THE KNOWLEDGE OF NURSES ON MULTIDRUG RESISTANT TUBERCULOSIS AT PRIMARY HEALTH CARE FACILITIES IN THE NELSON MANDELA METROPOLITAN

by

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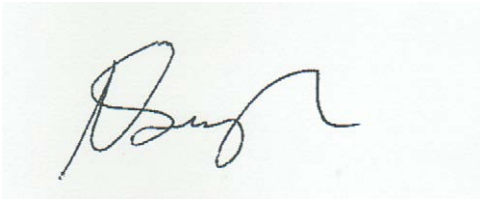
Student number: 45874603

DECLARATION

I declare that **THE KNOWLEDGE OF NURSES ON MULTIDRUG RESISTANT TUBERCULOSIS AT PRIMARY HEALTH CARE FACILITIES IN THE NELSON MANDELA METROPOLITAN** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before for any degree at any other institution.



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SIGNATURE **DATE**

Vikesh Singh

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ABSTRACT

Decentralisation of the multidrug resistant tuberculosis (MDR TB) programme to primary health care (PHC) facilities in the Nelson Mandela Metropolitan was implemented in order to improve the effectiveness of MDR TB services. This study explored the knowledge gaps of nurses at PHC facilities as regards MDR TB. A quantitative, cross-sectional descriptive study was conducted; data was collected using a structured questionnaire. Non-probability sampling was applied in this study. A convenient sampling technique was used and 25 of the 42 facilities were selected. Thirty-two respondents completed the questionnaire with a response rate of 64%. Descriptive statistics were used to describe the data. Only 38% of the nurses had been trained on MDR TB. Overall scores were high with a mean knowledge score of 61%. However there were knowledge gaps regarding side effects of MDR TB medication. This study revealed gaps in knowledge of certain areas of MDR TB management.

KEY CONCEPTS:

Knowledge; multidrug resistant tuberculosis; primary health care; Nelson Mandela Metropolitan.

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- The nurses who took the time to partake in this study.
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Dedication

I would like to dedicate this dissertation to my late father Mr Amar Singh, who inspired me to pursue my studies no matter what challenges existed. He believed that if I educated myself I would be in a better position to benefit the causes that I supported.

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LIST OF ABBREVIATIONS

ADRs	Adverse drug reactions
DOTS-Plus	Directly Observed Treatment Short course (DOTs) Plus
DST	Drug susceptibility testing
HIV	Human Immuno-deficiency Virus
M	Mycobacterium
MDR	Multidrug resistant
NMM	Nelson Mandela Metropolitan
PHC	Primary health care
TB	Tuberculosis
WHO	World Health Organization

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CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

Tuberculosis (TB) remains a major global health problem. An estimated 2 billion people, or one-third of the global population, are infected with TB (Olson, Lebovitz & Claiborne 2011:1). Tuberculosis is an airborne infectious disease resulting in the deaths of 1.8 million people each year, or 4,500 each day (World Health Organization (WHO) 2009:1) despite there being treatment available capable of curing most cases of TB. In addition to the harmful effects of TB, there is a growing threat of drug-resistant strains of the disease in many parts of the world, threatening the health of the individual as well as the community. Based on global drug resistance surveillance data, it was estimated that 3.6 percent of global TB cases, or a total of 440 000 cases, were multidrug resistant (MDR) in 2008 (WHO 2010:18).

South Africa has the third highest TB and the fifth highest MDR TB burden in the world (National Department of Health South Africa 2011:v). The number of MDR TB cases diagnosed has doubled from 7 386 recorded in 2010 (National Department of Health South Africa 2011:4) to 15 400 recorded in 2013 (Gonzalez 2013). Of the nine provinces, KwaZulu-Natal and the Eastern Cape shoulder the heaviest burden of MDR TB cases in South Africa (National Department of Health South Africa 2011:4). The limited number of bed spaces available at hospitals has resulted in the management of MDR TB being decentralised, with nurses at primary health care (PHC) facilities consequently having to manage patients diagnosed with MDR TB, a disease that formerly was managed in a few of the country's specialised TB hospitals. There have been limited studies documented on the knowledge of nurses in the PHC setting on MDR TB. Their knowledge plays an important role in the management of MDR TB, especially in areas where a doctor might only be available on certain days.

A study, conducted in Russia, showed that there was a gap in the knowledge observed amongst health care workers, including nurses, regarding TB and infection control and

that this could increase the risk of acquiring nosocomial infection for TB health care workers (Woith, Volchenkov & Larson 2010:1491).

Multidrug resistant TB is an infectious disease, and lack of knowledge creates risk for the health care worker as well as influencing the effective management of patients with TB and MDR TB in urban and rural areas. The results from this study illustrated the knowledge gaps of nurses in an urban PHC setting and provided recommendations to address these knowledge gaps. For the purpose of this study, the term 'nurses' will refer to professional nurses working in PHC facilities, involved in the management of MDR TB.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

The background to the research problem is discussed firstly, in terms of decentralised management of MDR TB and secondly, in terms of the knowledge of health care workers on MDR TB.

- **Decentralised management of MDR TB**

The South African Department of Health programme dictates that all laboratory diagnosed MDR TB patients be hospitalised in a centralised MDR TB hospital until they have two consecutive negative TB cultures taken at least 30 days apart (National Department of Health South Africa 2011:5). Consequently, patients are hospitalised for several months and waiting lists for patients needing admission to these hospitals are widespread. In addition, the number of patients diagnosed with MDR TB far exceeds the number of beds available per province, with only 2 500 beds available nationally while, as mentioned previously, 7 386 patients were diagnosed in 2010 (Ndjeka 2013; National Department of Health South Africa 2011:5). For this reason, the National Treatment Plan adopted a policy of decentralised management for MDR TB (Padayatchi, Naidoo, Dawood, Kharsany & Abdool Karim 2010:95). Decentralised management of MDR TB refers to the transfer of responsibility of treating MDR TB patients to lower levels of the system such as PHC facilities (National Department of Health South Africa 2011:2). The intention of this was to shorten the number of days between diagnosis and treatment initiation, increasing treatment coverage, reducing the transmission and making it possible for patients to be treated closer to their homes, increasing the acceptability of

treatment (National Department of Health South Africa 2011:7). The centralised and decentralised MDR TB units would be responsible for initiating and monitoring treatment of MDR TB cases, in addition to providing support to PHC facilities. The role of the nurse at the PHC facilities would be to identify high risk groups, such as: non-converters, re-treatment patients and drug resistant contacts; collect sputum for microscopy, drug susceptibility testing; contact screening and testing; administering injections and medication to all MDR TB patients, monitoring side effects, provide ongoing education on adherence, side effects and infection control practices (National Department of Health South Africa 2013:18).The process of decentralisation of the management of MDR TB thus requires health care workers, and specifically nurses at PHC facilities, to have adequate knowledge of MDR TB.

The decentralisation of MDR TB care from hospitals to PHC facilities in the Nelson Mandela Metropolitan (NMM) was implemented in October 2011 due to the limited bed space and the growing number of patients with MDR TB. By 2014, the TB hospital that admits MDR TB patients had the bed capacity to treat 129 MDR TB patients; however, there were approximately 500 patients with MDR TB in the NMM district (Jose Pearson Hospital: Personal communication 2014). Since the decentralisation of MDR TB, PHC facilities play a significant role in the management of MDR TB in the NMM. Patients that have MDR TB and who do not require hospitalisation are started on treatment as outpatients and then receive care and management by the nurses at the PHC facility. The management of the disease entails administering injections and medication to all MDR TB patients, monitoring side effects, contact screening, providing ongoing education on adherence, side effects, infection control practices as well as managing other co-morbidities experienced by the patient (National Department of Health South Africa 2011:23). There have, however, been no studies conducted in the Nelson Mandela Metropolitan (NMM) to assess the knowledge that nurses possess, on the management of MDR TB at PHC facilities.

- **Knowledge of health care workers on MDR TB**

The researcher conducted a search for studies using the following search engines: Ebscohost®, Medline and CINAHL. The keywords used were MDR TB, knowledge and nurses. The studies found focused on knowledge of TB. The lack of research, regarding nurses' knowledge of MDR TB, indicated a gap in the literature as well as the fact that

the face of managing and treating infectious diseases such as MDR TB is fast changing and evolving.

A study in Peru revealed a lack of knowledge amongst doctors and nurses regarding assessing treatment outcome of TB (Kiefer, Shao, Carasquillo, Nabeta & Seas 2009:783; Savicevic 2009:484) while one conducted in Russia indicated that treatment and infection control were areas where knowledge was poor (Woith et al 2010:1489). Nurses in Turkey lacked knowledge on side effects of TB medication (Yükseltürk & Dinç 2013:54). In South Africa, a study was conducted in the Western Cape in which the experiences of nurses in South Africa with regard to the factors influencing TB infection prevention and control were investigated and highlighted, as one of the challenges a lack of TB-related training amongst nurses (Sissolak, Marais & Mehtar 2011:6). The areas identified by Sissolak et al (2011:6) as requiring training included infectious time and infection control. In a study conducted in KwaZulu-Natal amongst doctors and nurses, a lack of knowledge of the storage of sputum was highlighted as a challenge (Loveday, Thomson, Chopra & Ndlela 2008:1045).

In South Africa, in 2012, the Democratic Nursing Association, launched training on MDR TB for nurse educators to include the process and management of MDR TB in the nursing curriculum (Denosa 2012:1). The programme encompassed a number of issues ranging from diagnosis of Human Immuno-deficiency Virus (HIV) in adults and children, the diagnosis of TB and MDR TB in adults and children to infection and control prevention as well as community-based care and patient education. Thus it can be seen that training nurses on MDR TB is becoming an important aspect.

The role of the nurse is always evolving and expanding. Faced with the shortage of doctors and the burden of HIV/AIDS and TB, South Africa changed policies to allow nurses to initiate antiretroviral treatment in 2010 (National Department of Health South Africa 2010:7). The chronic shortage of beds at TB hospitals, as well as the increasing number of patients, has led to MDR TB management by nurses (National Department of Health South Africa 2011:23). Hence the function and responsibility of nurses is increasing.

1.3 PROBLEM STATEMENT

In 2012, the researcher, as a pharmacist, had received numerous queries from the nurses involved with the management of MDR TB patients at the PHC facilities regarding the MDR TB medication regimes, management of side effects and counselling patients on adherence, as this was previously a hospital managed disease. Prior to the decentralisation of MDR TB, nurses only had to identify patients with MDR TB and refer them to an MDR TB hospital for care overseen by doctors (National Department of Health South Africa 2009). However, due to the growing threat of drug resistant TB and the insufficient number of hospitals and doctors to manage MDR TB patients, nurses now have to provide care and medication to MDR TB patients at the PHC facilities. In addition, most of the PHC facilities in the NMM did not have a full time doctor available, resulting in nurses working in the absence of doctor support with limited MDR TB training.

As yet, no studies have been conducted in the NMM with regard to the knowledge gaps on MDR TB management that nurses at PHC facilities might display. As the South African government moves towards nurse-initiated treatment of MDR TB (National Department of Health South Africa 2011:2) it is imperative that existing knowledge gaps of the nurses on MDR TB be ascertained so that further training can be planned for nurses providing care in the PHC setting. Capacitating nurses is essential if global initiatives such as the United Nations Millennium Development Goals to halt and reverse incidence of TB by 2015 (WHO 2013:1) are to be successful.

1.4 RESEARCH QUESTIONS

The following research question was formulated in the context of the study:

- What knowledge do the nurses working in NMM urban PHC settings have on the management of MDR TB?

1.5 PURPOSE OF THE STUDY

The aim of this study was twofold; firstly, to explore the knowledge gaps of nurses working at PHC facilities, on the management of MDR TB in the NMM. Secondly, it was

to enhance the knowledge of the said nurses working at PHC facilities on the management of MDR TB through recommendations based on the study findings.

1.6 OBJECTIVES OF THE STUDY

The objectives of the study were the following:

- Determine the knowledge gaps of nurses working in PHC facilities on the management of MDR TB.
- To improve knowledge gaps of nurses working in PHC facilities on the management of MDR TB through recommendations based on the findings of this research.

1.7 SIGNIFICANCE OF THE STUDY

There are not enough beds at TB hospitals to accommodate all the cases of MDR TB as indicated in the background of this study. Primary health care facilities treatment for MDR TB has gained increased recognition as the most effective, efficient and ethical means of delivering care to patients with MDR TB (TBCare 2012). The PHC MDR TB programme was implemented in the NMM district in 2011. It is essential to identify knowledge gaps of these nurses in order to make recommendations for addressing these. This study will contribute towards providing a baseline analysis of the said gaps to enhance nurses' training. This in turn will capacitate nurses and improve the effective management of patients diagnosed with MDR TB.

1.8 DEFINITION OF KEY TERMS

- Knowledge − Oxford Online Dictionary (2013) defines knowledge as facts, information, and skills acquired through experience or education.
- Management − Oxford Online Dictionary (2013) defines management as the treatment or control of diseases or disorders, or the care of patients who suffer from them.
- Multidrug resistance tuberculosis (MDR TB) − The National Department of Health South Africa (2013:1) defines MDR TB as a TB disease where there is in vitro resistance to both Isoniazid and Rifampicin, with or without resistance to other

anti-TB drugs. As Isoniazid and Rifampicin are the two most important first-line TB drugs, their exclusion through resistance from the anti-TB drug list has serious implications. In this study MDR TB management will refer to the management that nurses in PHC facilities have to provide: collecting sputum for microscopy, drug susceptibility testing or line probe assay; contact screening and testing; administering injections and medication to all MDR TB patients, monitoring side effects, providing ongoing education on adherence, side effects and infection control.

- Nurse − Is a person registered as a nurse under section 16 of the Nursing Act no 50 of 1978, as amended (South Africa 1997b, section 16). (South African Nursing Council 2012:1). In this study, a nurse will refer to the professional nurses working in PHC facilities, involved in the management of MDR TB patients.
- Nurse's knowledge − In this study knowledge will refer to the knowledge that nurses working in PHC facilities have on the management of MDR TB.
- Primary health care facilities − The National Department of Health South Africa (1997:22) defines primary health care facilities as a health care centre, which offers comprehensive primary health care to patients including a TB care and treatment service. In this study, the PHC facilities were part of the urban areas of the Nelson Mandela Metropolitan.

1.9 RESEARCH DESIGN AND METHODOLOGY

According to Polit and Beck (2012a:741), a research design is described as the overall plan for addressing a research question, including strategies for enhancing the study's integrity. Chapter 3 includes a more detailed review of this section and the under mentioned discussion is merely a brief overview of the research methods.

The researcher adopted a quantitative, cross-sectional, descriptive design in order to give a description of the respondents' knowledge gaps.

1.9.1 Quantitative research

Polit and Beck (2012a:739) describe quantitative research as the 'investigation of phenomena that lend themselves to precise measurement and quantification, often involving a rigorous and controlled design'. Quantitative research allows for generation

of numerical data that can be interpreted, organised and presented. In this study, the research design was quantitative as the researcher used a structured questionnaire to collect data from the respondents in order to measure their knowledge gaps.

1.9.2 Descriptive research

Descriptive studies involve observing, describing and documenting aspects of a situation as it naturally occurs (Polit & Beck 2012a:226). In this study, the researcher aimed to describe the knowledge gaps, on the management of MDR TB, of nurses working in PHC facilities.

1.9.3 Cross-sectional research

Cross-sectional studies entail the collection of data at one point in time and are appropriate for discussing a phenomenon at a fixed point (Polit & Beck 2013:162). In this study a sample of nurses from the PHC facilities were included and the questionnaire was administered at one point in time. The data obtained were representative of that point in time only.

1.9.4 Study setting

The research setting is the environment in which the research study takes place and may be a natural or controlled environment. Natural settings are real-life study environments without any changes made for the purpose of the study. (Burns, Grove & Gray 2012:373) This research was conducted in urban PHC facilities in the NMM, Eastern Cape Province of South Africa. More detail is provided in Chapter 3.

1.9.5 Study population

According to Polit and Beck (2012a:59) a population is defined as all the individuals or objects with common, defining characteristics. In this study, the target population is those nurses working in PHC facilities with MDR TB patients, in the NMM district of the Eastern Cape Province of South Africa.

1.9.6 Sample and sampling

Polit and Beck (2012a:290) describe sampling as 'the process of selecting a portion of the population to represent the entire population'. The advantage of selecting a sample is that it is less costly and time consuming than collecting information from a large group of respondents. Before sampling, the researcher obtained a list of all the PHC facilities in the NMM district. There are 42 facilities in the NMM district. As the distances between these facilities are considerable, the researcher selected 25 facilities to be included in the study. The sites were chosen using the convenience technique. Convenience sampling is also known as 'accidental sampling' and respondents are usually those that are nearest and most easily available (Strydom 2011:232). Convenience sampling is also used because of money savings (Cottrell & McKenzie 2011:132). In this study convenience sampling was used due to the researcher's lack of resources and budget constraints. The researcher chose facilities that were easy to access and focused on those facilities which were nearest, most available and approachable for the researcher.

1.9.7 Sample size

Burns et al (2012:367) state that there are no hard and fast rules about a sample size but that a sample should contain at least thirty respondents. Grinnel and Williams (1990:127) as cited in De Vos, Strydom, Fouche and Delport (2011:225) contend that thirty is sufficient to perform basic statistical actions. According to Polit and Beck (2012a:285), most nursing studies use samples of convenience. In this study the total population was small. As there are usually two nurses in the TB unit at a PHC facility, the sample size for this study was 50 respondents, of which 32 participated. All the available nurses who were willing to participate were invited to take part in this study. The shortage of nurses at the facilities due to absenteeism and redistribution of nurses to other clinical areas also contributed to the small sample size. Chapter 3 provides more detail in this regard.

1.9.8 Data collection

Data collection is an organised process in which the researcher collects information relevant to attain the research purpose and objectives. In quantitative studies the data collected is usually numerical (Burns et al 2012:45). In this study, the measuring

instrument was in the form of a questionnaire developed by the researcher (Annexure B). The main sections of the questionnaire included Section 1, which included biographical information of the respondents, Section 2, which asked general questions regarding the training received by respondents and Section 3, which contained Likert scale type questions on the management of MDR TB. The questionnaire is discussed in more detail in Chapter 3 under the section titled Data Collection Instrument.

1.10 VALIDITY AND RELIABILITY

Validity is a quality criterion referring to the degree to which inferences made in a study are accurate and well founded (Polit & Beck 2012a:244). Reliability is defined as the degree of consistency or dependability with which an instrument measures an attribute (Polit & Beck 2012a: 331). The concepts of validity and reliability are discussed in detail in Chapter 3. Validity was ensured by performing a literature review, involving experts in the construct of the questionnaire and doing a pre-test. Reliability was measured using the Cronbach's Alpha co-efficient.

1.11 DATA ANALYSIS

The responses to the questionnaires were edited and then captured by the researcher to form a data set for analysis. This process involved converting the collected data into an organised visual representation so that it facilitated data analysis. The data were then captured and analysed using the SPSS version 20.0 computer software programme by a statistician. Descriptive statistics were used to synthesise and describe the data as defined by Polit and Beck (2012a:379) and in this study, also used to analyse the data in relation to each question. A pre-test was done to ensure the content validity and reliability of the questionnaire and to identify flaws, prior to the administration of the questionnaires to the respondents (Polit & Beck 2012a:247). The results from the pre-test were not included in the final study, but were used by the researcher to refine the questions in the questionnaire.

The data were then presented in frequency tables, pie and bar graphs and discussed in detail in Chapter 4.

1.12 LIMITATION OF THE STUDY

The limitation of this study included the small sample size, while the facilities were limited to one district in the Eastern Cape Province only. The small sample size was justified by the shortage of nurses in the PHC setting (refer to the research setting in Chapter 3 for more detail and literature to support this). This means that the results and conclusions cannot be generalised to other areas. More details are provided in Chapter 5.

1.13 ETHICAL CONSIDERATIONS

Ethical clearance to conduct the study was obtained from the Higher Degrees Committee of the Department of Health Studies, University of South Africa Research and Ethics (Annexure A). Permission was sought from the Eastern Cape Department of Health (Annexure C) as well as the District Manager of Nelson Mandela Metropolitan (Annexure D). In addition, the nurse in charge of the facility was informed prior to the administration of the questionnaires. During the current research, the ethical principles of the Declaration of Helsinki were considered and followed. These were beneficence, respect for human dignity and justice (Declaration of Helsinki 2013). These are discussed in detail in Chapter 3.

1.14 OUTLINE OF THE STUDY

This study contains five chapters as outlined below.

Chapter 1 Orientation to the study
Chapter 2 Literature review
Chapter 3 Research design and methodology
Chapter 4 Analysis, presentation and description of the research findings
Chapter 5 Findings, conclusion, limitations and recommendations

1.15 CONCLUSION

A literature review is an important component of the research process and in this study allowed the researcher to understand the topic, refine the research question and

provided information on research methodology. In addition the information gained from the literature review assisted the researcher in the development of the questionnaire.

This chapter provided an overview of the problem statement, objectives, research questions, significance of the study, the research design and methodology. A quantitative, descriptive and cross sectional research design was chosen, using structured questionnaires to collect data on the knowledge of nurses about MDR TB.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

According to De Vos, Fouche and Delport (2011:134), a literature review 'serves to put the researcher's efforts into perspective' and should be commenced early on in the research process. The literature review provides readers with the necessary knowledge and information that allow for a good understanding of the topic under investigation, and provides the foundation on which the questionnaire was developed and the new knowledge generated by the study will be based. Journal articles, books, policy documents and electronic sources such as Ebscohost® (2013), CINAHL and Medline (2013) were used in the review of the literature. The researcher used the keywords: MDR TB, knowledge and nurses. There were 141 hits in Ebscohost®, of which 14 were related to care and treatment and therefore applicable to this study. The reference lists of relevant research articles were also reviewed. During the literature review process, the researcher focused on both the global and South African contexts of MDR TB. Literature on the decentralisation programme for MDR TB in South Africa was also examined (National Department of Health South Africa 2011).

Discussion arising from the literature review assisted in the development of the questionnaire and takes place under the following headings: Epidemiology of tuberculosis; Global and national phenomenon of MDR TB; HIV and MDR TB, Development of MDR TB; Signs and symptoms of MDR TB; Diagnosis and treatment of MDR TB; Management of contacts; Patient counselling; Infection control plan and Decentralisation of MDR TB management and care.

2.2 EPIDEMIOLOGY OF TUBERCULOSIS

Tuberculosis continues to be a major global health problem and is one of the world's most infectious diseases. Although the causative organism, Mycobacterium (M) tuberculosis, was documented over 100 years ago, TB programmes still have difficulty in controlling the disease (Jain, Gyanu, Nimmagadda, Pomper & Bishai 2008:285),

which causes ill health among millions of people each year: according to the WHO (2013), TB ranks as the second leading cause of death from an infectious disease worldwide, after HIV. Despite there being treatment available to treat TB, the disease continues to be a global health concern (WHO 2011:3). In 1993, the WHO declared TB a global public health emergency. By 2011, there were an estimated 8.7 million new cases of TB (13% co-infected with HIV) and 1.4 million people died from TB, including almost one million deaths among HIV-negative individuals and 430 000 among people who were HIV-positive (WHO 2012:3).

According to the Merck Manual (2011), TB is a chronic infectious disease characterised by a long and variable incubation period. The interval between infection, with the bacterium M. Tuberculosis, and either a demonstrable primary lesion or significant tuberculin reaction is about 4-12 weeks (Sharma 2013:246). The transmission of TB is almost entirely by droplet infection from a source case who is coughing and producing sputum contaminated with M. tuberculosis (Knechel 2009:35).

Effective treatment of tuberculosis is possible using the first line drugs Isoniazid, Rifampicin, Pyrazinamide and Ethambutol (National Department of Health South Africa 2011:31). According to Sarkar and Suresh (2011:148), this first line therapy often fails to cure TB for several reasons. Firstly, the treatment regimen is long, consisting of an initial 2 months of intensive phase treatment with all four drugs, followed by the continuation phase for 4 months with Isoniazid and Rifampicin. Secondly, the long treatment period often results in a lack of compliance, causing treatment failure and contributing to the emergence of drug resistant bacteria.

2.3 MULTIDRUG RESISTANT TUBERCULOSIS – A GLOBAL AND NATIONAL PHENONOMEN

A large percentage of TB cases are able to be treated effectively with available antibiotics (Jain et al 2008:285). However, MDR TB strains are emerging. These strains are resistant to the two principal, first line, TB drugs (Rifampicin and Isoniazid) and are a major and growing global concern (Institute of Medicine National Academies 2009).

The increase in the number of reports of MDR TB from around the world prompted the start of the Global Project on Anti-Tuberculosis Drug Resistance Surveillance by WHO

in 1994 (WHO 2009). Since then, drug resistance data has been collected and analysed from 135 countries, accounting for 70% of WHO's 194 Member States. The data in these reports indicate that MDR TB is increasing and ubiquitous (Weyer 2005:75; WHO 2012:41).

The median values for the estimated proportion of TB cases that have MDR TB is 4.3% in new patients and 21% in retreatment patients amongst the 27 high MDR TB burden countries in the WHO region (WHO 2012:23), while the overall burden is considerable at an estimated 630 000 (United Nations 2013).

The spread of MDR TB continues. The WHO (2012:42-43) Global Report on Tuberculosis outlines the data on the extent of drug resistant TB. Figure 2.1 reveals the percentage of MDR TB amongst all new cases of TB while Figure 2.2 indicates the percentage of previously treated TB cases with MDR TB. From these figures it may be observed that the darker the intensity of the colour the higher the percentage of MDR TB. Globally, 3.7% of new cases and 20% of previously treated cases are estimated to have MDR TB. Both figures provide evidence that Eastern Europe and central Asian countries represent the areas most affected with MDR TB, with proportions of new TB cases with MDRTB ranging from 0% to 32.3% (WHO 2012:42).

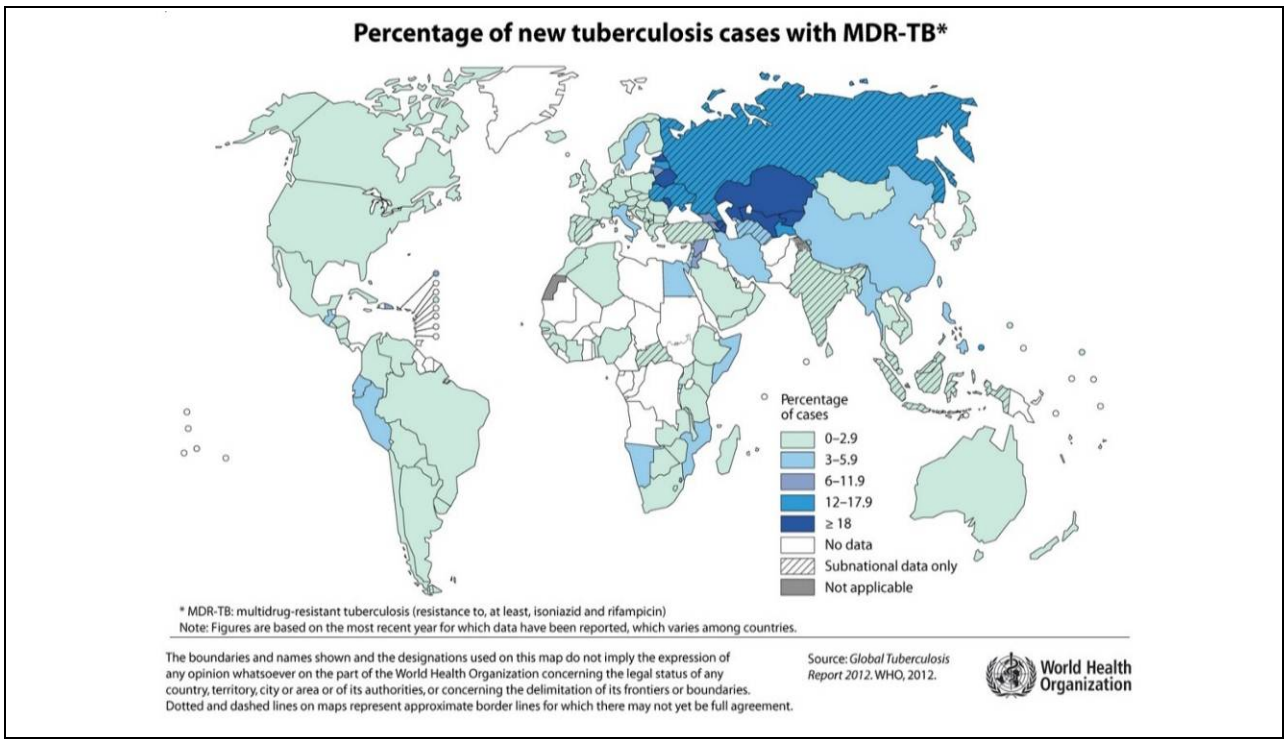

Figure 2.1 The percentage of new cases with multidrug resistant tuberculosis

Source: (WHO 2012:43)

China also faces a serious MDR TB burden and in 2007, a third of new patients and one-half of previously treated TB patients had drug resistant TB (Zhao, Xu, Wang, Chin, Wang, Jiang, Xia, Zhou, Li, Ou, Pang, Song, Zhao, Zhang, He, Guo & Wang 2012). The prevalence of MDR TB among new patients was 3.5 times the global median and double the global average (WHO 2010).

There has been an increase in the number of MDR TB cases notified in the high MDR TB countries with some countries, including India, the Philippines, The Russian Federation, South Africa and Ukraine each enrolling more than 2000 patients in 2011 (WHO 2012:47).

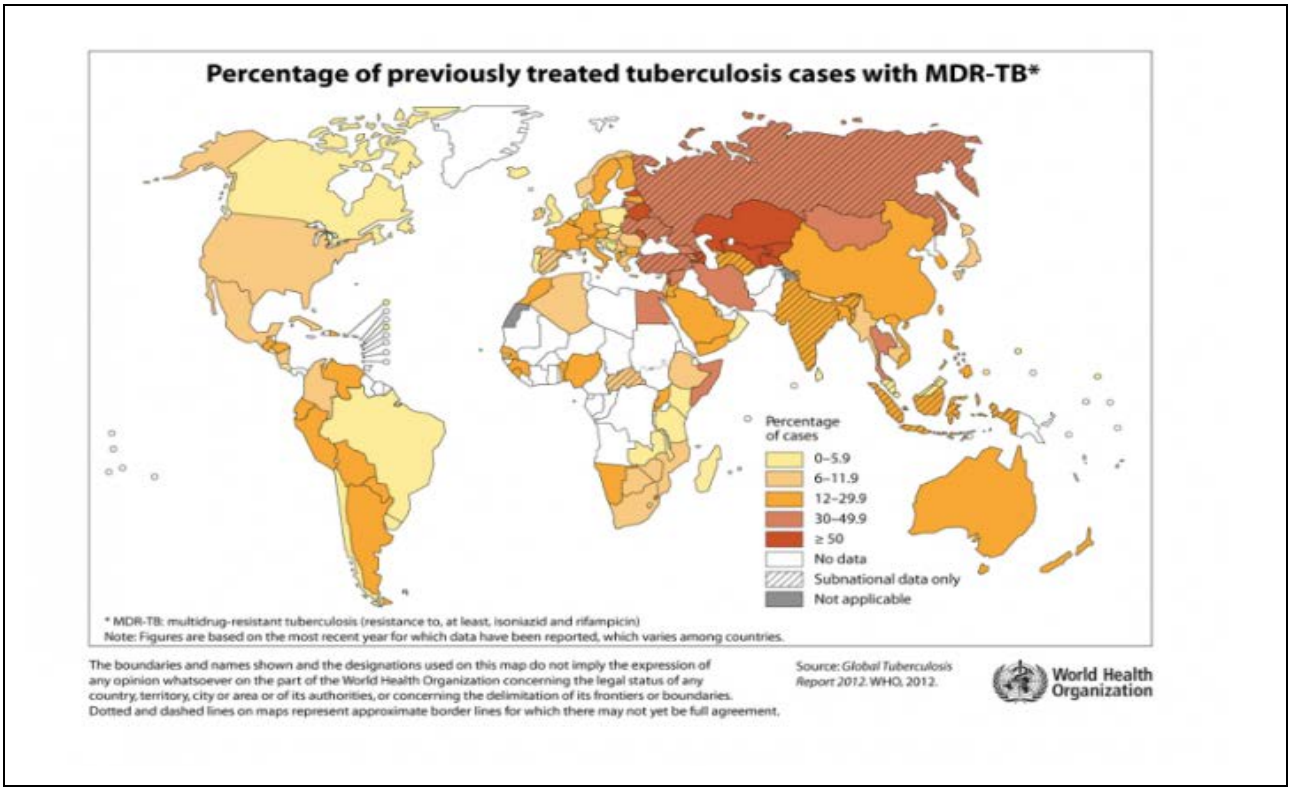

Figure 2.2 Percentage of previously treated cases with multidrug resistant tuberculosis

Source: (WHO 2012:43)

Data from African countries on MDR TB is very scarce despite the high prevalence of TB, with the African region accounting for 24% of the world's TB cases (in WHO 2012:2). In a 2008 study that gathered estimates of MDR TB rates in African countries, the proportion of MDR TB among all TB cases varied from 5.8% in the Democratic Republic of Congo to virtually 0% in Kenya. The median MDR TB rate was 1.9% (Amor,

Nemser, Singh, Sankin & Schluger 2008:1347). Ethiopia and Nigeria are among the 27 high MDR TB burden countries in the WHO region, together with South Africa (Wells, Cegielski, Nelson, Laserson, Holtz, Finlay, Castro & Weyer 2007:96).

Together with the Russian Federation, China and India, South Africa accounted for 60% of all reported MDR TB cases among notified TB patients in 2011 (WHO 2012:41). Patients with MDR TB have been diagnosed in all provinces of South Africa since the mid-eighties (Weyer 2005:75). A recent national survey by the Medical Research Council indicated an overall MDR TB prevalence of 2.9%, arising from 1.8% of new TB cases and 6.7% of previously treated cases (WHO 2012:23). Given the high TB burden, these relatively low prevalence levels translate into a high burden of at least 8000 MDR TB cases estimated per year. The financial burden of the MDR TB epidemic is already severe, given that a case of MDR TB costs up to 100 times more to treat than an uncomplicated drug-susceptible case (Weyer 2005:75). Furthermore, suboptimal TB control, together with the rapidly progressing HIV epidemic, creates a fertile environment for transmission of MDR TB. Epidemiological and genetic studies have confirmed on-going transmission of drug-resistant TB (Calver, Falmer, Murray, Strauss, Streicher, Hanekom, Liversage, Masibi, van Helden, Warren and Victor 2010:264). In 2010 the National Health Laboratory Services (NHLS) diagnosed 7386 MDR TB cases (National Department of Health South Africa 2011:4), with KwaZulu-Natal and the Eastern Cape having the highest burden of MDR TB cases in South Africa.

2.4 HIV AND MDR TB

One of main reasons why controlling tuberculosis is failing is the presence of HIV, particularly in settings with a high HIV prevalence. Sub-Saharan Africa shoulders the highest burden of HIV infections in the world and accounts for 75% of the global AIDS deaths (WHO 2013). One of the earliest opportunistic diseases to develop amongst patients infected with HIV is tuberculosis (Sethi, Mewara & Dhatwalia, Singh, Yadav, Singh, Gupta, Wanchu & Sharma 2013:1) making TB the major cause of death among people living with HIV (WHO 2011).

HIV co-infection complicates TB therapy and is associated with delays in diagnosis and poorer treatment outcomes. In addition, both TB and HIV are responsible for disarming the immune response in a host through mechanisms that are not fully understood while

HIV co-infection increases the risk of latent TB reactivation 20-fold (Getahun, Gunneberg, Granich & Nunn 2010:3). Whether HIV is a risk factor for the development of MDR TB is still a subject under debate. Some studies show no overall association between MDR TB and HIV (Suchindron, Brouwer & Van Rie 2009:6) but these studies were undertaken prior to the HIV and TB co-epidemic (Getahun et al 2010:3). Nonetheless, several studies have established an increased risk of MDR TB in patients infected with HIV (Wells et al 2007:86; Gandhi, Moll, Sturm, Pawinski, Govender, Lalloo, Zeller, Andrews & Friedland 2006:1575).

Regardless of whether HIV is an independent risk factor for the development of MDR TB or not, the large numbers of HIV infected people who have and who transmit both TB and MDR TB, are bound to increase the overall burden of drug resistant TB (Andrews, Shah, Ghandi, Moll & Friedland 2007:482). Moreover, the risk of patients with HIV developing active TB increases to 5-10% annually (Centre for Disease Control 2013:12).

The development of MDR TB, signs and symptoms, diagnosis and treatment are discussed next.

2.5 DEVELOPMENT OF MDR TB

The ability of the TB bacterium to undergo a slow and constant mutation is a natural phenomenon that results in resistant organisms developing. In order for MDR TB organisms to develop, a high bacterial load is required. (Weyer 2005:75)

These mutations are spontaneous and occur in the chromosome of the TB bacterium. When resistant organisms develop, they result in a decrease in the organism's susceptibility to specific drugs (Colijn, Cohen, Ganesh & Murray 2011:1). This development of MDR TB is not a recent occurrence but has evolved over a considerable period and is an expected result due to the use of antibacterial agents (Fauci 2008:1494). To an extent, the problem is due to sub optimal drug levels, enabling the development of resistant bacteria, or to infection with a drug resistant strain (Andrews et al 2007:482). Inadequate treatment, such as direct or indirect monotherapy, or non-adherence to the medication, exacerbates the problem, making MDR TB a potentially fatal disease (Weyer 2005:76).

2.6 SIGNS AND SYMPTOMS OF MDR TB

The symptoms of MDR TB are the same as for drug susceptible TB: cough, chest pain, dyspnoea, haemoptysis and systemic symptoms such as fever, chills, night sweats, tiredness, anorexia, and weight loss (Paauw 2013:553). The South African Policy Guideline for the Management of MDR TB indicates that in addition to the systemic effects of MDR TB, there may be isolated signs unrelated to the site of involvement. These include haematologic abnormalities, hyponatraemia and psychological disorders. The most common haematological manifestations include increases in the peripheral blood leukocyte count and anaemia. (National Department of Health South Africa 2013:34).

In order to identify patients with MDR TB, nurses at the PHC facilities need to recognise the signs and symptoms of MDR TB. In this way, delays in diagnosis and treatment of patients with MDR TB are prevented.

2.7 DIAGNOSIS OF MDR TB

The identification and treatment of infected patients is the primary strategy for the control of TB (Yagul, Perales, Asencios, Vergara, Suarez, Yale, Salazar, Saavedra, Shin, Ferrousier & Cegielski 2006:838). The non-specificity of clinical features of TB and the technical demands in identifying and determining drug susceptibility of TB in clinical specimens make the diagnosis of MDR TB difficult and extremely challenging (Nachega & Chaisson 2003:24).

Multidrug resistant TB should be suspected in patients who continue to have positive acid fast bacilli smears or cultures despite being on adequate treatment (Weyer 2005:75). In addition, MDR TB should also be suspected in the close contacts of MDR TB patients, particularly those who are immune-compromised (Seung, Omatayo, Keshavjee, Furin, Paul, Farmer & Satti 2009:2). According to Weyer (2005:75) MDR TB can, however, only be diagnosed by *in vitro* confirmation of resistance, that is by detecting resistance to antimicrobial agents by a clinical microbiology laboratory (Jorgensen & Ferraro 2009:1749). An inadequate clinical response in an adherent patient is often supported by a positive smear at 2/3 months, which should prompt a

request for culture and Drug Susceptibility Testing (DST) against Isoniazid, Rifampicin and Ethambutol. The culture and DST should be carried out if by the end of the treatment the sputum remains positive or the patient has not shown an adequate clinical response. (Weyer 2005:75) In addition, the close contacts of an MDR TB patient should also be investigated for MDR TB, especially if signs and symptoms exist (National Department of Health South Africa 2011:23).

The clinical appearance of MDR TB patients is the same as that of patients diagnosed with drug susceptible TB disease and the radiological features are undifferentiated. However, the diagnosis of MDR TB is dependent on the quality of laboratory techniques. A single laboratory report of MDR TB without supporting clinical evidence should therefore be treated with caution, and follow-up investigations should be requested (Weyer 2005:75).

It is important for nurses to acquire knowledge about the diagnosis of MDR TB as nurses usually collect the sputum for culture as well as DST and submit it to the NHLS. However, there are different diagnostic tools available, one of them being the 'GeneXpert'. When the results are received, those patients with suspected MDR TB are referred to the TB hospital.

2.7.1 The use of 'GeneXpert' in the diagnosis of MDR TB

'GeneXpert' is a relatively new diagnostic tool for TB diagnosis in South Africa. The 'GeneXpert' assay is a fully automated molecular diagnostic test for TB disease that can detect MDR TB directly from sputum specimens in less than 2 hours (Helb, Jones, Story, Boehme, Wallace & Ho 2010:18). The advantage of this test over the existing TB smear microscopy is its higher sensitivity and specificity so that it identifies many patients that would not have been diagnosed using TB microscopy. The 'GeneXpert' test reports TB as detected or not detected and also provides data on the state of susceptibility or resistance to Rifampicin (National Department of Health South Africa 2013:37).

At PHC facilities, nurses collect sputum from patients and either send it to a laboratory for diagnosis or insert the sputum into the 'GeneXpert' machine. Nurses in this setting

should have knowledge of the ‘GeneXpert’ as a diagnostic tool. Those patients who are reported as having resistance are referred to the TB hospital for treatment.

2.8 TREATMENT OF MDR TB

In contrast to those drugs used to treat TB, the treatment of MDR TB requires reserve drugs that are much more expensive and more toxic (Ormerod 2005:17) than TB drugs. The treatment of MDR TB is long and patients face the real possibility of not surviving. As a result, in addition to the medication, they need intensive counselling and support (Weyer 2005:75; National Department of Health South Africa 2011:23). At PHC facilities where MDR TB patients are treated, the nurses provide their medication, the treatment, counselling and support (National Department of Health South Africa 2013:18).

Since 2000, all MDR TB centres in South Africa have used a standardised programmatic management of MDR TB called the DOTS-Plus programme, allowing clinicians to follow a standard method of patient management and treatment (Farley, Ram, Pan, Waldman, Cassell, Chaisson, Weyer, Lancaster & Van der Walt 2011:2).

The standardised approach to DOTS-Plus in South Africa comprises the following:

- Treatment at a dedicated MDR TB hospital where patients are admitted for at least the first four months of MDR TB treatment or preferably until the sputum has converted. This is defined as two consecutive negative cultures taken at least 30 days apart. Patients are then discharged to designated PHC facilities with the supply of the required medication.
- There are specialised teams overseeing all aspects of MDR TB management at the referral centres.
- The MDR TB regimen is a standardised treatment regimen, based on the Ethambutol resistance profile of the diagnostic strain and with drug administration standardised across three patient weight bands.
- Regular monitoring of patients during treatment, involves extensive documentation. All MDR TB patients must be registered in the DOTS-Plus Electronic Register at the MDR TB hospitals. This database contains all information necessary for patient management and follow-up, drug adverse effect monitoring and final treatment outcomes.
- Ambulatory treatment after discharge, provided that directly observed treatment is ensured.

- Patient follow-up for 5 years after treatment completion. Six-monthly visits are required to assess symptoms and signs of recurrence (National Department of Health South Africa 2004).

The policy guideline for the DOTS-Plus programme was written in 2004; however, it was intended for use by health professionals caring for patients with MDR TB. Since the decentralisation of MDR TB, it is another programme area with which nurses at PHC facilities need to be familiarised, to enhance the management of MDR TB treatment.

2.8.1 Standardised MDR TB Regimen

A standardised regimen for the treatment of MDR TB includes multiple second line drugs, not previously used by the patient. The duration of treatment is usually a minimum of 18-24 months. In South Africa, the standardised regimen consists of at least six months' intensive phase of daily treatment with five drugs: Kanamycin/Amikacin, Moxifloxacin/Levofloxacin, Ethionamide, Terizidone and Pyrazinamide. This phase is followed by a continuation phase, utilising four drugs: Moxifloxacin, Ethionamide, Terizidone and Pyrazinamide (National Department of Health South Africa 2013:42-46). Table 2.1 lists the drugs used to treat MDR TB as well as the customary dosages.

TABLE 2.1 SECOND LINE DRUGS USED TO TREAT MDR TB

DRUG	**DOSAGE**
Injectables	
Kanamycin (KM)	15 mg/kg intramuscularly once daily
Amikacin (AMK)	15 mg/kg intramuscularly once daily
Capreomycin (CM)	1 5mg/kg intramuscularly once daily
Fluroquinolones	
Ciprofloxacin	750 mg orally twice a day
Levofloxacin	500 mg orally once daily
Moxifloxacin	400 mg orally once daily
Gatifloxacin	400 mg orally once daily
Other second line drugs	
Ethionamide	500-1000 mg orally once daily
Prothionamide	500-1000 mg orally once daily
Cycloserine (CS)	500-1000 mg orally once daily
Clofazimime (CFZ)	200-300 mg orally once daily

(Source: Furin 2007:21)

Many of the drugs used in the second line treatment are highly toxic and adverse drug reactions (ADRs) are described in a few MDR TB cohort studies (Nathanson, Lambregts-van Weezenbeek, Rich, Gupta, Bayona, Blöndal, Caminero, Cegielski, Danilovits, Espinal, Hollo, Jaramillo, Leimane, Mitnick, Mukherjee, Nunn, Pasechnikov, Tupasi, Wells, Raviglione, & Rich 2006:1393; Shin, Furin, Bayona, Mate, Kim & Farmer 2004:1529; Shean, Wilcox, Siwendu, Laserson, Gross, Kammerer, Wells & Holtz 2008:1182). Table 2.2 shows the common adverse effects of the drugs used for the treatment of MDR TB. Primary health care nurses are able to monitor ADRs each time a patient receives treatment and refer the patient to the TB hospital if required. It is therefore important for the nurses to gain an understanding of the MDR TB medication and the ADRs associated with the treatment.

TABLE 2.2 ADVERSE EFFECTS OF SECOND LINE DRUGS

SYSTEM	**MILD ADVERSE REACTION**	**MODERATE TO SEVERE ADVERSE REACTION**	**LIKELY AGENT**
Neurologic	Dizziness Headache Fatigue Insomnia	Seizures Peripheral neuropathy Ototoxicity Optic neuritis	Cycloserine, Kanamycin, Amikacin, Capreomycin, Fluroquinolones
Psychiatric	Depression Irritability Anxiety Mood/behaviour changes	Psychosis Suicidal ideation	Cycloserine
Renal and Electrolyte		Renal failure Hypokalemia hypomagnesemia	Cycloserine, Kanamycin, Amikacin, Capreomycin
Dermatological	Change in skin colour Photosensitivty	Anaphylaxis Stevens-Johnson syndrome	Clofazimine, plus all drugs can cause rare dermatological adverse reactions

(Source: Furin 2007:212)

In addition to treating the MDR TB patient, PHC nurses need to manage the contacts of MDR TB patients, discussed in the next section.

2.9 MANAGEMENT OF MDR TB CONTACTS

'Close contacts' of MDR TB patients refers to those persons living in the same household as the MDR TB patient, or who spend many hours a day together with the patient in the same indoor space (National Department of Health South Africa 2013:103). In order to decrease the risk of transmission of MDR TB, household infection control measures should be applied by the patient and the family (Cobelens, Heldal, Kimerling, Mitnick & Podewils 2008:1040).

Two of the categories of close contacts that are at high risk of contracting MDR TB are those patients who are immunocompromised with HIV, and children. In patients who have a compromised immune system, the risk of developing active MDR TB is highest within the first 2 years following infection (National Department of Health South Africa 2013:102). Children who are contacts of MDR TB patients are at a higher risk of developing active MDR TB soon after infection, especially children under 2 years of age (Marais, Gie, Schaaf, Hesseling, Obihara, Starke, Enarson, Donald & Beyers 2004). Although HIV is the most common reason for immune deficiency in South Africa, it should be kept in mind that impaired immunity can also result from malnutrition, congenital syndromes, haematological diseases, endocrine or renal disease and diabetes mellitus. Patients who are receiving immunosuppressive drugs or radiation therapy may also be at increased risk of active MDR TB after exposure. (Onyango 2011:3).

The management of asymptomatic contacts of MDR TB is carried out in the same manner as contacts of drug susceptible TB as there is a possibility that they could have been infected with a drug susceptible strain (National Department of Health South Africa 2013:103). Isoniazid Preventative Therapy is therefore prescribed to prevent drug susceptible TB, not MDR TB. All child contacts aged 5 years and younger should receive preventive therapy with Isoniazid once active TB has been excluded (Newton, Brent, Anderson, Whitaker & Kampmann 2008:10). In children older than five years, as well as in adult contacts, a careful risk assessment is required and MDR TB must be confirmed before treatment with Isoniazid is started (University Research Company 2013). The South African guideline for the management of MDR TB includes a complete medical history (for example, assessing cough, sputum production, fever and weight loss), physical examination and bacteriological investigations as part of the risk

assessment (National Department of Health South Africa 2013:34). This assessment should be performed by the PHC nurses for every contact when they visit the PHC facility. Capacitating the PHC nurse on the management of contacts of MDR TB patients will assist in identifying those patients who develop symptoms of TB and MDR TB earlier.

The management of symptomatic contacts of MDR TB who do not have TB includes treatment with a broad spectrum antibiotic that is not active against tuberculosis such as Trimethoprim/Sulphurmethoxazole. If the patient continues to be symptomatic then further investigations are carried out (National Department of Health South Africa 2013:104).

In addition, PHC nurses play an important role in educating the families and communities about the importance of seeking medical attention as soon as they develop any of the symptoms of TB. The next section discusses the education and counselling of MDR TB patients.

2.10 PATIENT EDUCATION, COUNSELLING AND ADHERENCE

One of the dangers for public health is the transmission of MDR TB resulting from infectious patients remaining in their community. As discussed earlier, the treatment for MDR TB is a lengthy one, and can take as long as 24 months. During this time patients require continuous education and counselling in order for them to remain adherent to their treatment. However, many people do not take their medication as prescribed and this could result in prolonged periods of infectiousness and, more threateningly, the emergence of drug resistant strains of the bacteria (Imunya, Kredo & Volmink 2012:2; Hirpa, Medhin, Girma, Melese, Mekonen, Suarez & Ameni 2013:1). As the treatment of MDR TB is lengthy, involving numerous drugs with adverse effects, treatment disruption and non-adherence is a common problem (Podewils, Tarcela, Gler, Quelapio & Chen 2013:1). Furthermore, other factors that affect adherence to MDR TB treatment include loss of a salary as patients are often unemployed, as well as challenges regarding availability of second line drugs, substance abuse and psychiatric disorders (Toczek, Cox, Du Cros, Cooke & Ford 2012:1). Another reason why patients default in their treatment is the absence of symptoms such as fever and cough after the initial phase of treatment, leading patients to believe that they are well, as cited in previous studies

among drug susceptible TB patients (Munro, Lewin, Smith, Engel & Fretheim 2007:238).

The WHO endorsed the Directly Observed Treatment Short course (DOTs) Plus programme in 2000 (Grover & Takkar 2008:219) which served to complement the TB DOTs programme with the exception that MDR TB diagnosis, management and treatment are included. According to Hirpa et al (2013:1), DOTs programmes should be firmly prescribed, as studies have shown that patients who do not follow a DOTs programme are at serious risk of defaulting in treatment and developing MDR TB. The DOTs programme also allowed for daily monitoring and the timely management of adverse effects, which may promote adherence. Education, counselling and emotional support are particularly important for patients diagnosed with MDR TB, much as in any other chronic, life-threatening illness. On-going intensive counselling will also help to ensure good adherence to the treatment regimen and increase the likelihood of a successful outcome (National Department of Health South Africa 2013:93).

The South African National Department of Health MDR TB guidelines (2013) indicate that patients and their families should also be informed on an on-going basis about how MDR TB is spread and how it can be prevented and treated. In addition the patients should be educated about the potential adverse effects of the medication and the need to adhere to it should be stressed. Nurses at PHC facilities play an important role as they are in contact with the MDR TB patients weekly and can counsel and educate patients regarding MDR TB.

2.11 INFECTION CONTROL PLAN

One of the reasons for a high incidence of TB in South Africa comprises the poor infection control measures at PHC facilities (Sissolak et al 2011:8; Engelbrecht & Van Rensburg 2013:221). Not only is it important to halt the spread of TB and MDR TB amongst patients, but it is also important to protect the staff working in PHC facilities from infectious diseases. The staff that work at facilities are at higher risk of becoming infected with TB and MDR TB, especially if they are immunocompromised due to HIV (WHO 2008:ii). The South African guideline on the management of MDR TB indicates that the development of the infection control plan is specific for each area and occupational group in a facility. A facility may contain a combination of low,

intermediate, and high-risk areas or occupational groups at the same time (National Department of Health South Africa 2013:120).

However, irrespective of the level of risk, the following principles apply for infection control:

- Education on the transmission of TB, the consequences of MDR TB, and the importance of complying with the infection control policies must be provided at all times in facilities.
- HIV testing must be promoted as there is an increased risk of patients with HIV acquiring TB and MDR TB.
- Staff who are immunocompromised can be offered other areas to work in.
- There must be infection control policies which include safe waste disposal, and these must be implemented in all facilities.
- There must be policies on cough hygiene and sputum collection (National Department of Health South Africa 2013:120).

The policy on cough hygiene is discussed below.

- **Cough hygiene**

Patients infected with TB may be found in any service area in a PHC facility, including voluntary counselling and testing sites, HIV section, maternal and child health, general patient waiting area, and chronic section. As TB is an infectious disease, any delays in TB diagnosis and treatment initiation, especially under conditions of crowding and poor ventilation, facilitate nosocomial transmission of TB among patients and health care workers (Basu, Andrews, Poolman, Ghandi & Shah 2007:1500).

The prevention of MDR TB focuses on both the infectious patient (and infected material) and on the health care worker at risk of being infected. Good practice entails that all patients be instructed to cover their mouths and noses with a handkerchief, surgical mask or a tissue when coughing. After use, these materials should be disposed of in small plastic or paper refuse bags, which should be regularly changed and discarded into larger refuse bags for incineration. Health care workers should wear particulate

respirators such as N95 masks, which are impermeable to droplet nuclei, when nursing patients or collecting sputum (National Department of Health South Africa 2013:121). Several PHC facilities in South Africa have been shown to have poor infection control practices and a lack of training for nurses on infection control was highlighted as one of the compounding reasons (Engelbrecht & Van Rensburg 2013:225; Mphahlele, Tudor, Van der Walt & Farley 2012:8; Sissolak et al 2011:5). Capacitating nurses as regards knowledge of infection control will help to provide a safe area for staff and patients (Andrews et al 2007:485).

In the next section, the decentralisation of MDR TB management and care will be discussed.

2.12 DECENTRALISATION OF MDR TB MANAGEMENT AND CARE

Conventionally, MDR TB treatment has been provided through small, individualised programmes with specialist clinical support, typically in dedicated TB hospitals (Cox & Ford 2013:1). However, while such a process might work where the number of patients are small, in settings like South Africa and Russia, where there is a large burden of MDR TB patients, centralised programmes requiring specialist support are unlikely to meet the need (Cox & Ford 2013:1). To that end, many countries have begun to move from managing MDR TB in terms of a centralised model to incorporating a decentralised model of care.

Decentralised management of MDR TB refers to the transfer of responsibility for treating MDR TB patients to lower levels of the system, such as PHC facilities. There are many barriers to the access to MDR TB treatment, ranging from insufficient funding, poor laboratory diagnostic capacity and health system challenges (Fitzpatrick & Floyd 2012:63) as well as limited specialist hospitals and bed space to treat patients (National Department of Health South Africa 2011:1). One of the factors promoting the decentralised approach was that the increased efforts in global TB control had resulted in strong basic TB programmes in PHC settings. It is feasible that integration of MDR TB care and management into these routine TB programmes at PHC facilities will allow patients with MDR TB to receive treatment close to where they live (Cox & Ford 2013:1).

As early as 2003 and 2004, studies conducted in Lima, Peru, showed successful treatment of MDR TB patients in a decentralised setting (Mitnick, Bayona, Palacios, Shin, Furin, Alcántara, Sánchez, Sarria, Becerra, Fawzi, Kapiga, Neuberg, Maguire, Kim & Farmer 2003:119; Shin et al 2004:1529). Since then, other large-scale MDR TB programmes have shown that there is improved care and management of MDR TB through decentralisation (Malla, Kanitz & Akhtar 2009:6; Brust, Shah, Scott & Chaiyachati, Lygizos, Van der Merwe, Bamber, Radebe, Loveday, Moll, Margot, Lalloo, Friedland & Gandhi 2012:998). Furthermore, treatment outcomes have not been affected, even with programmes that have task shifted initiation of MDR TB treatment to trained nurses (Cox & Ford 2013:1).

- **Decentralisation of MDR TB in South Africa**

In South Africa, the National Department of Health published a policy framework on the decentralisation management for MDR TB in 2011. It included the management of MDR TB in decentralised MDR TB units, PHC facilities, or in the community, using mobile teams and community caregivers and households (National Department of Health South Africa 2011:1).

Prior to the decentralised guideline, the South African National Department of Health guidelines stipulated that all MDR TB patients should be hospitalised for at least six months. However, a clinical audit of MDR TB services in South Africa revealed that the current programme was facing many challenges as discussed previously. This included delayed initiation of treatment, inadequate bed capacity and poor infection control in hospitals as well as poor adherence to treatment which was often caused by the six months of hospitalisation where patients are forced to relinquish work and home responsibilities (National Department of Health South Africa 2011:1).

According to Padayatchi et al (2010:95), of the 2 472 and 2 572 cases of MDR TB diagnosed in KwaZulu-Natal laboratories in 2005 and 2006 respectively, only 56% in 2005 and 28% in 2006 were treated in hospital. Those patients not treated in hospital were either deceased or remained infectious in the community. The statistics of the number of patients diagnosed and the number treated highlighted the discrepancy between the number of beds available to treat patients with MDR TB and the actual caseload. In response to this discrepancy the National Treatment Plan introduced the

policy of decentralised management for MDR TB in which decentralised MDR TB units will initiate and monitor treatment but only of MDR TB cases. Those patients that did not need to be hospitalised were to be managed at PHC facilities by nurses (Padayatchi et al 2010:95).

As mentioned before, the outcome of a decentralised procedure would decrease the number of days between diagnosis and treatment initiation and increase treatment coverage of patients. As a result, there would be a reduction in the transmission of MDR TB. In addition, it would enable patients to have treatment closer to their homes, increasing the social acceptability of treatment as well as adherence to it (Ndjeka 2013:10).

- **Role of primary health care facilities**

Primary health care facilities play a significant role in the decentralised model, as it intends that patients receive their treatment for MDR TB from the PHC clinic. According to the South African guidelines on the Management of MDR TB, the role of the PHC nurse includes providing the treatment, monitoring side effects and adherence. The PHC nurse must treat minor side effects such as nausea, vomiting and diarrhoea but also needs to identify the more serious side effects and refer the patient to a TB hospital. Furthermore, the nurse is involved in the provision of education concerning MDR TB to the patient and the family, as well as education on household infection control policies. Other functions of the PHC nurse involve identifying and managing contacts of MDR TB, collecting monthly sputum and other routine tests (National Department of Health South Africa 2011:23).

2.13 KNOWLEDGE OF HEALTH CARE WORKERS ON THE MANAGEMENT OF MDR TB

There have been few studies documenting the knowledge of nurses with regard to MDR TB. A review of the literature from search engines such as CINAHL, Medline and Ebscohost® revealed the following studies (Engelbrecht & Van Rensburg 2013; Kiefer et al 2009:783; Savicević 2009:484; Sissolak et al 2011:6; Woith et al 2010:1491).

As previously mentioned, a quantitative study in Peru revealed a lack of knowledge amongst doctors and nurses regarding assessing treatment outcomes of TB (Kiefer et al 2009:783; Savicević 2009:484). In South Africa, a qualitative study conducted in the Western Cape investigated the experiences of nurses in South Africa, with regard to the factors influencing TB infection prevention and control. The study highlighted a lack of TB-related training amongst nurses as one of the challenges facing them (Sissolak et al 2011:6). Areas identified by Sissolak et al (2011:10) as requiring training included infectious time and infection control. The study also emphasised that effective TB infection prevention and control practices by nurses were hampered by the lack of clear TB policy directives; the lack of appropriate isolation facilities and availability of personal protective equipment; the lack of TB training for staff and patients and a persistent work overload. Through on-going training and continuing professional development, nurses could develop the skills and enhance their confidence in TB and HIV care in a high burden environment as well as make informed clinical judgements on appropriate management (Sissolak et al 2011: 8). A cross sectional study of 127 PHC facilities in South Africa also indicated that there was a gap in the knowledge of nurses regarding TB and infection control which could result in an increased risk of nurses contracting TB and MDR TB (Engelbrecht & Van Rensburg 2013:225). Another study by Mehtar (2008:321) showed that all health care staff, including support staff, must receive training in infection control. In a retrospective study conducted in KwaZulu-Natal amongst doctors and nurses, a lack of knowledge of the storage of sputum was highlighted as a challenge (Loveday et al 2008:1045).

The guideline for decentralised MDR TB management in South Africa states the importance of including MDR TB into the nursing curriculum. While the management of drug susceptible TB is covered in the nursing curriculum, there is very little coverage of MDR TB (National Department of Health South Africa 2011:61). In 2012, DENOSA trained nurse educators regarding MDR TB so that in the future, the content could be incorporated into their curriculum when training nursing students (DENOSA 2012:1). However, since MDR TB patients are currently being managed at PHC facilities it is important for the nurses there to be capacitated with knowledge on MDR TB signs and symptoms, treatment, side effects, management of contacts, infection control and counselling.

The management of MDR TB patients is a relatively new role for nurses at PHC facilities, arising from the high numbers of patients requiring treatment. As a result, there is a gap in the literature with regard to nurses' knowledge of managing MDR TB in the PHC setting. The findings from this study will be important as it will provide a basis of the areas in which MDR TB nurses need to be capacitated.

2.14 CONCLUSION

The literature review presented in this chapter included the epidemiology of TB and MDR TB, the development of MDR TB, the symptoms and diagnosis of the disease as well as the management of MDR TB, the management of MDR TB contacts and decentralisation of MDR TB care. In addition, the literature review assisted in the development of the questionnaire by enabling the researcher to identify the relevant information and to establish content validity. South Africa faces a significant burden of disease from HIV/AIDS and TB and the health care system is predominately nurse based. As a result, nurses need to be capacitated in order to assist in managing the country's burden of disease and meet the country's health care needs.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

While Chapter 2 provided a literature review of MDR TB, this chapter describes the research design and methodology, including the target population, data collection and analysis. The researcher used a quantitative, descriptive, cross-sectional design in order to give a detailed description of nurses' knowledge gaps on the management of MDR TB.

3.2 RESEARCH DESIGN

A research design, according to Babbie (2013:124), allows a researcher to clearly state what it is they wish to discover and the methods they will pursue. Polit and Beck (2012a:741) offer a closely related definition of design by describing research design as the overall plan for addressing a research question, including specifications for enhancing the study's integrity.

Brink, Van der Walt and Van Rensburg (2012:112) describe a quantitative research design as a suitable design that provides a description of the situation. In this study, a quantitative, descriptive and cross sectional design was utilised to describe the knowledge gaps of the respondents by using a questionnaire as a measurement instrument. In descriptive research, the researcher can obtain complete and accurate information about the characteristics of a particular individual, event or group in actual situations. In this study, the population group consisted of nurses working at PHC facilities and the information that was required was the gaps in their knowledge regarding management of MDR TB.

3.2.1 Quantitative research

Quantitative research is a formal, objective and systematic process for generating information about the world. Polit and Beck (2012a:739) describe such research as the investigation of measurable and quantifiable occurrences. In quantitative research, the measurement instrument used allows for the generation of numerical data and statistics to interpret, organise and present the data. The advantage of this approach is that it allows for generalisable findings (Cottrell & McKenzie 2011:7). In this study, the knowledge gaps that nurses have regarding the management of MDR TB were quantified using a questionnaire as a measurement test. In addition, the researcher chose the quantitative approach because it helped to convert data into numeric indices and to employ statistical analysis for the measurement of the knowledge gaps of nurses as regards the topic.

3.2.2 Descriptive research

Descriptive studies involve observing, describing and documenting aspects of a situation as it naturally occurs (Polit & Beck 2012a:226). These studies do not attempt to manipulate or control the respondents but may be used to describe what exists, identify problems in current practice, justify current practice, make judgments and determine what others are doing in similar situations (Burns et al 2012:225). The purpose of this study was to describe the knowledge gaps of nurses working in PHC facilities on the management of MDR TB. It did not involve any prediction of any occurrence or an explanation of the underlying factors of the variables involved; therefore a descriptive design was suitable for the study. Furthermore, descriptive studies provide valuable baseline information; in this study, a structured questionnaire elicited information regarding the knowledge of nurses on the management of MDR TB as well as the training that they had received and required.

3.2.3 Cross-sectional research

Cross-sectional studies entail the collection of data on a cross-section of the population, which may comprise the whole population or a sample of it (Holland & Rees 2010:119). Collection of data occurs at a point in time, but with differing study respondents, as opposed to different points in time for the same respondent (Brink, van der Walt & van

Rensburg 2007:10). The researcher chose cross-sectional research for this study, because data collected from the respondents occurred at one point in time, as opposed to a longitudinal research design whereby data collection from subjects occurs over an extended period. Therefore, the data obtained from a sample of the nursing population was considered as representative of what was going on at a specific point in time.

3.3 RESEARCH METHODOLOGY

The research method is defined as a systematic approach to the research process and explains to the reader how the study was carried out. It includes the population used, sampling, data collection and data analysis (Polit & Beck 2012a:59).

3.3.1 Research setting

The research setting is the environment in which the research study takes place and may be a natural or controlled environment. Natural settings are real-life study environments without any changes made for the purpose of the study (Burns et al 2012:373). This study was conducted in urban PHC facilities in the Nelson Mandela Metropolitan (NMM), Eastern Cape Province of South Africa. The NMM is the third largest and most densely populated district in the Eastern Cape Province (Health Systems Trust 2013:224). The facilities were selected from the 42 PHC facilities that render TB services in the NMM. There are usually two nurses in the TB unit at the PHC facilities. Over the past eight years the number of patients visiting PHC facilities has doubled and during the 2012-2013 year, the total number of patients receiving care at the 42 PHC facilities in the NMM amounted to over 3 million (Health Systems Trust 2013:224). In 2011-2012, the total nurse to patient ratio in the NMM was 1:44 (Nelson Mandela Metropolitan 2012:20). Some of the existing challenges at PHC facilities include the limited staff complement and the fact that the number of facilities has not increased significantly. Moreover, the increasing burden of disease caused by HIV/AIDs and TB has fuelled the increase in patients seeking care. Studies conducted at other PHC facilities in South Africa also indicate a shortage of nurses (Daviaud & Chopra 2008:48; Nyasulu, Muchiri, Mazwi & Ratshefola 2013:235) and that expanding services without the needed increase in the available human and functional space resources results in an increased workload at PHC levels (Nyasulu et al 2013:235). Furthermore, a

study conducted by Nkosi, Horwood, Vermaak & Cosser (2009:412) illustrated that the scope of practice of nurses has broadened in recent years.

At the PHC facilities in the NMM, sessional doctors work at some of the facilities for a few hours a day once or twice a week. However, these doctors are usually booked for patients requiring chronic disease evaluation, not TB or MDR TB services. This shortage of doctors was also revealed in a study conducted by Nkosi et al (2009:412) in which the doctors usually worked at more than one facility per day, seeing mostly chronic disease patients. The patients that present to the TB unit are varied and a considerable number of them are HIV co-infected (District Health Information System 2013). Therefore, the nurses play a crucial role in the management of MDR TB, as the doctors are not always available to assist.

3.3.1.1 Study population

According to Polit and Beck (2012a:59), a population is defined as all the individuals or objects with common, defining characteristics, also known as the target population. The accessible population is the aggregate of cases that conform to the chosen criteria and that are accessible for a study (Polit & Beck 2012a:274). Polit and Beck (2012a:274) further describe the target population as 'the aggregate of cases about which the researcher would like to generalize'. In this study, the target population was the professional nurses working in the PHC facilities in the urban area of the NMM district of the Eastern Province of South Africa. The accessible population was all the available nurses working at the PHC facilities who were willing to participate in the study.

3.3.1.2 Sample and sampling

As previously mentioned, Polit and Beck (2012a:290) describe sampling as the process of choosing a portion of the population to represent the entire population and the advantage of selecting a sample is that it is less costly and more time saving than collecting information from a large group of respondents. The selected sample should therefore have characteristics similar to that of the population under study to allow generalisability of the results to represent the population (Polit & Beck 2012a:288). In quantitative studies, the larger the sample size the lesser the sample error (Brink et al

2012:143). There are two types of sampling, probability sampling and non-probability sampling. In this study non-probability sampling was employed.

- **Non-probability sampling**

In non-probability sampling, elements are selected by non-random methods. One such type of non-probability sampling is convenience sampling which involves utilising the most conveniently available people as respondents (Polit & Beck 2012a:288). Cottrell and McKenzie (2011:132) indicate that with convenience sampling respondents are selected based on their accessibility and proximity to the researcher and is used frequently because it saves time and money. As mentioned before, the distances between facilities were large and due to the researcher's lack of resources and small budget, in this study, the convenience sampling technique was used to select the sites. It was also based on availability and the willingness of respondents to participate.

As mentioned in Chapter 1, before sampling, the researcher obtained a list of all PHC facilities in the NMM. The researcher chose the NMM due to convenience as he resided and worked in this metropole. As the distances between these facilities are considerable, the researcher selected 25 accessible facilities to be included in the study. These sites were chosen using the convenience technique, selecting the sites nearest and most available to the researcher. As convenience sampling was used, no statistical formula was used to determine the sample size.

- **Inclusion criteria**

The criteria specifying the population characteristics are called the 'inclusion criteria' (Polit & Beck 2012a:274). According to Brink et al (2012:131), it is important for the researcher to describe and mention inclusion criteria for the population. As noted, the respondents included in this study were all registered nurses working in the PHC facilities TB unit who were available and willing to complete the questionnaire. Due to the shortage of nurses in this setting, there was no restriction on the length of time that the respondents had worked in the facilities. The researcher feared that setting a time constraint might limit the size of the population. The number of years of work experience in the PHC setting was included in the questionnaire to correlate the influence of work experience with knowledge on MDR TB.

- **Exclusion criteria**

Exclusion criteria are those characteristics that the population must not possess (Polit & Beck 2012a:274). In this study, the exclusion criterion was those respondents who were not willing to participate.

3.3.1.3 Sample size

Burns et al (2012:367) state that there are no firm rules concerning sample size but that a sample should have at least thirty respondents. According to Polit and Beck (2012a:285), most nursing studies use samples of convenience. As there are typically two registered nurses in the TB unit at a PHC facility, due to the limited scope of this study, 50 respondents made up the sample. All the nurses working at the TB units at the PHC facilities, who were available and willing to participate in the research, were included in the sample. Ultimately, 32 respondents completed the questionnaire and were included in this study. As mentioned earlier, the shortage of nurses at the facilities due to absenteeism and redistribution of nurses to other areas also contributed to the small sample size. The respondents that completed the questionnaire represented the study population and this could allow for reliable statistical inferences to be made about the study population (Cottrell & McKenzie 2011:134).

3.3.2 Data collection

Data collection is the process of selecting respondents and gathering data from these respondents (Burns et al 2012:523). In this study, data were collected using a respondent administered structured questionnaire that was hand delivered to the respondent, at the PHC facility, by the researcher. The researcher waited for the respondents to complete the questionnaires. Those respondents that did not have the time to complete the questionnaires kept them; these were collected after one week by the researcher. If respondents experienced difficulties answering the questionnaires, the researcher was available for clarification while waiting for the completed questionnaire and when the questionnaires were collected. The questionnaire elicited demographic information from the respondents as well as information regarding the respondent's knowledge about the management of MDR TB and the training they had received regarding it. Respondent fatigue was avoided, as the time taken to complete the

questionnaire was brief, and ranged from 15 to 20 minutes. The researcher handed out 50 questionnaires; as mentioned, 32 questionnaires were returned. Collection of the data occurred over the period August to October 2013.

3.3.2.1 Data collection instrument

According to Polit and Beck (2012a:328), quantitative studies derive data through the measurement of variables. Measurement requires allocation of numbers to represent attributes present in the respondents (Polit & Beck 2012a:328). Although it takes a great deal of time to develop a well-designed questionnaire, the researcher chose to develop a structured questionnaire, because relative to interviews, questionnaires are less costly and require less time to administer as well as offering the respondent relative anonymity. Some of the disadvantages of questionnaires include poor response rates and the possibility of respondents misunderstanding the questions. The researcher managed these disadvantages by collecting the questionnaires from the PHC facilities as opposed to having them posted. This ensured that the researcher was available at the time of issuing and collection of the questionnaires and was able to clarify any questions not understood by respondents. The advantages of using a questionnaire for this study were that they allowed the researcher to collect the data from the respondents at the same time, enhancing cost effectiveness and that the nurses at the PHC facilities, who were very busy, had the option of completing the questionnaire in their own time.

The design of the questionnaire was based on the literature review.

- **Layout of the questionnaire**

Questions on the said questionnaire were written in English. The researcher used the same structured questions for all the respondents to ensure consistency of the responses. As indicated in Table 3.1, the questionnaire was divided into three sections.

TABLE 3.1: SECTIONS COVERED IN THE QUESTIONNAIRE

SECTION	ASPECTS COVERED
Section 1: Staff demographics Question 1-6	 Questions required demographic information of respondents' gender, qualifications and experience
Section 2: Training Questions 1-3 Questions 4-10 Question 11	 Questions required respondents to indicate if they had received training regarding MDR TB General questions covering Continuing Education courses, weekly meetings and updates on MDR TB. Questions covered aspects of the training respondents would like to receive, including frequency and facilitator. The question required respondents to indicate if the training they had received had prepared them for aspects of MDR TB control such as providing medication, educating patients, monitoring side effects, screening contacts, sputum collection and infection control.
Section 3: Multidrug resistant tuberculosis Questions 1-7 Question 8-10	Likert Scale Questions covered knowledge of management of MDR TB, covering: causes, susceptibility, prevention and symptoms of MDR TB as well as side effects of treatment. Questions required respondents to rate if they had adequate knowledge on 'GeneXpert', contact management and infection control. The Likert scale options of choice included 'strongly agree', 'agree', 'disagree' and 'strongly disagree'.

- **Refinement of the questionnaire**

In this study, the researcher designed the structured questionnaire after performing the literature review and with the help of his Supervisor and a statistician (Annexure B refers); changes were made according to the recommendations. In Section 3, multiple choice questions were altered to a Likert type scale question with four responses (1 for strongly agree, 2 for agree, 3 for disagree and 4 for strongly disagree). The researcher chose to use a four point Likert scale as it allows the respondents the chance to be

thoughtful and choose a response as well as eliminating the possible misinterpretation of a mid-point.

- **Competency indicator**

The questionnaire was submitted to two field experts in order to validate the minimum mark that would be required by respondents to indicate their knowledge level. The field experts both work at a TB hospital and possess medical degrees. This enhanced the validity and the reliability of the questionnaire. A competency score of 50% was set. The competency indicator was used to enhance the validity and reliability of this study.

3.3.2.2 Pre-test

Polit and Beck (2012a:738) define the pre-test as the trial administration of a newly developed instrument to identify problems or assess time requirements. The purpose of the pre-test is not to answer the research question but to identify and prevent problems that may be caused by the parent study (Polit & Beck 2008:213). The researcher pre-tested the questionnaire with four nurses, involved with MDR TB treatment, at two PHC facilities prior to data collection. The facilities who participated in the pre-test were not included in the final study. Most of the recommended changes were related to minor grammatical aspects. The open ended question 'Do you think the training has prepared you for your job?' was found to be vague and was changed to be more specific and closed-ended. The pre-test enabled the researcher to make the necessary changes to the questionnaire as well as determine the amount of time required to complete it.

3.3.3 Data analysis

The purpose of data analysis is to obtain meaning from the data generated during the study and involves transforming or coding the data into numbers, obtaining a data set and then performing statistical analyses (Polit & Beck 2012a:463-473). In this instance the questionnaire was pre-coded with codes designated before data was collected. The coding system is indicated in the questionnaire (Annexure B refers). The coded data was then entered onto an Excel spread sheet to create a data set; the researcher then verified the data by checking for wild codes. Polit and Beck (2012a:465) describe wild codes as codes that are not possible and not part of the coding system. This data was

then exported for analysis to a statistical package; the SPSS version 20.0 software, and analysed by a statistician. Brink et al (2012:178) indicate that statistics is one of the most useful tools available in analyzing quantitative data. Descriptive statistics allows researchers to summarise and describe quantitative data (Polit & Beck 2012a:226). The descriptive statistics such as frequency, percentage, mean and standard deviations were primarily used to describe the data with the results being presented in bar graphs, tables and pie-diagrams.

Chi square tests were also used were appropriate to identify whether relationships existed between variables.

3.4 VALIDITY AND RELIABILITY

In order to ensure that the results obtained from a research study are of a high quality, there are some aspects of the measurement procedures and measurement instruments that need to be assessed and to show acceptable levels. Validity and reliability are two of the most important concepts in the context of measurement (Delport & Roestenburg 2011:172).

3.4.1 Validity

Validity is the extent of accuracy of an instrument to measure the construct which it is supposed to measure, in the context of the concepts being studied (Polit & Beck 2012a:336). The four aspects of internal validity are outlined below. In this research two aspects of internal validity were achieved: content and face validity. These are discussed in more detail.

- **Content validity** was ensured by conducting a literature review prior to the design of the questionnaire. The researcher developed the structured questionnaire with the aid of his Supervisor to ensure that it measured the desired variables. The questionnaire was then submitted to field experts in order to assist in determining a score that could be regarded as the minimum score respondents should achieve to be regarded as 'knowledgeable enough' on the subject of MDR TB. This was termed the competency indicator. Validity was tested during the pre-test conducted prior to the actual research data collection

process. This ensured that all questions asked would be correctly understood, and that the researcher was satisfied with responses to questions. Therefore, the pre-test improved the internal validity of the questionnaire. The results from the pre-test were not included in the final data analysed. All captured data was cross-checked and proof-read by the researcher to ensure accuracy.

- **Face validity** refers to whether the instrument appears to measure the variable that it claims to measure rather than what it actually measures (Delport & Roestenburg 2011:174). To measure face validity, experts within the MDR TB field were requested to review the questionnaire used in this study. It was decided by the same experts that the competency indicator would be 50%, which is the same measure that is mostly used to indicate if a test is passed or not as mentioned earlier. The pre-test also assisted the researcher to clarify some of the questions and determine that the questions were clear and readable.

- **Criterion validity** involves correlating what an instrument measures with another measure accepted as being valid. Criterion validity considers whether scores in a measuring instrument are in agreement with a defined standard instrument that covers the same theme (Delport & Roestenburg 2011:174). For this study, the researcher designed the instrument, after a literature review, as no other instrument that addressed the questions could be found. Thus, the instrument designed could not be compared with other questionnaires.

- **Construct validity** refers to whether an instrument successfully measures a theoretical construct or the concepts it set out to measure. The challenge as regards construct validation is that the theory itself cannot be measured and therefore it would be difficult to determine if a construct in fact actually represents theory (Delport & Roestenburg 2011:174) in the case of this study.

3.4.2 Reliability

Reliability refers to the consistency of an instrument in terms of which it measures the target attribute and can be equated with a measure's stability, consistency or dependability (Polit & Beck 2012a:331). According to Burns et al (2012:391) internal consistency testing is used to address the correlation of various items within the

instrument and examines the extent to which all the items in the instrument consistently measure a concept. Internal consistency exists in degrees and is usually expressed as a form of correlation coefficient, with 1.00 indicating perfect reliability and .00 indicating no reliability. Values of 1.00 are not obtained in study results because all instruments have some measurement error. A reliability coefficient of 0.80 is considered the lowest acceptable value for a well-developed measurement instrument while for a newly developed instrument, a reliability of 0.70 is considered acceptable, although instruments developed in the last five years reflect internal reliability from 0.60 to 0.69 (Burns et al 2012:391-392; Polit & Beck 2012a:331). The researcher in consultation with a statistician used the Cronbach's alpha co-efficient to test reliability for this study. In addition, the researcher ensured that care was taken to ensure accurate phrasing of each question in order to avoid ambiguity and pre-tested the questionnaire before the final study. The C alpha values were calculated for the knowledge questions in Section 3 of the questionnaire. Only two of the values were below 0.7, that is: 0.4 (How can MDR TB be prevented) and 0.6 (What is latent/inactive TB). However, these questions were not discarded as they did not approach zero and the reason for the low alpha score could have been the low number of questions asked (Tavakol & Dennick 2011:54).

3.5 ETHICAL CONSIDERATIONS

To ensure that the study was conducted ethically, the researcher observed the following:

3.5.1 Permission to conduct the study

The researcher obtained permission to conduct the study from the Higher Degrees Committee of the Department of Health Studies, University of South Africa (Annexure A); the Eastern Cape Department of Health (Annexure C) and the District Manager of Nelson Mandela Metropolitan (Annexure D) and the facility supervisors (Annexure E).

3.5.2 Ethical principles for protecting respondents

The three broad principles on which standards of ethical conduct in research are based that were respected in the conduct of this study are, as mentioned: beneficence, respect

for human dignity and justice (Polit & Beck 2012a:152). Respondents were recruited at the facility by the researcher when he hand delivered the questionnaire and were able to decide then whether to participate in the study.

3.5.2.1 Beneficence

Researchers are obliged to protect persons from harm, maximise possible benefits and minimise possible harm (Polit & Beck 2012a:152). The respondents were told that there was no foreseeable risk or discomfort as a result of participating in the study. The respondents were also informed that there was to be no direct, immediate benefit except for the awareness that arose from respondents in identifying their own knowledge gaps. The study findings would assist health services managers in the district to improve service delivery. The possible risk of respondents feeling that they were incompetent when answering the questionnaire was overcome by ensuring that the questions on knowledge were formulated using a Likert scale. These scales do not force a respondent to answer Yes or No, but allow the respondent to answer in a degree of agreement, thus making the question easier to answer. Respondents were assured that the data collected would not be reflecting their competencies but rather aspects of the management of MDR TB that required training.

3.5.2.2 Respect for human dignity

According to Polit and Beck (2012a:154), humans should be treated as autonomous agents capable of controlling their actions. Researchers have an obligation to respect each respondent as a person capable of making a decision regarding participation in the study. In this study the researcher, who was not known to the respondents, ensured that all respondents received full disclosure of information regarding the nature of the study, its purpose and benefits to the district as it will inform the district regarding the training required. According to Polit and Beck (2012a:154), respect for human dignity also includes freedom from coercion. Coercion involves explicit or implicit threats of penalty from failing to participate on the study or excessive rewards from agreeing to participate. The respondents were able to exercise their right to refuse to participate in the study. The voluntary completion of the questionnaires implied that informed consent was obtained from respondents.

3.5.2.3 Justice

In this study the information provided by respondents during data collection was not divulged to others without permission. To ensure confidentiality and anonymity, no name or any form of identity was required on the questionnaire, thus protecting the privacy of any respondent. The respondent was assured that the information they provided would be used for research only and that the results of the research would be presented to national and international audiences to improve nursing practice.

3.6 CONCLUSION

This chapter described the research methodology including the sample population, data collection instruments and strategies to ensure the ethical standards, reliability and validity of the study.

The findings of the study are discussed in the next chapter.

CHAPTER 4

ANALYSIS, PRESENTATION AND DESCRIPTION OF THE RESEARCH FINDINGS

4.1 INTRODUCTION

The research design and methodology were described in the previous chapter. This chapter presents the research findings with the aid of percentages, tables and graphs. The aim of this study, as noted, was firstly to explore the knowledge gaps of nurses working at PHC facilities, on the management of MDR TB, in the Nelson Mandela Metropolitan. Secondly, it was to enhance the knowledge of these nurses working at PHC facilities on the management of MDR TB through recommendations based on the findings of this study.

The specific objectives of the study were to:

- Determine the knowledge gaps of nurses working in PHC facilities on the management of MDR TB.
- To propose recommendations to improve the knowledge gaps of nurses working in PHC facilities with regard to the management of MDR TB.

The symbol ‘N’ refers to the total number of subjects while the symbol ‘n’ refers to the number of subjects in a subgroup of the study (Polit & Beck 2012b:loc 24262). In this study ‘N’ refers to the 32 respondents who completed the questionnaire. The symbol ‘*f*’ reflects the frequency of the variables.

4.2 DATA MANAGEMENT AND ANALYSIS

A satisfactory response rate of 64% was achieved as 32 of the 50 questionnaires issued were received. Burns and Grove (2009) as cited in Moule and Hek (2011:114), indicate that response rates above 50% are regarded as satisfactory. Therefore a total of 32 respondents took part in the study (N=32). The variation in responses to an item in this report is denoted as frequencies (*f*) and in the text that follows, numerical values unless otherwise indicated pertain to the frequencies (*f*).

4.2.1 Section 1: Staff demographics

A total of 32 respondents who met the inclusion criteria participated in this study by completing the questionnaires (heading of 3.3.1.3 refers). Questions 1-4 covered the demographical data about the nurses working in PHC facilities, which included gender, rank category and years of experience.

4.2.1.1 Gender

This question determined the gender of the respondents (N=32). The results are reflected in Figure 4.1. As illustrated, the analysis showed that 93.8% (n=30) of the respondents were female and 6.3% (n=2) were male. This is in keeping with the general trend in nursing in which the number of male nurses is approximately one tenth that of female nurses (South African Nursing Council 2013).

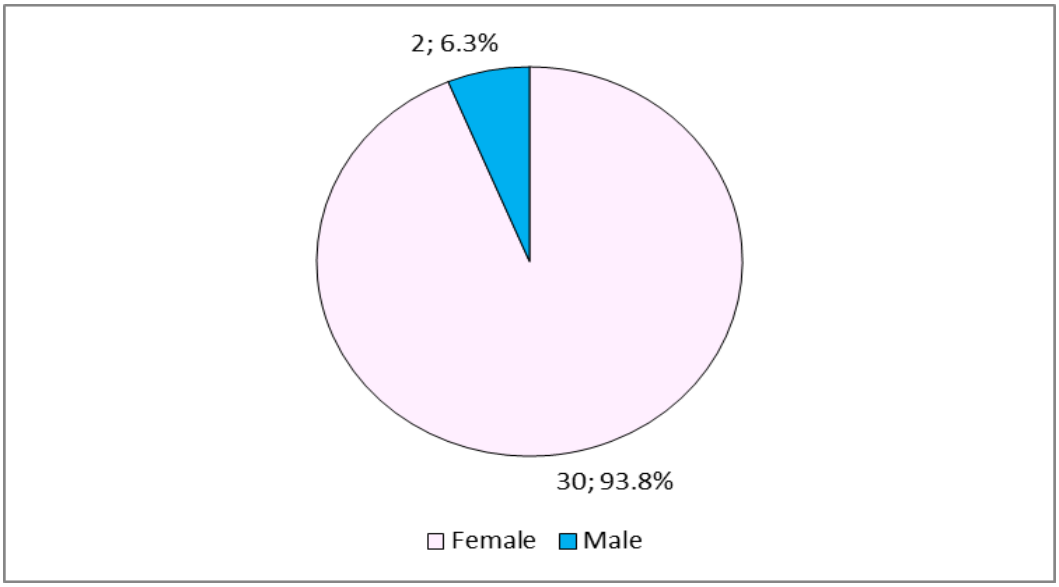

Figure 4.1: Gender of respondents (N=32)

4.2.1.2 Designation of nurses

The study was intended to target the nurses working in PHC facilities who were involved in the provision of TB services. The majority of the respondents, 88.6% (n=31), were professional nurses. There were 8.6% (n=3) enrolled nurses who completed the questionnaire because, at the time, they were working in the TB unit in the absence of the professional nurse. However, these three respondents' data were not included as

they did not meet the inclusion criteria stated in Chapter 3, (heading of 3.3.1.2 refers). Of the respondents 2.9% (n=1) completed the section as 'other' namely: Facility manager. This facility manager was a professional nurse.

4.2.1.3 Number of years since qualified

Table 4.1 indicates that 22% (n=7) of the nurses had qualified less than five years' ago, 28% (n=9) had qualified 5-10 years previously, 41% (n=13) of nurses had qualified 11-20 years ago. Only 9% (n=3) had qualified more than 20 years ago.

TABLE 4.1: WORKING EXPERIENCE SINCE QUALIFICATION AS A PROFESSIONAL NURSE (N=32)

YEARS EXPERIENCE	***f***	**%**
<2 years	2	6
2-4 years	5	16
5-10 years	9	28
10-20 years	13	41
>20 years	3	9

4.2.1.4 Experience working in the TB section of the PHC facilities

The majority of nurses in the study 71.9% (n=23) had worked in the TB section for less than three years (Figure 4.2). The respondents that had four to six years' experience in the TB section was 12.5% (n=4) while 15.6% (n=5) had over seven years' experience. The limited experience could be attributed to numerous factors, including the increase in TB infection rates observed, as a result of the HIV epidemic and the limited number of health care professionals at the facilities. As a result, there is a high turnover of nurses who are required to attend to TB services. As mentioned earlier, this shortage of nurses at PHC facilities was also reported by Daviaud and Chopra (2008:48) and Nkosi et al (2009:412). A study conducted by Nyasulu et al (2013:235) at PHC facilities in South Africa, revealed that providing extra services, such as antiretroviral initiation, without increasing the staff complement, increased the workload at the facility.

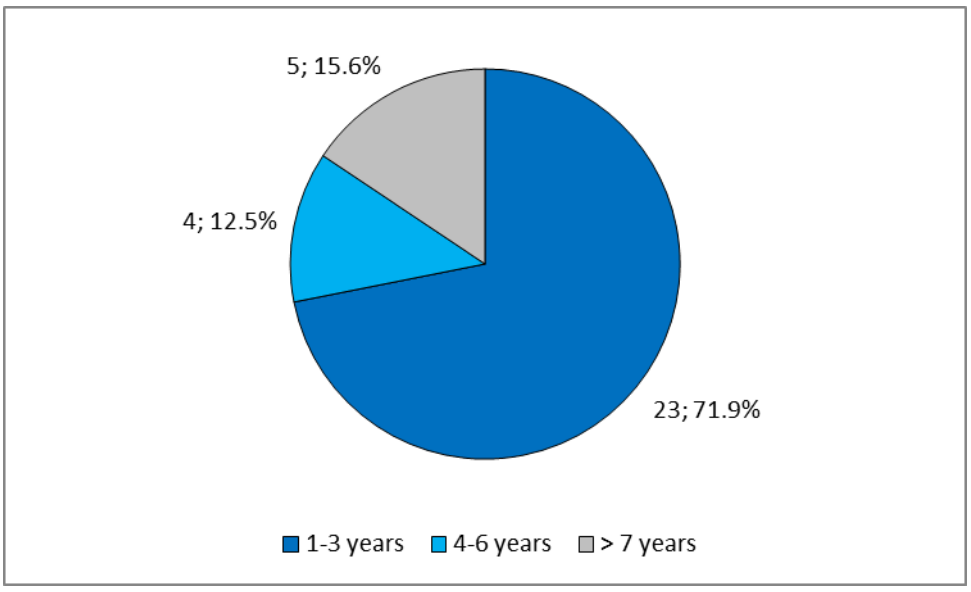

Figure 4.2: Number of years' working experience in the TB unit of PHC facilities (N=32)

4.2.2 Section 2: Training

This section dealt with the training received on MDR TB and elicited responses on aspects such as training frequency, facilitator required and areas that required training.

4.2.2.1 Training received

Table 4.2 illustrates the percentage of respondents that received training on HIV/AIDS, MDR TB and decentralisation programme of MDR TB.

TABLE 4.2: TRAINING RECEIVED ON HIV/AIDS, MDR TB AND DECENTRALISATION PROGRAMME (N=32)

TRAINING RECEIVED	YES		NO	
	f	%	*f*	%
HIV/AIDS	29	91	3	9
MDR TB	12	38	20	63
Decentralisation of MDR TB	5	16	27	84

As can be seen from Table 4.2, the majority of respondents, 91% (n=29) had received training on HIV/AIDs, while less than half of the respondents, 38% (n=12) had been

trained on MDR TB. Only 16% (n=5) of respondents had been trained on the decentralisation of MDR TB processes. The HIV/AIDS programme was expanded to include nurse initiation of HIV positive patients at PHC facilities in 2011 in the NMM, the same year in which the decentralisation of MDR TB was started. The results indicate that as opposed to MDR TB, much more training occurred regarding HIV/AIDS.

4.2.2.2 Continuing professional development (CPD)

Only 25% (n=8) of the respondents took part in continuing education programmes (Figure 4.3). This could be attributed to the non-compulsory nature of the CPD programme.

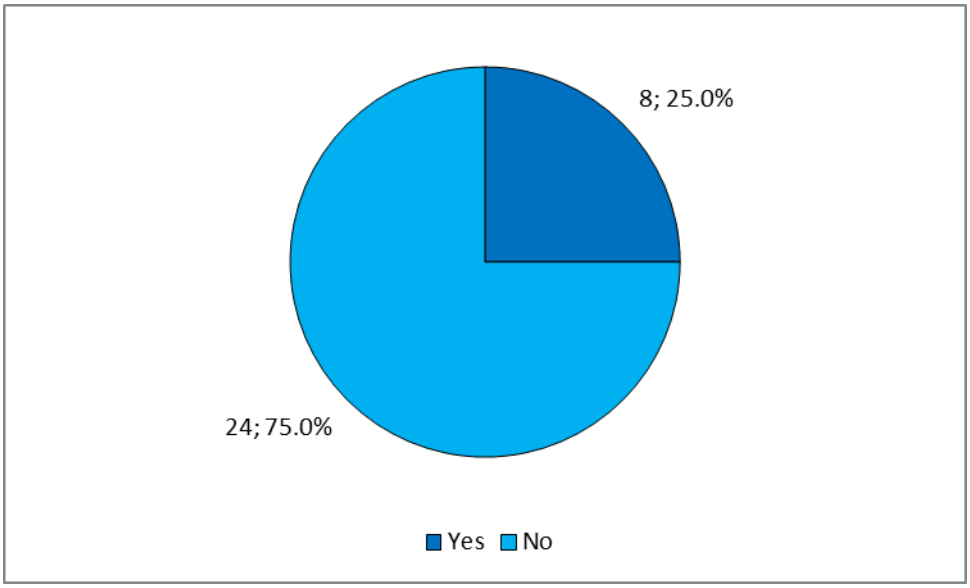

Figure 4.3: Participation in continuing professional development programmes (N=32)

4.2.2.3 Weekly meetings to discuss MDR TB patients and challenges experienced and point of referral for information

Table 4.3 shows that only 22% (n=7) of the respondents had weekly meetings to discuss the MDR TB programme while Figure 4.4 illustrates that the majority of respondents, 87.5% (n=28) would go to a colleague when they had questions regarding MDR TB patient care.

TABLE 4.3: WEEKLY MEETINGS TO DISCUSS THE MDR TB PROGRAMME (N=32)

ATTANDANCE	*f*	%
Yes	7	22
No	25	78

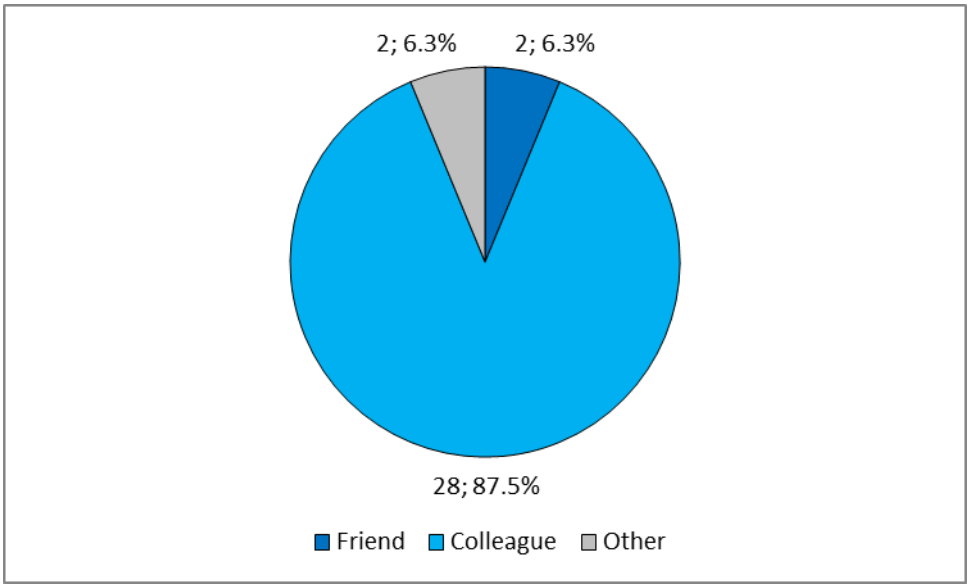

Figure 4.4: Point of reference for advice (N=32)

4.2.2.4 Training offered on current information and MDR TB guidelines

When asked whether training on MDR TB was offered with regard to current information, updates and guidelines, 78% (n=25) of the respondents responded in the negative (Table 4.4). Ninety-one percent (n=29) of respondents responded that they would like to receive training on MDR TB (Table 4.5). These results show that, according to the respondents, they were provided with very little information regarding MDR TB. In a study conducted by Wajanga, Peck, Kalluvya, Fitzgerald, Smart and Downs (2014:4) regarding barriers to initiation of ARVs and TB therapy it was found that lack of awareness and acceptance of new WHO guidelines and lack of trained staff could be addressed by continuing education of the staff. The above results indicated that the respondents would like to receive training on MDR TB.

TABLE 4.4: FREQUENCY DISTRIBUTION: IS ANY TRAINING OFFERED ON CURRENT INFORMATION, UPDATES AND GUIDELINES ON MDR-TB? (N=32)

TRAINING OFFERED	*f*	%
Yes	7	22
No	25	78

TABLE 4.5: FREQUENCY DISTRIBUTION: WOULD YOU LIKE TO RECEIVE TRAINING ON MDR TB? (N=32)

WILLINGNESS TO TRAIN	*f*	%
Yes	29	91
No	3	9

According to Table 4.6, the majority of respondents, 69% (n=22) indicated that they would like training to occur once a quarter.

TABLE 4.6: SCHEDULE FOR IN SERVICE TRAINING (N=32)

SCHEDULE FOR TRAINING	*f*	%
Weekly	1	3
Monthly	6	19
Quarterly	22	69
Yearly	3	9

Ninety-one percent (n=29) of the respondents thought that the most qualified person to do this training for them was a doctor (Table 4.7).

TABLE 4.7: FREQUENCY DISTRIBUTION: THE MOST QUALIFIED PERSON TO DO THE TRAINING (N=32)

TRAINING FACILITATOR	*f*	%
Doctor	29	91
Pharmacist	2	6
Other	1	3

The results show that according to the respondents, the doctor is regarded by the respondents as the person most qualified to do the training.

4.2.3 Perception of knowledge

When asked whether the training they had received had prepared them for managing patients with MDR TB in terms of providing injectables and MDR TB medication, educating patients on adherence and MDR TB, monitoring side effects of treatment, screening contacts, sputum collection and infection control the response varied according to the discipline. Table 4.8 illustrates the results obtained.

TABLE 4.8: RESPONDENTS' RATING OF THEIR KNOWLEDGE TO MANAGE PATIENTS WITH MDR TB (N=32)

KNOWLEDGE	ADEQUATE		NOT ADEQUATE	
	f	%	*f*	%
1. Providing injectables	16	50	16	50
2. Providing MDR TB medication	13	41	19	59
3. Educating patients on MDR TB and adherence	21	66	11	34
4. Monitoring side-effects of treatment	8	25	24	75
5. Screening contacts	24	75	8	25
6. Sputum collection	25	78	7	22
7. Infection control	23	72	9	28

Table 4.8 illustrates that there is a need for training on MDR TB medication and monitoring side effects. The respondents' rating of their knowledge ranged from 25% (monitoring of side effects of treatment) to 78% (Sputum collection), rating their knowledge as adequate. The majority of respondents (75% and 78%) had received adequate training on screening contacts for MDR TB and sputum collection respectively. More than half (72% and 66%) of the respondents indicated that they had been given adequate training as regards infection control and educating patients on MDR TB and adherence respectively.

4.2.3.1 Comparison of years of experience in TB unit with perceived knowledge of managing patients

In order to compare the experience of nurses in the TB unit (Figure 4.2 refers) with their perceived adequate knowledge (Table 4.8 refers), Chi square tests were performed as the data was categorical, which made cross tabulations possible. Respondents were categorised into two groups based on their experience: 1 to 3 years and 4 or more

years. The results are shown in Table 4.9 below. In the table n1 represents the number of respondents with 1-3 years' experience and n2 represents the number of respondents with 4 and more years' experience.

TABLE 4.9: COMPARISON OF YEARS' EXPERIENCE IN TB UNIT WITH PERCEIVED ADEQUATE KNOWLEDGE

ADEQUATE KNOWLEDGE	EXPERIENCE IN TB UNIT				CHI SQUARE	P (df=1)
	1-3 YEARS (n1=23)		4+ YEARS (n2=9)			
Providing injectables	10	43%	6	67%	1.18	.278
Providing MDR TB medication	7	30%	6	67%	2.86	.091
Educating patients on MDR TB and adherence	14	61%	7	78%	0.27	.603
Monitoring side-effects of treatment	6	26%	2	22%	0.05	.831
Screening contacts	17	74%	7	78%	0.05	.831
Sputum collection	18	78%	7	78%	0.20	.654
Infection control	15	65%	8	89%	0.56	.455

For all of the questions, there was no statistical difference between the groups 1-3 years and >4 years. Nevertheless, a trend emerges: the more experienced the group the more they rate their knowledge as being adequate. Given the differences between the experience of the two groups for most of the knowledge items, the reason that there were no statistically significant differences is the small sample size that was used in the study.

In the next section, the results of the knowledge questions are presented while in Section 4.5, the results of the knowledge indicator are depicted. Section 4.6 illustrates the cross tabulation between the number of years with experience in the TB unit and Section 3 scores**.**

4.2.4 Section 3: Multidrug resistant tuberculosis

The aim of this section was to determine if there were any areas of MDR TB that required training to be conducted. Respondents answered a total of 10 questions which were designed using a Likert scale scoring from 1 to 4 (*strongly agree, agree, disagree*

and strongly disagree). Each question had three to four statements. Each statement elicited a response to one of the statements about MDR TB as a disease. For statistical inference purposes because the sample size was small, and to make interpretation easier, 'strongly agree' and 'agree' were combined and 'strongly disagree' and 'disagree' were combined.

4.2.4.1 Cause of MDR TB

Almost all the respondents were knowledgeable about the cause of MDR TB, with 84% (n=27) of the respondents *correctly* attributing it to organisms resistant to Rifampicin and Isoniazid. However, 31% (n=10) of the respondents also *incorrectly* agreed that Streptomycin in addition to Rifampicin and Isoniazid lead to MDR TB.

TABLE 4.10: FREQUENCY DISTRIBUTIONS FOR QUESTION ON 'CAUSES OF MDR TB' (N=32)

CAUSES OF MDR TB	AGREE		DISAGREE		MEAN	SD
	f	%	*f*	%		
By an organism resistant to Rifampicin	19	59	13	41	2.2.5	0.72
By an organism resistant to Isoniazid	15	47	17	53	2.47	0.72
By an organism resistant to Rifampicin and Isoniazid	27	84	5	16	1.97	0.59
By an organism resistant Rifampicin, Isoniazid and Streptomycin	10	31	22	69	2.72	0.73

4.2.4.2 Who can contract MDR TB?

With regards to who can contract MDR TB, 84% (n=27) of the respondents *correctly* agreed that patients who were not adherent to the TB medications could contract MDR TB. Only 53% (n=17) believed that people who came from areas of the world where drug resistant TB was common could contract MDR TB (Table 4.11). Thus, training on who can contract MDR TB was required to encompass all possible areas.

TABLE 4.11: FREQUENCY DISTRIBUTIONS FOR QUESTION ON 'WHO CONTRACTS MDR TB?' (N=32)

WHO CONTRACTS MDR TB	AGREE		DISAGREE		MEAN	SD
	f	%	*f*	%		
People who do not take their TB medicines regularly	27	84	5	16	2.03	0.54
People who come from areas of the world where drug resistant TB is common	17	53	15	47	2.34	0.70
People who develop TB again after having taken TB medicine in the past	17	53	15	47	2.38	0.66

4.2.4.3 Prevention of MDR TB

Fifty-three percent (n=17) of the respondents *correctly* agreed that MDR TB cannot be prevented. Sixty-three percent (n=20) *agreed* that MDR TB could be prevented if patients took all their medicines as prescribed. However, 72% (n=23) of the respondents *incorrectly agreed* that taking Isoniazid Preventative Therapy (IPT) could prevent MDR TB in adults.

TABLE 4.12: FREQUENCY DISTRIBUTIONS FOR QUESTION ON 'PREVENTION OF MDR TB' (N=32)

PREVENTION OF MDR TB	AGREE		DISAGREE		MEAN	SD
	f	%	*f*	%		
MDR TB cannot be prevented	17	53	15	47	2.28	0.77
Take all their TB medicines as prescribed	20	63	12	38	2.31	0.69
Take Isoniazid preventative therapy (IPT) in adults	9	28	23	72	2.97	0.74

4.2.4.4 What is latent/inactive TB?

More than half of the respondents, 63% (n=20) *correctly* agreed that latent /inactive TB was TB infection without active disease. Fifty-three percent (n=17) of the respondents answered *incorrectly* by agreeing that latent TB was sputum smear negative TB and 75% (n=24) answered *incorrectly* that latent TB is TB characterised by fever, chills and night sweats.

4.2.4.5 Symptoms of MDR TB

There was a general agreement with regard to the symptoms of MDR TB: 78% (n=25) to 81% (n=26) of respondents answered *correctly* (Table 4.13).

TABLE 4.13: FREQUENCY DISTRIBUTIONS FOR QUESTION ON 'SYMPTOMS OF MDR TB' (N=32)

SYMPTONS OF MDR TB	AGREE		DISAGREE		MEAN	SD
	f	%	*f*	%		
Cough	26	81	6	19	1.94	0.67
Chest pain, dyspnoea	26	81	6	19	1.97	0.65
Systemic symptoms (e.g. fever, chills, night sweats)	25	78	7	22	2.06	0.62

4.2.4.6 Side effects of MDR TB

Table 4.14 demonstrates that the majority of respondents knew the side effect profiles of MDR TB drugs that cause peripheral neuropathy (69%, n=22) and hearing loss (50%, n=16). A high number of respondents did not know the side effect profile of MDR TB drugs that caused depression (81%, n=26) and psychosis (78%, n=25).

TABLE 4.14: FREQUENCY DISTRIBUTIONS FOR QUESTION ON 'SIDE EFFECTS OF DRUGS USED TO TREAT MDR TB' (N=32)

SIDE EFFECTS OF DRUGS USED TO TREAT MDR TB	AGREE		DISAGREE		MEAN	SD
	f	%	*f*	%		
Peripheral neuropathy Isoniazid, Cycloserine, Ethambutol, injectables	22	69	10	31	2.06	0.76
Depression Cycloserine, Clofazimine	6	19	26	81	2.75	0.57
Hearing loss (otoxicity) Kanamycin, Streptomycin	16	50	16	50	2.34	0.75
Psychosis Cycloserine	7	22	25	78	2.72	0.68

4.2.4.7 Diagnosis of MDR TB

The respondent responses, as to whether the respondents believed they possessed adequate knowledge regarding 'GeneXpert', may be seen in Table 4.15. Forty-four percent (n=14) of the respondents *did not believe* they had adequate knowledge regarding the use of 'GeneXpert' in the diagnosis of MDR TB and 66% (n=21) *did not have adequate* knowledge regarding what to do with patients who had tested positive for Rifampicin resistance. The majority of respondents (78%, n=25) *did not have adequate* knowledge on how to manage mono and poly resistant TB.

4.2.4.8 Patient information and Infection control

Table 4.15 indicates that respondents believed they *had adequate* knowledge with regards to counselling and educating patients on MDR TB and infection control, with only 28% (n=9) of respondents *not having adequate* knowledge on how to use an N95 mask. The majority of respondents *had knowledge* on how to prevent nosocomial infections (91%, n=29) and on sputum collection (91%, n=29). A large number of respondents (69%, n=22) *did not have* adequate knowledge on how to manage symptomatic contacts of MDR TB while 50% (n=16) *did not have* adequate knowledge on how to manage asymptomatic contacts of MDR TB.

TABLE 4.15: FREQUENCY DISTRIBUTIONS FOR QUESTION ON 'DO YOU HAVE ADEQUATE KNOWLEDGE ON THE FOLLOWING?' (N=32)

ADEQUATE KNOWLEDGE	AGREE		DISAGREE		MEAN	SD
	f	%	*f*	%		
The use of 'GeneXpert' in the diagnosis of MDR-TB	18	56	14	44	2.38	0.61
What to do with patients who test 'GeneXpert' positive for resistance to Rifampicin	11	34	21	66	2.59	0.61
How to manage mono and poly resistant TB	7	22	25	78	2.72	0.58
Counsel and educate patients on MDR-TB	24	75	8	25	2.22	0.49
How to manage the asymptomatic contacts of MDR-TB patients	16	50	16	50	2.44	0.62
Managing symptomatic contacts of MDR-TB patients	10	31	22	69	2.66	0.55
Measures to prevent nosocomial infection	29	91	3	9	2.06	0.50
How to use an N95 mask	23	72	9	28	2.22	0.55
Sputum collection	29	91	3	9	2.06	0.50

4.3 SCALE RELIABILITY MEASURE OF RESPONDENTS' RESPONSES TO KNOWLEDGE ON MDR TB

Section 3 consisted of questions developed to ascertain if there were areas of knowledge gaps that required training.

Reliability was measured by means of the Cronbach's alpha coefficient, calculated as part of scale reliability testing for the questions asked.

TABLE 4.16: CRONBACH'S ALPHA COEFFICIENT (N=32)

QUESTION	CRONBACH'S ALPHA
Causes of MDR TB	0.72
Who contracts MDR TB	0.78
Can MDR TB be prevented	0.70
How can MDR TB be prevented	**0.38**
What is latent/inactive TB	**0.64**
Symptoms of MDR TB	0.78
Side effects of drugs used to treat MDR TB	0.72
Knowledge on 'GeneXpert'	0.89
Knowledge on counselling and patient contacts	0.72
Knowledge on infection control	0.66

Of note is that the scales were newly developed and that two of the questions had a low Cronbach's alpha coefficient namely, (i) 'How can MDR TB be prevented' (0.38) and (ii) 'What is latent/inactive TB' (0.64). As mentioned, a reliability coefficient of 0.70 or higher is considered acceptable (Polit & Beck 2012). The questions with low C alphas were not discarded as they did not approach zero and could have resulted due to the small number of questions (Tavakol & Dennick 2011:54) and that some of the questions may not have been understood.

4.4 COMPETENCY INDICATOR

In this study, the researcher, in consultation with field experts, reached the conclusion that a figure of 50% is an indicator of adequate competency. The results of the competency indicator are illustrated below.

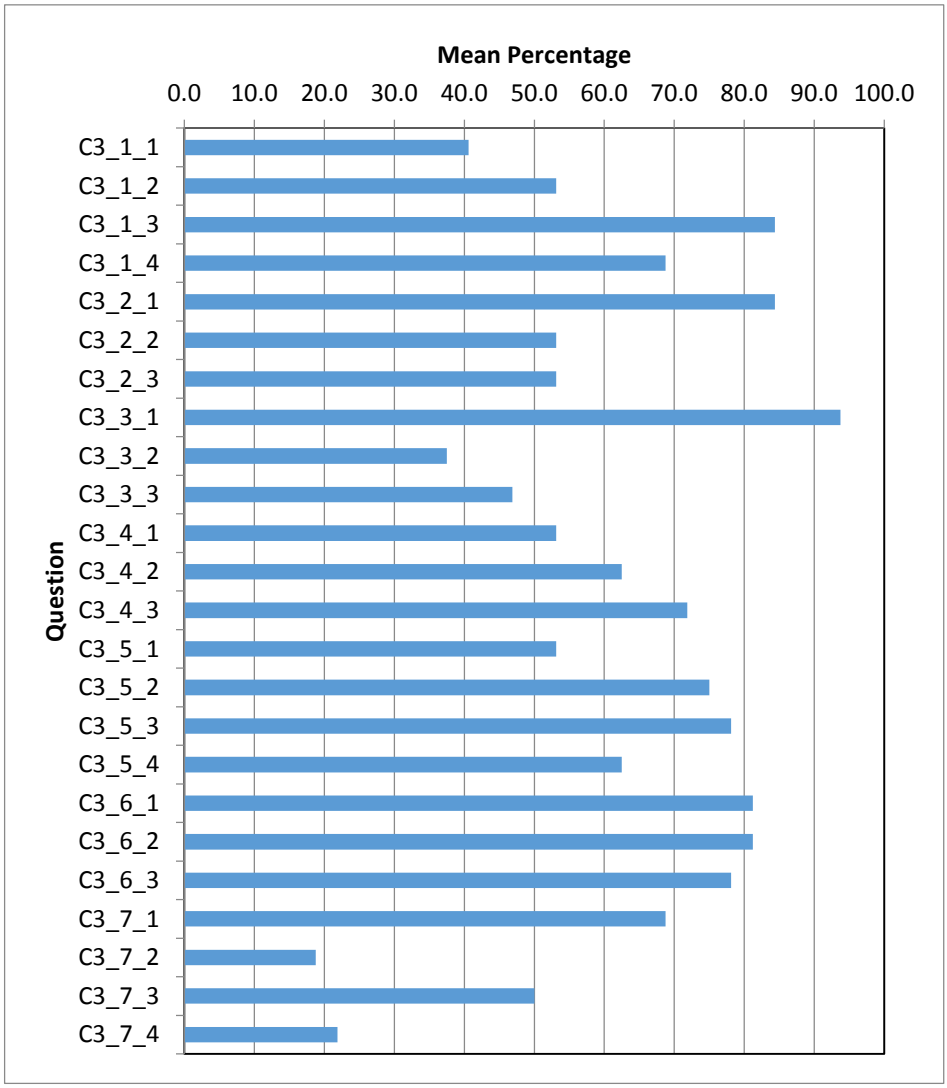

Figure 4.5: Average percentage attained for questions 3_1_1 to 3_7_3 (N=32)

Figure 4.5 indicates the average percentages attained by respondents for each question in the knowledge section, with the exception of questions 8, 9 and 10. These questions reflect the respondent's opinions regarding their competency level on Diagnosis, Patient information and Infection control and are therefore not included in Figure 4.5. The results for questions 8, 9 and 10 are displayed in Figure 4.6.

Figure 4.5 illustrates the respondents' achievement regarding each question, as measured in relation to the competency indicator. Respondents met the competency level of 50% to 19 (75%) of questions in the questionnaire. However, there are areas of MDR TB that require training and capacitating, such as monitoring side effects of MDR TB treatment.

Figure 4.6 portrays the respondents' achievements regarding Questions 8, 9 and 10 in relation to the competency indicator. Respondents met the competency indicator level of 50% in six (67%) of the questions. The areas that need strengthening include 'GeneXpert', managing mono and poly resistant TB and managing symptomatic contacts of MDR TB.

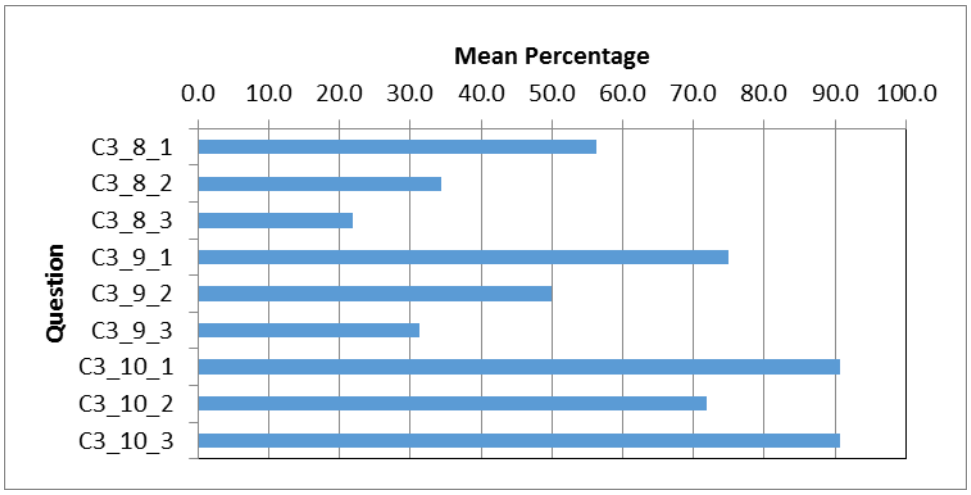

Figure 4.6: Average percentage attained for questions (N=32)

4.5 RELATIONSHIP BETWEEN NUMBER OF YEARS' EXPERIENCE WORKING IN A TB UNIT IN PHC FACILITIES AND SECTION 3 SCORES

Cross-tabulations with Chi square tests were used to determine whether the nurses' levels of knowledge (Section 3 sub-sections 1 to 7) and perceived levels of skill (Section 3 sub-sections 8 to 10) are related to their number of years' working experience in a TB unit in PHC facilities. The respondents were divided into two experience groups: 1-3 years and 4 and more years, and two knowledge/skills groups, namely <50% and 50% or better. The test results are shown in Table 4.17. Note that C3_1-7 is the average score for C3_1 to C3_7 scores. In the table, n1 represents the number of respondents with 1-3 years' experience and n2 represents the number of respondents with 4 and more years' experience.

TABLE 4.17: FREQUENCY OF SECTION 3 SUB-SECTION 1 TO 7 SCORES OF 50% OR BETTER FOR 'EXPERIENCE WORKING IN THE TB UNIT IN PHC FACILITIES' (N=32)

QUESTIONS	1-3 YEARS n1=23		4+ YEARS n2=9		TOTAL		CHI SQUARE	P (df=1)
		%		%				
C3_1	19	83	8	89	27	84%	0.11	.741
C3_2	13	57	6	67	19	59%	0.13	.720
C3_3	10	43	6	67	16	50%	1.18	.278
C3_4	17	74	6	67	23	72%	0.35	.552
C3_5	16	70	8	89	24	75%	0.18	.670
C3_6	17	74	9	100	26	81%	0.28	.598
C3_7	11	48	7	78	18	56%	1.58	.209
C3_1-7	18	78	8	89	26	81%	0.01	.924

The results in Table 4.17 show that there are no statistically significant ($p<0.05$) differences between the two groups for the indicated scores. This could be attributed to the small sample size. However, a trend is observable; a larger proportion of the respondents with more experience in the TB unit in PHC facilities obtained knowledge scores of 50% or better compared to their less experienced colleagues.

4.6 CONCLUSION

This chapter presented the data analysis and interpretation using frequency tables, graphs, figures and statistics. The results of the study revealed the knowledge gaps with regard to the management of MDR TB that require further in-service training. Some of the areas that require training include 'patients at risk of contracting MDR TB', 'side effects of MDR TB treatment', 'managing mono and poly resistant TB' as well as 'symptomatic contacts of MDR TB'. In the next chapter, a summary of the research findings, the limitations, conclusions and recommendations are presented.

CHAPTER 5

FINDINGS, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

Effective and efficient decentralisation of MDR TB services to PHC facilities requires an understanding by nurses of the management of MDR TB. The main aim of this study was described earlier. Recommendations made were based on the findings of this study and achieved through the following objectives:

- The first was to determine the knowledge gaps of nurses working in PHC facilities on the management of MDR TB. This objective was met through a literature review (Chapter 2) to provide a rationale for the study and to design a measuring instrument in the form of a questionnaire (Annexure B). The questionnaire determined the knowledge gaps of nurses working in PHC facilities on the management of MDR TB (Chapters 3 and 4).
- The second was to propose recommendations to improve knowledge gaps of nurses working in PHC facilities on the management of MDR TB (included in Chapter 5).

In this chapter, a brief description of the major findings, conclusions and limitations as well as the researcher's recommendations is given.

5.2 RESEARCH DESIGN AND METHOD

A quantitative, descriptive and cross sectional research design was employed in the study in which numerical data were collected at a specific point in time to describe the characteristics of the study variables. The research was conducted at 25 PHC facilities in the NMM district in the Eastern Cape Province. The data was obtained using a self-designed questionnaire containing structured and open-ended questions. Respondents were included based on the inclusion criteria: nurses working in PHC facilities with MDR TB patients. The accessible target population consisted of those nurses working in the

TB unit of PHC facilities who were available and willing to participate at the time of the study.

Sampling was carried out through convenience sampling: all the nurses working in PHC facilities in the NMM who were available and willing were included. Fifty (50) respondents from the selected PHC facilities were provided with the questionnaires, of which 32 (64%) respondents returned the completed questionnaire. The data were analysed using the SPSS version 20.0 software computer programme to generate descriptive statistics.

5.3 SUMMARY AND INTERPRETATION OF RESEARCH FINDINGS

This section addresses the interpretation of the findings and conclusions. In the following sections N=32.

5.3.1 Findings

The findings dealt with the biographic data and themes identified in the questionnaire as nurses' knowledge gaps related to MDR TB.

5.3.2 Biographic data

Fifty percent (n=16) of the respondents had qualified 11 to >20 years before the study was undertaken whereas 72% (n=23) had worked in the TB unit in the PHC clinic for less than three years. It seems that although the majority of the nurses reported more than 11 years of experience after qualifying as professional nurses, they had limited experience in working in the TB unit in the PHC clinic. This could be due to the high turnover of nurses that result, due to the chronic shortage of nurses in the PHC facilities. Refer to Chapter 3 (heading 3.3.1) for more detail about the research setting.

5.3.3 Themes from the questionnaire

- **Training received**

The findings regarding the training received by the respondent indicate that only 38% (n=12) had received training on *MDR TB* while even fewer respondents, 16% (n=5) had

received training on the *decentralized programme*. In comparison, 91% (n=29) of respondents had received training on *HIV/AIDs*. This might be the situation because previously MDR TB was managed only at TB hospitals (Cox & Ford 2013:645), while HIV services at PHC facilities have rapidly expanded (Nyasula et al 2013:235). The effects of a lack of training will result in nurses not receiving current information on the management of MDR TB and the processes involved in the decentralisation of MDR TB patients. There should be a greater emphasis on training the nurses at PHC facilities about the management of MDR TB and the decentralisation programme. In addition, there should be integration of MDR TB training into HIV/AIDS training by the district training coordinators and Non-Governmental Organisations (NGOs) supporting HIV/AIDS and TB training in the district. This will ensure greater coverage and distribution of MDR TB material.

- **Continuing education and weekly meetings**

The results indicated that only 25% (n=8) of respondents attend continuing education courses. In addition, merely 22% (n=7) of respondents had weekly meetings to discuss MDT TB patients and challenges. This could be due to the staff shortages experienced at the PHC facilities as well as a lack of time and transportation to attend the courses and meetings. This result also emerged in a 2010 study on nurses' perceptions of continuing education in which most of the registered nurses perceived continuing education as beneficial to their personal and professional growth and saw that it could lead towards improving the quality of patient care (Richards & Potgieter 2010:47). Attending continuing education courses will allow respondents to keep abreast with new developments in the field of MDR TB and increase their knowledge and skills in its management. Not allowing time for regular meetings to discuss MDR TB patient management, the challenges experienced and the best practices will hamper the personal development of the nurse. Limited weekly meetings also reduce the support received by nurses, as they are not able to voice their challenges and brainstorm solutions with other nurses working in a similar context. Continuous education could also include in-service training and nurses may be asked to identify their training needs on the management of MDR TB. Continuing education programmes/in-service training should be planned during the afternoons on the days when the PHC facilities are not busy so that most of the nurses can benefit. Furthermore, the MDR TB meetings could be integrated into the HIV/AIDS meetings. In this way the nurses will not have to leave

their facilities more than once in order to attend meetings. Nurses can identify a 'meeting' day once a week that will fit the schedules of the stakeholders and the facility's routines.

- **Knowledge on causes and risk of contracting MDR TB**

The findings revealed that respondents possessed varying degrees of knowledge regarding MDR TB. Eighty-four percent (n=27) of respondents *were knowledgeable* regarding the cause of MDR TB and also agreed that patients who were not adherent to their TB medication were at risk of contracting MDR TB. However, only 53% (n=17) of respondents believed that people who came from areas of the world where drug resistance TB was common were at a high risk of contracting MDR TB. Although a large percentage of respondents were knowledgeable about the causes and risks of contracting MDR TB, it is crucial that nurses' knowledge on these aspects relating to MDR TB be enhanced. They play a key role in providing health education to patients and their families and should be very knowledgeable concerning the causes and risks to provide relevant and recent information. This may enhance the prevention of MDR TB, as adherence to medication may increase. Pamphlets and posters may assist nurses during health education to convey relevant and recent information to patients and family members.

- **Isoniazid Preventative Therapy (IPT)**

Seventy-two percent (n=23) of the respondents indicated that IPT could be used to prevent MDR TB in adults. According to the NDOH guidelines, IPT can be used to prevent TB but not MDR TB. These results therefore indicate that there is a need to ensure that the reason why IPT is prescribed is understood. Heading 2.8, Management of MDR TB Contacts in Chapter 2, refers. The danger of giving IPT to adult patients to prevent MDR TB is that it will not be effective. With MDR TB, there is resistance to Isoniazid and Rifampicin; issuing IPT will increase the possibility of the patient contracting Isoniazid-induced hepatitis as seen in a study conducted by Smieja, Marchetti, Cook and Smaill (2000). The guideline for Tuberculosis Preventative Therapy should be explained in the context of MDR TB. It is recommended that pharmacists and doctors promote nurses' knowledge on IPT and the risk of Isoniazid-induced hepatitis through in-service training. It can be recommended as a discussion point during the

weekly MDR TB meetings mentioned earlier, to create awareness among nurses working in PHC settings.

- **Side effects of MDR TB drugs**

Another important area in which a knowledge gap was identified was that of the side effects of the MDR TB drugs. Only 19% (n=6) of the respondents *could link* the correct drug to the side effect of depression and 22% (n=7) *linked the correct* drug to the side effect of psychosis while 50% (n=16) *knew which drugs* caused hearing loss. Patients receive their MDR TB treatment from PHC facilities and should be monitored for the side effects of this regime by the nurses. The nurse can manage minor side effects and refer the more serious ones to a doctor. Brust et al (2012:6) found that 99% of the MDR TB patients monitored experienced at least one side effect during their treatment, most of which were mild and did not require a change in treatment, although 8% experienced a severe side effect such as hearing loss. Thus, an increase in the knowledge of the nurse regarding the side effects of the medications will allow them to refer the patient to the doctor for either a change in regimen or monitoring. Hirpa et al (2013:1) stated that one of the key factors affecting non-adherence to medication comprises the negative side effects. One of the inherent dangers with this infectious disease is that non-adherence to MDR TB medication is a risk factor for developing Totally Drug Resistant Tuberculosis which is almost untreatable (Matteelli, Roggi & Carvalho 2014:112). Nurses should be trained about recognising the side effects of MDR TB medication in order to improve the outcomes for the patient by decreasing non-adherence.

- **Counselling, infection control and managing contacts**

Seventy-five percent (n=24) of the respondents, *were knowledgeable* regarding counselling patients on MDR TB, while 91% (n=29) *were knowledgeable* regarding prevention of nosocomial infection and sputum collection. However, 28% (n=9) of the respondents *did not* know how to use an N95 mask. In addition, only 31% (n=10) and 50% (n=16) of the respondents respectively *knew* how to manage symptomatic and asymptomatic contacts of MDR TB. One of the dangers of not using an N95 mask correctly is the nurse contracting TB or MDR TB (Woith et al 2010:1489; Engelbrecht & Van Rensburg 2013:221). It is recommended that an infection control specialist with a focus on infection control and the correct use of the N95 mask should perform regular

in-service training, especially for new staff. It is crucial for nurses to know how to collect sputum as they perform sputum collections on a regular basis. Sputum should be collected through the correct procedure to ensure the correct diagnosis and management of MDR TB. It is recommended that posters demonstrating the correct technique be distributed and placed near areas where sputum is collected in PHC facilities to enhance the knowledge of sputum collection techniques for health care practitioner and nurses.

- **Comparison of working experience in TB unit with knowledge**

When comparing the number of years' working experience in the TB unit in PHC facilities with the knowledge scores, the results from the Chi square analysis indicate that in general the nurses with a greater number of years' experience in the TB unit, namely >4 years, demonstrated higher knowledge scores. However, the differences between the two groups were not significantly large and therefore not statistically significant. Recruitment of and retaining nurses working in the PHC setting are crucial to alleviate the shortage of nurses in this setting. More nurses in this setting will decrease the workload and may enhance job satisfaction. This may lead to nurses working longer in the PHC setting, increasing their exposure to continuous training, resulting in improved knowledge and skills which may improve patient outcomes. It is recommended that salaries and benefits for nurses working in the said setting be reconsidered as a recruitment strategy.

The results yield a good average score for all the knowledge questions (61%). The area that obtained less than 50%, which was the competency indicator level set, was that of 'Side effects of MDR TB medication' with an average score of 40%. The average score for 'diagnosis of MDR TB' was 59%. As discussed earlier, MDR TB treatment spans 18-24 months and there is a high risk of side effects occurring. Side effects must be detected at the earliest opportunity to prevent non-adherence and default in treatment as this could result in Totally Drug Resistant strains of TB, increasing patient mortality. Nurses need to be capacitated so that they are able to recognise and monitor the side effects of the MDR TB medication and manage or refer patients accordingly.

5.4 CONCLUSION

The results from this study indicated that the knowledge of the participating nurses is above that of the competency indicator; however, in comparison to training on HIV/AIDS, training on MDR TB and the decentralisation process was slow. In addition, there was limited involvement in Continuing Education courses and a lack of weekly meetings to discuss challenges experienced in MDR TB programme. There are also many areas identified that require further training. These include side effects of MDR TB medication, managing mono and poly resistant TB, as well as managing symptomatic contacts of MDR TB. In keeping with this, and as more MDR TB patients are decentralised to PHC facilities, there will be a greater need for nurses to possess knowledge of the management of MDR TB patients.

5.5 RECOMMENDATIONS

Recommendations were based on the findings of this study and address nursing practice, education and research. The research findings will be made available to the district at the end of the study.

5.5.1 Recommendations for nursing practice

Nurses at PHC facilities usually undertake numerous activities such as providing injectables and medicines to all MDR TB patients; monitoring side effects of medicines; screening, testing and managing symptomatic contacts and high risk groups; sputum collection and counselling MDR TB patients; amongst others.

The following recommendations are made to enhance nursing practice:

- The availability of reference guides on the side effects of MDR TB medication should be improved at the PHC facilities. It is recommended that pharmacists make these reference guides available to the given facilities on a quarterly basis.
- Improve the sputum collection procedures of health care practitioners, nurses specifically, through distributing the National policy guidelines for sputum collection at the PHC facilities. This may be achieved through posters being placed in the facilities.

- Integration of the screening of all MDR TB contacts into other PHC areas such as chronic care, acute care, immunisation, mother and child consultations. Nurses can create awareness through health education and perform screenings during routine consultations to improve early MDR TB identification.
- Distribution of the national MDR TB guidelines to all PHC facilities and increasing their applicability by provision of posters or pamphlets for nurses to enhance their knowledge and address knowledge gaps.
- Training of nurses at PHC facilities by medical practitioners or TB specialists to improve their knowledge on the management of these patients, contacts and referral pathways.
- Training of nurses at PHC facilities by the district TB coordinators on the process of decentralisation of MDR TB in the district in order to equip the PHC nurses with the operational procedures involved.
- Nurses trained will be followed up by the district TB coordinators to ensure that the information received is implemented.

5.5.2 Recommendations for nursing education/training

The knowledge gaps found in this study relate to education and training. The following recommendations are made to enhance these two areas:

- MDR TB and the management thereof should be included in the content of nursing curriculums for diploma and degree courses.
- Regular in-service training programmes on the management of MDR TB should be conducted once every quarter for nurses in the PHC facilities to ensure that nurses are kept abreast of the latest recommendations as well as to address the identified knowledge gaps. The key areas that need prioritising include MDR TB medication and side effects, managing symptomatic and asymptomatic contacts and infection control methods such as use of an N95 mask. These training programmes can be developed and presented by TB experts in the district; TB programmes in the Department of Health might be facilitated twice a year to improve knowledge and skills of MDR TB of nurses working in the PHC setting.
- Training to improve nurses' knowledge on MDR TB guidelines could be conducted every three months utilising the National Department of Health's

guideline on Management of Drug resistant tuberculosis and the National Department of Health's Decentralisation of MDR TB policy guidelines and Infection Control. The training could be conducted by the Department of Health training centre as well as by the NGOs giving support to the district.

- Training nurses regularly, once every quarter on 'GeneXpert' diagnosis by medical practitioners or TB experts.

5.5.3 Recommendations for further research

- Efforts should go towards further research to improve the management of patients with MDR TB by health care workers such as doctors, nurses and pharmacists, either by using the same study or designing a similar study but involving other multi-disciplinary team members.
- Further research should also be conducted with patients as the study group to evaluate the patients understanding of MDR TB, the causes, prevention and treatment.

5.5.4 Tools developed by the researcher to enhance the knowledge of nurses on MDR TB

The researcher, in response to the request received by the respondents at the time of issuing and receiving the questionnaires, developed the following tools to assist the nurses in their activities.

- one page quick reference to the drug doses for MDR TB medication for adults (refer to Annexure F)
- one page guidance on how to wear an N95 mask (Annexure G)
- patient's diary cards for patients to remember their next facility appointment dates (Annexure H)
- pocket guide on the management of MDR TB including drug side effects (Annexure I)

5.5.5 Additional tools and programmes to be developed

The researcher plans to develop the following programmes in future:

- algorithms summarising the guidelines for easy and quick reference by nurses
- working with NGO partners and the district to develop a system involving cell phone reminders for patients' appointment dates so as to combat non adherence
- budgeting for and procurement of pill boxes especially for elderly patients, and or co-infected patients who have a large number of medications to take and hence are often non-compliant with their medication
- working with the district pharmacist to enrol all eligible nurses at PHC facilities on the dispensing course
- designing a drug supply management tool for nurses in PHC facilities – a one page document to assist with the formulas required to quantify and forecast the amount of drugs to be ordered
- mentoring nurses at PHC facilities on the storage of drugs
- including community care workers in training programmes so that they understand the causes and prevention of MDR TB, infection control mechanisms and patient counselling.

5.6 SIGNIFICANCE OF THE STUDY

This study's findings may create awareness concerning the knowledge gaps of nurses working in PHC facilities as regards the management of MDR TB. The findings identified the existing knowledge gaps and made recommendations for nursing practice, education and research. These may contribute to the health priorities of the district as well as partner organisations, who implement TB and HIV collaborative activities, as an input during intervention plans and operational research. This may result in the scaling-up of decentralisation programmes in the NMM and the Eastern Cape. In addition, findings of this study may contribute as a reference guide to individual researchers who are assessing the MDR TB knowledge of nurses working in PHC facilities.

5.7 LIMITATIONS OF THE RESEARCH

The study focused on PHC facilities in the NMM in the Eastern Cape; therefore the findings cannot be generalised to other areas. However, it is likely that similar issues are prevalent in other South African provinces. As the control of TB and MDR TB is a national health priority, similar studies should be considered in these settings. Furthermore, although the data were collected using a structured questionnaire another limitation is that the information was self-reported; one cannot discount the existence of a personal desirability bias, meaning that respondents might not have reported their actual knowledge. A further limitation was the small sample size. Although 50 respondents were invited to participate in the study, only 32 submitted the completed questionnaire. One of the reasons for this small number could be the shortage of nurses at PHC facilities and the extra workload experienced by these nurses hindering them from completing the questionnaire. Chapter 3, section 3.3.1, Research setting, refers.

5.8 CONCLUDING REMARKS

The present study determined the knowledge of nurses working in PHC facilities on the management of MDR TB in the NMM. The findings and recommendations could serve to further improve the knowledge of nurses and health care providers regarding the management of MDR TB, resulting in improving the management of patients diagnosed with this disease. This will eventually increase the wide implementation of MDR TB management at PHC facilities, not only in the NMM but also in the entire country. The researcher also believes this study will contribute significantly to further research into effectively ensuring the success of the decentralisation of the MDR TB programme in the country.

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ANNEXURE A

UNISA university of south africa

UNIVERSITY OF SOUTH AFRICA
Health Studies Higher Degrees Committee
College of Human Sciences
ETHICAL CLEARANCE CERTIFICATE

HSHDC/192/2013

Date: 3 July 2013 Student No: 4587-460-3

Project Title: The knowledge of nurses on multidrug resistant tuberculosis at primary health care facilities in the Nelson Mandela Metroplitan.

Researcher: Vikesh Singh

Degree: Masters in Public Health Code: DLMPH95

Supervisor: Dr ES Janse van Rensburg
Qualification: D Cur
Joint Supervisor: -

DECISION OF COMMITTEE

Approved √ **Conditionally Approved**

Prof L Ross
CHAIRPERSON: HEALTH STUDIES HIGHER DEGREES COMMITTEE

UNIVERSITEIT VAN SUID-AFRIKA
PRETORIA
UNIVERSITY OF SOUTH AFRICA

Prof MM Molaki
ACTING ACADEMIC CHAIRPERSON: DEPARTMENT OF HEALTH STUDIES

PLEASE QUOTE THE PROJECT NUMBER IN ALL ENQUIRES

ANNEXURE B

HEALTH CARE WORKER QUESTIONNAIRE

INSTRUCTIONS

This questionnaire is directed to the nurses working in the TB unit.

Please answer all questions.

Please tick with an (X) in the relevant blocks. Give comments where necessary.

Thank you for your valuable contribution and for taking the time to complete this questionnaire. The results obtained from this study will enable the researcher to make recommendations on the gaps identified.

Please feel free to contact Vikesh Singh, if you have any difficulties or queries, on 0741622907.

CLINIC: …….

DATE: ……..

SECTION 1: STAFF DEMOGRAPHICS

1. What is your gender?

1	2
male	female

2. What is your age group?

1	2	3	4	5
25-30yr	31-35yr	36-40yr	41-45yr	46-55yr

3. Please state your qualifications.

1	2
Diploma	Degree

4. What is your designation?

1	2	3	4
Auxiliary nurse	Enrolled nurse	Professional nurse	Other

If other, please specify:

_____

5. How many years since you qualified?

1	2	3	4	5
<2 years	2-4 years	5-10 years	10-20 years	>20 years

If other, please specify:

_____

6. How many years' experience have you had in the TB unit?

1	2	3	4
1-3 years	4-6 years	7-9 years	>10 years

SECTION 2: TRAINING

1. Have you received training on HIV/AIDS?

1	2
Yes	No

2. Have you received training on MDR-TB?

1	2
Yes	No

3. Have you received training on the decentralisation of MDR-TB?

1	2
Yes	No

4. Do you attend Continuing Education Courses?

1	2
Yes	No

5. Do you have weekly meetings to discuss MDR-TB patients and challenges experienced in the management of MDR-TB patients?

1	2
Yes	No

6. If you have questions regarding MDR-TB patients' care where do you go to for answers?

1	2	3
Friend	Colleague	specify

If other, please explain:

_____

7. Is any training offered on current information, updates and guidelines on MDR-TB?

1	2
Yes	No

8. Would you like to receive more training on MDR-TB?

1	2
Yes	No

9. How often would you like training to occur at the facility?

1	2	3	4
Weekly	Monthly	Quarterly	Yearly

10. Who do you think would be the most qualified person to do the training?

1	2	3	4
Doctor	Nurse	Pharmacist	Other, please specify

11. Do you think the training you have received has prepared you for managing patients with MDR-TB in terms of providing injectables and MDR-TB medication, educating patients on adherence and MDR-TB, monitoring side effects of treatment, screening contacts, sputum collection and infection control?

	Adequate	Not adequate
1. Providing injectables		
2. Providing MDR-TB medication		
3. Educating patients on MDR-TB and adherence		
4. Monitoring side-effects of treatment		
5. Screening contacts		
6. Sputum collection		
7. Infection control		

SECTION 3: MULTIDRUG RESISTANT TUBERCULOSIS

Please mark the most appropriate number for each statement.

1= strongly agree	2=agree	3=disagree	4=strongly disagree

CAUSES OF MDR-TB AND SYMPTOMS

Question 1: What causes MDR TB?

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
MDR TB is caused by an organism resistant to Rifampicin				
MDR TB is caused by an organism resistant to Isoniazid				
MDR TB is caused by an organism resistant to Rifampicin and Isoniazid				
MDR TB is caused by an organism resistant Rifampicin, Isoniazid and Streptomycin				

Question 2: Who contracts multidrug resistant tuberculosis?

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
People who do not take their TB medicines regularly				
People who come from areas of the world where drug resistance TB is common				
People who develop TB again after having taken TB medicine in the past				

Question 3: Who is at risk of getting MDR TB?

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
People who do not take their TB medicines regularly				
People who come from areas of the world where drug resistance TB is common				
People who develop TB again after having taken TB medicine in the past				

Question 4: How can MDR TB be prevented?

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
MDR TB can't be prevented				
Take all their medicines as prescribed				
Take isoniazid preventative therapy for adults (IPT)				

Question 5: What is latent/inactive TB?

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
Sputum smear negative TB				
TB characterised by fever, chills and night sweats but no cough				
TB that requires treatment with first-line therapy				
TB infection without active disease				

Question 6: The symptoms of drug resistant TB are?

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
Cough				
Chest pain, dyspnoea				
Systemic symptoms (e.g. fever, chills, night sweats)				

PRICIPLES OF THERAPY AND SIDE EFFECTS of DRUGS USED TO TREAT MDR TB?

Question 7: The side effects of drugs used to treat MDR-TB are caused by the following medication:

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
Peripheral neuropathy – Isoniazid, Cycloserine, Ethambutol, injectables				
Depression – Cycloserine, Clofazimine				
Hearing loss (otoxicity) – Kanamycin, Streptomycin				
Psychosis – Cycloserine				

DIAGNOSIS

Question 8: I have adequate knowledge on the following:

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
The use of GeneXpert in the diagnosis of MDR-TB				
What to do with patients who test GeneXpert positive for resistance to Rifampicin				
How to manage mono and poly resistant TB				

PATIENT INFORMATION

Question 9: I have adequate knowledge on the following:

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
Counsel and educate patients on MDR-TB				
How to manage the asymptomatic contacts of MDR-TB patients				
Managing symptomatic contacts of MDR-TB patients				

INFECTION CONTROL

Question 10: I have adequate knowledge on the following:

	1= strongly agree	2=agree	3=disagree	4=strongly disagree
Measures to prevent nosocomial infection				
How to use an N95 mask				
Sputum collection				

ANNEXURE C

Eastern Cape Department of Health

Enquiries:	Zonwabele Merile	Tel No:	040 608 0830
Date:	31st July 2013	Fax No:	043 642 1409
e-mail address:	zonwabele.merile@impilo.ecprov.gov.za		

Dear Mr Vikesh Singh

Re: The knowledge of nurses on multi drug resistant tuberculosis at primary health care facilities in the Nelson Mandela Metropolitan

The Department of Health would like to inform you that your application for conducting a research on the abovementioned topic has been approved based on the following conditions:

1. During your study, you will follow the submitted protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.
2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.
3. The Department of Health expects you to provide a progress on your study every 3 months (from date you received this letter) in writing.
4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Epidemiological Research & Surveillance Management. You may be invited to the department to come and present your research findings with your implementable recommendations.
5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

DEPUTY DIRECTOR: EPIDEMIOLOGICAL RESEARCH & SURVEILLANCE MANAGEMENT

ANNEXURE D

Province of the
EASTERN CAPE
HEALTH

Office of the Nelson Mandela Bay Health District Manager
Private Bag X28000 • Greenacres • PORT ELIZABETH • 6057 • REPUBLIC OF SOUTH AFRICA

Enquiries : Dr. F. Fourie
Telephone : 041-391-8150
Facsimile : 041-391-8133
E-mail : francois.fourie@impilo.ecprov.gov.za

Our Reference :
Our Reference :
Date : 01 August 2013

Mr. V. Singh

PORT ELIZABETH

Dear Mr. Singh

REQUEST FOR PERMISSION TO DO RESEARCH ON THE KNOWLEDGE OF NURSES ON MULTI DRUG RESISTANT TUBERCULOSIS AT PRIMARY HEALTH CARE FACILITIES IN THE NELSON MANDELA METROPOLITAN

In response to your application for permission to conduct the above research at health care facilities, permission is hereby granted with the following proviso:

- Health service delivery should not be disrupted under any circumstances.
- Timeous appointments must be made with the relevant persons prior to commencement of interviews/visits.

The Nelson Mandela Bay Health District, as the research site, will expect a copy of the final research report when the study is completed. If the duration of the research period is required to be extended, the District Office (Acting District Manager, Dr. Fourie) will be informed accordingly.

This Office would like to wish you well in your research study.

Yours faithfully

DISTRICT MANAGER

ANNEXURE E

Province of the
EASTERN CAPE
HEALTH

Office of the District Manager
Nelson Mandela Bay Health District
Private Bag X 28000,
Greenacres,
Port Elizabeth.
6057.
REPUBLIC OF SOUTH AFRICA

Enquiries : Dr F Fourie
Telephone : 041-391-8150
Facsimile : 041-391-8133
E-mail : francois.fourie@impilo.ecprov.gov.za

Our Reference:
Your Reference:
Date: 01 August 2013

Sub district A	Sub district B	Sub district C
Sub district manager/HAST manager/Facility manager	Sub district manager/HAST manager/Facility manager	Sub district manager/HAST manager/Facility manager
Sign:	Sign:	Sign:
Ikamvelihle clinic	Du Preez clinic	Gqebera clinic
Motherwell CHC	Gustav Lamour Clinic	Joe Slovo clinic
NU11 clinic	Isolomzi clinic	Max Madlingosi clinic
NU8 clinic	Lukhanyo clinic	Kwamagxaki clinic
NU2 clinic	Middle st clinic	Booysens clinic
Well Estate clinic	Silvertown clinic	Rosedale clinic
Thandoxolo clinic	Missionvale clinic	Gelvandale clinic
Emmanuel Haven clinic	Govan Mbeki clinic	Empilweni clinic (N.B.C.H.C.)
Tshangana clinic		

ANNEXURE F

DOSING OF STANDARD MDR TB REGIMEN IN ADULTS

MDR TB Standardised Treatment Regimen for Adults and Children >8 Years – Intensive phase: Treatment taken at least 6 times weekly for at least 6 months, guided by TB culture conversion				
Drug	Dose (<33kg)	Dose (33-50kg)	Dose (51-70kg)	Dose (>70kg)
Kanamycin	15-20mg/kg	500-750mg	1000mg	1000mg
Moxifloxacin	400mg	400mg	400mg	400mg
Ethionamide	15-20mg/kg	500mg	750mg	750-1000mg
Pyrazinamide	30-40mg/kg	1000-1750mg	1750-2000mg	2000-2500mg
Terizidone	15-20mg/kg	750mg	750mg	750-1000mg

MDR TB Standardised Treatment Regimen for Adults and Children >8 Years – Continuation phase: Treatment taken at least 6 times weekly for at least 18 months following culture conversion				
Drug	Dose (<33kg)	Dose (33-50kg)	Dose (51-70kg)	Dose (>70kg)
Ethionamide	15-20mg/kg	500mg	750mg	750-1000mg
Pyrazinamide	30-40mg/kg	1000-1750mg	1750-2000mg	2000-2500mg
Moxifloxacin	400mg	400mg	400mg	400mg
Terizidone	15-20mg/kg	750mg	750mg	750-1000mg

ANNEXURE G

HOW TO WEAR AN N95 MASK

Prior to wearing the N95 mask, inspect the mask for damage and contamination. Verify all components of the respirator are in good condition (e.g. straps, nose-piece, etc.)

To remove the respirator, hold the respirator with one gloved hand. With the other hand, pull the bottom strap over your head, and then pull the top strap off. Dispose as a bio-hazardous waste.

ANNEXURE H

Next visit	D	N	C	B	M	S	H

D – doctor, N – nurse, C – counsellor, B – bloods, M – medication
S – sputum, H – hospital

Next visit	D	N	C	B	M	S	H

S – sputum, H

D – doctor, N – nurse, C – counsellor, B – bloods, M – medication
S – sputum, H – hospital

Next visit	D	N	C	B	M	S	H

D – doctor, N – nurse, C – counsellor, B – bloods, M – medication
S – sputum, H – hospital

Next visit	D	N	C	B	M	S	H

D – doctor, N – nurse, C – counsellor, B – bloods, M – medication
S – sputum, H – hospital

ANNEXURE I

CLINICAL FOLLOW UP DURING M(X)DR TREATMENT

Clinical Follow up	Recommended Frequency
Evaluation by clinician (if outpatient)	At baseline and at least monthly until culture conversion, then at least every 2-3 months
Weight	At baseline, weekly during intensive phase, then monthly
BMI	Baseline, then monthly
Height	Baseline
Side Effect Monitoring	On-going
Sign and symptoms of hypothyroidism	Monthly
Audiometry	Baseline, monthly during injectable, 3 months after injectable stopped
Eye test	Baseline, when indicated

Source: South Africa National Guidelines, Management of MDR TB Policy

Pocket guide – Multidrug Resistant TB

A GUIDE TO ASSIST NURSES

DRUG RESISTANT TB – DEFINITIONS

Mono-Resistance:

- Resistance to ONE first line drug (rifampicin, isoniazid, pyrazinamide or ethambutol)

Poly Resistance:

- Resistance to TWO or more first-line drugs, but **NOT** BOTH isoniazid and rifampicin

Multi-Drug Resistance (MDR):

- Resistance to BOTH isoniazid and rifampicin

Extensively-Drug Resistance (XDR):
Resistance to isoniazid and rifampicin PLUS a fluroquinolone (ciprofloxacin, levofloxacin, moxifloxacin) PLUS one or more second line injectable drug (kanamycin, amikacin or capreomycin)

Source: South African National Guidelines, Management of Drug-Resistant Tuberculosis Policy Guidelines, 2011

Smear Conversion:

- Two consecutive negative smears, at least 30 days apart

Smear Conversion date:

- Smear conversion date is the date the first negative smear was collected

Culture Conversion

- Two consecutive negative cultures, at least 30 days apart

Culture Conversion date:

STANDARD MDR TB AND XDR TB REGIMENS

MDR TB

Intensive phase: Km(Am)-Mfx-Eto-Trd-Z
Kanamycin(amikacin)-moxifloxacin-ethionamide-terizidone-pyrazinamide
Continue for 4 months after culture conversion, minimum duration 6 months

Continuation phase: Mfx-Eto-Trd-Z
Moxifloxacin-ethionamide-terizidone-pyrazinamide
Continuation phase ends 18 months after culture conversion

XDR TB

Intensive phase: Cm-Mfx-Eto-Trd-PZA-PAS-clofazimine
Capreomycin-moxifloxacin-ethionamide-terizidone-pyrazinamide-PAS-clofazimine
Continue for 4 months after culture conversion, but must be a minimum of 6 months

Continuation phase:Mfx-Eto-Trd-PZA-PAS-clofazimine
Continuation phase ends 18 months after culture conversion

DOSING OF STANDARD MDR TB REGIMEN IN ADULTS

Intensive Phase

MDR TB Standardised Treatment Regimen for Adults and Children >8 Years – Intensive phase: Treatment taken at least 6 times weekly for at least 6 months, guided by TB culture conversion				
Drug	Dose (<33kg)	Dose (33-50kg)	Dose (51-70kg)	Dose (>70kg)
Kanamycin	15-20mg/kg	500-750mg	1000mg	1000mg
Moxifloxacin	400mg	400mg	400mg	400mg
Ethionamide	15-20mg/kg	500mg	750mg	750-1000mg
Pyrazinamide	30-40mg/kg	1000-1750mg	1750-2000mg	2000-2500mg
Terizidone	15-20mg/kg	750mg	750mg	750-1000mg

Source: Management of drug resistant Tuberculosis: Policy guidelines. Updated Jan 2013

DOSING OF STANDARD MDR TB REGIMEN IN ADULTS

Continuation phase

MDR TB Standardised Treatment Regimen for Adults and Children >8 Years – Continuation phase: Treatment taken at least 6 times weekly for at least 18 months following culture conversion				
Drug	Dose (<33kg)	Dose (33-50kg)	Dose (51-70kg)	Dose (>70kg)
Ethionamide	15-20mg/kg	500mg	750mg	750-1000mg
Pyrazinamide	30-40mg/kg	1000-1750mg	1750-2000mg	2000-2500mg
Moxifloxacin	400mg	400mg	400mg	400mg
Terizidone	15-20mg/kg	750mg	750mg	750-1000mg

Source: Management of drug resistant Tuberculosis: Policy guidelines. Updated Jan 2013

COMMON SIDE EFFECTS EXPERIENCED DURING MDR TB TREATMENT

DRUG	COMPLAINT/SIDE EFFECT
Aminoglycosides	Hearing loss, Vestibular toxicity, Hypokalemia, Hypomagnesemia, Rash
Amikacin	Ototoxicity*, dizziness and hearing loss, Renal failure*
Capreomycin	Hearing loss, Vestibular toxicity, Hypokalemia, Hypomagnesemia, Rash
Fluroquinolone	Seizures, Headache, GI complaints. Rash
Clofazimine	GI complaints, Rash
Cycloserine	GI complaints, Behavioural changes including depression and anxiety*, Rash, Peripheral neuropathy, Seizures*, Headache*, Psychosis
Ethambutol	Visual changes, Rash, Headache
Ethionamide	GI complaints (nausea, anorexia)*, Hypothyroidism*, Hepatotoxicity*, Behavioural changes, Rash, Peripheral neuropathy*, Headache
Isoniazid	Hepatotoxicity, Behavioural changes, Visual changes, Rash, Bone marrow suppression, Peripheral neuropathy, Seizures, Headache
linezolid	Visual changes, Rash, Bone marrow suppression, Peripheral neuropathy
Para-Aminosalicylic acid	GI complaints, Hyperthyroidism, Hepatotoxicity, Rash
Pyrazinamide	Hepatotoxicity, Rash

Source: Management of drug resistant Tuberculosis: Policy guidelines. Updated Jan 2013

MONITORING DURING M(X)DR TB TREATMENT

MONITORING	RECOMMENDED FREQUENCY
Sputum smear	At baseline, monthly
TB culture	Baseline, monthly until conversion then at least every other month
Drug Susceptibility Testing	On admission and if no improvement (patient TB culture positive on treatment) within 3-6 months
Liver Function tests	Every 1-3 months if on Pyrazinamide or at risk/symptoms of hepatitis (children: if symptomatic, every 6 months if on ART)
Serum creatinine	Baseline, monthly while on injectable
Serum potassium	Monthly while receiving injectable
TSH	Baseline, every 6 months if receiving ethionamide and/or PAS, monthly monitoring for signs of hypothyroidism (children: every 2 months)
HIV and Pregnancy tests	Baseline and repeat as indicated
Chest X-ray	Baseline, every 6 months, at treatment completion, when requested by clinician (children: every 2-3 months during intensive phase)
Lung CT scan	When indicated

Source: Management of drug resistant Tuberculosis: Policy guidelines. Updated Jan 2013

ANNEXURE J

CERTIFICATE

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Member of South African Translators Institute. For bouquets or brickbats regarding quality of service please contact SATI at P O Box 1710, Rivonia, 2128. Tel. +27 (0)11 803-2681, sati@intekom.co.za,

TO WHOM IT MAY CONCERN

This is to certify that I have edited the following document for English style, language usage, logic and consistency; it is the responsibility of the author to accept or reject the suggested changes.

Author: Mr Vikesh Singh Student no: 45874603

Item: Unisa Master in Public Health Dissertation: **THE KNOWLEDGE OF NURSES ON MULTIDRUG RESISTANT TUBERCULOSIS AT PRIMARY HEALTH CARE FACILITIES IN THE NELSON MANDELA METROPOLITAN**

Sincerely

Levey

DAVID LEVEY
2014-05-31

Annexure A

Approval from the Higher Degrees Committee, University of South Africa Research and Ethics

Annexure B

Questionnaire

Annexure C

Approval from the Eastern Cape Department of Health

Annexure D

Approval from District Manager of Nelson Mandela Metropolitan

Annexure E

Approval from Facility Supervisors

Annexure F

Drug doses – MDR TB

Annexure G

How to use an N95 mask

Annexure H

Patient diary

Annexure I

Pocket guide on MDR TB

Annexure J

Certificate from language editor

Province of the
EASTERN CAPE
HEALTH

Office of the District Manager
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E-mail : francois.fourie@impilo.ecprov.gov.za

Our Reference:
Your Reference:
Date: 01 August 2013

Sub district A	**Sub district B**	**Sub district C**
Sub district manager/HAST manager/Facility manager	**Sub district manager/HAST manager/Facility manager**	**Sub district manager/HAST manager/Facility manager**
Sign:	Sign:	Sign:
Ikamvelihle clinic	Du Preez clinic	Gqebera clinic — C
Motherwell CHC	Gustav Lamour clinic	Joe Slovo clinic
NU11 clinic	Isolomzi clinic	Max Madlingosi clinic
NU8 clinic	Lukhanyo clinic	Kwamagxaki clinic
NU2 clinic	Middle st clinic	Booysens clinic — C
Well Estate clinic	Silvertown clinic	Rosedale clinic
Thandoxolo clinic	Missionvale clinic — C	Gelvandale clinic — C
Emmanuel Haven clinic	Govan Mbeki clinic — C	Empilweni clinic — C (N.B. C.H.C.)
Tshangana clinic		