revealed that besides using the available materials for prevention, other control measures such as separating high risk patients (MDR/ XDR) from other patients reduces transmission of the TB germs among patients. With regards to benefits of preventative action towards TB in TB units, participants shared that:

> *In TB wards, we usually open windows. We don't close windows, we make sure that windows are open... those who are coughing too much we give them masks to wear and we separate the MDR for other patients. However not all patients get masks except those who are coughing too much.* (Participant 1)

> *We are encouraged to use our masks once a day ….and we wash our aprons twice a week.* (Participant 5)

Participants mentioned that they use various preventative measures, such as opening windows in TB wards at the selected hospital. In a study carried out at a health institution in the UK, Munoz et al., (2015) comment that HCWs assigned in TB units manage air circulation by opening windows and doors in TB wards. HCWs at the selected hospital gave patients who cough too much masks so that they do not cough on open air. The use of N95 masks on patients that are severely infected help to control the spread of TB amongst patients and HCWs. This concurs with the findings of Mirtskhulava et al., (2016) which emphasise that in the USA HCWs are required to use N95 masks for extremely coughing TB patients. Participants revealed that they are also given masks (N95) and they use one mask per day. Tshitangano (2016) emphasises that lack of N95 masks in health facilities compel HCWs to use one mask per day. However, participants felt that despite the availability of masks (N95), they were not of fitting sizes. Participants also revealed that they wash their aprons twice a week. Such hygiene initiatives were reported by Grobbler et al., (2016) in the Occupational Health Report for SA. Brower et al., (2016) concur that the use of

masks (N95) on a daily basis, and washing of aprons twice a week was also encouraged among HCWs in Mozambique. Practising similar patterns of hygiene are crucial for minimising the risk of acquiring TB at the selected hospital.

4.7 Challenges faced by Health Care workers in TB units

The results reveal that HCWs at the selected hospital are faced with difficult working conditions. They risk being infected by TB while attending to TB patients under compromising situations, characterised by inadequate preventative facilities. Such challenges impact on worker morale and ultimately on the quality of services provided to patients. The Department of Health expect that TB patients receive good quality services in line with international standards, but lack of adequate facilities at the selected hospital frustrate such endeavours. As a result, TB induced fatalities among HCWs remain at their pick levels across the Limpopo Province. The following challenges were highlighted:

> *We have challenges because there are no isolated wards or isolation rooms for MDR. We also don't have adequate staff members to work with MDR cases in particular. The specialised staffs for MDR are not supposed to work with other patients and this is not the case here. We don't have enough gowns to use when attending patients. You find that one gown is used for the whole week without being washed and this increases the risk of patients as well as health care workers in contaminating TB germs. Lack of protective materials such as well as fitting N95 masks continues to give us problems because every time we are not free and safe to use them.* (Participant 6)

> *The wards have poor ventilation; if sliding glass doors are installed this can improve the circulation of air around the area. Patients who default on treatment continue to give us challenges because they worsen our duties. Some of them they do not get enough treatment because they stay in over congested areas. Also sometimes the medicine is not adequately available for TB patients. We struggle to maintain the prescribed treatment pattern in this regard.* (Participant 10)

> *I have worked with TB patients for over 20 years. The challenges remain the same. For example we have very limited professional nurses and patients are attended very slowly. Again it takes time to get medical results and sometimes conditions of TB patients may not reveal the actual stage of infection. Usually at the beginning, the bacteria are not easy to diagnose so it require several tests to be conducted.* (Participant 9)

> *Patient holding period is also too long before they get treatment such that other non TB infected patients are likely to be contaminated. So there is need to separate patients and hold them in secluded areas wherein children are not allowed to enter. So you find that hospitals and clinics are the main sources of TB infection for many people including Health Care Workers.* (Participant 2)

Results indicate that TB transmission is more common in health care centres, such as clinics and hospitals, due to persistent challenges faced in TB units by HCWs. Participants mentioned that challenges faced include a lack of isolated wards for MDR cases. Matlala et al. (2017) highlight that many hospitals in South Africa, particularly those that are designated for TB treatment, lack adequate rooms to accommodate TB patients. Such findings revealed compromised competitiveness in relation to provisions of WHO (2015) health facilities infrastructure standards.

Participants revealed that the staff allocation in TB units is inadequate at the selected hospital. South Africa has experienced a loss of HCWs through migration to other countries (WHO, 2015). The resulting deficit in HCWs implies that there was a substantial increase in nurse to patient ratio in TB units as well. A lack of staff in TB units causes work overload which compromises the quality of services provided by HCWs. For example, it is reported that there are specialised staff for MDR cases who are not supposed to work on other patients but that is not the case at the selected hospital (Matlala et al., 2017). However, there is no clarity on the exact ratio of clinical nurses who are supposed to attend a specified number of TB patients (Matlala et al., 2017). Besides, a shortage of staff translates to long hours of working in TB units. Thus HCWs perceived that prolonged interaction with TB patients exposed them to risk of acquiring TB.

Participants highlighted that there is a lack of gowns that are used when attending to TB patients. As mentioned in earlier discussions, a lack of such materials, together with other medicinal equipment, increases the risk of acquiring TB infection at the workplace. HCWs perceived that working in such compromised hygiene conditions expose them to contracting TB bacilli. Hygiene issues in TB wards was emphasised in the WHO (2015) report, which stated that cleanliness of gowns and masks are basic requirements for reducing the risk of exposure of acquiring TB infection among HCWs. However, irregular changing of gowns and masks (N95) frustrated HCWs in TB units at the selected hospital.

Staff perceived that the lack of adequate ventilation in TB wards increased their risk of exposure to acquiring TB infection at the selected hospital. They suggested that sliding doors be installed to improve air circulation around the area. Senedu, Yimer and Gunner (2016) offer similar findings in a study carried out at a health facility in north-west Ethiopia, which concluded that a lack of improved infrastructural design is a challenge in TB treatment units. They emphasise that HCWs who work in poorly ventilated TB units end up acquiring TB infections. Nardell (2016) adds that the challenges of a lack of adequate facilities, such as ventilated TB units, a lack of medicinal

equipment and staff, hinder TB control initiatives in many ways. Thus, the challenges of poor ventilation raised by HCWs at the selected hospital are genuine, and they require resourceful interventions.

HCWs perceived that TB patients that default on treatment raise challenges in terms of their duties. Several cases of defaulting were identified in a study carried out at a health care facility in the Gauteng province of South Africa. Matlala et al., (2017) comment that defaulting patients require accurate and close monitoring which will expose HCWs to acquiring TB, as they continuously interact with acute TB conditions. Participants perceived that defaulting patients require specialised medicine which is not readily available for TB patients. Hence, they struggle to maintain the prescribed treatment patterns for patients. It is against this backdrop that complicated conditions of TB infection such as MDR-TB and XDR-TB arise, such that the circle for TB treatment becomes hard to monitor.

Participants perceived that delayed results of TB screening hold back nurses in taking appropriate action on instituting treatment on TB patients. Senedu et al., (2016) argue that in many occasions TB patients default because incorrect prescriptions are instituted in them. Kanzer et al., (2010) reiterate that there are common instances wherein results of TB tests do not show the actual stage of infection. Staff perceived that such circumstances prevail at the selected hospital, and they are afraid to institute treatment on numerous occasions; hence they delay treatment. This resonates with another challenge raised concerning the holding period before the patient get treatment. Whereas, there is no specified hold period for TB patients in particular, it is inappropriate to brush off the challenge of holding a TB patient without treatment because it increases the risk of HCWs acquiring TB at the work place as noted at the selected hospital.

4.8 Summary

The current study focused on perceptions of HCWs exposure to acquiring TB infection in TB units at the selected hospital in the Vhembe District of South Africa. Study findings show that HCWs deployed in TB units perceive that they are susceptible to acquiring TB infections due to several factors. Risks are exacerbated by a lack of adequate staff, poorly ventilated infrastructures, a lack of medicines for treating TB patients, long waiting periods for TB patients and a lack of appropriate masks (N95) sizes to guard them against inhalation of TB contaminated air. However, participants perceived that preventative measures such as the use of masks, separating TB patients, and practicing hygiene measures help HCWs in TB units from acquiring TB.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMNDATIONS

5.1 Introduction

This chapter contains a summary, conclusions and recommendations from the study. The purpose of the study was to explore the perceptions of health care workers' exposure to TB infections in TB units at the selected hospital in the Vhembe district of South Africa. The study was carried out at a rural hospital in South Africa which is a referral hospital for TB treatment in the region. The study was undertaken for academic purposes under the supervision of the University of Venda.

5.2 Summary of findings

- The study findings revealed that HCWs perceive that they are exposed to the risk of contracting TB at the workplace.
- Health care workers who have a long duration of working in TB units are aware of the risk of working with TB patients.
- HCWs perceived that lack of adequate wards for TB patients, inadequate staff (professional nurses), lack of gowns and masks (N95), poor ventilation in TB wards, shortage of TB treatment medicines, long holding periods for TB patients and delayed TB test results as the main challenges faced by HCWs at a selected hospital.
- Challenges that exacerbate the risk of acquiring TB infection of HCWs at a selected hospital include, shortage of TB drugs, lack of capacity to deal with extreme TB cases such as MDR and XDR, poor ventilation, shortage of staff, lack of TB diagnostic facilities and high patient to nurse ratio.
- Staff rationing occurs at a selected hospital and this lead to staffs being forced to treat MDR-TB and XDR-TB which are supposed to be transferred to speciality hospitals.
- Health care workers use their discretion to determine the need for N95 masks for TB patients and not all TB patients use masks except the severely infected.

5. 3. Recommendations

- Strategies for ensuring protection such as adequate supply of N95 respirators, individual HCW behaviour change and culture change need to be strongly promoted particularly for TB units' occupants.
- Considering the inescapable risk of exposure to TB patients in the facility, the steps taken to reduce HCWs' risk of acquiring TB as a result of such exposure assume particular

importance and involve not only clinical staff, who have the most regular contact with TB patients, such as in clinical examination, but also other workers who face exposure as incidental to performing their jobs.

- It is imperative that the hospital pursue other preventative measures such as early recognition of HCWs with TB symptoms, prompt investigation of HCWs and patients showing symptoms of TB, screening and training of HCWs on diagnosis of signs and symptoms of TB, separation of TB infected high risk patients from other patients.
- In addition, periodic testing of health-care workers for latent TB infection (LTBI) should be encouraged and forcefully implemented to strengthen the effectiveness of the above mentioned points.
- The hospital management are encouraged to implement cost-effective and feasible TB IPC measures such as training in respiratory cough etiquette and patient triaging in addition to observation of health and safety principles.
- Regular worker education about TB and its symptoms is needed to reduce stigma among infected HCWs because it results to workers resentment for seeking care and early treatment.
- Similar measures are deemed necessary particularly for high risk HCWs who have HIV/AIDS because their susceptibility to TB and graduation to MRD and XDR condition is very high.
- Environmental control starting with construction of well-ventilated rooms and avoidance of air cleaners should be prioritised.
- It is important to regulate the occupancy rate (crowding) in a building.
- Administrators should ensure that access and building use are strictly controlled.

5. 4. Recommendations for further research

The study findings should prompt other researchers to employ mixed research methods design that generates both qualitative and quantitative insights. Such design could help to nurture ground breaking localised models to solve current surging TB infections particularly among HCWs.

5.5. Conclusion

The main purpose of the study was to explore perceptions of HCWs regarding their risk to exposure to TB infection at DFH in Vhembe District, South Africa. The study was qualitative and it employed an exploratory descriptive research design. The HBM model was used to unpack and understand perceptions of HCWs regarding their risk of exposure to acquiring TB infection. HCWs are exposed to health risk of TB infection because they frequently interact with TB patients; therefore they are susceptible to contracting TB. HCWs in TB units face a myriad of challenges which need immediate mitigation measures to be implemented at local level. They include regular screening, providing adequate equipment and early treatment of TB. In light of these challenges, it is imperative that hospital management adhere to occupational health standards through appropriate implementation, monitoring and evaluation of policies and procedures laid out by the department of health. Lack of drastic measures to counter incidences of TB infection will ultimately lead to loss of precious staff which the country is in need of.

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APPENDICES

APPENDIX A: INTERVIEW GUIDE

Research Topic: Perceptions of healthcare workers in TB hospital units regarding risk of exposure to TB infections in the Vhembe district, South Africa.

1. Biographical information

- Age:
- Gender:
- Section of Placement:
- Period of service:
- Year completed Studies:

2. Questions

- What is your perceived susceptibility to TB infection?
- What is your perceived severity of TB infections?
- What is your perceived benefits of preventative action towards TB prevention?
- What are the challenges you are facing regarding compliance to TB preventative practices?

Appendix B: INFORMED CONSENT

LETTER OF INFORMATION

Title of the Research Study: **Perceptions of healthcare workers regarding risk of exposure to infection in tuberculosis units within a selected hospital in the Vhembe District, South Africa.**

Principal Investigator/s/ researcher: Mbara Fhatuwani Godfrey (MBCHB)

Co-Investigator/s/supervisor/s: Mashau Ntsieni (PHD)

Brief Introduction and Purpose of the Study:

The aim of this study is to investigate the perceptions of healthcare workers regarding risk of exposure to tuberculosis infections in tuberculosis units within a selected hospital of Vhembe District, South Africa.

Outline of the Procedures:

The study involves face to face interviews. The researcher will set out a schedule that will be approved by the Hospital management to accommodate time for interviews with consenting healthcare workers working in TB wards. The interviews will be aided by an interview guide and it will take place at a private place within the hospital premises. Information provided by the interviewee will be kept in confidence and no names will be attached to the information. The inclusion criteria will be as follows: nurses of all categories, they must be working or have worked in a TB Unit at the selected hospital. The interviews will take 30-45 minutes.

Risks or Discomforts to the Participants:

There are minimal risks foreseen associated with participating in this study because there will be no invasive procedure in this study. The study will only involve face to face interviews between the researcher and the participants and there will be no sensitive questions asked.

Benefits:

Participants may benefit indirectly through the interaction with the researcher because they will be able to express their feelings freely with someone listening. Participants in this study may also benefit through revision of TB policies and guidelines which might be influenced by the findings from this study.

Reason/s why the Participant May Be Withdrawn from the Study:

Participation is voluntary and is based on informed consent. Participants will be free to withdraw from participation at any given time due to various reasons such as ill health or non-compliance and there will be no consequences on the participant.

Remuneration: No remuneration is attached to the study

Costs of the Study: no costs will be incurred by participants on this study.

Confidentiality: The interview will take place in a secluded room to make sure that only the interviewer and the interviewee interact. Assurance will be given that such information will not cause any harm to the interviewee and such measures as anonymity and confidentiality will be closely observed. Sensitive and personal information will be protected and will not be made available to anyone other than the researcher, research assistants and supervisors.

Research-related Injury:

No injuries are anticipated since the study on involves answering questions prepared on the interview guide.

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (tel no. 079 629 4756), my supervisor (tel no. 015 962 8892) or the University Research Ethics Committee Secretariat on 015 962 9058. Complaints can be reported to the Director: Research and Innovation, Prof G.E. Ekosse on 015 962 8313 or Georges Ivo.Ekosse@univen.ac.za

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, DR F.G. Mbara, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (*Participant Letter of Information*) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant Date Time Signature

I, ……. ……. ……. ……..

(*Name of researcher*) herewith confirm that the above participant has been fully

Informed about the nature, conduct and risks of the above study.

Full Name of Researcher

……. Date**…….** Signature**…….**

Full Name of Witness (If applicable)

……. Date **…….** Signature**……..**

Full Name of Legal Guardian (If applicable)

……. Date**…….** Signature**…….**

APPENDIX C: ETHICAL CLEARANCE

RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Dr FG Mbara

Student No:
14005757

PROJECT TITLE: **Perceptions of healthcare workers regarding risk of exposure to infection in Tuberculosis units within a selected hospital in Vhembe District, South Africa.**

PROJECT NO: **SHS/18/PH/24/0911**

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr NS Mashau	University of Venda	Supervisor
Dr TG Tshitangano	University of Venda	Co- Supervisor
Dr FG Mbara	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: September 2018
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Senior Prof. G.E. Ekosse

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
2018 -09- 11
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950 LIMPOPO PROVINCE SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 FAX (015) 962 9060
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