Factors associated with adherence to TB treatment among TB patients in Modimolle Sub-District, Limpopo Province

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N MUKOMAFHEDZI

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Factors associated with adherence to TB treatment among TB patients in Modimolle Sub-District, Limpopo Province

By

NDIVHUWO MUKOMAFHEDZI

STUDENT NO: 201601961

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DECLARATION

I declare that the research dissertation hereby submitted to Sefako Makgatho Health Sciences University, for the degree of Master of Public Health has not been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

Miss N Mukomafhedzi 12 March 2018
Surname; initials (title) Date
DEDICATION

This dissertation is dedicated to my family, especially my mother Selina Mukomafhedzi, husband Khathutshelo Justice Nyamande, children Ronewa, Phumudzo Emmanuel and Rotondwa for their understanding, support and encouragement.
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ABSTRACT

Tuberculosis (TB) is a major global health problem including South Africa. South Africa is ranked sixth among the most burden countries globally. World Health Organization (WHO) introduced DOTS as global strategy for providing TB services which was expected to be delivered primarily by public health services to ensure that proper medications are given at a proper interval and at a right dose. Adherence to TB treatment requires active participation of patients in self-management of treatment and cooperation between patients and health care provider. Hence the study seeks to identify factors associated with adherence to TB treatment among patients diagnosed with pulmonary and Extra-pulmonary TB in Modimolle Sub-District, Limpopo Province.

Aim: To investigate factors associated with adherence to TB treatment in Modimolle Sub-District, Limpopo Province.

Materials and methods: This was a quantitative, descriptive cross-sectional study conducted at Modimolle Sub-district facilities, among TB patients initiated on TB treatment for more than two months. Closed-ended questions were used to collect data. Prior data collection informed consent was obtained from the participants. Raw data was captured into an excel spread sheet and coded, and it was imported into STATA software version 14.0 (StataCorp, Texas, USA) for statistical processing and analysis. Descriptive statistics and frequency distribution was used to analyze and interpret the mean, median and ratio variables (e.g. demographic variables). Logistic regression was constructed to determine factors associated with non-adherence. Statistical significance was set at p-value <0.05 with confidence interval of 95%. The Odds Ration and Chi-square (chi²) were used to determine measure of association between variables. Convenience sampling method was used to select study participants. All TB patients were identified from the TB registers when they come for their follow-up visits in the clinics.

Results: A total of 256 participants responded to the questionnaires. The mean age of respondents was 38 years with minimum of 15 and maximum of 78 years of age. There were more males (n=136/53.1%) than females (n=120/46.9%) participated in the study and a higher proportion of males (53.1%) were found to be more compliant
as compared to females (46.9%), but statistically there were not significantly different (p-value 0.743). Participants who wait more than 2hrs were found to be four times more likely to stop taking TB treatment before they complete as compared to those who wait less than 1hr (OR 4.2973; 95% CI=0.4997-0.36.9532), this was found to be statistically significant with p-value 0.047. Participants who felt better in less than 2 months after taking TB treatment were found to be less likely to be associated with TB treatment adherence amongst the participants (OR 0.5189; 95% CI= 0.1296-2.0771), although this was found to be statistically not significant p-value 0.354. The knowledge related to what should the participant do when he/she experiences signs of TB, e.g. by consulting: self-treatment was found to be three times more likely to be associated with stopping TB treatment before they complete (OR 3.450; 95% CI=0.9927-11.9917), although this was found to be not statistically significant. The p-value 0.051 was slightly greater than 0.05. With therapy and condition related factors, none of the aspects like for example whether participants were taking other medication while taking TB treatment and side effects experienced were not significant factors affecting TB treatment adherence.

Conclusion: The results suggest that reducing waiting times at the TB clinic through linkages with community programmes aimed at improving access to TB diagnosis and treatment, and maintaining successful treatment outcomes in the face of emerging drug resistance will improve TB treatment adherence. However, treatment supervision policies need to be enhanced to improve TB treatment outcomes.

Key words: Tuberculosis, Pulmonary TB, adherence, TB patients, TB treatment.
# TABLE OF CONTENTS

## CHAPTER 1

**ORIENTATION OF THE STUDY** ................................................................. 1

1.1 Introduction and background ......................................................... 1

1.2 Problem statement ........................................................................... 3

1.3 Research Aim ................................................................................... 4

1.4 Research questions ........................................................................... 4

1.5 Study objectives ............................................................................... 4

1.6 Significance of the study ................................................................. 5

1.7 Summary............................................................................................ 5

## CHAPTER 2.................................................................................................. 6

**LITERATURE REVIEW** ......................................................................... 6

2.1. Introduction ..................................................................................... 6

2.2. Factors associated with adherence and non-adherence to TB treatment .... 6

2.2.1 Socioeconomic factors ................................................................. 6

2.2. Patient related factors ................................................................... 7

2.3. Therapy and condition related factors ............................................. 8

2.4. Patient knowledge about TB ........................................................... 9

2.5. Health care system related factors ................................................. 10

2.6. Strategies for improving TB treatment adherence ......................... 11

2.6.1. Directly Observed Therapy (DOTS) ........................................... 12

2.6.2. Patient education ....................................................................... 12

2.6.3. Treatment support group........................................................... 13

2.6.4. Health system strengthening .................................................... 13

2.6.5. Engaging NGO’s in providing community TB care ................... 13

2.7. Conclusion ...................................................................................... 14

## CHAPTER 3 ................................................................................................. 15

**METHODOLOGY AND MATERIALS** ................................................... 15

3.1. Introduction .................................................................................. 15

3.2. The study designs ......................................................................... 15

3.3. Study setting and study population .............................................. 15

3.4. Sampling and sampling size .......................................................... 16
# LIST OF TABLES

Table 4.1: Mean age of participants.................................................................21  
Table 4.2: Relationship between age and TB patient stopping treatment..........22  
Table 4.3: Relationship between gender and TB patients stopping treatment......24  
Table 4.4: Relationship between marital status and TB patients stopping treatment 25  
Table 4.5: Relationship between level of education and stopping TB treatment......27  
Table 4.6: Measure of association between age and TB treatment non-adherence. 28  
Table 4.7: Measures of association between demographic information and  
participants stopping taking TB treatment before they complete .......................28  
Table 4.8: Relationship between employment status and stopping TB treatment.....30  
Table 4.9: Relationship between Food availability while taking TB treatment and 
stopping TB treatment....................................................................................31  
Table 4.10: Relationship between participants taking other treatment and stopping 
TB treatment..................................................................................................32  
Table 4.11: Measures of association: Therapy and condition related factors .........33  
Table 4.12: Relationship between clinic opening time and closing time .............34  
Table 4.13: Relationship between waiting period and stopping TB treatment.......35  
Table 4.15: Relationship between TB patients stopping treatment and transport cost.  
.....................................................................................................................................36  
Table 4.16: Relationship between DOT status and TB patients stopping TB treatment  
........................................................................................................................................37  
Table 4.18: Relationship between healthcare workers attitude and TB treatment non- 
adherence................................................................................................................38  
Table 4.19: Measure of association: healthcare system related factors .............38  
Table 4.20: Participants response with regard to knowledge of duration of taking TB  
treatment..............................................................................................................40  
Table 4.21: Relationship between knowledge of seeking medical care...............41  
Table 4.22: Measures of association: patient knowledge about TB ......................42
LIST OF FIGURES

Figure 4.1: Age distribution of all participants .................................................22
Figure 4.2: Gender distribution of participants ..................................................23
Figure 4.3: Participants distribution according to their marital status ..............24
Figure 4.4: Participants distribution according to their level of education attained ....26
Figure 4.5: Participants distribution of other treatment they were taking while taking TB treatment ........................................................................................................32
Figure 4.6: Participant knowledge regarding duration of taking TB treatment ......41
LIST OF ABBREVIATIONS

DOT    Directly Observed Treatment
DOTS   Directly Observed Treatment Short-course
ETBP   Extra-Pulmonary Tuberculosis
HAART  Highly Active Anti-Retroviral Therapy
HIV    Human Immunodeficiency VIRUS
HPT    Hypertensive treatment
PTB    Pulmonary tuberculosis
PHC    Primary Health Care
SMUREC Sefako Makgatho Health Sciences University Research Ethics Committee
SREC   School Research Ethics Committee
TB     Tuberculosis
WHO    World Health Organisation
LIST OF ANNEXURES

Annexure 1: Questionnaire (ENGLISH VERSION) .................................................57
Annexure 2: Lenaneopitšolšišo (SEPEDI VERSION) ........................................61
Annexure 3: Patient consent ...........................................................................66
Annexure 4: Clearance certificate from Sefako Makgatho Health Sciences University .................................................................67
Annexure 5: Permission letter from Limpopo Provincial Department of health ....68
Annexure 6: Permission letter from Waterberg district ....................................69
CHAPTER 1

ORIENTATION OF THE STUDY

1.1 Introduction and background

Tuberculosis (TB) is one of the major health problems in South Africa, with South Africa ranked sixth on the list of 22 high burden tuberculosis in the world (WHO, 2015). Despite the availability of effective short course regimen, tuberculosis (TB) remains a major global health problem that is associated with severe morbidity and mortality rates (Tola et al, 2014). For instance, according to a study conducted in some provinces in South Africa, indications were that there is a relationship between TB-infected individuals receiving anti-TB medications and certain factors such as: socio demographic characteristics, social support, adherence to therapy and quality of life dimensions (Finlay et al, 2012).

Although there are treatment regimens that have a greater than 95% efficacy in TB patients infected with mycobacterium tuberculosis strains susceptible to first line drugs, there are many patients who are unable to comply with treatment in some parts of Africa such as Uganda (13.0%), Nigeria (1 0.0%) and South Africa, with a non-compliance rate of 9.1% (Finlay et al, 2012). Because of this, thousands of patient’s die from tuberculosis every year (WHO, 2016).

Non-adherence to anti-TB treatment is one of the crucial challenges in improving TB cure-rates and reducing further healthcare costs (Adane et al, 2013). This is aggravated by non-adherence to anti-TB treatment tendencies in South African rural villages. Non-adherence to anti-TB treatment impacts negatively on healthcare costs, as TB patients end up being admitted at hospitals.

Adherence to treatment requires active participation of the patient in self-management of treatment and cooperation between the patient and the health care provider (Lackey et al, 2015). Early diagnosis and adherence to TB treatment may be beneficial to individuals in a community and may help reduce the risk of clinical deterioration and
prevent the development of drug resistant tuberculosis and relapse, which in turn prolongs morbidity and mortality (Ayisi et al, 2011).

In 1993, WHO declared TB as a global emergency and the organisation began a management and patient support strategy known as a Directly Observed Treatment Short course (DOTS). DOTS strategy was recommended to ensure that proper medications are given at proper intervals and at the right doses. However, a study conducted in North West province showed that majority of patients having TB on DOTS tend to default or interrupt TB treatment (Serapelwane et al, 2016).

A study conducted in three provinces of South Africa revealed that TB patients received DOTS during only intensive phase of treatment. The main findings demonstrate incomplete DOTS (Ershova et al, 2014). Moreover, a study conducted in North West province revealed that DOTS was ineffectively used. Study findings showed that Ineffective use of DOTS strategy occurred because of poor nursing administration and lack of communication (Serapelwane et al, 2016).

eThekwini Municipality in KwaZulu-Natal, the study found that smoking, alcohol consumption, and having a family member with TB were the significant predictors of defaulting treatment in informal dwellers. However, unemployment and malnutrition contribute to patient non-adherence to treatment (Rajagopaul et al, 2014). Reducing malnutrition, alcohol consumption, smoking and TB-related stigma are important to facilitate treatment adherence. Intervention to reduce these issues include food support and social and behaviour change education (NDOH, 2015)

A study conducted in Limpopo Province showed that there is an association between knowledge about TB and lost to follow-up. Patient education is a valuable component to control TB. According to Serapelwane et al (2016) regular and relevant health education about TB disease should be provided to patients having TB. Employed patients with TB are less likely to adhere with treatment due to inconvenience clinic hours. Defaulting on treatment remains a major challenge facing TB control program. Early patient tracing for missed appointment can be achieved by doing home visits. Community based worker can perform routine check-ups and take prescribed
treatment to patient’s home to improve patient adherence. However, prioritising TB patients’ appointments without waiting can reduce patient waiting time and increases compliance.

Integration of TB program with other chronic condition in the primary health care facility is an approach that strengthens the health care system providing integrated prevention, care and treatment for patients with chronic conditions. This approach aim at empowering people with TB and communities and it will help patient to take ownership of their own health (DOH, 2017).

1.2 Problem statement

Waterberg is the second district with the highest prevalence rate for TB in the Limpopo Province, contributing 20.3% of the total TB cases enrolled for treatment in Limpopo province in 2016. Non-adherence to tuberculosis (TB) treatment has a direct impact on cure rates which are currently below 85% amongst patients in Waterberg district (National Department of Health, 2015/2016).

Waterberg district has the highest non-adherence rate (13.2%) for pulmonary TB patients amongst the five districts in the province. The poor adherence to anti-TB treatment among patients is a major problem in the district as the stats for non-adherence stands at 12% defaulter rate as compared to the targeted rate of less than 5% (National Department of Health, 2015/2016). Non-adherence to TB treatment in Limpopo province will results to poor social and economic outcomes for individuals, families and society.

There is no evidence of research studies conducted in Limpopo province regarding treatment adherence among TB patients. Although the Directly Observed Treatment (DOT) strategy has been adopted in Waterberg District to reduce increasing TB prevalence and death rate, people are still failing to complete their treatment to declare cure rate. Patients’ ability to treatment plan is compromised by health system-related factors such as staff shortage, medicine stock out and long waiting time at clinics.
Equally, patient-related factors such as adhering to treatment and cost of accessing the clinic (Ndwandwe et al, 2014). Hence, this study deemed it necessary to investigate factors associated with adherence within this Sub-District.

1.3 Research Aim

The aim of the study was to investigate factors associated with adherence to TB treatment in Modimolle Sub-District, Limpopo Province.

1.4 Research questions

- What is the level of adherence in TB treatment among TB patients in Modimolle Sub-District?
- What are the factors associated with non-adherence to TB treatment among patients in Modimolle Sub-District?
- What are the factors associated with adherence to TB treatment in Modimolle Sub-District?

1.5 Study objectives

- To determine the level of adherence in TB treatment among TB patients in Modimolle Sub-District.
- To determine factors associated with non-adherence to TB treatment among patients in Modimolle Sub-District.
- To determine factors associated with adherence to TB treatment in Modimolle Sub-District.
1.6 Significance of the study

Identifying the factors associated with adherence to TB treatment in Modimolle Sub-District, Limpopo Province will give insight into the reasons behind high defaulter and subsequently low treatment success rates. This will not only contribute to the existing knowledge on the factors associated with TB treatment non-adherence in general, but it will also bring new knowledge specifically for Modimolle community. Once factors associated with non-adherence to TB treatment are identified then targeted strategies to address them can be formulated. The study will benefit TB patients (current and future) as the findings may be used to formulate strategies to improve quality of care. In addition, recommendations could then be made to the National Department of Health TB Control Programme on how treatment compliance could be improved in South Africa.

1.7 Summary

This chapter provided an introduction and background to the problem, as well as the research purpose, objectives and significance of the study. The next chapter will provide a detailed literature review.
CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

This chapter reviews relevant literature from previous studies on factors associated with TB treatment adherence and non-adherence. Several sources were consulted including WHO publications, District Health Information system, latest relevant journals and research articles sourced from the internet. This chapter covered factors associated with adherence and non-adherence to TB treatment and those factors included socioeconomic factors, patient related factors, therapy and condition related factors and health care system related factors.

2.2. Factors associated with adherence and non-adherence to TB treatment

2.2.1 Socioeconomic factors

Social factors such as low educational level, gender, poor health care worker-patient communication, lack of social support, unemployment and lack of transport money, are strongly associated with treatment non-adherence. In addition, overcrowding, HIV related immunological weakness and malnutrition facilitate the transmission of bacilli and TB treatment non-adherence. Furthermore, alcohol consumption and illicit drug use are two individual factors associated with TB treatment non-adherence (Finlay et al, 2012; Adane et al, 2013; Cherkaoui et al, 2014; Lackey et al, 2015).

A study that was conducted in South Africa, indications were that treatment non-adherence is associated with patient missing treatment due to employment. In addition, working far from the TB clinic, changing of residence during TB treatment, and fear of stigma and discrimination promote non-adherence to TB treatment (Finlay et al, 2012; Adane et al, 2013; Mohamed et al, 2013). However, cost and time of
travelling to the treatment centre is a major contributory factor associated with non-adherence to TB treatment (Finlay et al., 2012; Shargie et al., 2007). A study conducted by Finlay et al. (2012) revealed that non-adherence to TB treatment was associated with employment. The same study also revealed that reasons for non-adherence are working far from TB clinic, too busy and did not have time to go to the clinic and did not want others to know that they have TB. Moreover, unemployment, alcoholism and homeless were also related to non-adherence. Being employed is associated with treatment adherence because patients are able to afford transport cost, healthy food and healthcare fees. A study conducted in uMgungundlovu health district factors affecting non-adherence to tuberculosis treatment revealed that 91% of defaulters were earning less than R1 000 per months. The study further indicates that cost for transport accounts for non-adherence to TB treatment, especially once the patients feels better (Ndwandwe et al., 2014; Rajagopaul et al., 2014).

2.2. Patient related factors

A study that was conducted in Alamata District, Northeast Ethiopia on the Adherence to Anti-tuberculosis treatment and treatment outcomes revealed that non-adherence to TB treatment was due to forgetfulness, being away from home, treatment side effect and failure to visit health facility during appointment date (Cherkaoui et al., 2014; Tesfahuneygn et al., 2015). However, a study that was conducted by Tola et al. (2014) in developing countries such as Indonesia, Botswana and Morocco revealed that there is an increase in the level of knowledge about TB disease and its treatment. Besides socioeconomic factors, attitude towards treatment and lack of self-motivation to complete treatment are highly associated with treatment non-adherence (Tachfouti et al., 2012; Finlay et al., 2012; Cherkaoui et al., 2014). Furthermore a study conducted in South Africa revealed that alcohol consumption and cigarette smoking were associated with TB treatment non-adherence and lost to follow-up and it extends potential consequences, such as initial treatment failure and relapse. (Finlay et al., 2012; Adane et al., 2013; Tola et al., 2014). Alcohol and smoking are common challenges to treatment adherence.
A recent study conducted in Ethiopia on Factors contributing to non-adherence with treatment revealed that food insecurity and lack of money are associated with non-adherence to TB treatment. Furthermore, patients believed that lack of food or inadequate food was associated with severe side effects and a difficulty to tolerate TB treatment (Boru et al, 2017). Adults with poor nutrition are more likely to develop TB because Malnutrition can lead to secondary immunodeficiency that increases the host's susceptibility to infection. Nutritional status of patients improves during tuberculosis chemotherapy (Gupta et al, 2009; Boru et al, 2017). Provision nutritional supplements can result in fast recovery in TB patients.

Culqui (2012) revealed that treatment adherence is associated with patient sex usually male, treatment experience especially feeling malaise, or history of previous non-adherence, use of recreational drugs and dissatisfaction with the information received. Other predictive factors for default were inadequate knowledge about TB, feeling ashamed, herbal medication use, low income, alcohol abuse, previous default, HIV co-infection and the male sex. Participants said that they feel ashamed and embarrassed that they have TB (Finlay et al, 2012). Ershova et al (2014) found that Patients who received incomplete DOT or had a history of defaulting from TB treatment had an increased risk of non-adherence. Adherence to TB treatment can be improved by promoting TB treatment literacy among TB patients, their families and communities. This can be done by empowering healthcare provider with knowledge of TB.

According to Ndwandwe et al (2014) on their study conducted in uMgungundlovu on factors affecting non-adherence to tuberculosis treatment revealed that male was significantly associated with treatment default. A study conducted in Limpopo, South Africa reported a correlation between age and non-adherence. They further reported that defaulter rate among 22-55 years age group was 9.8%, which is higher than the international target of less than 5% (Gafar et al, 2014).

2.3. Therapy and condition related-factor

In Sub-Saharan Africa there is a high rate of non-adherence to TB treatment among TB patients. A study conducted in South Africa had revealed that most TB patients
have also visited traditional healer during their treatment which has resulted in non-adherence to treatment. However, patients with TB are expected to have adherence level of greater than 90% to facilitate a high cure rate (Finlay et al, 2012).

TB co-infected patients tend to default their TB treatment due to pill burden. Hence, a study conducted in South Africa revealed that not feeling better after few months of taking TB treatment promote non-adherence. Participants reported that they were taking TB treatment on empty stomach and they did not feel better after taking treatment (Finlay et al, 2012; Adane et al 2013). Even though the Directly Observed Treatment (DOT) strategy has been adopted in most regions of the country to reduce increasing TB prevalence and TB death rate patients are still failing to complete their treatment to declare cure rate (Adane et al, 2013). Adherence to TB treatment is crucial to achieve cure rate and avoid emergence of drug resistant TB (Tola et al, 2014). Stigma and discrimination in the community can be a barrier to patients adhering to TB treatment, seeking medical assistance and disclosing their disease to community members (Maswanganyi et al, 2014). The same author in Greater Giyani municipality on views of professional nurses regarding low TB cure rate revealed that TB patients uses facilities away from their home due to fear of stigma. Interviewed HCWs further stated that stigma may results in delay in seeking treatment or adhering to treatment correctly. Finlay et al (2012) and Adane et al (2013), also revealed that stigma and discrimination of TB and HIV patients result in patient not adhering to treatment because they do not want to be seen taking treatment. The stigma was mainly due to the fact that people associate TB with HIV. The same study also revealed that TB patients do not attend clinic regularly because they do not want people to know that they suffer from TB.

2.4. Patient knowledge about TB

Knowledge and patient attitudes about TB and its treatment differ usually due to different cultural, and beliefs affect compliance to TB treatment. Several studies revealed that lack of knowledge about TB symptoms or failure to recognize signs and symptoms results in delays in seeking healthcare. Thus, late diagnosis and delay in
treatment result in increased transmission of TB to close contact and community in general (Gupta et al, 2009; Culqui, 2012; Boru et al, 2017). A study conducted by Ali and Prins (2016) in Sudan on patient knowledge and behavioural factors leading to non-adherence to TB treatment revealed that there is knowledge gap between rural and urban area. The same study also revealed poor knowledge of signs and symptoms, transmission, treatment and prevention of TB in rural areas. Serapelwane et al (2016) revealed that defaulting from TB treatment due to lack of knowledge of the duration of treatment, treatment side effects results in low cure rate.

Lack of knowledge about TB and its treatment has a negative impact on management of TB patients. A study conducted in Limpopo, Giyani revealed that non-adherence to TB treatment was associated with moving from one area to another without informing HCW. The same study revealed that TB patients did not take the consequences of TB disease seriously which has led in complications and death (Maswanganyi et al, 2014). The study further recommends that running community awareness about TB disease can empower people and minimize stigma attached to TB disease. A study that was conducted in Sub-Saharan Africa revealed that there is lack of knowledge about the disease (TB), duration of treatment, and the consequences of non-adherence to treatment. Despite health education about TB treatment, literature reveals that there is knowledge gap about TB treatment in Sub-Saharan Africa (Finlay et al, 2012).

2.5. Health care system related factors

Inconvenient clinic hours and distance to the clinic plays a major role in influencing adherence to TB treatment (Shargie et al, 2007; Adane et al, 2013). Moreover, health education and counselling to TB patients may increase adherence and treatment completion. A study conducted in Sub-Saharan Africa revealed that majority of TB patients had not received enough education about TB disease and duration of treatment at the beginning of their treatment (Finlay et al, 2012; Norgbe et al, 2011; Ayisi et al, 2011). However, a good communication between health care workers and TB patients plays a major role in treatment adherence (Tachfouti et al, 2012).
Although DOTS is less likely to improve treatment compliance, literature has revealed that patients who are supported by the Directly Observed Treatment (DOT) strategy had the best compliance rates (Finlay et al, 2012). Hence, early identification of TB patients and observing patients while they are taking their TB treatment are sufficient to prevent non-adherence to TB treatment. However, understanding of associated factors which promote non-adherence is a corner stone in TB for treatment success (Tola et al, 2014).

Several issues has been raised up that affects adherence to TB treatment, for example, clinic hours were inconvenient, healthcare workers attitude, healthcare worker knowledge, insufficient counselling and poor health education (Finlay et al, 2012). According to Primary Health Care (PHC) package it is recommended that prior initiating TB treatment patients need to be informed by health care workers on how the treatment works and all risk factors associated with defaulting treatment. This information will assist in preventing treatment non-adherence. As part of TB control, planning, implementation, monitoring and evaluation is very important. WHO set the targets in line with WHO guidelines to monitor and evaluate the progress on TB control. However, the following targets are to be met by PHC facilities, 90% smear conversion rate, 90% cure rate, and defaulter rate of 2%. Failure to meets these targets increases the risks of drug resistance TB.

2.6. Strategies for improving TB treatment adherence

World Health Organization recommended TB control strategies, strategy set ambitious target of 95% reduction of TB death and 90% reduction in cases of TB by 2035. Patient adherence is the key factor in treatment success. DOH (2014) indicated that promoting adherence in South Africa can be done through a patient centred approach such as facilitating access to treatment and DOTS.
2.6.1. Directly Observed Therapy (DOTS)

DOT strategy is the most effective strategy for making sure that patient take their treatment. According to National TB guideline, the treatment supporter may be family member, healthcare worker or community health worker or whoever the patient choses (DOH, 2014). The role of treatment supporter is to encourage patient to continue treatment and to counter any factors that may results in treatment interruption. Moreover, close supervision of TB patient while taking their treatment improves adherence and increases the chances of early detection of side effect due to treatment.

Serapewane et al (2016) in their study conducted in North West province revealed that no direct observation and supervision of patients when taking treatment at home. These suggested that TB patients were at risk of defaulting treatment due to lack of supervision. Moreover, the study evaluations done in KwaZulu-Natal, South Africa showed poor implementation of DOTS where coverage, low quality caseloads were associated with poor treatment outcomes (Finlay et al, 2012).

2.6.2. Patient education

Patient education about TB disease prior treatment initiation promote adherence to treatment. Patients may have lack knowledge about TB disease and its treatment. A study conducted by Tang et al (2015) revealed that lack of knowledge about TB disease and treatment duration was associated with treatment non-adherence. However, the goal for patient education is to influence or change patient’s health behavior by providing them with information that motivates them to adhere to TB treatment (DOH, 2014). Tesfahuneygn et al (2015) in their study conducted in Alamata District, Ethiopia on adherence to Anti-tuberculosis treatment and treatment outcomes among tuberculosis patients concluded that further efforts like health education on patients and family promotes adherence to TB treatment. In addition, Tang et al (2015) in their study showed that health education for TB patient prior treatment initiation was the most important step of implementing DOTS.
2.6.3. Treatment support group

Building relationship between members of the team and patients can help to improve adherence. HCW should emphasize the importance of patient taking responsibility for their treatment and they must treat TB patients with respect. A study conducted by Ali and Prins (2016) reported that other potential factor associated with non-adherence to TB treatment was lack of support by families, friends and colleagues. Boru et al, (2017) in their study on Factors contributing to non-adherence with treatment among TB patients in Ethiopia revealed that family and community support is an important factor for influencing treatment adherence. They further reported that family and community support is crucial for adherence to TB treatment not only by providing money for transportation and food, also by providing encouragement, motivation and reminding them to take their treatment and comfort those who lost hope. The department of health should have the capacity to help TB patients to overcome their difficulties during the course of treatment. Family and community DOTS support can achieve good treatment outcome by allowing TB patients chose treatment supporter (WHO, 2014).

2.6.4. Health system strengthening

Improving access to quality healthcare services will improve treatment adherence. TB control programs should improve system, financing, human resource and service delivery. However, DOTS and decentralisation can improve treatment success (Thiam et al, 2007).

2.6.5. Engaging NGO's in providing community TB care

DOH (2014) showed community involvement in the selection of community treatment supporter may improve treatment adherence. However, training on TB disease, transmission, treatment, prevention, side effects and monitoring response to treatment should be provided to community health care worker. Partnership with civil society, traditional healers, TB patients and health care provider will have a positive influence.
in TB prevention and TB control strategies. Failure to engage all the relevant stakeholders can result in treatment non-adherence.

2.7. Conclusion

TB can be cured if patients take treatment for the recommended period. However, TB treatment takes a minimum period of six months and thus patients may experience pill tiredness or stop taking treatment once they feel better before completing treatment course. Thus, it is very important for TB patience to be supervised either by family member, healthcare worker or community member while taking their treatment. DOT strategy helped to improve adherence to TB treatment.
CHAPTER 3

METHODOLOGY AND MATERIALS

3.1. Introduction

In this chapter methodology is discussed in detail covering study design, study setting and study population, sampling and sampling size, inclusion and exclusion criteria, data collection tool, data collection process, validity, reliability, bias, data analysis and ethical consideration.

3.2. The study designs

A quantitative, descriptive cross-sectional design was used to identify factors associated with adherence to TB treatment among TB patients diagnosed and put on treatment in January 2017 onwards.

3.3. Study setting and study population

The study was conducted in Modimolle Sub-District primary health care facilities. Modimolle Sub-District is one of the five Sub-Districts under Waterberg district in Limpopo Province. Waterberg is the biggest district in Limpopo Province situated in the western part of the province. Modimolle was previously known as Nylstroom during the former dispensation. Modimolle Sub-District has four fixed Clinics, one mobile Clinic and one local hospital. The study was conducted in four Clinics (Vaalwater Clinic, Phomolong Clinic, Modimolle town Clinic and Alma Clinic). This is because the local hospital refers TB diagnosed patients to the four Clinics for further treatment.

The catchment population served by these facilities is estimated at 73,332 consisting predominantly of black people from different ethnic groups, (Northern Sotho, Tsonga and Venda). The total number of TB patients registered in the register is 345 in the
whole Sub-District as of April 2015 to March 2016 (Modimolle Sub-District Statistics, 2015/2016).

3.4. Sampling and sampling size

The researcher was targeting all TB patients, both adherent and non-adherent taking TB treatment within the proposed period of study. Convenience sampling method was used to select study participants. All TB patients were identified from the TB registers when they come for their follow-up visits in the clinics. The total numbers of TB patients registered were 345 and the total population reached and participated on the study was 256.

3.4.1. Inclusion criteria

The study included all patients with active TB age 15 years and above, both adherent and non-adherent who started treatment on 1 January 2017. Participants included the pulmonary and extra pulmonary TB, newly diagnosed patients, retreatment and treatment relapse. Participants included were captured in the TB register and have been on TB treatment for more than 2 months.

3.4.2. Exclusion criteria

All TB patients in the TB register who were initiated on TB treatment before 1 January 2017 and have not completed a period of two months of TB treatment, below 15 years of age were excluded in the study.

3.5. Data collection tool

The researcher interviewed all consented participants and recorded their responses in the questionnaire. A structured questionnaire was developed and the covering letter
with a description on the purpose of the study and the instructions attached to it (Appendix 1). The tool was administered to TB patients who have agreed to participate in the study. The questionnaires administered was designed in English and translated to a local language (Sepedi) during interview for the participants to have a better understanding of the questions. Questionnaires were coded, and no names were used to identify participants. The questionnaire that was utilized was adapted from previous study conducted at Namibia on factors affecting adherence to TB treatment (Chani, 2010). The structured questionnaire composed of closed-ended questions. The variables included were Demographic information, Socio-economic factors, Therapy and condition related-factor, Health care system related factors and Patient knowledge about TB treatment.

3.6. Data collection

Approval was granted from Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC) and permission was granted from the Provincial Department of Health (Limpopo Province), Waterberg district office, Modimolle Sub-District office and the researcher informed operational Managers in all participating clinics about the data collection process. Data was collected after participating participants signed an informed consent. The researcher approached patients individually while making their normal routine. Participants were interviewed in the office/free consultation room requested from the facility after their consultation to ensure confidentiality. Patient who has refused to participate in the study were left and the researcher moved to the next patient. The researcher interviewed patients, recorded the responses and double checked for missed questions in the questionnaires. All answered questionnaires were put in a box. Data collection process took about 6 weeks. Interview took about 15 to 20 minutes per patient.
3.7. Validity

To ensure validity of the data collection tool, the tool was piloted by selecting patients in another Sub District (Bela-Bela Sub District) who did not form part of the study sample and corrective measures were taken as deemed necessary. The researcher avoided to take too long or too shorts an interval between pre-test and post-test to collect data. Data collection tool, questions was formulated using simple language that the participants understand.

3.8. Reliability

To ensure reliability data collection tool was piloted to ensure that participants understand questions clearly. The questionnaire was adapted from a previous study conducted in Namibia by Chani (2010). Questions were simple, not vague, and clearly stated in the language that the participants understand.

3.9. Bias

The social desirability bias was minimised through avoiding leading questions and providing pre-specified ranges of answers when possible. Response bias was minimized by using closed-ended questions. To reduce response information bias, the questionnaire gave clear instructions and respondents were requested to give accurate answers. The questionnaires were available in both language (English and Sepedi). To minimize selection bias through utilization of convenience sampling, the results were the representative of the whole population in those facilities were data was collected. Recall bias was minimized by gaining information from alternative source i.e. TB registers.
3.10. Data analysis

Raw data was captured into an excel spread sheet and coded, and it was imported into STATA software version 14.0 (StataCorp, Texas, USA) for statistical processing and analysis. Descriptive statistics and frequency distribution was used to analyze and interpret the mean, median and ratio variables (e.g. demographic variables). Data was checked for normality distribution and outliers for continuous numerical variables and categorical variables were presented as proportions, graphs and tables. Non-adherence to TB was coded as 1 and adherence as 0. Factors associated with non-adherence to TB treatment among TB patients were identified using logistic regression analyses since the outcome is binary (0 or 1). Following each univariate logistic regression, multivariable logistic regression models was constructed to determine factors associated with non-adherence. Independent variables from the univariate analyses were entered the multivariable model if at 0.05 level of significance. P-values were reported to three decimal places and values less than 0.05 was considered significant. The Odds Ration and Chi-square (\(\chi^2\)) were used to determine measure of association between variables.

3.11. Ethical consideration

Before the study was conducted, approval was requested and obtained from Sefako Magatho Health Science University Research Ethics Committee (SREC and SMUREC Ref: SMUREC/H/215/2017:TG) appendix B. The researcher was sensitive to issues such as confidentiality, anonymity, privacy, obtaining consent and approval and termination of research.

- Ethical approval prior conducting the study was obtained and

- Permission to conduct a research study was requested and granted by Department of Health (Limpopo Province), Waterberg district manager, Modimolle Sub-District Manager and Primary Health facilities Managers.

- Before interview conducted, participants were informed about the purpose of the study and they were asked to sign an informed consent form (appendix 3).
3.12. Conclusion

This chapter dealt with research methodology, that is research design, population and sampling technique used, data collection and data collection process, data analysis and ethical principles.
CHAPTER 4

STUDY FINDINGS AND INTERPRETATION

4.1 Introduction

In this chapter the research findings and interpretation are presented. Questionnaires were analysed for Demographic information, Socio-economic factors, Therapy and condition related-factor, Health care system related factors and Patient knowledge about TB treatment. The Odds Ratio and Chi-square (\( \chi^2 \)) were used to determine measure of association between variables, with the p value set at 0.05%. If the p value is higher than 0.05%, then the result is not statistically significant. The findings are demonstrated in the form of: mean, frequency distributions, and also presented in bar and pie graphs.

4.2 Response rate

The researcher was targeting all TB patients from TB register when they come for their follow-up visits in the clinics. Two hundred and fifty six (256) participants were approached during data collection and they all responded to the questionnaires, leaving the response rate of 100%.

4.3 Demographic factors

The demographic factors included age, gender, and marital status, level of education, and religion. A total of 256 respondents were interviewed. The socio-economic demographic factors are presented below.

Table 4.1: Mean age of participants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs</th>
<th>Mean</th>
<th>Std.Dev</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td>256</td>
<td>38.47</td>
<td>12.651</td>
<td>15</td>
<td>78</td>
</tr>
</tbody>
</table>
The mean age of respondents was 38 years with minimum of 15 years and maximum of 78 years of age, about 97.7% of the respondent belonged to Christian religion and only 2.3% belonged to other religions.

Figure 4.1: Age distribution of all participants

Age was categorised into six categories (see figure 4.1 above). There were more participants in category 26-35 years (n=78/30.5%). Only n=5 (2.0%) participants were over the age of 65 years.

Table 4.2: Relationship between age and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Age categories</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-25</td>
<td>30 (76.9%)</td>
<td>9 (23.1%)</td>
<td>39 (100%)</td>
</tr>
<tr>
<td>26-35</td>
<td>62 (79.5%)</td>
<td>16 (20.5%)</td>
<td>78 (100%)</td>
</tr>
<tr>
<td>36-45</td>
<td>55 (79.7%)</td>
<td>14 (20.3%)</td>
<td>69 (100%)</td>
</tr>
<tr>
<td>46-55</td>
<td>37 (80.4%)</td>
<td>9 (19.6%)</td>
<td>46 (100%)</td>
</tr>
<tr>
<td>56-65</td>
<td>18 (94.7%)</td>
<td>1 (5.3%)</td>
<td>19 (100%)</td>
</tr>
<tr>
<td>65 above</td>
<td>5 (100%)</td>
<td>0 (0.00%)</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

$\text{Pearson chi}^2 (5) = 4.0974 \quad \text{Pr} = 0.535$

Table 4.2 above shows that non-adherence is more on the younger participants. Participants between the ages 15-25 years had higher rate of 23.1% non-adherence as compared to other age groups. The overall non-adherence rate is 19.1%. The Pearson chi-squared value of 4.0974 and the correspondents’ p-value of 0.535 shows that there was no statistical significance between the age groups non-adherence to TB treatment at 5% significance level. This is because the chi-squared p-value (0.535) is greater than 0.05.

![Gender distribution of participants](image)

**Figure 4.2: Gender distribution of participants**

Participants were categorised according to gender, of all 256 participants, the majority were males at n=136 (53.1%) and n=120 (46.9%) were females.
Table 4.3: Relationship between gender and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Gender</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>111 (81.6%)</td>
<td>25 (18.4%)</td>
<td>136 (100%)</td>
</tr>
<tr>
<td>Female</td>
<td>96 (80.0%)</td>
<td>24 (20.0%)</td>
<td>120 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100.0%)</td>
</tr>
</tbody>
</table>

Pearson chi² (1) = 0.1078  Pr = 0.743

Table 4.3 above shows that non-adherence rate was high in females as compared to males (20.0% vs 18.4%). The two percentages were tested whether they were statistically significant at 5% significant level. The p-value of 0.743 is more than 0.05 which shows that they were not statistically significant difference.

Figure 4.3: Participants distribution according to their marital status

Each respondent was asked about his/her marital status (married, widowed, divorced or single). Over half (n=141/55.1%) of all study participants reported being married,
n=92 (35.9%) of respondents were single, n=12 (4.7%) were divorced and n=11 (4.3%) were widowed.

Table 4.4: Relationship between marital status and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Marital status</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Divorced</td>
<td>11 (91.7%)</td>
<td>1 (8.3%)</td>
<td>12 (100%)</td>
</tr>
<tr>
<td>Married</td>
<td>114 (80.6%)</td>
<td>27 (19.1%)</td>
<td>141 (100%)</td>
</tr>
<tr>
<td>Single</td>
<td>72 (78.3%)</td>
<td>20 (21.7%)</td>
<td>92 (100%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>10 (90.9%)</td>
<td>1 (9.1%)</td>
<td>11 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson chi² (3) = 2.0248  Pr = 0.567

Table 4.4 above shows that participants who are single have a higher proportion (21.7%) of non-adherence as compared to other groups. Those who were divorced have the lowest non-adherence rate of 8.3%. The p-value 0.567 is more than 0.05 level of significance; statistically there is no association between marital status and TB treatment non-adherence amongst the participants.
Figure 4.4: Participants distribution according to their level of education attained

The respondents were asked their highest level of education they had attained. Figure 4.3 above shows that the majority, (n=141/55.1%) of the respondents only attained secondary education level, about n=42 (16.4%) attained primary school, n=39 (15.2%) attained grade 12, n=21 (8.2%) had no formal education and n=13 (5.1%) attained tertiary education.
Table 4.5: Relationship between level of education and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 12</td>
<td>34 (87.2%)</td>
<td>5 (12.8%)</td>
<td>39 (100%)</td>
</tr>
<tr>
<td>No-formal education</td>
<td>21 (100%)</td>
<td>0 (0.0%)</td>
<td>21 (100%)</td>
</tr>
<tr>
<td>Primary</td>
<td>34 (80.9%)</td>
<td>8 (19.1%)</td>
<td>42 (100%)</td>
</tr>
<tr>
<td>Secondary</td>
<td>108 (76.6%)</td>
<td>33 (23.4%)</td>
<td>141 (100%)</td>
</tr>
<tr>
<td>Tertiary</td>
<td>10 (76.9%)</td>
<td>3 (23.1%)</td>
<td>13 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.14%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson \(\chi^2\) (4) = 7.7640  \(Pr = 0.101\)

Table 4.5 above shows that participants with no formal education adhered to their TB treatment, the non-adherence rate was 0.0%. Those participants with secondary and tertiary education had higher non-adherence rate as compared with those with lower level of education. Statistically there was no association between educational level and TB treatment non-adherence p-value=0.101 is more than 0.05 level significant.
Table 4.6: Measure of association between age and TB treatment non-adherence

| TB treatment Non-adherence | OR | Std. Err. | z  | P>|z|  | [95% Conf. Interval] |
|----------------------------|----|-----------|----|------|------------------------|
| Age                        | 0.9824 | 0.0130 | -1.34 | 0.179 | 0.9572 - 1.0082 |
| _cons                      | 0.4615 | 0.2360 | -1.51 | 0.131 | 0.1694 - 1.2575 |

Age was found to be less likely to be associated with TB treatment non-adherence amongst the participants (OR 0.9824; 95% CI=0.9572 – 1.0082), although this was found to be statistically not significant (p-value 0.179).

Table 4.7: Measures of association between demographic information and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Logistic regression</th>
<th>Number of obs</th>
<th>= 235</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR chi²(12)</td>
<td>= 4.16</td>
<td></td>
</tr>
<tr>
<td>Prob &gt; chi²</td>
<td>= 0.9803</td>
<td></td>
</tr>
</tbody>
</table>

Log likelihood = -118.23223  Pseudo R² = 0.0173
| TB treatment Non-adherence | Odds ratio | Std.Err | z    | P>|z| | [95% conf. interval] |
|---------------------------|-----------|---------|------|-----|-----------------|
| **Agecat**                |           |         |      |     |                 |
| 15-25                     | 1         |         |      |     |                 |
| 26-35                     | 0.9017    | 0.4566  | -0.20| 0.838 | 0.3342 - 2.4328 |
| 36-45                     | 0.8965    | 0.5572  | -0.18| 0.861 | 0.2652 - 3.0310 |
| 46-55                     | 0.9307    | 0.6707  | -0.10| 0.921 | 0.2267 - 3.8212 |
| 56-65                     | 0.3441    | 0.4441  | -0.83| 0.408 | 0.0275 - 4.3162 |
| 66-above                  | 1         | empty   |      |     |                 |
| **Religion**              |           |         |      |     |                 |
| Christian                 | 1         |         |      |     |                 |
| others                    | 0.8885    | 1.0242  | -0.10| 0.918 | 0.0928 - 8.5089 |
| **Gender**                |           |         |      |     |                 |
| Male                      | 1         |         |      |     |                 |
| Female                    | 1.0454    | 0.3665  | 0.13 | 0.899 | 0.5258 - 2.0784 |
| **Maritalstatus**         |           |         |      |     |                 |
| Widowed                   | 1         |         |      |     |                 |
| Single                    | 0.7854    | 1.0008  | -0.19| 0.850 | 0.0646 - 9.5436 |
| Married                   | 0.7816    | 0.9604  | -0.20| 0.841 | 0.0703 - 8.6867 |
| Divorced                  | 0.3415    | 0.5448  | -0.67| 0.501 | 0.0150 - 7.7839 |
| **Edu level**             |           |         |      |     |                 |
| Tertiary                  | 1         |         |      |     |                 |
| Secondary                 | 0.9608    | 0.697   | -0.06| 0.956 | 0.2317 - 3.9837 |
| Primary                   | 0.0767    | 0.7183  | -0.16| 0.872 | 0.1759 - 4.3682 |
| Noformal Edu              | 1         | empty   |      |     |                 |
| Grade12                   | 0.5088    | 0.4332  | -0.79| 0.427 | 0.0959 - 2.6910 |
| _cons                     | 0.4370    | 0.6622  | -0.55| 0.585 | 0.0224 - 8.5162 |

Table 4.7 above shows that participants between the ages of 26-35 years were less likely non-adherent to their TB treatment as compared to other age groups (OR 0.9017; 95% CI=0.3342-2.4328), but there is no statistical significant difference since the p-
values in the multivariate analysis looking at demographic information and non-adherence to TB treatment were more than 0.05 level of significance. This shows that demographic information does have influence over non-adherence to TB treatment.

4.4 Socio-economic factors

The following were assessed as socio-economic factors: employment status, income status, food availability, drinking alcohol, smoking status.

Table 4.8: Relationship between employment status and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Employment status</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>61 (81.3%)</td>
<td>14 (18.7%)</td>
<td>75 (100%)</td>
</tr>
<tr>
<td>self-employed</td>
<td>5 (100%)</td>
<td>0 (0.0%)</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>unemployed</td>
<td>141 (80.1%)</td>
<td>35 (19.9%)</td>
<td>176 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson chi² (2) = 1.2577  Pr = 0.533

The respondents were asked whether they were employed, self-employed or unemployed. Table 4.8 above shows that participants who are self-employed adhered to their TB treatment; the non-adherence rate was 0.0%. Those participants who are unemployed had a higher non-adherence rate of 19.9% as compared to other groups. There was no association between employment status and TB treatment adherence, since p-value 0.533 was found not to be statistically significant.
Table 4.9: Relationship between Food availability while taking TB treatment and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Food Availability</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>always available</td>
<td>106 (83.5%)</td>
<td>21 (16.5%)</td>
<td>127 (100%)</td>
</tr>
<tr>
<td>never available</td>
<td>3 (100%)</td>
<td>0 (0.0%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>not always</td>
<td>35 (79.5%)</td>
<td>9 (20.5%)</td>
<td>44 (100%)</td>
</tr>
<tr>
<td>available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always available</td>
<td>63 (76.8%)</td>
<td>19 (23.2%)</td>
<td>82 (100%)</td>
</tr>
<tr>
<td>most of the time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson chi² (3) = 2.1767  Pr = 0.537

Participants were asked to rate the availability of food while they were on treatment. A total of 256 responses were recorded. Table 4.9 above shows that participants who never had food all adhered to their TB treatment. Table 4.9 above also shows that participants who always had food available most of the time had a higher proportion of non-adherence rate 23.2% as compared to other groups. Food availability during TB treatment was not to be associated with TB treatment adherence, since the p-value 0.537 was found not to be significant.

4.5  Therapy and condition related-factors

Participants were asked many questions to assess different diseases and medicine related factors that could contribute to compliance or non-compliance to TB treatment.

Response of participants experiencing side effects

Participants were asked if they had experienced any side effects while taking TB treatment. Only n=40 (15.6%) of the patients had experienced some side effects while taking medicines and n=216 (84.4%) did not experience side effects. Experiencing side effect while taking TB treatment was not associated (p-value 0.880) with TB treatment non-adherence.
Table 4.10: Relationship between participants taking other treatment and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Other treatment</th>
<th>Adherence n(%)</th>
<th>Non-adherence n(%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>52 (86.7%)</td>
<td>8 (13.3%)</td>
<td>60 (100%)</td>
</tr>
<tr>
<td>Yes</td>
<td>165 (84.2%)</td>
<td>41 (15.8%)</td>
<td>196 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson chi² (1) = 1.7076 Pr = 0.191

Table 4.10 above shows that participants who were taking other treatment while taking TB treatment had a higher proportion of 15.8% non-adherence rate as compared to those who were not taking TB treatment. The p-value 0.191 indicates that there was no statistical significance difference between taking other treatment while taking TB treatment and non-adherence.

Figure 4.5: Participants distribution of other treatment they were taking while taking TB treatment.
All participants were asked if they were taking other treatment while taking TB treatment. Only n=196 (76.6%) participants responded that they were taking other treatment, n=185 (94.4%) were taking Highly Active Anti-Retroviral Therapy (HAART), n=8 (4.1%) were taking hypertensive treatment (HPT), n=1 (0.5%) was taking other treatment and, n=1 (0.5%) was taking both HAART and HPT treatment and other. Participants who were taking TB treatment only were n=60 (23.4%).

Table 4.11: Measures of association: Therapy and condition related factors

<table>
<thead>
<tr>
<th>Logistic regression</th>
<th>Number of obs = 252</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR chi² (5)</td>
<td>4.25</td>
</tr>
<tr>
<td>Prob &gt; chi²</td>
<td>0.5146</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-122.01324</td>
</tr>
<tr>
<td>Pseudo R²</td>
<td>0.0171</td>
</tr>
</tbody>
</table>

| TB treatment Non-adherence | Odds Ratio | Std. Err. | z  | P>|z| | [95% Conf. Interval] |
|---------------------------|------------|-----------|----|-------|---------------------|
| sidesffyn2                | 1.2297     | 0.6322    | 0.40| 0.40  | 0.4488 3.3685       |
| no                        |            |           |     |       |                     |
| howfelbeterxx2            | 1          | (empty)   | -0.93| 0.354 | 0.1297 2.0772       |
| did not feel better       |            |           |     |       |                     |
| less than 2months         | 0.5190     | 0.3672    | -0.93| 0.354 | 0.1297 2.0772       |
| Diseaseclassification2    | 0.3879     | 0.3206    | -1.15| 0.252 | 0.0768 1.9596       |
| PTB                       | 1          | empty     |     |       |                     |
| PTB & Extra               |            |           |     |       |                     |
| Hivstatus                 | 0.8221     | 0.7252    | -0.22| 0.824 | 0.1459 4.6321       |
| Negative                  |            |           |     |       |                     |
| not indicated             | 1          | empty     |     |       |                     |
| otherrxyn2                | 0.7467     | 0.7053    | -0.31| 0.757 | 0.1173 4.7551       |
| no                        |            |           |     |       |                     |
| _cons                     | 1.0287     | 0.9103    | 0.03| 0.974 | 0.1816 5.8277       |

Participants who felt better less than 2 months after taking TB treatment were found to be less likely to be associated with TB treatment adherence amongst the participants.
(OR 0.5189; 95% CI= 0.1296-2.0771), although this was found to be statistically not significant (p-value 0.354).

4.6 Healthcare system related factor

Healthcare system related factors assessed included the convenient TB clinic opening times, waiting time at the TB clinic, the attitude of the health worker at the clinic, distance and cost of getting to the clinic, availability of medicines at the clinic and the DOT status.

Table 4.12: Relationship between clinic opening time and closing time and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Convenient TB clinic opening time</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;8 to 5pm</td>
<td>1 (50.0%)</td>
<td>1 (50.0%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>8 to 5pm</td>
<td>4 (100%)</td>
<td>0 (0.0%)</td>
<td>4 (100%)</td>
</tr>
<tr>
<td>&lt;8 to &gt;5pm</td>
<td>202 (80.8%)</td>
<td>48 (19.2%)</td>
<td>250 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson chi² (2) = 2.1780  Pr = 0.337

Participants were asked which TB clinic opening times were most convenient for them. The options they were given were less than 8h00-5pm, 8h00-5pm and <8h00>5pm. Table 4.12 above shows that participants who felt the clinic should open from 8h00 to 5pm were adherent to their TB treatment, non-adherent rate of 0.0%. Participants who felt that the clinic should open from <08h00-5pm had a higher proportion of non-adherence rate of 50% as compared to other groups. This shows that there is no statistical significant difference between clinic opening and closing times and TB treatment non-adherence (p-value 0.337).
Table 4.13: Relationship between waiting period and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Clinic waiting time</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2hrs</td>
<td>148 (57.8%)</td>
<td>39 (15.2%)</td>
<td>187 (73%)</td>
</tr>
<tr>
<td>less 1hr</td>
<td>57 (22.3%)</td>
<td>7 (2.73%)</td>
<td>64 (25%)</td>
</tr>
<tr>
<td>more than 2hrs</td>
<td>2 (0.8%)</td>
<td>3 (1.2%)</td>
<td>5 (1.9%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>207 (80.9%)</strong></td>
<td><strong>49 (19.1%)</strong></td>
<td><strong>256 (100%)</strong></td>
</tr>
</tbody>
</table>

Pearson $\chi^2$ (2) = 8.5314  $Pr = 0.014$

Amongst the different waiting times at the clinics, waiting between 1hr to 2hrs was more likely to influence TB treatment adherence amongst the participants (n=148 57.8%) with a likelihood Pearson $\chi^2$ ratio of 8.5314 and a p-value of 0.014.

Table 4.14: Relationship between distance travelled and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Distance travelled</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>less 5km</td>
<td>74 (76.3%)</td>
<td>23 (23.7%)</td>
<td>97 (100%)</td>
</tr>
<tr>
<td>5 to 10km</td>
<td>100 (80.6%)</td>
<td>24 (19.4%)</td>
<td>124 (100%)</td>
</tr>
<tr>
<td>16 to 20km</td>
<td>7 (100%)</td>
<td>0 (0.0%)</td>
<td>7 (100%)</td>
</tr>
<tr>
<td>11 to 15km</td>
<td>26 (92.9%)</td>
<td>2 (7.1%)</td>
<td>28 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>207 (80.9%)</strong></td>
<td><strong>49 (10.1%)</strong></td>
<td><strong>256 (100%)</strong></td>
</tr>
</tbody>
</table>

Pearson $\chi^2$ (3) = 5.5742  $Pr = 0.134$
The respondents were asked about the distance they travelled to go and collect their medicines at TB clinic. Table 4.14 above shows that all participants who travel 16-20km adhered to their TB treatment as compared to other groups. Those participants who travelled less than 5km had a higher proportion of non-adherence rate n=23 (23.7%). There was no significance difference between distance travelled to the clinic and non-adherence rate (p-value of 0.134).

Table 4.15: Relationship between non-adherence to TB treatment and transport cost.

<table>
<thead>
<tr>
<th>Transport cost</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>walking distance</td>
<td>149 (80.1%)</td>
<td>37 (19.9%)</td>
<td>186 (100%)</td>
</tr>
<tr>
<td>R10 to R15</td>
<td>50 (83.3%)</td>
<td>10 (16.7%)</td>
<td>60 (100%)</td>
</tr>
<tr>
<td>more than R20</td>
<td>4 (80.0%)</td>
<td>1 (20.0%)</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>less R10</td>
<td>4 (80.0%)</td>
<td>1 (80.0%)</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson chi² (3) = 0.3100  Pr = 0.958

Participants were asked to indicate how much they had to pay for transport to get to the clinic. The table 4.15 above shows that among those participants who walk to the clinic n=37 (19.9%) were non-adherence to their TB treatment. Although those participants who paid R10 to R15 had a higher proportion of adherence rate (n=50/83.3%). This shows that there was no statistical significance difference between transport cost and non-adherence to TB treatment with the p-value of 0.958.
Table 4.16: Relationship between DOT status and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Dotstatus</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>none</td>
<td>23 (82.1%)</td>
<td>5 (17.9%)</td>
<td>28</td>
</tr>
<tr>
<td>Healthcare worker</td>
<td>136 (78.6%)</td>
<td>37 (21.4%)</td>
<td>173</td>
</tr>
<tr>
<td>Family member</td>
<td>40 (87.0%)</td>
<td>6 (13.0%)</td>
<td>46</td>
</tr>
<tr>
<td>community member</td>
<td>8 (90.0%)</td>
<td>1 (10.0%)</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256</td>
</tr>
</tbody>
</table>

Pearson $\chi^2$ (3) = 2.0738  Pr = 0.557

Table 4.16 above shows that participants who were observed by healthcare workers had a high proportion of non-adherence (n=37/21.4%) as compared to other groups. This shows that there was not statistical significance difference between DOT status and TB treatment non-adherence with the p-value of 0.557.

Table 4.17: Relationship TB treatment availability and non-adherence to TB treatments

<table>
<thead>
<tr>
<th>TB treatment availability</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>always available</td>
<td>200 (80.6%)</td>
<td>48 (19.4%)</td>
<td>248</td>
</tr>
<tr>
<td>sometimes not available</td>
<td>7 (87.5%)</td>
<td>1 (12.5%)</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256</td>
</tr>
</tbody>
</table>

Pearson $\chi^2$ (1) = 0.2353  Pr = 0.628
Table 4.17 above shows that participants who indicated that TB treatment was always available had a higher proportion of non-adherence rate (n=48/19.4%) as compared to those indicated that TB treatment was sometimes not available. Statistically there was no significance difference between treatment availability and TB treatment non-adherence with the p-value of 0.628.

Table 4.18: Relationship between healthcare workers attitude and TB treatment non-adherence

<table>
<thead>
<tr>
<th>Healthcare worker attitude</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friendly</td>
<td>192 (81.0%)</td>
<td>45 (19.0%)</td>
<td>237 (100%)</td>
</tr>
<tr>
<td>Unfriendly</td>
<td>15 (78.9%)</td>
<td>4 (21.1%)</td>
<td>19 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson ch² (1) = 0.0485  Pr = 0.826

Participants were asked to rate healthcare workers attitude who attended them when they went to collect their TB treatment. Table 4.18 above shows that participants who responded that healthcare worker were unfriendly had higher proportion of non-adherence rate of 21% as compared to those who responded that they are friendly. Although those participants had adhered to their treatment (n=192/81.0%), statistically there was no significance difference between healthcare worker attitude and TB treatment non-adherence with the p-value of 0.826.

Table 4.19: Measure of association: healthcare system related factors

Logistic regression

| Number of obs | 245 |
|               |     |
| LR ch² (13)   | 15.48 |
| Prob > chi²   | 0.2783 |

Log likelihood = -114.85777  Pseudo R² = 0.0631
|                        | Odds ratio | Std. Err. | z     | P>|z| | [95% conf. interval] |
|------------------------|------------|-----------|-------|------|-----------------------|
| **TB treatment non-adherence** |            |           |       |      |                       |
| dotstatus2             |            |           |       |      |                       |
| healthcare worker      | 1.1052     | 0.7130    | 0.15  | 0.877| 0.3121                | 3.9140                |
| family member          | 0.6972     | 0.5275    | -0.48 | 0.634| 0.1582                | 3.0719                |
| community member       | 0.4279     | 0.5326    | -0.68 | 0.495| 0.0373                | 4.9068                |
| **medicineAvailability** |            |           |       |      |                       |
| always available       | 1          | empty     |       |      |                       |
| sometimes not available| 0.5976     | 0.7073    | -0.43 | 0.664| 0.0587                | 6.0792                |
| **Waiting period**     |            |           |       |      |                       |
| less than 1hr          | 0.4089     | 0.1839    | -1.99 | 0.047| 0.1694                | 0.9871                |
| more than 2hrs         | 4.2973     | 4.7176    | 1.33  | 0.184| 0.4997                | 36.9532               |
| **Travelling distance**|            |           |       |      |                       |
| 5 to 10km              | 0.8052     | 0.2953    | -0.59 | 0.555| 0.3924                | 1.6523                |
| 16 to 20km             | 1          | empty     |       |      |                       |
| 11 to 15km             | 0.2400     | 0.2031    | -1.69 | 0.092| 0.0457                | 1.2606                |
| **transcost2**         |            |           |       |      |                       |
| R10 to 15              | 0.9351     | 0.4171    | -0.15 | 0.880| 0.3901                | 2.2413                |
| more than R20          | 2.1510     | 3.6191    | 0.46  | 0.649| 0.0795                | 58.1819               |
| less than R10          | 0.9286     | 1.0752    | -0.06 | 0.949| 0.0960                | 8.9818                |
| **Clinicclosing&opentimes** |        |           |       |      |                       |
| 8 to 5                 | 1          | empty     |       |      |                       |
| Less than 8 to 5       | 0.4057     | 0.5850    | -0.63 | 0.532| 0.0240                | 6.8467                |
| **staffattitude2**     |            |           |       |      |                       |
| unfriendly             | 1.0352     | 0.7637    | 0.05  | 0.963| 0.2438                | 4.3956                |
| _cons                  | 0.9048     | 1.4065    | -0.06 | 0.949| 0.0430                | 19.0418               |

Participants who wait more than 2hrs were found to be four times more likely non-adherence to their TB treatment as compared to those who wait less than 1hr (OR 4.2973; 95% CI=0.4997-0.36.9532), this was found to be statistically significant with p-value 0.047.
4.7 Patient knowledge about TB

Knowledge of TB and treatment was assessed with questions checking the knowledge of the respondents on treatment duration, spread of TB, if TB is infectious and seeking medical care.

Table 4.20: Participants response with regard to knowledge of duration of taking TB treatment

<table>
<thead>
<tr>
<th>Treatment duration</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>6months</td>
<td>127 (82.5%)</td>
<td>27 (17.5%)</td>
<td>154 (100%)</td>
</tr>
<tr>
<td>6monthsHCWstop</td>
<td>78 (78.0%)</td>
<td>22 (22.0%)</td>
<td>100 (100%)</td>
</tr>
<tr>
<td>When feels better</td>
<td>2 (100%)</td>
<td>0 (0.0%)</td>
<td>2 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>207 (80.9%)</td>
<td>49 (19.1%)</td>
<td>256 (100%)</td>
</tr>
</tbody>
</table>

Pearson chi² (3) = 1.5749  Pr = 0.665

Table 4.20 above shows that participants who indicated that one should stop taking TB treatment 6 months and healthcare worker tell them to stop had a higher proportion rate of non-adherence (n=22/22.0%) as compared to other groups. Those participants who indicated that one should stop TB treatment when feels better adhered to their treatment. This shows that there is no statistical significance difference between treatment duration and non-adherence to TB treatment with the p-value of 0.665.
Figure 4.6: Participant knowledge regarding duration of taking TB treatment

Knowledge of participants on the duration of taking TB treatment is as follows: Two participants 0.8% stated that once you feel better after taking TB treatment one can stop the treatment. Participants who responded that one have to take TB treatment for six months and healthcare worker inform you to stop were n=154 (60.1%) and n=100 (39.1%) indicated that one have to stop treatment after six months.

Table 4.21: Relationship between knowledge of seeking medical care and non-adherence to TB treatment

<table>
<thead>
<tr>
<th>Seeking medical care</th>
<th>Adherence n (%)</th>
<th>Non-adherence n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>traditional</td>
<td>11 (100%)</td>
<td>0 (0.0%)</td>
<td>11 (100%)</td>
</tr>
<tr>
<td>self-treatment</td>
<td>8 (61.5%)</td>
<td>5 (38.5%)</td>
<td>13 (100%)</td>
</tr>
<tr>
<td>consult clinic</td>
<td>188 (81.0%)</td>
<td>44 (18.9%)</td>
<td>232 (100%)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>207 (80.9%)</strong></td>
<td><strong>49 (19.1%)</strong></td>
<td><strong>256 (100%)</strong></td>
</tr>
</tbody>
</table>
Pearson \( \chi^2 \) (2) = 5.7440  Pr = 0.057

Table 4.21 above shows that participants who responded that they would use traditional medicine more adherent to TB treatment as compared to other groups, non-adherence rate 0.0%. Participants who would use self-treatment had a higher proportion of non-adherence rate 38.5%. This shows that there is no statistical significance difference between seeking medical care and TB treatment non-adherence with the p-value of 0.057 which is slightly above 0.05.

Table 4.22: Measures of association: patient knowledge about TB

<table>
<thead>
<tr>
<th>Logistic regression</th>
<th>Number of obs = 225</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR ( \chi^2 ) (3) = 5.19</td>
<td>Prob &gt; ( \chi^2 ) = 0.1586</td>
</tr>
</tbody>
</table>

1. Log likelihood = -115.32492  Pseudo R2 = 0.0220

| TB treatment Non-adherence | OR    | Std. Err. | z     | P>|z| | [95% Conf. Interval] |
|----------------------------|-------|-----------|-------|------|----------------------|
| howtbspread2               | 3.9585| 4.0178    | 1.36  | 0.175| 0.5415 - 28.9385     |
| tbisinfecitiousyn2         | 0.5989| 0.6835    | -0.45 | 0.653| 0.0640 - 5.6088      |
| TBRxduration               | 1     |           |       |      |                      |
| whattodocoughblood2        | 3.4503| 2.1930    | 1.95  | 0.051| 0.9927 - 11.9917     |
| _cons                      | 0.2526| 0.0439    | -7.92 | 0.000| 0.1797 - 0.3551      |

The knowledge related to what should the participant do when he/she experiences signs of TB, e.g. by consulting: self-treatment was found to be three times more likely to be associated non-adherence to TB treatment before they complete (OR 3.450; 95% CI=0.9927 - 11.9917), although this was found to be not statistically significant. The p-value 0.051 was slightly greater than 0.05.
4.8 Summary

In this study, the overall non-adherence rate was found to be 19.1%, and a higher rate of non-adherence was found in younger participants. Females were more likely not to adhere to TB treatment as compared to males but there was no statistical significance between their proportions in terms of adherence. Participants with no formal education and those who were self-employed their non-adherence proportion rate was zero (0). Participants who wait more than 2hrs were found to be four times more likely to stop taking TB treatment before they complete as compared to those who wait less than 1hr, this was found to be statistically significant with p-value 0.047. The knowledge related to what should the participant do when he/she experiences signs of TB, e.g. by consulting: self-treatment was found to be three times more likely to be associated with stopping TB treatment before they complete, although this was found to be not statistically significant. The p-value 0.051 was slightly greater than 0.05.
CHAPTER 5

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter presents a discussion, the conclusion and recommendations made by the researcher. In this study, factors associated with adherence to TB treatment among TB patients were assessed in the Primary Health care (PHC) facilities of Modimolle Sub-District, Limpopo Province. The discussion will focus on the research objectives of the study and compare the research findings with existing literature.

5.2. Discussion of findings

This is the only study conducted to identify factors associated with adherence to TB treatment in Modimolle Sub-District PHC facilities in Limpopo Province. Based on the findings, recommendations are then made to the Sub-District Management team to come up with measures to improve TB treatment adherence and also to reinforce and strengthen other factors that enhance TB treatment adherence like treatment supervision policies.

5.2.1 Factors affecting adherence to TB treatment

TB treatment non-adherence is recognized as one of the major challenges in achieving TB control (WHO, 2016). Some of the most often cited factors contributing to non-adherence in developing countries include socio-demographic information, patient related factors, health care systems related factors, those factors related to the patient including knowledge of TB disease and treatment related factors.

5.2.1.1 Demographic characteristics

The demographic factors included age, religion, gender, marital status and educational level. The mean age of participants was 38 years of age. The results indicated that
age, religion, gender, marital status and educational level were not statistically significant to TB treatment adherence (p-value 0.9803) (Table 4.7). The study conducted by Chani had similar findings with respect to age, religion, gender and marital status (p-value 0.926) (Chani, 2010). Most studies had similar finding with respect to age and gender, but the level of education has been found to contribute to treatment adherence (Ndwandwe et al, 2014; Rajagopaul et al, 2014).

5.2.1.2. Socio-economic factors

Employment status, income, food availability, smoking status and drinking alcohol may affect TB treatment adherence. We considered employment status and income and found that these were not significant factors associated with TB treatment adherence (p-value 0.537), probably because most of the participants stayed within the walking distance of the TB clinic and thus no monetary cost was involved. The findings are consistence with the study that was conducted in Andara Kavango Region Namibia which found that employment status and income were not statistically significant factors associated with TB treatment adherence (p-value 0.573) (Chani, 2010). As previously reported from other studies, employment status and income have significant association with TB treatment adherence (p-value 0.05) (Ndwandwe et al, 2014; Tola et al, 2014).

Food availability, smoking status and drinking alcohol were not determinants of TB treatment adherence. The study conducted by Chani in Namibia had similar findings with respect to smoking status and drinking alcohol, but food availability had been found to contribute to TB treatment adherence (p-value 0.035) (Chani, 2010). In our study however is not consistent with results reported from other studies. As found in other studies smoking and drinking alcohol are highly associated with TB treatment adherence (p-value 0.02; 0.001; 0.005) (Ndwandwe et al, 2014; Peltzer, 2014; Rajagopaul et al, 2014). Cigarette smoking and drinking alcohol has been associated with an increased risk of developing TB disease and poor treatment outcomes (Peltzer, 2014). Moreover, drinking alcohol while taking TB treatment can increase drug side effects as both can affect the liver. In addition, drinking alcohol patients may forget to
take their TB treatment when drunk. Therefore, patients should be advised to stop drinking alcohol while on TB treatment.

5.2.1.3. Therapy and condition related factors

Therapy and condition related factors include side effects experience, TB disease classification, HIV status, co-morbidities and other medicine taken. In our study we found that side effects experience, TB disease classification, HIV status, co-morbidities and other medicine taken were not significantly associated with TB treatment adherence. A total of 99.2% tested for HIV and 73% tested HIV positive. HIV positive patients have a higher proportion of non-adherence as compared to HIV negative. Of all patients taking HAART, 20.1% were non-adherence to their TB treatment. According to WHO (2017), TB treatment should be initiated first regardless of their CD4 count followed by ART as soon as possible within 8 weeks. HIV co-infected patients have many pills to take and the adverse effects of anti-TB medication are more common for Anti-Retroviral Treatment (Adane et al, 2013). Patients on HAART and TB treatment may have pill burden than those not on HAART, which may affect treatment adherence. Therefore, HIV co-infected patients with TB should be encouraged to comply with TB treatment to reduce the risk of clinical deterioration and prevent the development of drug resistant tuberculosis and relapse, which in turn prolongs morbidity and mortality.

About 15.6% of all participants had experienced at least one side effect of TB treatment, the most common being painful limbs (27.5%) and diarrhoea (25%), even though side effects were not a significant factor affecting TB treatment adherence (p-value 0.880). Some patients may have had more than one side effects but the question did not capture these. The results are similar with the study conducted in Namibia (p-value 0.19) (Chani, 2010). Experiencing side effects while taking TB treatment may discourage patients from taking their treatment, because patient may feel sick after taking their treatment, particularly during the first weeks of treatment (Rajagopaul et al, 2014). It is important that side effects are managed early and healthcare providers should provide health education to TB patients before they start treatment. This finding is not consistent with other studies (Finlay et al, 2012; Adane et al, 2013; Rajagopaul
et al, 2014) which revealed that experiencing side effects while on TB treatment is significantly associated with treatment adherence.

In our study patient health status in the form of feeling better after starting TB treatment was found not a significant factor associated with TB treatment adherence (p-value 0.354). About 93% took less than two months to feel better, while 6.6% took between two to four months and 0.4% did not feel better at all. This result was not consistent with other studies which showed that felt better was associated with default among re-treatment patients (Finlay et al, 2012; Adane et al, 2013). Therefore, healthcare worker should provide health education and encourage patient to continue with treatment until they are discharged by healthcare worker. Participants were asked if they were taking other treatment besides TB treatment. A total of 256 responded, about 76.6% said they were taking other treatment while 23.4% said they were not taking other treatment. Taking other treatment was not a significant factor affecting TB treatment adherence (p-value= 0.191) (Table 4.10).

5.2.1.4. Healthcare system related factors

Clinic opening and closing times, waiting time, the attitude of the health worker, distance and cost of getting to the clinic, availability of medicines and DOT status have been shown to be important factors affecting TB treatment adherence (Chani, 2010). In our study participants were asked to rate healthcare worker attitude from friendly to unfriendly, only 7.4% (n=19) ranked them as unfriendly. About 20.1% (n=4) were non-compliant. Healthcare worker attitude was not a significant factor to TB treatment adherence (p-value 0.826) (Table 4.18). The study conducted in South Africa had different findings that there was an association between non-adherence and poor perceived relationship between healthcare worker and patients (OR 2.1; 95% CI 1.1-4) (Finlay et al, 2012). Poor communication between healthcare worker and patients may affect treatment outcome because healthcare workers may not provide enough counselling.

Most participants (89.1%) in our study had a treatment supporter while they were taking treatment and 10.9% did have one. However, our findings indicated that 17.2% who had treatment supporter did not comply with their treatment, while 17.9% without
a treatment supporter did not also comply with their treatment. In our study, having treatment supporter was no statistically significance with TB treatment adherence (p-value 0.557). The study conducted in three provinces South Africa revealed different finding that incomplete DOT, specifically receiving DOT during intensive phase is associated with treatment adherence (p-value 0.0001) (Ershova et al, 2014). However, according to WHO (2014), ensuring adherence is therefore a key component of WHO global TB strategy: the “End TB Strategy.” Pillar 1 of this strategy calls for ‘supportive treatment supervision, to help patients to take their medication regularly and to complete treatment, thus facilitating their cure and preventing the development of drug resistance. DOT has long been recommended by WHO and is the global standard of care.

Participants were asked about medicine availability when they went to collect in the clinic. About 96.9% reported that medicine were available each time they went to collect them, while 2.1% reported that medicine was sometimes not available when they went to collect them. Availability of medicine was however not statistically significant to TB treatment adherence (p-value 0.628). A study conducted by Chani in Namibia had similar findings, this is because all participants indicated that medicines were always available at the clinic when they went to collect them (Chani, 2010). Medicine unavailability may force patient to interrupt treatment even if they went to clinic on time to pick up their medicine.

Clinic opening times may be inconvenient, particularly to patient who are employed. About 98.4% participant would prefer the clinic to have flexible opening times that is opening before 08h00 and closing after 17h00, because even those who are employed will be catered for. Clinic opening and closing times was not statistically significant to TB treatment adherence (p-value= 0.337).

Waiting time at the clinic was statistically significant to TB treatment adherence (p-value=0.014). Our finding was however consistent with a study conducted in Namibia that clinic waiting time is statistically significant to TB treatment adherence (p-value 0.049) (Chani, 2010). Fast lane for TB patients may have better treatment out because patients will not have to wait in queues to be attended by healthcare worker. The study
conducted in South Africa also reflected that long waiting time had a negative impact on patient adherence to TB treatment (Finlay et al, 2012).

Distance and cost of travelling to the clinic were not significant factors affecting TB adherence and it was interesting to note that participants who did not complete treatment were staying within five kilometres of the TB clinic and did not have to pay any money to travel to the clinic (p-value 0.134). Most studies made a different observation that the risk of non-adherence to TB treatment is higher among those who had financial constraint to back transport cost and food (Finlay et al, 2012; Adane et al, 2013; Tola et al 2015). Even though transport was not required, walking for up to 5km may be strenuous for patients on the days when they do not feel well.

5.2.1.5. Patient knowledge about TB

Patient knowledge about TB disease and its treatment enhance treatment adherence. Knowledge about TB was assessed with questions checking the knowledge of the participants on the treatment duration and seeking medical treatment when they experience TB signs and symptoms. How TB is spread is not statistically significant factor contributing to TB treatment adherence (p value 0.175). About 90.6% had a good respond as compared to 9.4% that TB is spread though cough. Knowledge of TB disease and its treatment increases awareness and health seeking behavior of individuals. However, lack of knowledge may affect treatment outcomes. In this study majority of participants indicated that they would stop TB treatment after six months and after being informed by healthcare worker to stop. Therefore it is important for healthcare provider to provide health education about TB treatment duration before patients start treatment.

In order to assess the participant’s knowledge with regard to seeking medical treatment when they experience TB signs and symptoms 90.6% (n=232) indicated that they will consult clinic while 3.1% will seek self-treatment and 2.6% will delay seeking medical treatment when they experience signs and symptoms and consult traditional healer. Seeking medical treatment was not significant factor contributing to TB treatment adherence (p-value 0.057) (Table 4.21).
5.3. Strategies to improve adherence to treatment

Concurrently with the efforts to improve the understanding of factors affecting adherence to TB treatment, numerous measures have been introduced in different settings in attempt to improve it. These strategies are outlined as follows by World Health Organization (WHO, 2016).

- The most effective adherence enhancing interventions directed at patients aim to enhance self-regulation or self-management capabilities. Self-management programmes offered to patients with chronic diseases can improve health status and reduce health care utilization and costs.
- Staff motivation and supervision- includes training and management processes aimed at improving the way in which providers care for patients with TB.
- Health education: provision of information about TB and the need to attend for treatment.
- Defaulter action: the action to be taken when a patient fails to keep pre-arranged appointments.
- Prompts: routine reminders for patients to keep pre-arranged appointments.
- Training providers in patient-centred methods of care may be effective, but the strongest effects of such training appear to be on patient satisfaction with treatment.
- Because providers have such a significant role in adherence, designing interventions to influence their behaviour seems a reasonable strategy.

5.4. Limitations of the study

Findings captured only certain issues from a limited sample size of patients of TB as other patients had already left the area. Therefore a total of two hundred and fifty six (256) participants were approached rather than 345 that were targeted for. Therefore results are not intended to be representative of the general population.
5.5. Conclusion

This study has enabled the researcher to investigate factors associated with adherence to TB treatment in Modimolle Sub-District. A non-adherence is an issue of concern in Modimolle Sub-District with an overall level of non-adherence at 19.1%. Factors associated with non-adherence to TB treatment among patients in this Sub-District PHC facilities include patient waiting times at the TB clinic and knowledge of seeking medical care when experiencing signs and symptoms of TB. One of the important areas for TB control programmes is to improve or enhance TB treatment adherence. This study suggests that reducing patient waiting times at the TB clinic through linkages with community programmes aimed at improving access to TB diagnosis and treatment, and maintaining successful treatment outcomes in the face of emerging drug resistance and intensifying health education will improve TB treatment adherence. However, treatment supervision policies need to be enhanced to improve TB treatment outcomes.

5.6. Recommendations

Based on the findings from the study, the following recommendations are made:

5.6.1 Recommendations for further research studies

Further research is needed to identify the comparison between male and female non-adherence to TB treatment in Modimolle Sub-District.

Further research on patient reported delays in seeking Tuberculosis treatment as this has a negative impact on treatment outcome.

5.6.2 Recommendations to decrease non-adherence to TB treatment

The following recommendations are for the Modimolle Sub-District health management team to consider in order to reduce non-adherence to TB treatment:
• Health education to communities about TB through awareness campaigns, road shows, door-to-door campaigns, educating people about TB to reduce the myths surrounding TB and HIV, as well as educating people about the importance of compliance with TB treatment and the dangers of interrupting treatment.

• Intensify health education to all TB patients, particularly at the beginning of treatment, with reinforcement at each visit using the local language, duration of treatment, and possible side effects and how to deal with them.

• Carers should implement DOTS strategy.

• Traditional healers should be incorporated in as DOT supporters.

• Volunteers should be trained on patient supervision. E.g. Supervise taking of medication, Volunteers could form part of a valuable support system.

• Staff shortages should be addressed to allow sufficient time for health education.

• Reduce patient waiting times at the TB clinic by strengthening fast lanes for TB patients.

• Health promotion activities that target patient delays have the potential to improve individual patient outcomes and lessen the spread of TB at a community level.

• Strengthen follow-up of patients who interrupt TB treatment before they actually default treatments.

• Involve TB patients in developing strategies to improve treatment adherence.

• Health facilities should establish heath facility based or community based adherence clubs.

• Strengthen facility DOT for patients staying close to the health facility. This would enable as many patients as possible to be observed by a health worker when swallowing their medicines.

• Initiate income-generating activities to improve food provision for patients on treatment. Also, link TB patients to social services and community programmes that provide food.
6. LIST OF REFERENCES


among tuberculosis patients in three provinces of South Africa. *South African Medical Journal, 104*(5).


ANNEXURE 1: Questionnaire (ENGLISH VERSION)

Individual Patient’s Questionnaire Number: □
Date of Interview: __________________________
Instructions:
PLEASE TICK THE APPROPRIATE BOX/BOXES WITH AN X

SECTION A: DEMOGRAPHIC INFORMATION

Qn.1. Age in Years ________
Qn.2. Religion
☐ 1. Christian
☐ 2. Islam
☐ 3. Other
Qn.3. Gender
☐ 1. Male
☐ 2. Female
Qn.4. Marital Status
☐ 1. Married
☐ 2. Widowed
☐ 3. Single
☐ 4. Divorced
Qn.5. Education level
☐ 1. None
☐ 2. Primary
☐ 3. Secondary
☐ 4. Grade 12
☐ 5. Tertiary

SECTION B: SOCIOECONOMIC FACTORS

Qn.6. Employment Status
☐ 1. Employed
☐ 2. Self-employed
☐ 3. Unemployed
Qn.7. What is your income (Rand per month)?
☐ 1. Low (<1000)
☐ 2. Medium (1000-5000)
☐ 3. High (>5000)
Qn.8. What can you say is your situation in terms of food availability?
☐ 1. Always available to take with medicines
☐ 2. Available most of the time
☐ 3. Not always available
☐ 4. Never available
Qn.9. Have you smoked cigarettes in the last 6 months?
   1. Yes
   2. No
   3. Cannot remember

Qn.10. Did you drink alcohol in the last 6 months?
   1. Yes
   2. No
   3. Cannot remember

SECTION C: THERAPY AND CONDITION RELATED-FACTOR

Qn.11. Do you experience any side effects while you are taking TB treatment?
   1. Yes
   2. No

Qn.12. If Yes to above question, what side effects did you experience?
   1. Diarrhoea & Vomiting
   2. Skin rashes
   3. Headaches and dizziness
   4. Numb feet or hands
   5. Yellow eyes
   6. Painful limbs
   7. Other

Qn.13. From the day you started taking your TB treatment, how long did it take you
        before you felt better? (Months)
   1. <2
   2. 2-4
   3. 5-6
   4. Did not feel better.

Qn.14. Did you stop your treatment before you complete TB treatment?
   1. Yes
   2. No

Qn.15. If the response to the above question is No, what were the reasons for you to
        stop treatment?
   1. Side effects
   2. Too many pills to take
   3. Distance
   4. Cost of travel
   5. Lack of family support
   6. No food
   7. Inadequate supply of medicines
   8. Not feel better on treatment
   9. No reason or other
Qn.16. Disease classification (tick appropriately according to treatment card or TB register)

1. PTB smear positive
2. PTB smear negative
3. Extra-pulmonary TB
4. PTB and Extra-pulmonary TB
5. Not indicated

Qn.17. HIV status (as indicated on TB treatment card or TB register)

1. Positive
2. Negative
3. Not indicated

Qn.18. Are you taking other medicines besides TB treatment?

1. Yes
2. No

Qn.19. If yes to the above question, which medicines are you taking?

1. HAART
2. Anti-hypertension
3. Psychiatric (antipsychotic, antidepressants)
4. Other

SECTION D: HEALTH-CARE SYSTEM RELATED FACTORS

Qn.20. Who is supervising you when you are taking your TB medicine? (DOT Status)

1. None
2. Family member
3. Health Worker at the facility
4. Community member

Qn.21. When you pick-up your medicines at the TB clinic, what would you say about the availability of medicines there?

1. Always available
2. Sometimes not available

Qn.22. How much time do you spend in the clinic/facility for monthly refill of TB treatment?

1. <1 hour
2. 1-2 hours
3. >2 hours

Qn.23. What distance do you travel to collect your TB medicines (Km)?

1. [<5]
2. [5-10]
3. [11-15]
4. [16-20]
5. [>20]
Qn.24. How much does it cost you to get to the health facility (Rand)?

1. Nothing (walking distance)
2. <10
3. 10-15
4. >20

Qn.25. What would be the most convenient TB clinic opening times for you?

1. <8am- 5pm
2. 8am- 5pm
3. 8am- >5pm
4. <8am- >5pm

Qn.26. How would you rate the attitude of staff who attends you at the health facility?

1. Friendly
2. Unfriendly

SECTION E: PATIENT KNOWLEDGE ABOUT TB TREATMENT

Qn.27. How do you think TB is spread? (Tick all that applies)

1. Cough (Air)
2. Unclean food or water
3. Public area / Hereditary
4. Sexual contact with TB patient
5. Don't know

Qn.28. Do you think TB is infectious?

1. Yes
2. No
3. Don't know

Qn.29. How long do you think TB treatment should be taken? (Tick all that applies)

1. 6 months
2. When feels better then stop on your own
3. 6 months completed and health worker tells you to stop

Qn.30. What do you think you would do if you cough and blood comes out? (Tick ONE of the 4 choices)

1. Self-treatment: Traditional medicine
2. Self-treatment: Modern medicine
3. Consult someone: Traditional medicine
4. Consult someone: Modern medicine

........... THANK YOU VERY MUCH FOR YOUR TIME AND COOPERATION...........
ANNEXURE 2: Lenaneopotšološišo (SEPEDI VERSION)

Nomoro ya letlakalapotšišo ya mokgatatema: 
Letšatšikgwedi: ____________________
Ditaelo:
SWAYA KA "(X)" KA SEKGOBENG SA MALEBA
KAROLO A: TŠA BOWENA
Qn.1. Mengwaga ya mokathatema: ____________________
Qn.2. Tumelo
   □ 1. Bokreste
   □ 2. Islamo
   □ 3. Dingwe
Qn.3. Bong
   □ 1. Monna
   □ 2. Mosadi
Qn.4. Maemo a Lenyalo
   □ 1. Ke nyetše/nyetšwe
   □ 2. Mohlolo/Mohlologadi
   □ 3. Ga se o nyale
   □ 4. Ohladile
Qn.5. Maemo a Dithuto
   □ 1. Ga gona
   □ 2. Mphato wa fase
   □ 3. Mphato o phagamego
   □ 4. Kreiti lesome pedi
   □ 4. Marematlou
KAROLO B: DIKA TŠA LEAGO LE BOIPHIDIŠO
Qn.6. Boemo bja Mošomo
   □ 1. Kea šoma
   □ 2. Kea itšhoma
   □ 3. Ke hloka mošomo
Qn.7. Mogolo wa gago wa kgwedi ka Diranta ke bokae?
   □ 1. Ka fase ga R1000
   □ 2. Magareng ga R1000 le R5000
   □ 3. Ka godimo ga R5000
Qn.8. O ka reng ka goba gona ga dijo bophelong bja gago?
   □ 1. Di dula dile gona ka mehla
   □ 2. Di ba gona matšatšing a mangwe
   □ 3. Ga dibe gona ka mehla
   □ 4. Ga di gona
Qn.9. O kile wa kgoga motšoko mo di kgweding tše tshelelang tša go feta?
1. Ee
2. Aowa
3. Ga ke gopole

Qn.10. O kile wa nwa jwala mo di kgweding tše tshelelang tša go feta?
1. Ee
2. Aowa
3. Ga ke gopole

KAROLO C: DIKA TŠA KALAFO LE MALWETŠI
Qn.11. Ge o enwa dihlare (dipilisi) tša bolwetši bja mafahla (TB) o ba le ditlamorago?
1. Ee
2. Aowa

Qn.12. Ga eba o arabile Ee potšišong ya ka godimo, ke ditlamorago dife tšeo o bang le tšona?
1. Letšholic/Lehlatsı̂o
2. Dišo mo letšalı̂o
3. Hlogo/Modikologo
4. Bogašu menwaneng
5. Mahlo a sorolwane
6. Maoto le matsogo a boholoko
7. Tje dingwe

Qn.13. Go tloga mola o thomang go nwa dipilisi tša bolwetši bja mafahla (TB), go tšere dikgwadi tše kakang pele o ekwa bokaone?
1. Dikgwedi tša fase ga tše pedí
2. Gare ga dikgwedi tše pedí le tše nne
3. Gare ga dikgwedi tše thano le tše tshela
4. Go swana feela

Qn.14. O feditše gonwa dihlare ka moka tša kalafo ya bolwetši bja mafahla (TB)?
1. Ee
2. Aowa

Qn.15. Ga eba o arabile Aowa potšišong ya ka godimo, mabaka a go se fetše gonwa dihlare/dipilisi ka moka tša kalafo ya bolwetši bja mafahla (TB) ke eng?
1. Ditlamorago
2. Dipilisi ke tše ntšhi
3. Bokgole
4. Tefo ya leeto
5. Go hloka thekgo lapeng
6. Go hloka dijo
7. Tlhokego ya kabo ya dihlare
8. Go se kaonafale eupša ke dutše ke enwa dipilisi
9. Ga go na lebaka

Qn.16. Tlhao lo ya bolwetši bja mafahla – TB (Swaya go ya ka karata ya dihlare):
1. Bolwetši bja TB bo gona sehubeng
2. Bolwetši bja TB a bogo sehubeng
3. Bolwetši bja TB ka ntle ga maswafo
4. Bolwetši bja TB ka gare le ka ntle ga maswafo
5. Ga go tlhaloso

Qn.17. Maemo a bolwetši bja kokwanahloko
1. Kokwanahloko e gona
2. Kokwanahloko ga e gona
3. Ga go tlhaloso

Qn.18. Go nale dipilisi goba dihlare tše dingwe tšeo o di nwago ka ntle le tša bolwetši bja mafahla (TB)?
1. Ee
2. Aowa

Qn.19. Ga eba o arabile Ee potšišong ya ka godimo,ke dipilisi goba dihlare dife tšeo o di nwang?
1. Tša kokwanahloko (HAART)
2. Tša kgatelelo ya godimo ya madi
3. Tša kgatelelo ya monagano
4. Tje dingwe

KAROLO D: DIKA TŠA TSEPEDIŠO YA KALAFI LE TŠA MAPHELO

Qn.20. O hlokomela ke mang ge o enwa dipilisi/dihlare tša bolwetši bja mafahla (TB)?
1. Ga go motho
2. Mongwe ka lapeng
3. Wa tša maphelo bookelong/tliniking
4. Modüdi wa motseng

Qn.21. Ge o lata dipilisi/dihlare tša bolwetši bja mafahla (TB) bookelong/tliniking, o kareng ka goba gona ga tšona?
1. Di dula dile gona ka mehla
2. Di nale go hlokega nako enngwe
Qn.22. O tšea nako a kaakang bookelong/tšiliniking ge o lata dipilisi/dihlare tša bolwetši bja mafahla (TB) kgwedi ka kgwedi?
   □ 1. Fase ga iri e tee
   □ 2. Gare ga iri e tee le tše pedi
   □ 3. Go feta iri tše pedi

Qn.23. Ke leeto le le kaakang go ya bookelong/tšiliniking go yo lata dipilisi/dihlare tša bolwetši bja mafahla (TB) kgwedi ka kgwedi?
   □ 1. Fase ga khilomithara tše thano
   □ 2. Gare ga dikhlomithara tše thano le tše lesome
   □ 3. Gare ga dikhilomithara tše lesomete le tše lesomethano
   □ 4. Gare ga dikhilomithara tše lesomethla le tše masomepedi
   □ 5. Go feta dikhilomithara tše masomepedi

Qn.24. O lefela bokae ge o eya bookelong/tšiliniking go yo lata dipilisi/dihlare tša bolwetši bja mafahla (TB) kgwedi ka kgwedi?
   □ 1. Ke sepela ka maoto
   □ 2. Ka fase ga diranta tše lesome
   □ 3. Gare ga diranta tše lesome le tše lesomethano
   □ 4. Go feta diranta tše masomepedi

Qn.25. Ke nako mang yeo e go loketšeng go ya bookelong/tšiliniking go yo lata dipilisi/dihlare tša bolwetši bja mafahla (TB) kgwedi ka kgwedi?
   □ 1. Ga iri ya seswai mesong
   □ 2. Gare ga iri ya seswai mesong le iri ya bohlano mathapama
   □ 3. Morago ga iri ya bohlano mathapama
   □ 4. Pele ga iri ya seswai mesong le morago ga iri ya bohlano mathapama

Qn.26. Maitshwaro a bašomi ba tša maphelo bookelong/tšiliniking a bjang?
   □ 1. Ba nale lethabo
   □ 2. Ga bana lethabo

KAROLO E: TSEBO YA MOLWETŠI KA BOLWETŠI BJA MAFAHLA (TB)
Qn.27. Ka mogopoło wa gago, bolwetši bja mafahla (TB) bo phatlalatšwa bjang? (Swaya kamoke tše di tshwanetšing)
   □ 1. Ka sekgohlolo
   □ 2. Meetsle le dijo tša ditšhila
   □ 3. Lefelo la bohle
   □ 4. Thbalano le molwetši wa bolwetši bja mafahla (TB)
   □ 5. A ke tsebe
Qn.28. Ka mogopoloha wa gago, bolwetsi bja mafahla (TB) boa fetelana?
[ ] 1. Ee
[ ] 2. Aowa
[ ] 3. A ke tsebe

Qn.29. Ka mogopoloha wa gago, dipilisi/dihlare tša bolwetsi bja mafahla (TB) di swanetshe go nwewa dikgwedi tše kae? *(Swaya kamoke tše di tshwanetšing)*
[ ] 1. Dikgwedi tše tshela
[ ] 2. Ge molwetsi a ekwa bokaone a kano tlogela go nwa
[ ] 3. Morago ga dikgwedi tše tshela ge mošomi wa tša maphelo a laela molwetsi go tlogela

Qn.30. Ka mogopoloha wa gago, ge okare o gohlola wa tshwa madi, o tša dira eng? *(Swaya e tee mo tše nne)*
[ ] 1. Nka ikalafa ka dihlare tša setšo
[ ] 2. Nka ikalafa ka dihlare tša sekgowa
[ ] 3. Nka ya go ngaka ya setšo
[ ] 4. Nka ya bookelong goba tšiliniking

**RE LEBOGA NAKO YA GAGO LE GO ITHAOPA GA GAGO GE OTŠERE KAROLO MO DINYAKIŠIŠONG**
ANNEXURE 3: Informed consent

SEFAKO MAKGATHO HEALTH SCIENCES UNIVERSITY ENGLISH CONSENT FORM

Statement concerning participation in a study.

Name of the Study:
Factors associated with adherence to TB treatment among TB patients in Modimolle Sub-District, Limpopo Province. I have read the information on the aim and objectives of the proposed study and I was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurized to participate in any way.

I understand that participation in this study is completely voluntary and that I may withdraw from it at any time and without supplying reasons.

I know that this study has been approved by Sefako Makgatho Health Science University Research Ethics Committee (SMUREC) and Department of Health (Limpopo Province), Waterberg district Manager, Modimolle Sub-District Manager and Primary Health facility Manager. I am fully aware that the results of this study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this study.

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

Name of participant. Signature of Participant.

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

Place. Date. Witness

Statement by the Researcher

I provided verbal and/or written information regarding this study.

I agree to answer any future questions concerning the study as best as I am able.

I will adhere to the approved protocol.

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

Name of Researcher Signature Date Place
07 September 2017

Miss N Mukomafhzedzi
Department of Public Health
P.O Box 215
Medunsa, 0204

MEETING: 07/2017

SMUREC Ethics Reference Number: SMURECH/215/2017: PG

The New Application received on 10 August 2017, was reviewed by members of Sefako Makgatho University Research Ethics Committee 07 September 2017 and was approved on 07 September 2017.

Title: Factors associated with adherence and non-adherence to TB treatment in Modimolle Sub-District, Limpopo Province

Researcher: Miss N Mukomafhzedzi
Supervisor: Dr S Mndebele
Department: Public Health
School: Health Care Sciences
Degree: MPH

Please note the following information about your approved research protocol:

Approval Period: 07 September 2017 – 07 September 2018

Please remember to use your protocol number (SMURECH/215/2017: PG) on any documents or correspondence with the REC concerning your research protocol.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modification, or monitor the conduct of your research and the consent process.

After Ethical Review: Please note a template of the progress report is obtainable in the Research Office and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit. Translation of the consent document in the language applicable to the study participants should be submitted.

International Organisation (IORG0008691), Institutional Review Board (IRB000010386) Expiry date: 09 December 2018, Federal Wide Assurance (FWA000023943) Expiry date: 03 March 2021 and NHREC No: REC 210408-003

Sincerely

PROF C BAKER
DEPUTY CHAIRPERSON SMUREC
Enquiries: Stols M.L (015 293 6169)  
Ref:4/2/2

Ndlovuwe M  
Sefako Makgatho Health Sciences University  
P.O. Box 163  
MEDUNSA  
0204

Greetings,

RE: Factors associated with adherence and no-adherence to TB treatment in Modimolle Sub-District, Limpopo Province

The above matter refers.

1. Permission to conduct the above mentioned study is hereby granted.
2. Kindly be informed that:
   - Research must be loaded on the NHRD site (http://nhrd.hst.org.za) by the researcher.
   - Further arrangement should be made with the targeted institutions, after consultation with the District Executive Manager.
   - In the course of your study there should be no action that disrupts the services.
   - After completion of the study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   - The above approval is valid for a 3 year period.
   - If the proposal has been amended, a new approval should be sought from the Department of Health.
   - Kindly note, that the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated.

Head of Department  
Date  

2017/11/06
DEPARTMENT OF HEALTH
WATERBERG DISTRICT

REF: 4/3/3
ENQ: NGOGDI D.R (PA TO THE DISTRICT EXECUTIVE MANAGER)
DATE: 08/11/2017

TO: NDIVHUWO M
SEFAKO MAKGATHO HEALTH SCIENCES UNIVERSITY
P.O. BOX 163
MEDUNSA
0204

RE: PERMISSION TO CONDUCT RESEARCH: YOURSELF.

The above bear's reference:-

1. The office of the Acting District Executive Manager, hereby confirms receipt of your request to conduct research on factors associated with adherence and non-adherence to TB treatment in Modimolle Sub-District Limpopo Province, South Africa.

2. Permission is hereby granted as per approval by the HOD.

3. You are further requested to notify this office on when you are going to start with the research and make sure that there is no action that disturbs service delivery.

Your support and cooperation in terms of the above will be highly appreciated.

[Signature]

ACTING DISTRICT EXECUTIVE MANAGER
WATERBERG DISTRICT

9/11/2017
DATE