KNOWLEDGE, ATTITUDES AND PRACTICES OF TUBERCULOSIS MANAGEMENT AMONG CLINICIANS WORKING AT PRIMARY HEALTH CARE FACILITIES IN THE NORTHERN TYGERBERG SUB-STRUCTURE, CAPE TOWN

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A mini-thesis submitted in partial fulfillment of the requirements for the degree of Master of Public Health at the School of Public Health, University of the Western Cape

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KEY WORDS

Knowledge

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Clinicians

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Treatment

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ABSTRACT

Introduction: Tuberculosis (TB) is one of the most infectious diseases globally and is a huge public health concern. In 2016, the Western Cape Province had the fourth highest incidence of TB in South Africa, with 728 new cases per 100 000 population. Effective management of TB includes screening, diagnosis, treatment, control and elimination. The local health authority (municipality) has historically managed tuberculosis in the Cape Metropole but due to the increased TB burden, primary health care (PHC) facilities managed by Metro Health Services (MHS) (provincial government) have recently commenced providing TB services. The challenge that the Cape Metropole is facing, is whether the clinicians in MHS facilities are equipped to manage these patients effectively.

Aim: To determine the knowledge, attitude and practices of clinicians in the screening, diagnosis and treatment of tuberculosis in the MHS PHC facilities in the Northern Tygerberg Sub-structure, Cape Town between mid-March 2018 and mid- June 2018.

Methods: A descriptive cross-sectional study was conducted using a self-administered questionnaire, based on previous studies and literature. Six PHC facilities were purposively selected and all eligible professional nurses and medical officers working in all departments of these facilities were included (n=169). Questionnaires elicited information on the knowledge of TB screening, diagnosis and treatment and composite knowledge, attitude and practice scores were developed. After pre-testing, data was collected by the researcher, transcribed into a Microsoft Excel Spreadsheet, and then exported to SPSS version 25 and Amos version 23 for analysis of descriptive and inferential statistics.

Ethics: Ethical approval was obtained from the University of Western Cape's Biomedical Research Ethics Committee and permission obtained from the Western Cape Government: Health. Informed written consent was obtained from the clinicians and confidentiality and anonymity was maintained through the coding of personal information. All original questionnaires were stored in a locked cupboard and the computer-generated information was stored on a password-protected computer.

Results: A sample of 150 clinicians was realized which yielded a response rate of 89%. Seventy eight percent of respondents were professional nurses and 22% were medical officers. The mean clinicians scores were as follows: knowledge score was 6.9 on a scale of 10 at 95% CI (6.7, 7.1); attitude score was 1.5 on a scale of 10 at 95% CI (1.371, 1.554) and practice score was 5.5 on a scale of 10 at 95% CI (5.105, 5.867). There were no significant differences in the knowledge level within facilities or across facilities. No significant relationship was found between practice and knowledge; and attitude and knowledge; however, a significant but negative relationship was found between practice and attitude. Better knowledge did not necessarily translate into adherence to correct practices. Individual clinicians' practices were not in line with best practice and were positively and strongly related to facility-based practices.

Conclusion: The study found that knowledge and practices of clinicians working at PHC facilities in the Northern Tygerberg Sub-structure to TB screening, diagnosis and treatment were above average. Positive attitude towards TB was reported but attitudes towards TB screening; diagnosis and treatment were low and had an inverse impact on treatment. It was also found that there was no difference in the knowledge, attitudes and practices between staff categories or across facilities rendering TB treatment and those not.

Recommendations: Recommended strategies include implementation of TB-related training, and behavioral change interventions to address infection control practices in PHC facilities. A larger, more in-depth observational study to uncover barriers to the effective TB management at facilities is recommended.

DECLARATION

I, Juanita Desireé Mclaughlin (nee Prins), hereby declare that **"The knowledge, attitudes and practices on Tuberculosis management among clinicians working at primary health care facilities in the Northern Tygerberg Sub-structure, Cape Town"** is a true reflection of my own research. This work or part thereof has not been submitted for a degree or examination at any other institution of higher education. All sources I have used or quoted have been indicated and acknowledged as complete references.

Signed: 

Date: December 2018

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ABBREVIATIONS

CDC	Community Day Centre
CHC	Community Healthcare Centre
CHWs	Community Healthcare Workers
CoCT	City of Cape Town
DS TB	Drug Sensitive Tuberculosis
DR TB	Drug-resistant Tuberculosis
HAST	HIV/Aids, STI and TB
HCWs	Health Care Workers
HIV	Human Immunodeficiency Virus
IC	Infection Control
IPC	Infection Prevention Control
KAPs	Knowledge, Attitudes and Practices
MDR TB	Multi-drug Resistant Tuberculosis
MHS	Metro Health Services
MOs	Medical Officers
NTSS	Northern Tygerberg Sub-structure
PHC	Primary Health Care
TB	Tuberculosis
TB IC	Tuberculosis Infection Control
TB IPC	Tuberculosis Infection Control Prevention
WCG	Western Cape Government
WHO	World Health Organization

TABLE OF CONTENTS

KEYWORDS ii
ABSTRACT iii
DECLARATION iv
ACKNOWLEDGMENTS vi
ABBREVIATIONS vii

CHAPTER 1: INTRODUCTION 1
1.1 Introduction 1
1.2 Problem Statement 2
1.3 Setting 4
1.4 Purpose 5
1.5 Aim and Objectives 5
1.5.1 Aim 5
1.5.2 Objectives 5
1.6 Definition section 6
CHAPTER 2: LITERATURE REVIEW 8
2.1 Introduction 8
2.2 Tuberculosis burden 8
2.3 Gaps, challenges and possible solutions to TB control 8
2.4 Tuberculosis knowledge 10
2.5 Attitudes towards TB 10
2.6 Practices 11
2.6.1 TB infection control measures 13
2.7 Conclusion 15
CHAPTER 3: RESEARCH METHODOLOGY 17
3.1. Introduction 17
3.2 Study design 17
3.3 Study population and sampling 17
3.4.1 Inclusion criteria 18
3.4.2 Exclusion criteria 19
3.5 Data collection 19
3.5.1 Data collection tool 19
3.5.2 Pre-testing 19

3.5.3 Data collection procedure 20
3.6 Data analysis 21
3.6.1 Procedure for measuring variables 21
3.7 Validity 22
3.8 Reliability 23
3.9 Generalisability 23
3.10 Ethical considerations 23
CHAPTER 4: RESULTS 25
4.1. Introduction 25
4.2 Study participants 25
4.3. Description of study participants 27
4.4 Level of knowledge, attitudes and practices of clinicians in TB screening, attitudes and practices 28
4.4.1 Knowledge of TB screening, detection and treatment 28
4.4.2 Attitudes towards TB screening, detection and treatment 30
4.4.3 Practices of TB screening, detection and treatment 32
4.4.3.1 Individual practices 32
4.3.3.2 Facility practices 32
4.4.4 Overall analysis of clinicians' knowledge, attitudes and practice scores of TB management 33
4.5 Relationship between TB knowledge, attitudes and practices among clinicians 34
4.6 Impact of knowledge and attitudes on practices 35
4.7 Relationship between facility-based practices and clinicians' individual practices 36
CHAPTER 5: DISCUSSION 37
5.1 Introduction 37
5.2 Overall knowledge, attitudes and practices of clinicians of TB management 37
5.3 Knowledge of clinicians of TB screening, detection and treatment 38
5.4 Attitudes of clinicians to TB screening, detection and treatment 39
5.5 Practices of clinicians to TB screening, detection and treatment 40
5.5.1 Individual practices 40
5.5.2 Facility practices 41
5.6 Link between individual and facility practices 42
5.7 Relationship between TB knowledge, attitudes and practice 433
5.8 Limitations 43

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS 44

6.1 Conclusion 44

6.2 Recommendations 45

REFERENCES ……..46

LIST OF TABLES

Table 1: Participation in study……..…….……..…….26

Table 2: Characteristics of six facilities and included clinicians……...……...……..27

Table 3: Demographics of study participants (N=150)……..28

Table 4: Clinicians correctly answering knowledge of TB screening, detection and treatment questions (N=150)……30

Table 5: Clinicians' attitudes towards TB screening, detection and treatment (N=150)……..……..……....31

Table 6: Reported clinicians' practices of TB screening, detection and treatment (N=150)…….……..32

Table 7: Estimated mean level of clinicians' knowledge, attitude and practices towards TB screening, diagnosis and treatment by primary health clinic (n= 6)…….…….……..34

Table 8: Relationships between practice, attitude and knowledge…….…….…….…….34

Table 9: Regression weights estimating the effect of knowledge and attitude on clinicians' practice of TB screening, diagnosis and treatment……..…….…….35

LIST OF FIGURES

Figure 1: Participation in study…….……25

CHAPTER 1: INTRODUCTION

1.1 Introduction

Tuberculosis (TB), one of the world's most infectious diseases, is caused by *Mycobacterium tuberculosis* and is a global health problem. While TB mainly affects the lungs, it can also manifest in any other part of the body including the kidneys, spine and brain. In 2016, an estimated 10.4 million people (90% adults, 65% male, 10% people living with human immune deficiency virus (HIV)) fell ill with TB leading to an estimated 1,7 million TB deaths globally (World Health Organisation (WHO), 2017). In 2015, the United Nations member states committed to the End TB Strategy (2016 – 2035) and the Sustainable Development Goals (2016 – 2030) in a shared effort to end the global TB epidemic. The targets of the End TB Strategy include a 90% reduction in TB deaths and 80% reduction in TB incidence by 2030 (WHO, 2017). High TB burden countries include China, India, Brazil, Russian Federation, Thailand and several Sub-Saharan African countries, and the control of TB in these countries is complex as poor socio-economic factors negatively influence measures to control the disease. In 2015, South Africa ranked amongst the top thirty countries with the highest TB burden in the world with an incidence rate of 834 per 100 000 population (WHO, 2016). The Western Cape Province had the fourth highest TB incidence in South Africa (739 per 100 000 population) in 2016 with the largest number of new TB cases (728 per 100 000) in the Cape Town Metropole (WCG, 2017). Kwazulu-Natal, Gauteng and Northern Cape provinces had the highest TB incidence in the same year.

The TB epidemic has greatly been affected by the HIV dynamics and declines in TB incidence have been seen since 2010 (Churchyard et al., 2014). Despite a noticeable decline in TB incidence (834 cases per 100 000) in South Africa since 2015 (WHO, 2016) more needs to be done to close the occurrence of new cases. The current TB incidence in South Africa is 567 cases per 100 000 and translate to an estimated 322 000 people (WHO, 2018). Both the HIV epidemic and the TB diseases place a huge burden on limited health resources, with TB consuming about 271 million US dollars of the national health budget. The high incidence of HIV led to an elevation of TB incidence; however, the link between the two diseases was not initially appreciated. It is the researcher's opinion that the impact of TB/HIV co-infection has only been

fully realized among health professionals in recent years, thus the movement for interventions to manage both infections.

In 2015 South Africa adopted the global 90-90-90 strategy for TB control with the aim of strengthening the current health systems and practices by improving the screening of vulnerable groups, treatment and the cure rate of this disease by 2020 (WHO, 2016). The 90-90-90 strategy targets that 90% of vulnerable populations are screened for TB, that 90% of those diagnosed with TB are initiated on TB medication and that 90% of those initiated, are treated successfully. Suthar et al., (2016) is of the opinion that although the 90-90-90 strategy aims to decrease mortality, other factors like passive case detection strategies, multidrug resistant (MDR) TB, HIV coinfection and outdated care pathways need to be alleviated first.

In South Africa, TB is largely managed by medical doctors and professional nurses working at primary health care (PHC) facilities in the public health sector. Effective management of TB includes screening, diagnosis, treatment, control and elimination, however, for the purpose of this study we will mainly focus on screening, diagnosis and treatment. Health authorities in the Cape Town Metropole are finding it challenging to gain control over this epidemic. Primary health care services are managed by two health authorities in the Cape Town Metropole, namely the Western Cape Government: Health (Provincial Government or Metro Health Services (MHS)) and the City of Cape Town: Health (Local Government or CoCT). Historically, all TB services were rendered at CoCT- managed facilities but due to the increased burden of both drug sensitive (DS) and MDR TB, more MHS managed facilities are required to render TB services. Both CoCT and MHS support the vision of the National Health Department to provide comprehensive care to our communities (Doherty et al.,2000). However, despite a reasonably well resourced clinical workforce, PHC facilities, supply of TB medication and laboratory services, efforts to control the TB pandemic in South Africa, including the Cape Town Metropole, remain challenging. One of the key issues is whether clinicians at all PHC facilities have adequate knowledge, attitude and skills to deal effectively with TB in practice.

1.2 Problem Statement

The continuing high levels of TB in the Western Cape necessitate the early detection, diagnosis

and treatment of TB with the dual aim of reducing TB mortality and controlling the epidemic. The global plan to end TB also advocates for early detection and treatment (StopTB Partnership, 2015). TB services were historically offered by CoCT PHC facilities in the Cape Metropole but due to high TB incidence, the move towards integrated health services and the 90-90-90 strategy, clinicians in MHS PHC facilities are expected to provide TB services as per the Healthcare 2030 vision of the Western Cape Department of Health (WCG: Health, 2014).

Local studies conducted a few years ago at the Knowledge Translation Unit of the University of Cape Town and Western Cape PHC facilities found that TB screening and triaging of patients were inadequate and not all patients received appropriate TB management at PHC level (Fairall et al., 2015; Mphahlele et al., 2012). The average TB screenings conducted in the Northern Tygerberg Sub-Structure (NTSS), one of four sub-structures of the Public Health System in the Cape Town Metropole, is about 37%, far from the 90% targeted in the 90-90-90 strategy (Botha, 2018). It is assumed that clinicians who work in facilities not currently offering TB treatment services, may not recognize the importance of TB screening and treatment. Many clinicians in the NTSS still perceive TB as a health problem that has to be dealt with by the clinicians in CoCT facilities; this however, has resulted in the slow uptake of intensified screening at MHS facilities. Patient folder audits in the NTSS have shown that not all patients are routinely screened for TB when visiting a PHC facility. This creates a gap in identifying patients with TB as only clients who are perceived to be at a high risk of TB are screened. In addition, it is also likely that clinicians based in MHS facilities may experience barriers, which prevent them from having a high suspicion for TB when providing care to patients with general health complaints.

South Africa's PHC system has been moving towards an integrated approach where patients are seen holistically and clinicians treat individual patients' health needs in totality. Unfortunately, due to the current skill mix and inadequate implementation of an integrated service, patients are still being referred to different clinicians depending on their disease profile. This in itself also contributes to a lack of TB knowledge in the different disciplines and missed opportunities for routine screening of communicable and non-communicable diseases. A study by Van Rie et al., (2014) reported significant success when clinical staff integrated TB and HIV screening as part of the routine clinical consultation. The study will therefore describe the KAP among clinicians in NTSS on TB management.

1.3 Setting

The study was conducted in the NTSS, one of the four sub-structures of the Public Health System in the Cape Town Metropole, South Africa. According to the 2011 census, the NTSS had a population of over 1 million people. The NTSS comprises of two sub-districts, namely, Northern sub-district and Tygerberg sub-district. The Tygerberg sub-district has a population of 653 277 and is more urbanized, developed and more densely populated than the Northern sub-district which has a population of 411 958, and includes urban as well as peri-urban areas (DHER, 2018). Most of the patients seen in the NTSS are of low-socio economic status and it has a high disease burden of TB and HIV. A total of 907 580 (85, 2%) out of 1 065 235 people are dependent on the Public Health System which includes a medically uninsured and partially insured population (DHER, 2018).

The NTSS has 29 PHC facilities, which are managed by either MHS (nine facilities) or CoCT (fourteen facilities) or jointly managed (six facilities). Tuberculosis treatment was historically only offered at CoCT facilities but due to the high disease burden and moves to increase accessibility of PHC services, MHS has rolled out TB services to more of their MHS-managed facilities. Currently all CoCT facilities and CoCT/MHS jointly managed facilities render TB services whereas only four of the nine MHS managed facilities in NTSS provide TB services (See Appendix 1). The proposed plan is that the NTSS intend to roll out TB services at three more of MHS managed facilities during the 2018/19 financial year. This is in line with the National Department of Health's strategies to bring all health services closer to the community. All MHS facilities currently offer sputum tests on patients with TB symptoms and refer those with positive sputum results to a facility where TB services are rendered; either in the same facility (if at a jointly managed facility) or to a different facility. Registered nurses (professional nurses and clinical nurse practitioners initiates TB treatment for patients with a positive TB result. A doctor sees patients shortly after treatment commences, when treatment changes needs to happen or when patients develop complications. Doctors manage all drug-resistant patients. All MHS facilities have a medical officer on site, whereas only the bigger CoCT facilities have on-site medical officers. A roving medical officer visits the medium and small CoCT sites once a week. Lay counsellors provide TB counseling sessions and

community health care workers (CHWs) conduct follow-up visits and support patients in the community.

1.4 Purpose

The purpose of the study was to assess the TB knowledge, attitude and practices among clinicians working in MHS facilities in the NTSS. Despite a variety of TB studies, no previous study has been conducted to investigate this topic in the Western Cape Province. The findings may assist the management of the NTSS to identify gaps in knowledge, attitudes and practices (KAPs) of clinicians, to enhance clinical competency by planned appropriate training and to improve quality of care. The study among the clinicians aim to elevate awareness of the high TB burden, its effects on the health of local communities and might lead to improved adherence to infection control practices. The implications and recommendations from this study may expand on the current knowledge of TB management not only in MHS facilities in the NTSS but also on a provincial and national scale. Countries with a similar disease burden and health system may find the recommendations useful in their context.

1.5 Aim and Objectives

1.5.1 Aim

To determine the knowledge, attitude and practices (KAP) of clinicians in the screening, diagnosis and treatment of tuberculosis (TB) in the Metro Health Services (MHS) primary health care (PHC) facilities in the Northern Tygerberg Sub-structure (NTSS), Cape Town between mid-March 2018 and mid- June 2018.

1.5.2 Objectives

a) To determine the knowledge, attitudes and practices of clinicians in screening, diagnosis and treatment of TB in MHS facilities.
b) To determine the relationship between the knowledge, attitudes and practices of TB among clinicians in MDHS facilities
c) To determine the impact of knowledge and attitudes on practices of clinicians in screening, diagnosis and treatment of TB in MHS facilities.
d) To determine the relationship between facility practices and clinicians' practices in screening, diagnosis and treatment of TB in MHS facilities.

1.6 Definition section

TB Management - refers to elements in the screening, diagnosis, treatment and control of TB

Practices - refers to the actions involved in staff dealing with presumptive TB and confirmed TB clients in their personal capacity and/or in a particular facility.

Clinicians - include medical officers and professional nurses with a different levels of clinical experience and expertise. Comprises of junior and senior medical officers as well as family physicians, integrated registered nurses (qualification in general, psychiatric, community nursing and midwifery) and clinical nurse practitioners.

Primary Health Care facilities

- health facilities managed by Metro Health Services who focus on strengthening health promotion, disease prevention, and early disease detection. Opening hours at facilities are 8 hours or 24 hours depending on the types of services they provide.

Northern Tygerberg Sub-structure

- one of four health sub-structures in the Cape Town Metropole, comprising of two health sub-districts, namely Northern sub-district and Tygerberg sub-district

Health Care Workers

- includes different categories professional and unprofessional health workers, for example, medical officers, nurses, counsellors and community-based workers

Facility practices - refers to the infection prevention control practices adopted by clinicians

due to the culture and infrastructure at specific facilities

Clinicians practices - refers to the practices inherent to the individual clinician.

Cape Town Metropole - refers to the four health districts in the Cape Town area

Metro Health Services - refers to public health services that are being rendered by the provincial health authority in Cape Town

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Tuberculosis is an important public health problem. Tuberculosis control includes screening, diagnosis, treatment and prevention of TB to ultimately avoid TB deaths and reduce transmission. Tuberculosis is usually managed at primary health care (PHC) level by a variety of clinicians including professional nurses and medical officers. This literature review covers global and local aspects on TB including the TB burden, control of TB, TB knowledge, attitudes towards TB, practices and TB infection control measures among clinicians.

2.2 Tuberculosis burden

Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis* and remains a global public health problem. In 2015, there were an estimated 10.4 million new TB cases worldwide (834 per 100 000 population), of which 5.9 million (56%) were among men, 3.5 million (34%) among women and 1.0 million (10%) among children (WHO, 2016). Ranking among the top ten causes of deaths (1.4 million deaths in 2015) globally, it is also a leading cause of death among poor people around the globe (Liaqat et al., 2017). People living with Human Immunodeficiency Virus (HIV) account for 1.2 million (11%) of all new TB cases (WHO, 2016). South Africa is among the top thirty high TB burden countries (WHO, 2016) and TB is the fourth largest contributor to deaths in South Africa (StatsSA, 2013). The South African National Strategic Plan on Human Immunodeficiency Virus (HIV), Sexually Transmitted Infections (STIs) and TB (2017 - 2022), proposes a focused increase on prevention, treatment uptake and ultimately intensified TB case finding. Therefore, the need for all clinicians to be knowledgeable about TB to ensure that optimal patient care is rendered (NDoH et al., 2017). Despite the importance of TB as a public health concern, relatively little literature is published about the knowledge of TB among health care workers (HCWs) in the Cape Metropole.

2.3 Gaps, challenges and possible solutions to TB control

Despite the increased in global TB coverage programmes, a gap in the control of the TB epidemic remains. Thirty seven percent of all new TB cases worldwide in 2014 went undiagnosed (WHO, 2015). Churchyard et al., (2014) agrees that despite the notable progress

made in the improvement of TB control, a lot of work still needs to be done to lessen the TB burden in South Africa.

Tuberculosis is transmitted via airborne particles and primarily affects the lungs; yet it poses a serious risk to uninfected people who are exposed to undiagnosed infected people. Undiagnosed infectious TB patients similarly pose a high risk to HCWs and community health workers (CHWs) (Gizaw et al., 2015). Several studies concluded that HCWs have a 2 – 3 fold greater risk of active TB than the general population (Baussano et al., 2011; Tudor et al., 2014). Christian (2018) suggests that clinicians should therefore maintain a high index of suspicion for TB in order to prevent and interrupt TB transmission and a greater urgency should be place on diagnosis, treatment and continued care of the above disease to intensify TB case finding

Fairall et al., (2005) advocate that improved passive TB case detection by clinicians in the PHC sector is important in the management of the TB epidemic. Health care workers are a vulnerable group when it comes to the transmission of TB as they are at great risk of being infected with TB hence their constant contact with undiagnosed people when performing their daily routine duties. A few South African studies have shown that HCWs do not have sufficient TB knowledge, are not receptive in adopting preventative practices and do not treat TB adequately (Malangu & Mngomezulu, 2015;(Farley et al., 2011; Dheda et al., 2010). Another concern in the control of TB is the growing number of new drug resistant (DR) TB cases globally, the delayed recognition thereof and the prolonged exposure and ultimately intensified risk of transmission. Moreover, the treatment duration of DR TB (Cox et al., 2015) is costly, and treatment can have devastating side effects on patients.

The added burden of dually infected HIV and TB is not helping in the fight against the TB epidemic. TB and HIV patients are not always being offered ongoing or continuous care and are seen in specialized clinics in separate vertical programmes (Fairall et al., 2015); this, despite the high mortality and morbidity in South Africa (Mash et al., 2012). More effort should be placed on integration of these two diseases as this can deliver fruitful results. A study by McCarty et al., (2015) showed that integrated screening of systematic HIV and TB resulted in 90 new cases of TB. This amount corresponded to 2.7% (3284) of the TB prevalence rate among those with a positive symptom screen. The literature leans towards active TB case finding rather than passive TB case finding in high burden areas which aims to counter the increased infection and poor TB

outcomes when diagnosed late. The benefits of active screening is the increase in TB cases found as well as a shortened time of exposure to others before TB is detected (Kranzer et al., 2013). South Africa has made notable progress in improving TB control, but the burden of TB remains enormous (Churchyard et al., 2014).

2.4 Tuberculosis knowledge

Numerous TB knowledge, attitude and practices (KAP) studies among HCWs worldwide have revealed that majority of the participating HCWs had good TB knowledge (Abd Wahab et al., 2016). However, several gaps have been identified in the clinical competence and the management of TB by clinicians, both globally and locally. A study conducted in Russia discovered that the average TB knowledge score among HCWs was 61% (Mirtskhulava et al., 2015); a Mozambican (Noé et al., 2017) study reported that doctors were more knowledgeable than midwives; and Gizaw et al., (2015) reported contrasting findings in the fact that one third of Ethiopian health workers had relative poor TB knowledge.

Gaps in relation to the knowledge of treating TB are evident. Thirty percent of Mozambican professionals noted that fixed dose combinations were used in the intensive phase of TB treatment; however only 50% of those could identify all four drugs and the duration of the intensive phase, correctly (Noé et al., 2017). Furthermore, this study reported that only 20 respondents could correctly identify the cause of action in a patient who presents with jaundice shortly after commencing TB treatment.

An American study by Joseph et al., (2004) found that the HCWs lacked basic knowledge about general TB issues, including the transmission, symptoms and treatment whereupon many of the participants requested additional TB education. Poor health education concerning TB is another matter of concern. Watkins et al. (2004) reported that inadequate TB education of clinic staff contributed to the weakness of TB programmes in Indonesian.

2.5 Attitudes towards TB

Varying attitudes of HCWs towards TB were reported in previous studies. Tuberculosis control measures invests greatly in the clinical aspect and do not always consider the human aspects,

like perceptions of TB, non-adherence to TB treatment and the emergence of acquired resistance. Lertkanokkun et al., (2013) reflected that previous studies showed that negative attitudes of Thai health care providers towards TB treatment resulted in a high treatment dropout rate. A review article on HCW's knowledge, attitudes and practices of TB (Abd Wahab et al., 2016) reported that 80% of HCWs in a South Indian study where sympathetic towards TB patients whereas 8% were concerned about TB patients but chose to stay avoid them. The authors furthermore reported that 60% of HCWs in this South Indian study had a negative attitude towards TB patients, but that 56% were positive towards providing TB services and 60% were positive towards TB control systems. This review article reported that both South Indians and South Africans displayed positive attitudes whereas the Thai HCWs had negative attitudes towards TB patients. Tamir et al., (2016) reported that many Ethiopian HCWs were negative towards TB infection control (TBIC) activities due to a lack of interest in TB related work and these activities were left to the staff working in the TB clinics. Staff who displayed a negative attitude towards TBIC practice were working in the pharmacy, mother and child health, the laboratory and the in-patient departments. South African HCWs who had a higher TB knowledge displayed better attitudes towards infection control practice (Farley et al., 2012). Bhebhe et al., (2014) also reported positive attitudes among South African respondents. Ninety five percent of respondents agreed to attend training related to TB infection prevention control (TB IPC) methods (Noé et al., 2017). Tenna et al. (2013) reported that the majority of Ethiopian HCWs felt that masks were important in infection control (IC) while 71% were concerned about acquiring occupational TB.

South African HCWs working at a multi- and extensively drug - resistant (M/XDR) TB hospital felt that the hospital administration did not care about them and did not do enough to prevent nosocomial TB infection in staff (Kanjee et al., 2011). In the Berea District in Lesotho (South Africa) 93% HCWs had positive attitudes towards TBIC (Bhebhe et al., 2014).

It has been found that many HCWs are still prejudice over their colleagues who have tested positive for TB as they do not know the difference between latent TB infection and TB disease. Forty eight percent of Mozambican HCWs believed that TB stigma is bigger than HIV (Noé et al., 2017).

2.6 Practices

Upholding good Infection control practices is only one way in which facilities can control spread of TB in their immediate environment. Despite the fact that HCWs are at great risk of contracting TB, this disease still receives little attention as an occupational disease. Various IPC practices in facilities are implemented poorly and has an increased risk of infection in the PHC setting. It is worrying that a study among Italian medical students (Laurenti et al., 2013) and a study among Sub-Saharan African hospital professionals (Temesgen & Demissie, 2014) showed low uptake of masks while consulting with patients. The majority of HCWs had a low level of practice on TB prevention (Abd Wahab et al., 2016) and only 19.5% of 38 physicians took the necessary preventative approaches while examining patients.

Lack of TB knowledge reflects poor on clinical management of TB patients. Vietnamese staff members who attended TB training and who had a higher medical education, dealt better with clinical symptoms like coughing and weight loss than their colleagues who had a lower qualification (Hoa et al., 2005). Other studies from Uganda (Buregyeya et al., 2016), Kenya (Chakaya et al., 2005) and Lesotho (Bhebhe et al., 2014) found that insufficient knowledge of sputum tests, poor TB treatment procedure and non-adherence to infection control measures had a significant influence on how clinicians managed patients with TB.

An American study found that Baltimore physicians made frequent errors in the TB treatment (Roa et al. 2000). Furthermore, 79 out of 170, respondents who did monitor liver enzymes, failed to relate the occurrence of jaundice to TB treatment. Tenna et al. (2013) reported a low proportion of HCWs separated infectious TB patients from other patients and less than one third of the clinicians ordered sputum tests when TB in a patient was suspected (Noé et al. 2017).

Kanjee et al. (2011) reported good TB IC knowledge among HCWs in a resource-limited rural South African hospital where nosocomial transmitted multi- and extensively drug-resistant (M/XDR) TB had been reported. Although knowledge about TB symptoms, transmission and respirators were good, the administrative TB infection practices in this M/XDR TB hospital still varied. The authors furthermore reported that 77% of South African HCWs “always” inform their coughing patients about coughing hygiene versus the lower percentage (60%) of participants in an Ethiopian study (Tamir et al., 2016). Greater emphasis by all HCWs should be put on the education of patients on coughing etiquette, separation of coughing patients and TB

prevention strategies at home and in the community in order to protect HCWs and other patients against undiagnosed TB.

Similarly, Kakili (2010) reported that poor or inadequate health education by Namibian HCWs was linked to high defaulter rates. Due to the commonality of TB in the PHC setting, Tamir et al., (2016) recommends supportive supervision and trainings to Ethiopian HCWs who do not work in TB clinics. The authors are of the opinion that TB training and work experience in health facilities are key in the level of clinicians' knowledge, hence the recommendation of focused training.

While Bhebhe et al., (2014) reported "fair" scores for practice on half of the respondents in their study, only 10. 9% received good practice score on TB prevention and 26% educated patients on TB infection control. Tamir et al., (2016) suggest that TB related training and experience are predictors of good practice. The NTSS only re-started screening staff for TB in 2017 due to requirements of the Ideal Clinic and hopefully adherence to TB IPC measures will improve once management will realise the benefits. Health care workers should utilize every opportunity to up-skill themselves about personal protective equipment.

2.6.1 TB Infection control measures

TB IPC aims to reduce TB transmission the risk of TB infection for health care workers, patients and other users (Brouwer et al., 2014). Poor TBIC measures associated with poor attendance of TBIC training were noted among medical staff in MHS facilities. Farley et al., (2012) conducted a cross sectional descriptive study evaluating the infection control practices (IPC) in South African M/XDR TB hospitals and found that greater IC knowledge was associated with higher clinical training; however, IPC were poor across all disciplines (Farley et al.,2012; Engelbrecht et al., 2016).

Adherence to personal protective equipment is poorly implemented. Suthar et al., (2016) reported that IPC remains the foundation for reducing TB exposure among non-infected individuals in health facilities and closed settings. The incorrect use of the N95 masks was identified as a barrier to TB IC practices (Buregyeya et al. (2016) suggests that mentoring and support on TBIC measures would be beneficial to HCWs. According to Mirtskhulava et al.,

(2015) only 60% of HCWs reported frequent use of respirators when in contact with TB patients. The use of respirators by HCWs have an alienating or depersonalising effect and reduce the health care workers' ability to provide compassionate care (Brouwer et al., 2014). The authors strongly support the wearing of masks by patients. Participants however responded that respirators are uncomfortable to wear especially in high temperatures. A limitation to this study was that the focus groups responded in a socially acceptable way by giving desirable answers.

Unfortunately, not much has been done to prioritize IPC in many low to middle income country settings. Kanjee et al. (2011) reported that even though first year South African medical students were more likely to have received TB infection control training than nurses, they did not implement appropriate TB infection control measures (McCarthy et al., 2015). Similarly, nearly half had unsatisfactory TB infection control practices. Naidoo et al., (2012) suggests that N95 masks should be available and that HCWs should undergo training on fit tests, adequate maintenance and storage of masks. Hand hygiene is low on medical officers' infection prevention priorities. Medical officers have a low rate of hand hygiene; an Ethiopian study demonstrated a good understanding of the importance of hand hygiene and TB infection control but this did not translate into effective implementation of infection control measures (Tenna et al., 2013). Tenna et al. (2013) reports that nurses had had better hand hygiene than doctors.

Malangu & Mngomezulu (2015) reported thirty-five cases of occupational TB among PHC workers and according to the authors staff members might attribute this to poor compliance to TBIC measures. One can argue that better adherence to IC measures could have resulted in less TB cases among HCWs in their area. The World Health Organisation(WHO, 2009) updated its TB IPC policy on health care facilities by focussing on the level of importance of IPC measures. Less than 50% of facilities in four West African countries adhered to important administrative measures. With regards to environmental measures, less than 50% facilities assessed in Uganda, had adequate ventilation in the waiting rooms (Buregyeya et al., 2013). Similarly, the mentioned study also found that HCWs and patients resisted certain recommended behaviour changes, which formed a barrier to adequate use of TB IPC measures.

Administrative measures are closely aligned to clinical control measures aim to ensure that people with TB symptoms are promptly identified, separated and treated (Claassens et al., 2013). Environmental measures aim to reduce the concentration of infection agents in the air and promote natural airflow, like for example, the "open window policy". This policy recommends that all windows in a health facility should be kept open to allow for airflow in the absence of extractor fans. Costa et al., (2011) reported that a Portugal study showed that health care workers are at risk of TB infection due to inadequate ventilation in working spaces.

Due to the effectiveness N95 respirators as part of protective equipment, it is recommended that all HCWs utilize it when caring for patients suspected of having TB (Tudor et al., 2014). In a South African study among HCWs where TB IC measures were described and compared, less than 50% of TB IC measures were adhered to and 35 TB cases among HCWs were reported (Malangu & Mngomezulu, 2015b). Health facilities in the NTSS do not always comply with the WHO and South African National Department of Health Tuberculosis guidelines; reasons for non-compliance unsuitable infrastructure, ignorance about TB disease and crime. Brouwer et al., (2014) explain that HCWs are aware of their TB risks but find it challenging to implement risk reduction measures due to unclear facility guidelines, insufficient motivation, inadequate training and support. The authors furthermore explain that the behaviour of HCWs and patient behaviour complicate the use of TB IC measures. Global TB and HIV experts advocate IC as a key TB control strategy (Kanjee et al., 2011; WHO, 2009). Gizaw et al., (2015) refer to several studies where the health workers are recommended to adopt natural and mechanical ventilation systems to promote the early detection of TB cases, adherence to treatment and proper TB IC measures in health facilities. The authors advocate that HCWs go as far as to educate the community about adequate ventilation.

2.7 Conclusion

South Africa is a high TB burden country and the Western Cape Province is the province with the third highest TB incidence. Globally and nationally, a call has been made to have a more focussed approach on TB prevention and treatment, but more so to intensify TB case finding. It is therefore important that all clinicians (professional nurses and doctors) in the PHC sector have the adequate knowledge to screen, diagnose and treat presumptive TB patients. Infected TB

patients pose a high risk to uninfected people in the community as well as health care workers and if undiagnosed the spread of TB continues.

The literature shows that clinicians do not always have the appropriate level of knowledge and this reflects negatively in the treatment of TB cases. An integrated PHC approach, particularly in TB and HIV, could prove beneficial in identifying new TB cases when incorporated as part of clinicians' routine work. Naidoo et al., (2017) refer to an integrated model of TB and HIV healthcare service delivery as it is an efficient use of health system's resources that would address these two very important co-epidemics. Clinicians who display negative attitudes towards TB patients resulted in poor adherence and a high treatment dropout rate. Positive attitudes were associated with better knowledge level and better attitudes towards infection prevention control (IPC) measures. Staff did not wear masks as often as they were supposed to as they felt that it is uncomfortable and that it alienates them from the patients. Furthermore, both patients and staff were not keen on certain recommended IPC changes.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter describes the study design, study population and sampling, data collection, data analysis, validity, reliability, generalisability and ethics in the study.

3.2 Study design

A descriptive cross-sectional study collecting data using quantitative methods involving measurement and counting was conducted. Descriptive statistics were used to determine the knowledge, attitudes and practices (KAP) of clinicians to management of TB at PHC facilities in NTSS. This design was appropriate and cost-effective as it facilitates data collection at a particular point in time (Marston, 2013). This study collected information on a particular population, on what is known (knowledge), believed (attitude) and done in action (practice) by connecting it to a specific topic (WHO, 2008). An added benefit of this design is that it allows for exposure and outcomes to be collected simultaneously.

3.3 Study population and sampling

The study population consisted of all clinicians (n = 169) employed at MHS PHC facilities in NTSS who met the inclusion criteria. All the facilities (n= 29) in NTSS were clustered according to their sub-district, managing authority and TB services provision (Appendix 1).

Six MHS facilities out of the total of twenty-nine facilities in the NTSS were purposively selected. The selected sites included two MHS facilities without TB services, two MHS facilities where TB services are provided and two MHS/COCT jointly managed facilities. COCT – managed facilities where TB services are one of the primary functions of the facility were not included in this study as it was expected that the COCT clinicians would have had a different KAP of TB management. The selection also took into account sub-district and total monthly

headcount of the facility. The size of the facilities were determined by the community population that the facility were serving. Small facilities serve a community population of less than 30 000 people, medium facilities serve a community between 30 000 and less than 60 000 people and big facilities serve a community between 60 000 and less than 90 000 people. The bigger facilities offer a wider variety of services and are staffed by more specialized clinicians compared to the smaller facilities. One large and one small facility respectively per sub-district, namely Northern and Tygerberg sub-districts, and both medium size facilities from Tygerberg were selected as there were no medium sized facility in Northern sub-district under MHS management. The target population was selected on the basis that they fit the purpose of the study and specific inclusion and exclusion criteria (Daniel, 2012); the sites depict a broad picture of the KAP of clinicians to screening, diagnosis and treatment of TB in NTSS.

The identified health care facilities included in the study were Kraaifontein CHC and Ruyterwacht CDC (MHS non-TB rendering services); Delft CHC and Bishop Lavis CDC (MHS rendering TB service); and Ravensmead CDC and Scottsdene CDC (jointly MHS/CoCT managed facilities, rendering TB services) (Appendix 1). Due to the small number of the targeted population, all MHS clinicians at the selected six facilities were included. Only MHS staff at jointly managed facilities were approached for the study. A total sample of 169 eligible clinicians was identified in the six facilities.

3.4.1 Inclusion criteria

- Only MHS facilities were included in study sample
- Facilities with or without a TB service
- Both 8-hour and 24-hour facilities were included
- All MHS professional nurses, clinical nurse practitioners and medical officers working at chosen facilities
- Clinicians working outpatients departments, ARV units, emergency units, women's health, child health and psychiatry outpatient departments.
- Professional nurses, clinical nurse practitioners and medical officers on probation or on community service contract
- Clinicians on night duty

3.4.2 Exclusion criteria

- CoCT facilities
- CoCT clinicians working at joint MHS/CoCT facilities
- Medical interns
- Nursing students
- Locum medical officers and locum clinical practitioners and locum professional nurses

3.5 Data collection

3.5.1 Data collection tool

Data collection was conducted using a self-administered multiple answer questionnaire (Appendix 2). The questionnaire was based on literature found on similar themes by various researchers (Noé et al., 2017; Bhebhe et al., 2014; Buregyeya et al., 2016; Bristow et al., 2013) as well as on the South African National Tuberculosis Management Guidelines (NDOH,2014). The questionnaire had 45 questions and focused on key areas such as socio-demographics (7 questions), knowledge (14 questions), attitudes (10 questions) and practices (14 questions) of TB screening, diagnosis and treatment. The questionnaire was presented in English and took approximately 30 minutes to complete.

3.5.2 Pre-testing

The study questionnaire (Appendix 2) was pre-tested at a non-TB rendering facility, not included in the selected study sites, with a similar staff profile as the study sites. Ten participants completed the study questionnaire. A few amendments to the original questionnaires were made for clarity. In addition, data from the pre-tested questionnaires were captured into an Excel sheet and coded. The following amendments to the questionnaire were made:

Q. 6 - Categorized the years of experience

Q. 7 - Deleted the "how long" if had TB before

Q. 8 – Deleted “Tick all relevant answers” and added “Tick true or false”

Q. 13 – Added “Pleases select only one answer”

Q18.a & Q18.b – Added N/A as another option

Q. 30 & 31 – Added “drug-sensitive” TB/PACK guidelines

Q. 34 & 35 – Divided options into “Yes “and “No”

Q. 37 – Added “N/A” option

Q. 38 – Deleted “sometimes” – only “yes” and “no “option

Q. 41 – Changed the question to “Has there been any stock-outs of N95 masks at your facility? Also changed the options to ‘never’, “last month”, “3 months”, “6 months”, “N/A”

Q. 43.Added the word “usually” to the question as well as “Only pick one option

3.5.3 Data collection procedure

Data collection took place during a two month period (mid-March 2018 to mid- June 2018). The plan was to have a slot at the monthly staff meeting at each of the six facilities to explain the study to the staff; however, due to operational challenges this only happened at two facilities. The researcher visited the remaining facilities and explained the research study to facility managers, medical officers and available nurses who were facility based. Individual nurses, like the school health nurses and psychiatric nurses were approached individually and the study was explained to them. Information sheets (Appendix 3) were handed out to participants before they were requested to complete the consent form (Appendix 4). Study questionnaires were distributed after the researcher received the completed consent forms. Clinicians received the questionnaires in envelopes and they were allowed to complete the questionnaires in they own time. Participants were encouraged to complete questionnaires on their own and not to consult with their colleagues for the answers. Completion of the questionnaire took between 15 – 25 minutes depending on the knowledge and experience of the participants. Arrangements were made for collection of questionnaires directly from participants on specified dates. Upon collection, the researcher checked the questionnaires for completeness, and when participants were present, they were asked to complete missing information, if any. Questionnaires were anonymous; however, participants could be traced by their consent forms as the researcher attached a number to the questionnaire. These names of the participants and numbers were kept separately and used to track those questionnaires that were handed out, were received back.

3.6 Data analysis

Data was captured from the completed questionnaires (primary data source) onto an Excel spreadsheet. This allowed the researcher to conduct data clean up and validation of data. It was challenging to eliminate incomplete data of participants doing night shift. Data was randomly selected from the extraction sheet and manually compared with the original database source to verify the accuracy of transcription. Data was then sorted, categorized and coded after it had been captured on Excel. Subsequently, data was then imported into Statistical Package for Social Science (SPSS®) version 25 and Amos version 23 for analysis.

3.6.1 Procedure for measuring variables

Both descriptive and inferential statistics were used. Frequencies were used to describe the distribution of the respondents. For continuous data, counts, the measures of central tendency (mean), the measures of dispersion (range, standard deviation, and more) were calculated; for categorical data, proportions and percentages were determined. With regard to inferential statistics, cross tabulations were used to determine associations between variables. The level of statistical significance was set at <0.001. The demographic variables explored in this study included: gender of clinicians, profession of clinicians, years of postgraduate practice/experience, name of healthcare facility, department and whether the clinicians had a history of TB or not.

Scores were generated to represent the three main variables (knowledge, attitude and practices) from the items in the questionnaires.

- Each of the knowledge questions had varied ranges of options (between 2 and 4 options) with only one answer being correct (with the exception of one question which had 9 out of 10 correct options). All correctly answered questions were summed and divided by the highest possible points of 25 (standardized possible responses). The score was multiplied by 10 to obtain the level of TB knowledge among clinicians on a scale of 1 – 10.
- The attitude questions were placed on a 5-point Likert scale and then a structural model was developed to measure attitude with other variables (knowledge and practice). After

an iterative process, seven indicators of attitude were retained in a model that satisfied fitness indices (Hooper et al, 2008; Moss, 2009).

- To assess the practices of clinicians, 7 question items were developed from literature. The total points scored by each respondent was divided by 7 and multiplied by 10 to obtain a weighted score of practices on a scale from 1 – 10. An additional 7 items were developed relating to the facility-wide practices of screening, diagnosis and treatment of TB. The same process as above was followed to obtain a scale of 1 – 10.

For objective 1, one-way ANOVA was used to determine the level of clinicians' knowledge, attitudes and practices on an aggregate and facility basis. The Fisher's test (F) was used and the p values were estimated for the above three valuables.

For objective 2, correlation analysis was used to determine the relationship between clinician's knowledge, attitude and practices of TB among clinicians in MDHS facilities.

For objective 3, a structural equation model was used and regression weights were estimated to determine the amount of statistically significant effect of knowledge and attitude on clinicians' practice.

For objective 4, correlation coefficient was used to estimate the relationship between the facility-based practices and clinicians' practices

3.7 Validity

Content validity of the questionnaire was ensured through a literature review based on questionnaires from other studies on a similar topic (Noé et al., 2017; Bhebhe et al., 2014b; Buregyeya et al., 2016; Bristow et al., 2013). The study questionnaire (Appendix 2) was pre-tested among clinicians who were similar to the study population and who were employed at a non-TB rendering MHS facility with a high TB prevalence. Participants were asked whether they had difficulty to understand the questions and appropriate adaptations were made. All clinical staff who met the inclusion criteria was approached to participate in the pre-testing of questionnaire to minimize information and measurement bias.

3.8 Reliability

A standardised self-administered questionnaire was used so that the same questions were posed to all the participants using the same format, thus the responses were recorded in the same manner. The reliability of the questionnaire was pre-tested by ten participants in a facility with a similar staff profile. The participants in the pre-test were not included in the study but were used to determine the precision of the questionnaire in measuring the knowledge, attitudes and practices of clinicians towards TB.

3.9 Generalisability

The study findings could be applied to similar facilities in the NTSS. Inference beyond this cannot be made. It is hoped that the results of this study will raise awareness of effective TB management particularly in the rest of the NTSS and may initiate best practices that can be used by all the clinicians in the reminder of the facilities in the NTSS.

3.10 Ethical considerations

Ethical approval for the study was obtained from the University of the Western Cape Biomedical Research Ethics Committee (Appendix 5) in December 2017 (Registration number BM17/10/13). Subsequent approval was received from the Western Cape Health Research Committee (Appendix 6) in January 2018 for access to the facilities in the Northern Tygerberg Sub-structure. An Information Sheet (Appendix 3) describing the study, potential risks and benefits and contact details of the researcher was handed to participants. The Information Sheet was available English and assured the participants of their confidentiality. Participation in the study was voluntary and participants had the option to withdraw from the study at any stage without any consequences. While no harm during the study was anticipated during the study, the chances of a limited risk to participants still existed. Counselling services through the employee wellness programme were available should participants require any due to emotional discomfort.

Informed decision to partake in the study was followed by signing the study Consent Form (Appendix 4).

Questionnaires had no identifiable names, but unique identifiers were used to validate whether all questionnaires that were handed out, were received back. Names and codes of participants were stored separately. Completed hard copies of the questionnaires were kept safely in a lockable cupboard of which only the researcher had access to. Collected electronic data was stored on a password-protected laptop to maintain confidentiality. The raw data (questionnaires) will be kept confidential and destroyed five years after the acceptance of the thesis. No personal detail will be mentioned in the study report. On the acceptance of the research report by the University of Western Cape Senate Research Committee, the findings will be made known to the relevant stakeholders, namely the director of NTSS, facility managers and clinicians. Opportunities to share findings broadly with MHS facilities and the HIV/AIDS, STI and TB (HAST) directorate in the Western Cape will be sought.

CHAPTER 4: RESULTS

4.1. Introduction

This chapter describes the results of the study and is divided into several sections namely description of study participants; knowledge, attitudes and practices of clinicians in tuberculosis (TB) management; the relationship between the knowledge, attitudes and practices of TB among clinicians; the impact of knowledge and attitudes on practices of clinicians in TB management; the relationship between facility-based practices and clinicians' practices in the management of TB in Metro Health Services (MHS) facilities; and whether facility and clinician's practices in TB management in MHS facilities deviate from standard practice. The descriptive analysis includes frequencies and cross tabulations used to determine the associations between variables.

4.2 Study participants

A total of 169 eligible clinicians (registered nurses and doctors) were identified in the six selected MHS facilities, namely Kraaifontein community health centre (CHC), Delft CHC, Bishop Lavis community day centre (CDC), Ruyterwacht CDC, Ravensmead CDC and Scottsdene CDC, from Northern Tygerberg Sub-structure (NTSS) and approached to take part in the study. A sample of 150 clinicians agreed and completed a multiple answer, self-administered questionnaire, giving a response rate of 89% (Figure 1).

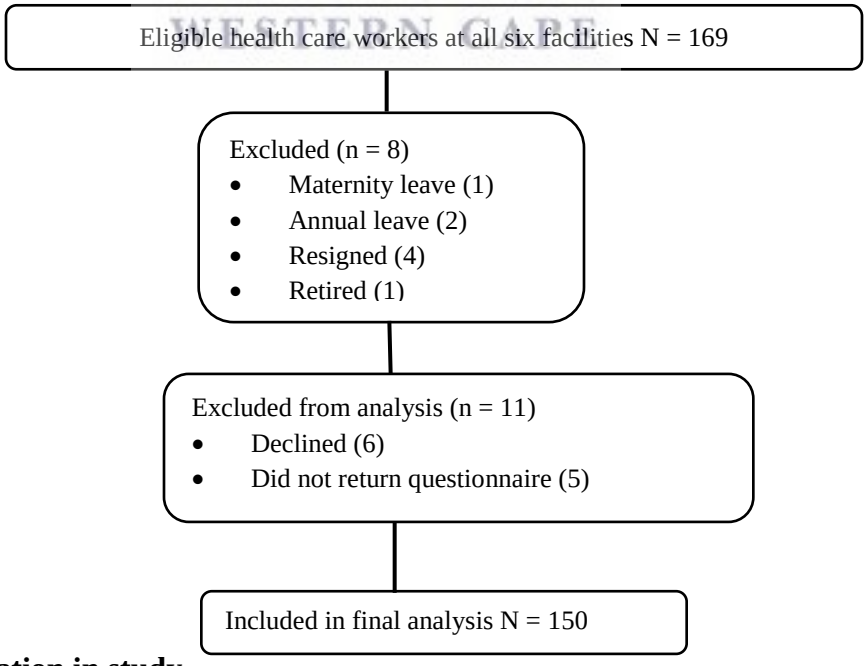

Figure 1: Participation in study

Table 1 provides further details of study participation per facility as well as reasons for non-participation. The numbers of clinicians per facility are in relation to the size of the facility and services provided. Six clinicians from Delft CHC, nine clinicians from Kraaifontein CHC, and four clinicians from Bishop Lavis CDC did not participate in the study due to various reasons. All the clinicians at Ruyterwacht, Ravensmead and Scottsdene CDCs participated in the study.

Table 1: Participation in study

Facility	Total clinicians	Clinicians participating in study				Clinicians not participating in study	
		Total	PNs	CNPs	DRs	Total	Reasons
Delft CHC	64	58	33	12	13	6	3 - declined 3 - did not hand back questionnaire
Kraaifontein CHC	46	37	20	7	10	9	3 - resigned 2 - declined 2 - leave(1 x maternity leave) 2- did not hand in questionnaire
Bishop Lavis CDC	40	36	20	11	5	4	1- declined 1- retired 1- maternity leave 1 - resigned
Ruyterwacht CDC	5	5	0	4	1	0	All staff participated
Ravensmead CDC	8	8	3	3	2	0	All staff participated
Scottsdene CDC	6	6	1	4	1	0	All staff participated
Total	169	150	77	41	32	19	

PN = professional nurse; CNP= clinical nurse practitioner; DR= doctor/medical officer

Table 2 shows the characteristics of the six MDS facilities and proportions of clinicians who participated. Delft CHC is a 24-hour facility and renders TB services. The largest proportion of respondents (39%) came from Delft CHC, which is expected, as Delft CHC is the biggest facility in NTSS. Kraaifontein CHC, also a 24-hour facility, contributed 25% of the respondents and does not currently offer TB services. Bishop Lavis CDC, a 8-hour facility, contributed 24% of the respondents and is the only CDC who offers TB services. Ruyterwacht, Ravensmead and Scottsdene CDCs are all 8-hour facilities and contributed 3%, 5% and 4% of the respondents,

respectively. The latter three facilities do not currently offer TB services. See Appendix 1 for a complete list of the primary health care facilities in NTSS and the managing authorities**.**

Table 2: Characteristics of six facilities and included clinicians

Health Care Facility	TB services	Operating hours	Included clinicians	Percent
Kraaifontein CHC	No	24hr	37	25
Delft CHC	Yes	24hr	58	39
Bishop Lavis CHC	Yes	8hr	36	24
Ruyterwacht	No	8hr	05	3
Ravensmead CDC	No	8hr	08	5
Scottsdene CDC	No	8hr	06	4
Total	**2**		**150**	**100.0**

4.3. Description of study participants

Table 3 shows the demographics of the study participants. There were a total of 117 (78%) professional nurses and clinical nurse practitioners and 33 (22%) medical officers included in the study. The vast majority were female (85%); only 22 (14.7%) were male.

Seventy-eight (51%) were professional nurses, of which 45% were female professional nurses and 41 (27%) were clinical nurse practitioners, all female. Thirty-three (22%) were medical officers, with higher proportion of females than males. The age of the clinicians ranged between 24-64 years, with a mean age of 40.9 years. The largest proportion, 57 (38%) of clinicians were between 40 – 49 years, and the second largest proportion were between 30 - 39 years old. Together these two age groups contributed 60% of the study participants. Only 5% of the study population was over 60 years.

Clinicians had very good levels of experience with 73% of the clinicians having more than 5 years of experience in primary health care (PHC). Clinicians worked in eight departments in the PHC setting. The majority of clinicians worked in the outpatient department and general (chronic diseases) (55), women's health (35), trauma (23), ARVs (17) and TB rooms (11). The psychiatric nurses (6) and paediatric nurses (3) were in the minority. A large proportion of clinicians were represented by Women's' Health which comprises clinicians working in the three Midwife Obstetric units in the sub-structure.

Table 3: Demographics of study participants (N=150)

Characteristics	Categories	Frequency	Percentage
Health care worker category	Professional nurse	76 68 (female) 8 (male)	50.7 45 5
	Clinical nurse practitioner	41 (all female)	27.3
	Medical officer	33 19 (female) 14 (male)	22 13 9
Gender	Female	128	85.3
	Male	22	14.7
Age categories	20 – 29 years	24	16
	30 – 39 years	33	22
	40 – 49 years	57	38
	50 – 59 years	28	19
	60 – 69 years	8	5
Health care worker category	Professional nurse	76 68 (female) 8 (male)	50.7 45 5
	Clinical nurse practitioner	41 (all female)	27.3
	Medical officer	33 19 (female) 14 (male)	22 13 9
Years working in primary care	Less than 5 years	40	27
	Between 5 and 10 years	52	34.7
	More than 10 years	58	38.7
Department	TB room	11	7.3
	ARV treatment	17	11.3
	Out-patient department	31	20.7
	General	24	16
	Trauma	23	15.3
	Paediatrics	3	2
	Psychiatric	6	4.0
	Women's health	35	23.3

4.4 Level of knowledge, attitudes and practices of clinicians in TB screening, attitudes and practices

4.4.1 Knowledge of TB screening, detection and treatment

Table 4 shows a summary of the frequencies and percentages of those clinicians who answered the knowledge statements correctly. Most of the clinicians, 144 (96%), agreed that TB is caused

by *Mycobacterium tuberculosis* and 136 (91%) agreed that TB is not caused by using utensils of a person with TB. Eighty five percent of participants thought that people with TB are still being stigmatized. One hundred and thirty five (90%) participants agreed that TB is a notifiable disease. The signs and symptom that received a high positive response rates were, persistent coughing, unexplained weight loss and drenching night sweats.

A large proportion of the participants (70%) correctly answered that all people infected with TB, do not have symptoms. Almost all of the participants (149) agreed that there is a strong link between TB and HIV. Fifty nine percent of participants identified that there is a difference between TB infection and TB disease. Only half (50%) of the participants could identify the standard Drug Sensitive (DS) TB treatment correctly, although the duration for DS TB treatment was answered correctly by 119 (79%). One hundred and twenty (80%) participants correctly indicated that TB medication should be taken for seven days a week. Only 80 (53%) of participants could define MDR TB correctly. Surprisingly, 121 (81%) participants identified the Genexpert as the preferred sputum test for diagnosing TB.

Table 4: Clinicians correctly answering knowledge of TB screening, detection and treatment questions (N=150)

Knowledge variables	Correct responses	
	Frequency	Percentage
TB is devastating to communities	130	(87%)
TB is caused by using utensils of a person with TB (correctly answered false)	136	(91%)
TB is caused by *Mycobacterium tuberculosis*	144	(96%)
People suffering from TB are being stigmatized	127	(85%)
TB is classified as a medical notifiable condition	135	(90%)
All people with TB infection have symptoms (correctly answered false)	105	(70%)
Difference between TB infection and TB disease	88	(59%)
Current preferred sputum test? – Genexpert	121	(81%)
Signs and symptoms of pulmonary TB?		
- Fever for more than 2 weeks	96	(64%)
- Shortness of breath	102	(68%)
- Loss of appetite	130	(87%)
- Persistent cough for 2 weeks or more	147	(98%)
- Unexplained weight loss (> 1, 5 kg in a month)	141	(94%)
- Child with pus coming out of the ear	26	(17%)
- Chest pain	79	(53%)
- On-going fatigue	106	(71%)
- Drenching night sweats	144	(96%)
Standard treatment for drug sensitive Pulmonary TB	75	(50%)
Duration of drug sensitive Pulmonary TB treatment	119	(79%)
Days per week a TB patient have to take medication	120	(80%)
Period a patient with TB should be considered less infectious	111	(74%)
People living with HIV should be concerned about TB	149	(99%)
Definition of multi-drug resistant TB	80	(53%)

4.4.2 Attitudes towards TB screening, detection and treatment

Table 5 shows the attitudes of clinicians towards TB screening, detection and treatment. Eighty seven percent (131) of the respondents indicated that they were comfortable diagnosing patients with TB, whilst 16 (10.7%) were unsure and 3 (2%) did not feel comfortable. On the question whether they are comfortable in treating patients with TB symptoms, only 119 (79%) responded positively, while 40 (26%) either felt unsure or did not feel comfortable. On the question whether the clinicians thought that they were sufficiently skilled to treat TB patients, only 65 (43%) indicated positively, while 40 (27%) responded that they were unsure, 45(30%) responded negatively. Ninety seven percent of the respondents felt that social and cultural factors have a huge influence on the developing of TB and treatment completion. All participants either strongly agreed or agreed that ventilation in the work area was important.

Surprisingly, a small percentage (8.7%) believed that traditional or alternative medication improves the effectiveness of TB treatment, whilst twenty-three (35%) were not sure about the effect of traditional medicine on TB treatment. The majority (90%) responded that MDR TB is curable, 19 (13%) of respondents were unsure and 5 (3%) felt that MDR TB is incurable. Sixty percent of the respondents agreed that MDR TB patients should hospitalized, 22 (15%) was unsure and 38 (25%) agreed against hospitalization.

To determine which of the latent reflective indicators adequately measured attitude, confirmatory factor analysis was conducted and seven indicators were retained that satisfied fitness indices. They are indicated in Table 5 by an asterisk. These seven indicators were used to calculate the attitude score (See Appendix 7 for further details).

Table 5: Clinicians' attitudes towards TB screening, detection and treatment (N=150)

ATTITUDE VARIABLES	Strongly agree/ Agree (%)	Not sure (%)	Strongly disagree / Disagree (%)
Comfortable diagnosing patients with TB symptoms*	131(87)	16(11)	3(2)
Comfortable treating patients with TB symptoms*	110(73)	29(19)	11(7)
Comfortable in treating TB patient if they have any other health conditions?*	119(79)	22(15)	9(6)
Social circumstances causes people to develop TB[#] *	136(90)	5(3)	8(5)
Social or cultural factors influence TB treatment completion.	146(97)	1(0.6)	3(2)
Traditional or alternative medicine improves the effectiveness of TB treatment.	13(9)	35(23)	102(68)
Drug-resistant TB can be cured?*	126(84)	19(13)	5(3)
All drug- resistant TB patients should be admitted to hospital for treatment.	90(60)	22(15)	38(25)
Ventilation is important in the area you work?*	150(100)	0(0)	0(0)
Sufficiently skilled to treat TB?*	65(43)	40(27)	45(30)

* Indicators used to calculate attitude score [#] one no-response

4.4.3 Practices of TB screening, detection and treatment

Clinicians' practice was assessed using 14 statements. The statements described all three levels of TB control, namely, administrative, environmental and person protective equipment. Seven of the items were based on facility practices. Table 6 shows the clinicians who reported optimal TB practice according to recognized guidelines.

Table 6: Reported clinicians' practices of TB screening, detection and treatment (N=150)

PRACTICE VARIABLES	FREQUENCY	%
INDIVIDUAL		
Consult Drug Sensitive TB guideline	104	(69%)
Consult Drug Resistant TB guideline	96	(64%)
Screen all patients	129	(86%)
Investigate/refer patients if suspect TB	142	(94%)
Educate patient on TB * combined always & often	114	(76%)
Educated on use of N95	117	(78%)
Often use N95 *every time and frequently combined	84	(57%)
FACILITY		
Copy of Drug Sensitive TB guidelines	104	(69%)
Copy of Drug Resistant TB guidelines	96	(64%)
Adhere to open window policy	141	(94%)
Missed TB doses and relation to resistance	109	(73%)
Facility provides N95	113	(75%)
Stock outs of N95	40	(27%)
Sputum collection method	61	(54%)

4.4.3.1 Individual practices: A total of 104 (69%) clinicians reported that they consulted the Drug Sensitive (DS) TB guidelines and 96 (64%) consulted the Drug Resistance (DR) TB guidelines. Eighty six percent of clinicians reported screening all patients for TB and 117 (78%) of the clinicians claimed they educate their clients about the risk of resistance. Ninety four percent of clinicians reported that they always investigate or refer patients if they suspect TB. Surprisingly, only 84 (57%) of clinicians frequently wore N95 mask while consulting patients (22% every time, 34% frequently, 32% rarely and 17% never use a mask). Yet, 117 (78%) of the clinicians had received training on the use of N95.

4.3.3.2 Facility practices: A total of 104 (69%) clinicians reported that they had a copy of DS TB guidelines and 96 (64%) reported that they had a DR TB guideline. Ninety four percent of the clinicians reported adhering to the open window policy. Twenty seven percent of clinicians

reported stock-outs of N95 masks. Only 61 (54%) of clinicians gave the correct method for collection of sputum. The majority of clinicians referred clients to the sputum booth to collect sputum but there is still a small percentage that allowed clients to produce sputum in consultation rooms (2%) and in the patient toilet (4%) in the facility.

4.4.4 Overall analysis of clinicians' knowledge, attitudes and practice scores of TB management

The estimated level of knowledge, attitude and practices of clinicians to TB screening, diagnosis and treatment were as follows:

- Knowledge score was 6.9 on a scale of 10 at 95% CI (6.708, 7.116)
- Attitude score was 1.5 on a scale of 10 at 95% CI (1.371, 1.554).
- Practices (individual) score was 5.5 on a scale of 10 at 95% CI (5.105, 5.867).

All scores were calculated by summing the total points scored by the study participants for knowledge, attitudes and practices (individual) and then dividing to convert to a scale from 1 – 10. The same was done for all the six facilities (Table 7).

The estimated mean for all three variables (KAP) were between the lower and upper bounds of the 95% confidence interval. This indicates that the clinicians' estimated level of their knowledge, their attitude and their practices are statistically significant. Individual clinician practices at facility level were all statistically significant. The results also showed that there was no significant difference in the clinicians' level of KAP across the six facilities. Due to the small sample size, Fisher's test (F) was used and p values for the three variables were also estimated. The following results were obtained: for knowledge, the F=0.89 at p=0.49; for attitude, F=0.82 at p=0.53; and for practices, F=1.35 at 0.25. The results show that there was no statistically significant difference in clinicians' knowledge, attitude and practices between different facilities and within facilities. This means that the mean level of knowledge, attitude and practices of clinicians were the same whether they were working at TB rendering sites or non-TB rendering sites. The sizes of the facilities also did not cause any skewness in the results.

Table 7: Estimated mean level of clinicians' knowledge, attitude and practices towards TB screening, diagnosis and treatment by primary health clinic (n= 6)

Variable	Facility	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Knowledge (6.9 on a scale of 10)	Kraaifontein	37	6.995	1.242	0.204	6.580	7.409	4.00	9.20
	Delft	58	6.890	1.338	0.176	6.538	7.242	2.80	9.20
	Ruyterwacht	5	7.280	1.308	0.585	5.655	8.905	5.20	8.40
	Bishop Lavis	36	6.767	1.316	0.219	6.321	7.212	4.00	8.80
	Ravensmead	8	6.500	0.701	0.248	5.914	7.086	5.60	7.60
	Scottsdene	6	7.733	0.547	0.223	7.160	8.307	7.20	8.80
	Total	**150**	**6.912**	**1.262**	**0.103**	**6.708**	**7.116**	**2.80**	**9.20**
Practice (5.5 on a scale of 10)	Kraaifontein	37	4.711	2.279	0.375	3.952	5.471	0.00	10.00
	Delft	58	5.640	2.244	0.295	5.050	6.230	0.00	10.00
	Ruyterwacht	5	6.856	2.118	0.947	4.226	9.486	4.29	10.00
	Bishop Lavis	36	5.833	2.470	0.412	4.997	6.669	1.43	10.00
	Ravensmead	8	5.536	2.465	0.871	3.476	7.597	2.86	10.00
	Scottsdene	6	5.475	3.052	1.246	2.273	8.677	1.43	10.00
	Total	**150**	**5.486**	**2.363**	**0.193**	**5.105**	**5.867**	**0.00**	**10.00**
Attitude (average=1.5 on a scale of 10)	Kraaifontein	37	1.515	0.469	0.077	1.359	1.672	0.81	2.69
	Delft	58	1.397	0.511	0.067	1.262	1.531	0.77	2.81
	Ruyterwacht	5	1.584	0.556	0.249	0.894	2.274	0.87	2.43
	Bishop Lavis	36	1.570	0.736	0.123	1.321	1.819	0.76	3.49
	Ravensmead	8	1.315	0.533	0.188	0.870	1.760	0.83	2.16
	Scottsdene	6	1.232	0.572	0.234	0.631	1.832	0.83	2.11
	Total	**150**	**1.463**	**0.568**	**0.046**	**1.371**	**1.554**	**0.76**	**3.49**

4.5 Relationship between TB knowledge, attitudes and practices among clinicians

The relationship between clinicians' knowledge, attitude and practices was determined using **correlation analysis and is presented in Table 8.**

Table 8: Relationships between practice, attitude and knowledge

Relationship	R	P value
practice and attitude	-0.419	<0.001
practice and knowledge	-0.017	0.836
attitude and knowledge	-0.078	0.346

There was no significant relationship between practice and knowledge; and attitude and knowledge. There was however a significant but negative relationship between practice and attitude (r=-0.419, statistical significant at <0.001). This was a very interesting result because it illustrated that no matter how knowledgeable the clinician is, it did not mean that the correct practices were adhered to. Even though the results showed that clinicians had positive attitudes, it had a negative weight to practices. This means that a positive attitude did not always translate into expected positive practices.

4.6 Impact of knowledge and attitudes on practices

The impact of clinicians' knowledge and attitude on daily routine practices were assessed with the assistance of a structural equation model (Appendix 7). Regression weights were estimated to determine the amount of statistically significant effect of knowledge and attitude on clinicians' practice. The results are presented in Table 9.

Table 9: Regression weights estimating the effect of knowledge and attitude on clinicians' practice of TB screening, diagnosis and treatment

Path	Standardised Estimate	Standard Error	P
practice <--- facility	0.425	0.068	<0.001
practice <--- knowledge	-0.069	0.123	0.297
practice <--- attitude	-0.320	0.469	<0.001

From the above table, it is seen that the regression weight measuring the impact of knowledge on practice, r=-0.069, at p=0.297. This shows a negative impact of knowledge on practice. That is, the more knowledgeable a clinician is concerning TB screening, diagnosis and treatment, the less likely the clinician might put the knowledge into practice; this may be because of facility-wide peculiarities that may hinder the use of such knowledge. For instance, if a clinician knows that he or she should use a particular treatment procedure, which the facility should provide resources for, and the resources are not available, then a negative relationship is bound to exist between knowledge and practice. In other words, the facility limits the clinicians' ability to conduct best practice despite having a positive attitude.

4.7 Relationship between facility-based practices and clinicians' individual practices

Correlation coefficient was used to estimate the relationship between the facility-based practices and the clinicians' individual practices. The result, $r=0.529$ at $p<0.001$, showed that the facility-based practices are positively and strongly related to the individual clinicians' practices concerning the diagnosis, screening and treatment of TB. On comparing the seven facility and seven individual items in the attitude questions, it is noted that there is a strong relation between what the clinician do versus what the facility allows the clinician to do. This result implied that what an individual clinician does is largely determined by what the healthcare facility resources allow. In other words, if the resources at facility level allowed the clinician to adhere to the standard prescribed TB management guidelines, the clinicians were more likely to do so. The opposite is also true. Despite the fact that clinicians were well aware of recommended standard practices, they tended to align to facility standards despite knowing the correct practice. This means that whatever the clinician knows as a standard practice, is not necessarily the clinicians' practice but rather dependent on the facility-wide practice baseline. This perhaps explains the reason for the negative and insignificant relationship between the clinician's knowledge and practice of TB screening, diagnosis and treatment found in objective three.

CHAPTER 5: DISCUSSION

5.1 Introduction

The aim of the study was to determine the knowledge, attitude and practices of clinicians in the screening, diagnosis and treatment of tuberculosis (TB) in the primary health care facilities of the provincial Metro Health Services (MHS). A total of 150 professional nurses, clinical nurse practitioners and medical officers (MOs) from six primary health care facilities (TB and non-TB rendering facilities) in the Northern Tygerberg Sub-structure (NTSS) were included in the study. A response rate of 89% was obtained. The age of the participants ranged between 24–64 years with a mean age of 40.9 years. Females constituted the majority of the participants as well as the majority in the each professional group. The majority of the participants were from Delft CHC (58) and Kraaifontein CHC (37). Pertinent findings of the research study are discussed in this chapter.

5.2 Overall knowledge, attitudes and practices of clinicians of TB management

In this study, the average knowledge score was 6.9 on a scale of 10, attitudes reached a mean of 1.5 on a scale of 10 and practices reached an average score of 5.5 on a scale of 10. The overall knowledge scores of clinicians pertaining to screening, diagnosis and treatment were average. The results in the current study is lower than the results from a review article by Abd Wahab et al., (2016) who reported on knowledge, attitude and practices (KAP) studies among health care workers worldwide were good. This review article included KAP studies from Thailand, Vietnam, South India, Philippines and Lesotho and concurred that clinical knowledge of clinicians were more good than fair. Overall attitudes of participants in the mentioned countries were generally positive and a good sense of awareness towards TB infection measures. Good scores were also reported concerning practices. Contrary to these study findings, a Nepalese study (Shrestha et al., 2017) showed poor levels of TB knowledge (45.8%) and the level of TB knowledge was significantly associated with educational status and training. A possible reason for the poor knowledge level in the aforementioned study might be the fact that different cadres of staff (clinicians, laboratory staff, community care workers and administrative staff) were included in the study. Similarly, low knowledge scores (<50%) were also reported in a South

African study by Malangu and Mngomezulu (2015). A Nepalese study (Shrestha et al., 2017) and Lesotho study (Bhebhe et al., 2014) reported that the majority of participants had positive attitudes toward TB IC. The majority of health care workers in the above study, however, had low levels of TB prevention practices. Similarly, Tamir et al., (2016), reported low scores on TB IC practices.

There were also no significant differences in the knowledge scores of clinicians working at TB rendering facilities and non-TB rendering facilities. An in-depth analysis is needed to assess whether clinicians working in TB departments were indeed more knowledgeable than clinicians working in other departments.

5.3 Knowledge of clinicians of TB screening, detection and treatment

The study found that a sizable number of clinicians do not know that there is a difference between TB infection and TB disease. This disturbing fact might be due to insufficient training or ignorance towards the TB disease.

Clinicians reported that they did screen all patients for TB, but the study did not verify if screening actually took place as follow-up folder reviews and observations during assessments of patients were not conducted. Clinicians working in departments other than TB tended not to screen patients optimally due to their high workloads. This was supported by a South African study measuring quality gaps in TB screening using Standardized Patient analysis highlighting gaps in the clinical practices at PHC facilities (Christian et al., 2018). This practice ultimately results in missed opportunities in the identification of TB patients and subsequent follow-up treatment.

A Western Ugandan study among HCWs and patients found that HCWs in more peripheral health centres were oblivious about the signs and symptoms of TB and therefore did not screen patients for TB (Wynne et al., 2014). The study also found that a significant percentage of deaths in HIV positive patients were reported due to undiagnosed TB. Retrospectively participants in this study realized the strong link between TB and HIV and the importance of active screening for TB in HIV patients. Local recognition of HIV/TB link is evidenced by Western Cape TB

treatment guidelines recommending that patients who have been diagnosed with TB should be screened for HIV, and this practice has been accepted and is being implemented in all TB rendering facilities in the Western Cape (PACK, 2018).

The detection rate of TB cases was not captured for the purposes of this study. The extent of correct diagnosis algorithms was also not assessed. Christian et al., (2018), identified some diagnostic deficiencies. Their study included the likelihood of presumptive TB patients leaving health care facilities without being tested for TB and some patients leaving facilities without being informed that they need to return for results. These findings strengthen the notion that care provided to control TB prevention in South Africa is not optimally effective if the country's resources are taken into consideration. Suthar et al., (2016) is of the opinion that by striving to reach the 90-90-90 targets for TB (i.e., 90% of vulnerable populations screened, 90% diagnosed and started on treatment, and at least 90% cured), progress towards reductions in TB mortality will be an added positive outcome. The authors furthermore advocate for a stronger movement towards active case detection strategies, multidrug-resistant TB management, HIV co-infection and new care pathways in order to reach the aforementioned targets.

It was disappointing that half of the clinicians were not able to identify the correct drug treatment for drug sensitive TB. By not being aware of the standard TB drug regimen, clinicians are at risk of prescribing incorrect regimens which is ultimately detrimental to the patient's health (drug-drug interactions, inefficient drug dosages and ultimately resistance), not to mention the impact on public health and the burden of TB in the province. In addition, only 53% of clinicians could define drug-resistant TB correctly. In a high TB burden setting like the Western Cape Province, it is imperative that clinicians know exactly what drug-resistant TB is and how to manage such patients accordingly. Kigozi et al., (2017) concur that for TB treatment to be effective, it is crucial that patients are initiated on the correct treatment regimen. Currently, TB training is offered on a quarterly basis by CoCT and the Western Cape training department (People Development Centre) but it currently training sessions do not satisfy the demand.

5.4 Attitudes of clinicians to TB screening, detection and treatment

The study found that clinicians were comfortable in diagnosing TB but not in treating TB. This correlated with the finding that only 43% of clinicians felt that they were sufficiently trained to treat TB. A contrasting finding in the study was that clinicians said that they felt comfortable

treating TB patients with co-morbidities. The discordant responses from the clinicians showed that attitudes were in a negative direction. Studies in South Indian and South Africa found that clinicians displayed positive attitudes towards TB; this however was not the same in their Thailand counterparts who displayed a negative attitude towards TB patients (Abd Wahab et al., 2016). Anecdotally, the attitudes of clinicians will be more positive once they have personal experience with TB diagnosis. Clinicians' attitudes also play a significant role in the implementation of TB IPC practices implementation within the primary health care facilities and therefore should be adequately motivated. Zinatsa et al., (2018) in their study among TB nurses and facility managers in the Mangaung Metropolitan District, South Africa found that low levels of motivation posed an impediment to the implementation of TB infection control. Definite interventions are needed to upskill clinicians in the whole management of TB.

5.5 Practices of clinicians to TB screening, detection and treatment

5.5.1 Individual practices

Scores on individual practices were fairly good. This is contrary to a study by Shrestha et al. (2017) where the overall knowledge and practices of HCWs on TB IPC were not satisfactory. The following section will discuss the individual practices that the study identified and encompasses the TB guidelines, screening and wearing of masks. Clinicians did not consult the TB guidelines optimally; clinicians only used drug sensitive and drug resistant TB guidelines respectively 69% and 64% of cases. The availability of separated infection control guidelines were not assessed as infection control guidelines with regards to TB infection are being describe in the TB guidelines. Adherence to these guidelines would already have a positive effect on infection control measures in facilities.

Clinicians reported relative high percentages in screening and referrals of patients with presumptive TB. Eighty six percent of patients were screened for TB and clinicians reported that in they referred patients with presumptive TB symptoms in 94% of cases. This is contrary to findings by (Christian et al., 2018) which found that TB screening protocols and best practices were poorly adhered to at PHC level. One important finding is the poor utilization of masks by

clinicians. Despite the fact that more than two thirds of the clinicians received training on the use of N95 masks, frequent use of masks remained low in comparison to percentage that received training and the availability of masks. Poor knowledge and practices on the use of personal protective equipment can also be linked to poor utilization of masks among South African clinicians (Engelbrecht et al., 2016). The mentioned study also highlighted the need of wearing a respirator while consulting a patient. Clinicians also perceived stigma associated with wearing masks when caring for TB also as a poor adherence. Similarly, Tenna et al., (2013) also reported that only 12% of HCWs wore respirators when caring for patients with active TB. This is in contrast with Mirtskhulava et al., (2015), who reported that availability of respirators in health care facilities seemed to have been was the only significant predictor of routine use of respirators (aOR, 5.1; 95% CI, 3.50–7.30).

5.5.2 Facility practices

Facilities do not prioritize the accessibility of TB guidelines in facilities. Drug sensitive TB guidelines TB guidelines were in 69% and 64%, respectively available in facilities. TB guidelines are valuable reference resources and can assist in the awareness of infection control measures and add to rendering quality health care. TB guidelines are very useful reference sources and should be more accessible for staff. In a study done in KwaZulu-Natal (Malangu and Mngomezulu, 2015,) less than 50% of requirements for TB infection control were adhered to at facility level.

A large proportion of participants indicated that they do adhere to the open window policy. No observations were done to confirm adherence to open window policy. The open window policy is not completely adhered to at MHS facilities in NTSS (Lloyd, 2018). Tenna et al., (2013) reported that only 43% of HCWs open windows to facilitate natural airflow in crowded hospital wards. This is contrary to a South American study (Escombe et al., 2007) where natural ventilation over performed the mechanical airflow within congregated wards. Stock-outs of N95 masks were reported in 27% of cases but stock-outs were for small periods and only at a minimum number of facilities.

Infrastructural challenges also have a substantial impact on the management of TB patients. Inadequate or poorly designed infrastructure made it difficult to adhere to infection control protocols, thus the low compliance (54%) to sputum collection methods due to inadequate facilities to collect sputa. However, infrastructural challenges were not explore in this study.

It appears that both individual and facility practices are lacking administrative and IPC measures but sufficient evidence to proof the above could not be extrapolated. Arguments from other investigators who noted failures in administrative controls (Buregyeya et al., 2016; Ogbonnaya et al., 2011; Tenna et al., 2013) forms a solid basis for further investigative studies.

5.6 Link between individual and facility practices

This study found a strong relationship between what clinicians do versus what the facility allows the clinicians to do. It appears as though it was mostly infrastructural challenges that did not allow clinicians to operate at a good practice standards. In the current study, adherence to correct sputum collection method and copies of TB guidelines scored below 70%. Although adherence to open window policy scored relatively high, actual implementation of this policy was not assessed. It is not difficult to link the insufficiencies in the health care system with the poor outcome of TB patients (Wynne et al., 2014). Wynne and others explain that the lack of relevant and updated TB training for HCWs result in patients having repeated visits to health facilities, progressed symptoms and ineffective medication before seeking care at higher level health facilities. Clinicians also tend to align to sub-standard facility practices despite knowing the correct practice and this behavior can be linked to the lack of support from facility management. In the current study, clinicians might feel that they do not get adequate guidance from their management with regards to infection control practices and that an aged facility infrastructure complicates the implementation and adherence to these practices. Small facilities, insufficient waiting rooms, inability to separate coughing patients, feelings of powerlessness, poor district health support and poor occupational health support were some of the factors that Zinatsa et al., (2018) identified as reasons that impede on good TB infection control.

5.7 Relationship between TB knowledge, attitudes and practice

In the current study, no significant relationship between practice and knowledge; and attitude and knowledge could found. There was a significant relationship between practice and attitude; this however, did not reflect positive practices among the clinicians. No positive adherence to practices from clinicians could be isolated and the study showed that practices were implemented poorly. An interesting finding was the fact that younger clinicians had a better knowledge level than older clinicians but that this knowledge did not translate into improving daily implementation of infection control measures. This may be because even though younger clinics had the theoretical knowledge, they have not yet had the experience to implement their knowledge. Wynne et al. (2014) also found that some clinicians rely on outdated TB knowledge, which makes it difficult for clinicians to identify and treat TB patients.

Individual practices, as well as facility practices, can hinder the relationship between knowledge, attitudes and practices of in some aspects of TB management. Hence, the reason why Engelbrecht et al., (2016) is in favor of interventions to change the behavioral of clinicians with regards to the overall management of TB.

5.8 Limitations

The assessment of knowledge, attitudes and practices on TB management was limited, as it did not cover all the aspects of TB management, for example, implementation of correct clinical guidelines and management, referral pathways, prior training in TB, perceptions of clinicians about TB on their workload and possible resistance to TB management. Secondly, self-reporting questionnaires can overstate the clinicians' knowledge and adherence to infection control practices and might not reflect clinicians' true reflection of knowledge, practices and attitude towards management of TB patients. No subsequent actions were taken to validate whether screening and infection control practices were adhered to. Lastly, despite a high response rate of 89%, the sample size of respondents was small, due to time and financial constraints of a Master of Public Health mini-thesis and one could argue that a bigger sample size might have given different results to the not statistically significant results.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

The study found that the mean knowledge and practice of clinicians working at PHC facilities in the Northern Tygerberg Sub-structure (NTSS) to TB screening, diagnosis and treatment were 6.9 and 5.5 respectively, above average on a scale of 10. However, it was found that despite reporting a positive attitude towards TB, attitudes towards TB screening, diagnosis and treatment were significantly low (1.5 on a scale of 10) and had an inverse impact on practices. Low and negative attitudes towards management of TB might be related to the fact that more than 88% percent of clinicians had no history of TB. Surprisingly, the study found no difference in the knowledge, attitudes and practices between the different staff categories or across facilities rendering TB treatment and those not.

Remarkably, clinicians did not know that there is a difference between TB infection and TB disease. Clinicians also did not deem clinical symptoms like chest pain and pus coming from a child's ear as important in the diagnosis of TB. In addition, only half of the respondents knew the correct drugs for treating DS TB and similarly, only half knew the correct definition of DR TB.

The majority of clinicians said they were comfortable diagnosing and treating patients with TB symptoms. It was unexpected that clinicians felt more comfortable in treating TB patients with co-morbidities versus patients with only TB diagnosis, however, only 43% reported that they are sufficiently skilled to treat TB. The majority of clinicians still felt that DR TB patients should be hospitalized.

The study found that individual practices were not in line with recognized TB guidelines. The less experienced clinicians showed an inability to transform their knowledge of TB into improved and sustainable infection control practices. Insufficient training and non-adherence to policies and guidelines are likely to have an undesirable influence on TB infection control implementation.

Despite the small sample size of the study, one could speculate that similar findings might be obtained in PHC facilities in the rest of the Cape Metropole.

6.2 Recommendations

The following strategies are recommended to improve clinicians' knowledge, attitudes and practices of TB management.

- Introduce focused TB-related training in screening, detection and treatment to improve clinical competencies and attitudes of all clinicians, as well as infection control practices.
- Conduct a more detailed observational study on this topic to reveal hidden barriers to the effective management of TB at PHC facilities.

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Appendix 1: Primary health care facilities in Northern Tygerberg Sub-Structure (with selected facilities in bold) and managing authorities

Authority	**MDHS facilities**		**MDHS and CoCT joint facilities**	**CoCT facilities**
TB services	Not providing TB services	Providing TB services	TB services provided by CoCT only	**All provide TB services**
Tygerberg sub-district	Bellville Reproductive Centre Elsies River Reed Street **Ruyterwacht (medium)** Symphony	**Bishop Lavis (medium)** **Delft (large)**	Goodwood Kasselsvlei Parow **Ravensmead (small)**	Adriaanse Delft South Elsies River Nooitgedacht St Vincent Uitsig Valhalla Park
Northern sub-district	**Kraaifontein (large)**	Bothasig	Durbanville **Scottsdene (small)**	Brackenfell Brighton Bloekombos Fisantekraal Harmonie Northpine Wallacedene

Appendix 2: Participant questionnaire

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa
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Study questionnaire

Project Title: Knowledge, attitudes and practices of tuberculosis management among clinicians working at primary health facilities in the Northern Tygerberg Sub-Structure, Cape Town.
Ethics approval number_ (BM17/10/13) _____

Study No:

Instruction: Please place a tick in the spaces provided for the selected answers.

A. **SOCIO-DEMOGRAPHICS AND PROFESSIONAL HISTORY**

1. **At which health care facility are you currently working?**

Kraaifontein CHC		1
Delft CHC		2
Ruyterwacht		3
Bishop Lavis CHC		4
Ravensmead CDC		5
Scottsdene CDC		6

2. **In what department do you currently work?**

TB room		1
ARV department		2
Out-patient department (OPD)		3
General		4
Trauma		5
Paediatric		6
Psychiatric		7
Women's health		8

3. **What is your age? _____**

4. **What is your gender?**

Female		1
Male		2

5. What is your profession? Tick one.

Professional nurse		1
Clinical nurse practitioner		2
Medical officer		3

6. Since you have graduated, how many years of experience in primary health care (PHC) facilities do you have?

Less than 5 years		1
Between 5 and 10 years		2
More than 10 years		3

7. Have you ever been diagnosed with tuberculosis (TB)?

Yes		1
No		2

B. **KNOWLEDGE OF TB**

8. Do you agree with the following statements on TB? Answer by ticking True or False.

The effect of TB is devastating to communities		1
TB is caused by using utensils of a person with TB		2
TB is caused by Mycobacterium tuberculosis		3
People suffering from TB are still being stigmatized		4

9. TB should be classified as a medical notifiable condition

Agree	1	Not sure	2	Disagree	3

10. All people with TB infection have symptoms

True		1
False		2
Don't know		3

11. There is a difference between TB infection and TB disease

Yes		1
No		2
Don't know		3

12. What is the current preferred sputum test used in your facility to diagnose TB? Please pick ONE only.

Sputum smear		1
Gene expert		2
Culture		3

13. What are the signs and symptoms of pulmonary TB? (Please tick all applicable)

Fever for more than 2 weeks		1	Child with pus coming out of the ear		6
Shortness of breath		2	Chest pain		7
Loss of appetite		3	On-going fatigue		8
Persistent cough for 2 weeks or more		4	Drenching night sweats		9
Unexplained weight loss (> 1,5 kg in a month)		5	Do not know		10

14. What is the standard treatment for drug sensitive Pulmonary TB? Tick the correct answer.

Pyrazinamide, Rifampicin, Streptomycin, Isoniazid(INH)		1
Rifampicin, Isoniazid(INH), pyrazinamide, Ethambutol		2
Rifampicin, Isoniazid(INH), Pyrazinamide, Kanamycin		3
Rifampicin, Isoniazid(INH), Pyrazinamide, Pyridoxine		4

15. What is the duration of drug sensitive Pulmonary TB treatment? Tick the correct answer.

6 months		1
9 months		2
18-24 month		3
Don't know		4

16. How many days per week does a TB patient have to take medication?

5 days per week		1
6 days per week		2
7 days per week		3
Do not know		4

17. How long should a patient with TB be considered less infectious?

After 2 days of starting TB medication		1
After 2 weeks of being adherent to TB medication		2
For the duration of TB treatment		3
Do not know		4

18. Do you think people living with HIV should be concerned about TB?

Yes		**If yes go to 18a**	1
No		**If no go to 18b**	2

18a. Why? Please tick one.

A person living with HIV is more likely to develop TB		1
I do not know		2

18b. Why not? Please tick one.

A person living with HIV is less likely to develop TB		1
I do not know		2

19. How would you define multi-drug resistant TB? Tick the correct answer.

Mycobacterium Bacillus resistant to Isoniazid(INH) and Rifampicin		1
Mycobacterium Bacillus resistant to INH and Ethambutol		2
Mycobacterium Bacillus resistant to Rifampicin, Ethambutol and Pyrazinamide		3
Mycobacterium Bacillus resistant to Streptomycin and Pyrazinamide		4

C. **ATTITUDES TOWARDS TB**

20. Are you comfortable in diagnosing patients with TB symptoms?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

21. Are you comfortable in treating patients with TB symptoms?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

22. Are you comfortable in treating a known TB patient if they have any other health conditions?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

23. Do you think that social circumstances causes people to develop TB?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

24. Do you think that social or cultural factors influence TB treatment completion?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

25. Do you think that traditional or alternative medicine improves the effectiveness of TB treatment?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

26. Do you think that drug-resistant TB can be cured?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

27. Do you think that all drug- resistant patients should be admitted to hospital for treatment?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

28. Do you think that ventilation is important in the area you work?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

29. Do you think you are sufficiently skilled to treat TB?

Strongly agree	1	Agree	2	Not sure	3	Disagree	4	Strongly disagree	5

D. **PRACTICES WITH REGARD TO TB & PREVENTION OF CONTROL OF TB**

30. Do you have a copy of the drug sensitive TB/PACK guidelines in your consultation room?

Yes		1
No		2

31. Do you consult drug sensitive TB guidelines in the management of the disease?

Often		1
Sometimes		2
Never		3

32. Do you have a copy of drug-resistant TB guidelines/PACK guidelines in your consultation room?

Yes		1
No		2

33. Do you consult drug resistant TB/PACK guidelines in the management of the disease?

Often		1
Sometimes		2
Never		3

34. Do you screen all patients irrespective of health condition for TB symptoms?

Yes		1
No		2

35. Do you investigate/refer patients to your colleagues when you suspect they have TB?

Yes		1
No		2

36. If you screen patients for TB symptoms, do you educate your patient on TB?

Always		1
Often		2
Sometimes		3
Never		4

37. Does the "open window" policy apply in your facility?

Yes		1
No		2

38. Do you inform your newly diagnosed TB patient that missed medication doses can lead to drug resistant TB?

Yes		1
No		2
Sometimes		3
Not applicable		4

39. Have you been educated on the use of N95 mask/respirator?

Yes		1
No		2

40. Does this facility provide you with N95 masks?

Always		1
Sometimes		2
Never		3

41. Has there been any stock-outs of the N95 masks at your facility? Pick ONE option only

In the last month		1
In the last three months		2
In the last six months		3
Never		4
Not applicable		5

42. How often do you use a N95 mask?

Every time when consulting a patient	1	Frequently	2	Rarely	3	Never	4

43. How do you usually collect sputum samples from your patients? Pick ONE option only.

Patient produces sputum whilst in consultation room		1
Patient use sputum booth		2
Patient produces sputum in patient toilets		3
Patient handed a sputum jar to collect sputum at home		4
Patient produces sputum in open area outside of the facility		5

Thank you for your participation

Appendix 3: Study Information sheet

UNIVERSITY OF THE WESTERN CAPE

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INFORMATION SHEET

Project Title: Knowledge, attitudes and practices of tuberculosis management among clinicians working at primary health facilities in the Northern Tygerberg Sub-Structure, Cape Town.

What is this study about?

This is a research project being conducted by Juanita Mclaughlin, a Master of Public Health student at the University of the Western Cape. We are inviting you to participate in this research project because you are knowledgeable about the topic. The purpose of this research project is to determine the knowledge, attitude and practices of clinicians in the screening, diagnosis and treatment of tuberculosis in the Metro District Health Services primary health care facilities in the Northern Tygerberg Sub-structure (NTSS), Cape Town.

What will I be asked to do if I agree to participate?

You will be asked to complete a multiple answer questionnaire. You will be informed about the details of the study and will be requested to sign informed consent. You will be allowed to complete the questionnaire in the comfort of the facility where you are working. It will take about 30 minutes to complete the questionnaire. It will be expected from you to deposit your completed questionnaire in a post box in the manager's office. If any incomplete questions, the researcher will inform you and you will be asked to complete these questions. There will be no financial incentives offered for participation in this study.

Would my participation in this study be kept confidential?

The researchers undertake to protect your identity and the nature of your contribution. To ensure your anonymity, questionnaires will not contain information that personally identifies you. Your

name will not be included on the questionnaire and other collected data. The researcher will be able to link your questionnaire to your identity and the facility where you work by making use of an identification key. The researcher will be the only person who will have access to the identification key.

To ensure your confidentiality, all completed questionnaires will be kept safe in a lockable cupboard and storage area. Identification codes will only be used on data forms and all research information will be stored in password-protected computer files. Your identity will be protected when producing any report or article written about this research project

What are the risks of this research?

There are no known risks to you. You may however experience emotional discomfort when completing the questionnaire. In the event of any emotional discomfort experience, counselling will be provided by the employee wellness programme.

What are the benefits of this research?

This research may not benefit you directly or personally, but the results will help the researcher learn more about the factors that may influence the treatment and management of TB patients. We hope that, in the future, other people might benefit from this study through improved understanding of factors influencing the optimal treatment of patients with TB or presumed TB.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you initially decided to participate in this research and change your mind at a later stage, you may withdraw from the study at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized in any way.

What if I have questions?

This research is being conducted by **Juanita Mclaughlin from the School of Public Health** at the University of the Western Cape. If you have any questions about the research study itself,

please contact Juanita Mclaughlin at: 1st Floor, Bellville Health Park, Karl Bremer Hospital. Telephone number 021 815 8558 or email at Juanita.Mclaughlin@westerncape.gov.za. Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Prof Uta Lehmann
Director of the School of Public Health
Head of Department
University of the Western Cape
Private Bag X17
Bellville 7535
soph-comm@uwc.ac.za

Prof Anthea Rhoda
Acting Dean of the Faculty of Community and Health Sciences
University of the Western Cape
Private Bag X17
Bellville 7535
chs-deansoffice@uwc.ac.za

This research has been approved by the University of the Western Cape's Research Ethics Committee. (REFERENCE NUMBER: *to be inserted on receipt thereof*)

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
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Appendix 4: Consent Form

UNIVERSITY OF THE WESTERN CAPE

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Tel: +27 21-959 2809, Fax: 27 21-959 2872
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CONSENT FORM

Title of Research Project: **Knowledge, attitudes and practices on tuberculosis management among clinicians working at primary health care facilities in the Northern Tygerberg Sub-Structure, Cape Town.**

The study has been described to me in a language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits. I understand that all information collected during the study will be dealt with confidentially.

Participant's name……..

Participant's signature…….

Date……

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Appendix 5: Ethics approval from University of Western Cape Biomedical Science Research Ethics Committee

UNIVERSITY of the WESTERN CAPE

OFFICE OF THE DIRECTOR: RESEARCH
RESEARCH AND INNOVATION DIVISION

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07 December 2017

Ms J Mclaughlin
School of Public Health
Faculty of Community and Health Sciences

Ethics Reference Number: BM17/10/13

Project Title: Knowledge, attitudes and practices of tuberculosis management among clinicians working at primary health facilities in the Northern Tygerberg Sub-Structure, Cape Town.

Approval Period: 07 December 2017 – 07 December 2018

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report in good time for annual renewal.

The permission from the Provincial Health Department must be submitted for record keeping purposes

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
Research Ethics Committee Officer
University of the Western Cape

PROVISIONAL REC NUMBER -130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

Appendix 6: Permission for research study: Western Cape Government: Health

Western Cape Government
Health

Health Impact Assessment
Health Research Sub Directorate
Health.Research@westerncape.gov.za
Tel: +27 21 483 0866; fax: +27 21 483 9895
5th Floor, Norton Rose House, 8 Riebeek Street, Cape Town, 8001
www.capegateway.gov.za)

REFERENCE: WC_201712_024
ENQUIRIES: Dr Sabela Petros

University of Western Cape

Robert Sobukwe Road

Bellville

Cape Town

7535

For attention: Mrs Juanita Mclaughlin

Re: Knowledge, attitudes and practices of tuberculosis management among clinicians working at primary health care facilities in the Northern Tygerberg Sub-Structure, Cape Town

Thank you for submitting your proposal to undertake the above-mentioned study. We are pleased to inform you that the department has granted you approval for your research. Please contact the following people to assist you with any further enquiries in accessing the following sites:

Scottsdene CDC	**Sr Alma Mullins**	**021 444 8130**

Kindly ensure that the following are adhered to:

1. Arrangements can be made with managers, providing that normal activities at requested facilities are not interrupted.
2. Researchers, in accessing provincial health facilities, are expressing consent to provide the department with an electronic copy of the final feedback (**annexure 9**) within six months of completion of research. This can be submitted to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

3. In the event where the research project goes beyond the *estimated completion* date which was submitted, researchers are expected to complete and submit a progress report (**Annexure 8**) to the provincial Research Co-ordinator (Health.Research@westerncape.gov.za).

4. The reference number above should be quoted in all future correspondence.

Yours sincerely

AJ HAWKRIDGE.

DR A HAWKRIDGE

DIRECTOR: HEALTH IMPACT ASSESSMENT

DATE: 31/01/2018.

CC: **J ARENDSE** **DIRECTOR: NORTHERN TYGERBERG**

Appendix 7: Structural Model Measuring KAP of Clinicians about TB screening, diagnosis and treatment