INTERVENTION STRATEGIES TO IMPROVE TUBERCULOSIS TREATMENT ADHERENCE IN LIMPOPO PROVINCE, SOUTH AFRICA

by

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DECLARATION

I, Hulisani Matakanye hereby declare that this thesis titled: ***Intervention strategies to improve Tuberculosis treatment adherence in Limpopo Province, South Africa*** is my own work, and has never been presented for any degree at this or any other university before. All sources that I have used in this document have been dully acknowledged.

Signature_____ Date __07 Jan 2021_____

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DEDICATION

I would like to dedicate this research to my beautiful wife, Tiisetso Maggie Ursula Matakanye, and my beautiful daughter, Mufunwa Matakanye, for their understanding, love, and comforting support that they have showed me whilst I was studying over the years. They have deeply inspired me to pursue my studies in PhD to better my knowledge and understanding to make a special contribution towards Public Health field.

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LIST OF ACRONYMS AND ABBREVIATIONS

AIDS;	Acquired Immune Deficiency Syndrome
AIMS;	Adherence Improvement Management Strategy
APEASE;	Affordable, Practical, Effective, Acceptable, Safe, Equitable
ART;	Antiretroviral Therapy
BCT;	Behaviour Change Technique
BCTv1;	Behaviour Change Technique Taxonomy version 1
BCW;	Behaviour Change Wheel
CHC;	Community Health Centre
CHWs;	Community Health Workers
COVID 19;	Coronavirus disease
DOH;	Department of Health
DOT;	Directly Observed Treatment
DOTS;	Directly Observed Treatment Short-course
FGD;	Focus Group Discussion
HIV;	Human Immunodeficiency Virus
NTCP;	National TB control Programme
NTP;	National TB Programme
MDR-TB;	Multi-drug Resistant Tuberculosis
MDR/RR-TB;	Multidrug- and rifampicin-resistant tuberculosis
MTB;	Mycobacterium Tuberculosis
NTCP;	National TB Control Programmes
PLWH;	People living with HIV
PTB;	Pulmonary Tuberculosis
SMS;	Short Message Service
SPSS;	Statistical Package for the Social Science
TB;	Tuberculosis
XDR-TB;	Extensively drug Resistant Tuberculosis
UHDC;	University Higher Degrees Committee
WHA;	World Health Assembly
WHO;	World Health Organization

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ABSTRACT

Even though tuberculosis is curable, it remains a major cause of ill-health among millions of people. Globally tuberculosis is the second leading cause of death from an infectious disease after the Human immunodeficiency virus. The major unresolved challenge in the management of tuberculosis is treatment completion. In the Limpopo Province, tuberculosis treatment adherence remains low with a tuberculosis treatment success rate of 80.6% which is below a national target of 85%. If this problem is not addressed, many people will develop Multidrug resistant tuberculosis or die. The purpose of the study was therefore to develop intervention strategies to improve tuberculosis treatment adherence in the Limpopo Province. The study was conducted in eight Community health centres in three selected districts (Vhembe, Waterberg, and Capricorn) of Limpopo province. The study comprised of three phases. Phase one used exploratory sequential mixed methods design to assess and describe factors contributing to non-adherence to tuberculosis treatment among tuberculosis patients. In phase two, the researcher used the findings obtained from Phases 1a and Phase 1b, to develop evidence-based intervention strategies that encompasses Behaviour change techniques aimed at overcoming the identified barriers and factors affecting tuberculosis treatment adherence. In phase three, the researcher then validates the developed intervention strategies with district tuberculosis manager using the checklist to see if they meet Affordable, Practical, Effective, Acceptable, Safe, Equitable criteria.

Qualitative approach was used to collect data among 16 tuberculosis patients, three district tuberculosis managers, eight facility operation managers, eight tuberculosis focal person through key informant interview and 18 directly observed treatment supporters through focus group discussion. Colaizzi's method for data analysis which follows seven data analysis steps was used to analyze qualitative data to identify meaningful information and organize it into themes. Results from the qualitative were used to inform development of questionnaire for quantitative approach to collect data among tuberculosis patients. Quantitative data were collected from 207 respondents using questionnaires and analysed using Statistical Package for Social Sciences® version 26.0.

In the analysis of qualitative data, the researcher found the most descriptive words for each topic and turned them into categories. Related topics were then grouped to reduce the number of categories and to create themes. Qualitative data findings revealed five major themes from the raw data: (1) Social and Cultural factors, (2) Patients related factors, (3) Treatment related factors, (4) Socio-economic factors and (5) Health care and health system factors. The findings indicated that TB patients do not adhere to their prescribed TB treatment because of lack of knowledge about TB and its treatment. Due to lack of

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knowledge tuberculosis patients were found to visit traditional healers and prophets for help even after their diagnosis. Only 9.2% of the participants indicated that they knew about tuberculosis before their diagnosis. Environmental related barriers were attitude of health workers, lack of support by family and community, lack of food and abuse of alcohol and illicit drugs. Wrong perception about tuberculosis and misperceptions cultural beliefs, stigma and refusal of directly observed treatment supporters affected treatment adherence. In Phase two, Adherence Improvement Management Strategy was developed through stakeholder workshop based on the interpretation of the findings from both approaches and was guided by the last two stages of Behaviour change Wheel. The Intervention strategy will be delivered using patient's information leaflets materials by the community health workers to the patients, community, and family members. In Phase three, the developed intervention strategy was then validated by the stakeholders using Affordable, Practical, Effective, Acceptable, Safe, Equitable criteria. The findings of this study highlight an urgent need for collaboration between Department of Health and the community to address the need of the community.

Keywords: Adherence, Intervention, Non-Adherence, Strategies, Treatment, Treatment adherence, Tuberculosis.

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CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 Introduction

Developing effective interventions strategies to improve treatment adherence amongst tuberculosis (TB) patients in TB care is crucial to reduce defaulter rate and patients' loss to follow up in order to achieve targeted TB cure rate. Tuberculosis is one of the oldest infectious diseases caused by a relatively large, non-motile, rod-shaped pathogen called Mycobacterium tuberculosis (MTB) (Maitra, Munshi, Healy, Martin, Vollmer, Keep & Bhakta, 2019). The MTB spreads from person-to-person through the air by droplet nuclei which enter the body via the respiratory mucous membranes and multiply to form a primary lesion. The main infection site is the lung, but any organ can become infected if the bacteria spread. Amongst infected people, 10–12% develop active TB disease after a period ranging from weeks to decades (World Health Organization (WHO), 2018). Tuberculosis is curable if patients with drug susceptible organisms are given enough uninterrupted treatment (Fentie, Jorgi & Assefa, 2020). The death from pulmonary TB patients is always related to the high rate of TB patients who interrupt their treatment and those who access treatment late. Incomplete adherence to treatment has been identified as the most serious problem in TB control and a major obstacle to the elimination of the disease. Patients who take their TB treatment in an irregular and unreliable way are at greatly increased risk of treatment failure, relapse, and the development of drug-resistant TB strains. Tuberculosis patients are expected to have adherence levels which are greater than 90% to facilitate cure. Treatment non-adherence increases the risk of development of drug resistant strains and further spread of TB in the community, which in turn increases morbidity and mortality. Adherence to TB treatment is crucial to achieve cure and avoid emergence of drug resistance (Gebreweld, Kifle, Gebremicheal, Simel, Gezae, Ghebreyesus, Mengsteab & Wahd, 2018).

This chapter consists of the introduction, background, problem statement, rationale, significance, purpose, objectives, and research questions of the study. Operational definition of concepts and key terms, and summary of the whole chapter are also discussed in this chapter.

1.2 Background to the study

Tuberculosis is a major global health problem, infecting millions of people annually and ranks alongside the human immunodeficiency virus (HIV) as a leading cause of death worldwide particularly in the low and middle-income countries. In 2016, there were an estimated 10.4 million new (incident) TB cases worldwide, of which 6.2 million were men, 3.2

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million were women, one (1) million were children and people living with HIV accounted for 10% of the total. It is estimated that about one-third of the world's population is infected with the tuberculosis bacillus (WHO, 2017). In 2016, the largest number of new TB cases occurred in Asia, with 61% of new cases, followed by Africa, with 26% of new cases (Aziz, Nazly & Norimah 2017). The HIV plague and increase in TB drug resistance TB are regarded as contributors to TB becoming a major global challenge that causes more deaths worldwide than any other infectious disease (Center for Disease Prevention and Control, 2016). Tuberculosis is one of the opportunistic infections common among people living with HIV (PLWH) and often the leading cause of deaths among PLWH. People living with HIV are 20 to 30 times more likely to develop active TB disease than people without HIV. In 2015, there were an estimated 1.2 million new cases of TB amongst PLWH globally, and 71% of whom were living in Africa. TB contributes to about 35% of deaths among PLWH.

According to WHO (2018), it is estimated that 10.0 million people developed TB disease globally in 2017, of which 5.8 million were men, 3.2 million were women and 1.0 million were children. Of 10.0 million cases, 90% were adults above the age of 15 years, 9% were people living with HIV. About 72% TB patients were in Africa and two thirds were in eight countries: India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (5%), Nigeria (4%), Bangladesh (4%) and South Africa (3%). These eight countries and 22 other countries in WHO's list of 30 high TB burden countries accounted for 87% of the world's cases. Only 6% of global cases were in the WHO European Region (3%) and WHO Region of the Americas (3%). The severity of national epidemics varies widely among countries. In 2017, there were fewer than 10 new cases per 100 000 population in most high-income countries, 150–400 in most of the 30 high TB burden countries, and above 500 in a few countries including Mozambique, the Philippines, and South Africa (WHO, 2018).

Tuberculosis treatment non-adherence is a public health challenge worldwide. Although TB infection is treatable and curable if patients take their TB treatment exactly as prescribed and finish their treatment many TB patients worldwide do not complete their treatment as prescribed. The WHO (2017) report shows that despite implementation of an internationally recommended strategy called Directly Observed Treatment Short-course (DOTS) in almost all parts of the world exerted against TB prevention and control, patients are still failing to complete their treatment to be declared cured or adhere to their prescribed TB treatment. The WHO (2012) global TB report shows that in 2011, many TB cases in the WHO regions failed after several treatments, 226, 813 TB patients relapsed after being exposed to TB after they completed their treatment, while 348, 734 patients were entered to retreatment after completion of treatment and 20% cases developed multidrug-resistant TB (MDR-TB) among retreatment cases throughout the world. The major cause of this problem is the non-

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adherence and lost to follow up by the patients to their health care facilities (Mekonnen & Azagew, 2018). According to the study that was conducted by Tola, Holakouie-Naieni, Mansournia, Yaseri, Tesfaye, Mahamed and Sisay (2019), indicated that, the chance of developing MDR-TB among patients who interrupted treatment is 13 time and is higher than compared to patients who never interrupted their treatment, and the risk of poor TB treatment outcome is also 3–4 times high for patients who interrupt the treatment for longer periods.

Tuberculosis patients stop taking their TB treatment as soon as they feel better. The challenge with this behaviour is that the TB bacteria may become resistant to the anti-TB drugs making it harder and more expensive to treat the patient. Globally in 2015, approximately 480 000 people developed MDR-TB (WHO, 2015). In 2017, 160 684 cases of Multidrug- and rifampicin-resistant tuberculosis (MDR/RR-TB) were detected and notified. Of these, a total of 139 114 people (87%) were enrolled on treatment with a second-line regimen, up from 129 689 in 2016 but this is still only 25% of the estimated 558 000 people who developed MDR/RR-TB in 2017. China and India alone accounted for 40% of the global gap; these and eight other countries accounted for 75%. Treatment success remains low, at 55% globally (WHO, 2018). The WHO (2017) further argues that drug resistance from inappropriate use of anti-TB medicines, incorrect prescription by health care providers, poor quality drugs, and patients stopping treatment prematurely are the major problems. It is therefore important that health providers ensure appropriate anti-TB drugs and correct doses are prescribed and that all patients on TB treatment are monitored closely throughout treatment to ensure that they take their treatment correctly (WHO, 2017).

As the major purpose or goal of TB treatment is to cure the patient, prevent the spread of TB disease in the communities and prevent the development of drug resistant TB, non-adherence to the treatment contradicts or reverses this goal and results in uncured TB, spreading of TB in communities and increase TB drug resistance. Patients with TB drug resistant often develop TB that is resistant to at least one first-line anti-TB drug. If the patient continues to be non-adherent to treatment, they may develop MDR-TB which is more difficult to treat and cure. Drug-resistant TB requires close management and consultation with experts in the disease (Center for Disease Prevention and Control, 2016). According to Mekonnen and Azagew (2018), non-adherence to TB treatment among patients is a main unresolved problem worldwide that results in high mortality rates, and the occurrence of drug-resistant TB which increase treatment cost. The implementation of DOTS by WHO globally was to ensure 100% adherence of treatment by TB patients which in turn increases the cure rates.

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Globally the DOTS strategy was adopted to be the backbone of TB control since 1995 as recommended by the WHO. Within the DOTS strategy, the cure rate and defaulter rate are key indicators for measuring TB programme performance. In 2015, the End TB strategy was adopted globally as a TB control strategy as recommended by WHO. The strategy aims to end the global TB epidemic, with the targets to reduce TB deaths by 95% and to cut new cases by 90% between 2015 and 2035. The Plan entails an ambitious drive to diagnose and successfully treat at least 90% of all reported TB cases (WHO, 2015). According to the study that was done by Tola, Shojaeizadeh, Tol, Garmaroudi, Yekaninejad, Kebede, Ejeta, Kassa & Klinkenberg, (2016), indicated that psychological counseling and educational interventions may significantly reduce the level of TB treatment non-adherence. This could be best achieved if these interventions are guided by behavioural theories and incorporated into the routine TB treatment strategy. According to Chen, Pan, Qu, Liu, Yao and Xiang (2015), in China, there is increased use of mobile phone-based interventions for promoting treatment adherence among TB patients. Short-message service (SMS) based interventions have been effective in improving adherence to loss to follow up TB patients in Uganda (Hermans, Elbireer, Tibakabikoba, Hoefman & Manabe, 2017).

The DOTS and END TB strategies were implemented in South Africa. However, the country has excessive default rates which result in poor cure rate. According to South Africa Department of Health (2018), the observed challenges included lack in human resource provision and poor supervision and monitoring of patients on treatment, resulting in an excessive increase in defaulter rate. An independent review of the National TB Programme (NTP) found that although there was rapid treatment initiation for patients diagnosed with TB, defaulter tracing interventions were not widespread and there was no guidance for community caregivers on handling defaulters and no systems for reporting or managing TB treatment side-effects (Health System Trust, 2017).

Adherence to TB treatment is one of the major factors that lead to increase in cure rate. This reduces mortality and emergence of MDR-TB and lowers the resulting high cost of treatment. Previous research in different contexts has shown various factors related to treatment non-adherence, including the psychological challenges faced because of having TB, the quality of health care received, and the use of traditional healing systems, such as herbal or animal derivatives. Psychosocial factors, including feelings of helplessness, depression, and a lack of appropriate social support were found to be the main barriers to adherence to the Directly Observed Treatment (DOT) programme (Van Rensburg, Dube, Curran, Ambaw, Murdoch, Bachmann, Petersen & Fairall, 2020). Other factors identified are: lack of knowledge about the disease, distance to travel from the healthcare facilities, partial or complete deterioration of symptoms in the first two months of treatment, treatment side

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effects, male gender, age, the use of toxic substances and hospitalization during treatment (Dassah, Aldersey, McColl & Davison, 2018).

For effective TB treatment, it is important to initiate TB patients on the correct treatment regimen on time and to sustain such treatment for the exact recommended period and to motivate patients to adhere to their treatment (National Department of Health, 2016). According to the South African TB management guidelines, TB patients are more likely to become less infectious within 2 weeks of taking TB treatment (National Department of Health, 2016). Tuberculosis treatment default is a serious problem in TB control and prevention. It presents serious consequences to patients such as prolonged illness, development of clinical complications, development of drug resistance, and premature death. It also causes serious challenges also to the families, communities, and healthcare providers who may become infected with TB (Kigozia, Heunisa, Chikobvub, Bothad & Van Rensburg, 2017). Tuberculosis patients who are also illicit drugs users or alcohol abusers are more contagious and remain contagious longer because treatment failure seemingly extends periods of infectiousness. Mortality rates are high among TB patients who discontinue treatment, especially when co-infected with HIV infection (da Silva Escada, Velasque, Ribeiro, Cardoso, Marins, Grinsztejn, da Silva Lourenço, Grinsztejn & Veloso, 2017).

According to Gebreweld, et al., (2018), factors related with TB treatment adherence can be grouped in the following three ways: Firstly, the health service-related factors which include the quality and availability of services, complexity of treatments and management of treatment side-effects, and relationship between patients and healthcare provider. Secondly, the social connectedness such as trust, confidentiality, disclosure, type, and source of support and relationships. Thirdly, the socio-demographic characteristics, personal beliefs, mental health, and risk behaviours such as drinking alcohol and tobacco smoking. These factors can directly or indirectly influence patient adherence to treatment. Therefore, to design effective strategies that can improve treatment adherence, it is important to understand the characteristics of each of those three factors. Factors that negatively affect adherence to TB treatment vary from person to person and across different populations. There are divided into patients related barriers such as, lack of knowledge and understanding about the disease and treatment, perception, and belief in relation to disease management, affective factors (depression, anxiety and shame), behavioural factors (missed appointment), factors related to treatment burden and adverse drug event (side effects) socio-economic and demographic factors (disease related-stigma, transport and age) and lack of family/social support. Health system related barriers such as poor-quality intervention (lack of health education, assessment, communication, and tracing system), lack of

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appropriate health provider's skills and attitude. Structural or organizational related barriers such as long waiting time, long distance to healthcare facilities and poor healthcare facilities can also affect patients negatively to adherence to their TB treatment (National Department of Health, 2016).

South Africa is one of the countries with the biggest burden of HIV epidemic worldwide, and therefore, TB remains a substantial public health problem in South Africa. Regardless of a 1.3-fold countrywide decline of TB incidence, from 576 per 100 000 population in 2000 to 430 per 100 000 population in 2012, the TB incidence in South Africa remains high (Bunyasi, Mulenga, Luabeya, Shenje, Mendelsohn, Nemes, Tameris, Wood, Scriba & Hatherill, 2020). In 2014, South Africa had the TB incidence rate estimated at 834 per 100 000 population among HIV-positive cases compared to 509 per 100 000 population among their HIV-negative counterparts (WHO, 2015). South Africa is among the 22 countries with the largest numbers of TB cases. Global statistics give an estimated incidence of 454,000 cases of active TB in 2015. In 2015, Limpopo Province reported a TB incidence rate of 301 per 100 000 (Health System Trust, 2015).

Despite all WHO and South Africa National Department of Health effort of zero TB and HIV infection rate, South Africa failed to meet the Millennium Development Goals (MDGs) targets to reduce TB prevalence and mortality by 50% by 2015, and the TB cure rate remained below the WHO and national target of 85% (Engelbrecht, Kigozi, Chikobvu, Botha & van Rensburg, 2017). In 2015, South Africa had a TB prevalence rate of 696 per 100 000, incidence rate of 834 per 100 000, mortality rate of 46 per 100 000 with HIV/TB mortality rate of 133 per 100 000 and MDR-TB incidence rate of 37 per 100 000. In 2015, South Africa had MDR-TB burden of 11577. In 2015, the MDR-TB burden per province was as follows; Eastern Cape, 1795, Free State, 595, Gauteng Province 985, Kwazulu-Natal, 3953, Limpopo Province 516, Mpumalanga, 1094, North West, 543, Northern Cape, 336 and Western Cape, 1760. In 2015, the national TB death rate was estimated at an average of 6.6% and this was higher than the national target of 5%. The TB death rate per province was as follows; Western Cape, 3.9%, Kwazulu-Natal, 5.4%, Gauteng Province, 6.3%, Eastern Cape, 6.7%, Mpumalanga, 7.6%, Northern Cape, 7.7%, North West, 9.0%, Free State, 10.5% and Limpopo Province, 11.9% and this was higher than the national target of 5% (Health System Trust, 2017). In 2013 the South Africa national defaulter rate was estimated at 6.2% which was above the national average of less than 5% set by the South African National TB Control Programme. In 2015, TB cure rate and treatment defaulter rate in the Limpopo Province were estimated at 71.8% and 5.8% respectively. Poor healthcare seeking behaviours and non-adherence to TB treatment remained the major contributory factors to this situation in this rural province and nationally (Massyn, Day, Peer, Paradath, Barron &

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English, 2018; Mabunda, Khoza, Van Den Borne & Lebese, 2016). The 2017/2018 Limpopo Province annual performance report indicated that the province had a consistent increase in the number of patients on the Directly Observed Treatment (DOT) supporter leading to an increase in TB DOT coverage from 72.0% in 2006 to 89.5% in 2015. However, the increase in the number of patients with DOT supporters in the province did not have a positive impact in the TB cure rate (Limpopo Department of Health, 2017).

In South Africa, treatment outcomes are poor among TB patients, only 48% of MDR-TB patients and 24% of extensive drug resistant (XDR-TB) patients who started treatment in 2013 were successfully treated, with high rates of mortality, loss from treatment and treatment failure. According to Health System Trust (2017), in 2016, Limpopo Province had the highest number of patients initiated on TB treatment of 96.7% and the treatment cure rate was 76.1% which was below the national target of 85% (Health System Trust, 2017). Similarly, all five districts in Limpopo Province experience the same challenges in the treatment of TB. In 2015, districts TB cure rate were estimated at 79.7% in Vhembe, 81.9% in Mopani, 7.4.4% in Waterberg, 71.1% in Capricorn and 75.0% in Shekhukhune which were below the provincial target of 85%. In 2015, TB clients lost to follow up in Limpopo Province was estimated at 6.1% and this was higher than the national average of 5.4%. Districts TB clients lost to follow up were estimated at 8.0% in Vhembe, 3.1% in Mopani, 6.5% in Waterberg, 6.4% in Capricorn and 6.3% in Shekhukhune. This was higher than the provincial average of 5.4% except for Mopani district. The MDR-TB client lost to follow up in Limpopo Province was estimated at 17.8%. This was higher than the national average of 16%. The districts MDR-TB client lost to follow up were estimated at 18.1% in Vhembe, 12.0% in Mopani, 23.2% in Waterberg, 19.8% in Capricorn and 15.3% in Sekhukhune. In 2015, Limpopo Province had a TB death rate of 11.9% which was way higher than the national average of 5%. Districts TB death rate were estimated at 8.1 in Vhembe, 10.7 in Mopani, 12.0 in Waterberg, 14.5 in Capricorn and 14.5 in Sekhukhune. The challenges facing the Limpopo Province in the treatment of TB are poor adherence to TB treatment, availability and accessibility to health care services and socio-economic challenges (Massyn, Day, Peer, Paradath, Barron & English, 2018; Mabunda, Khoza, Van Den Borne & Lebese, 2016).

Even though DOTS was implemented in the Limpopo Province since 1996, the low TB cure rates suggest ineffectiveness of the DOTS strategy in the province. Mabunda and Bradley (2011) state that poverty, food shortage, cultural beliefs, stigma, and side effects of the treatments impact negatively in the performance of DOTS strategy. The study indicated that

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cured TB patients in Mopani district did not relate to DOTS specifically as a major strategy that helped them.

The Health System Trust (2015) suggested that there is a need for the Limpopo Province to develop interventions strategy to engage successfully with the two key priorities of South Africa's National TB Control Programme: effective case finding and successful TB treatment. The WHO (2019) argues that besides patients' adherence to TB treatment, there are many other factors that contribute to TB treatment failure which should also be considered, and strategies developed to deal with these factors and ensure TB cure and reduce TB mortality rate and TB drug resistant in the community. Nezenega, Perimal-Lewis and Maeder, (2020), grouped the factors related with TB treatment adherence into health service-related factors, social connectedness, and socio-demographic characteristics. The End TB Strategy adopted by the World Health Assembly (WHA) in 2014 aims at ending the global TB epidemic with targets to reduce TB deaths by 95%, to reduce the number of new cases by 90% between 2015 and 2035, and to ensure that no family is burdened with catastrophic expenses due to TB. Therefore, treatment success and adherence rate of 90% is one of the key operational indicators for countries to monitor their progress towards "zero deaths, disease and suffering due to TB" (Health System Trust, 2017). As the success and cure of TB treatment is based on adherence it is, therefore, important to determine factors influencing non-adherence to TB treatment to inform development of intervention strategies in the Province.

1.3 Problem Statement

Despite the implementation of DOTS strategy in the Limpopo Province since 1996, In 2016, Limpopo Province had a TB treatment defaulter rate of 6.1% which was above the national target of 5,4%. While TB treatment success rate was 80.6%, this was below the national target of 90%. The TB death rate was 11.5%, which was way above the national average of 5%. Multidrug-resistance TB (MDR-TB) of client lost to follow up was 17.8% and was above the national average of 16%. Multidrug-resistance TB treatment success rate was 58.4% and was below national target of 90%. TB drug resistant client death rate was 16.4% and was above the national target of 12% (Massyn, Pillay & Padarath, 2018). Adherence to TB treatment is crucial to avert disease infectiousness, achieve cure and avoid emergence of drug resistance, relapse, and death (Gebreweld, et al., 2018). Data shows that in Limpopo Province there is a problem of TB treatment non-adherence among TB patients. If TB treatment non-adherence remain unresolved in the Limpopo province, it may cause major treatment failure and the emergence of TB drug-resistant which will increase the burden of TB infection including TB death rate in communities. It is from this perspective that the

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researcher developed an interest to conduct this study to develop intervention strategies to improve TB Treatment adherence In Limpopo Province.

1.4 Study Rationale

Previous studies that were conducted in Limpopo Province focused on the development of TB directly observed treatment interventions (Mabunda, Khoza, Van Den Borne & Lebese, 2016). Other studies focused on the assessment of compliance with the TB treatment, and other studies focused on the factors affecting TB treatment adherence (Mabitsela, 2012; Garaf, Nyazema & Dambisya, 2014; Dladla, 2013). Based on the literature, there is not enough available data on the development of intervention strategies to improve TB treatment adherence in Limpopo Province. It is therefore important to conduct this study to develop intervention strategies that will improve TB treatment adherence in the province, to achieve treatment success and adherence rate of 90% which is the one of the key operational indicators for countries to monitor their progress towards “zero deaths, disease and suffering due to TB.

1.5 Significance of the Study

The intervention strategies developed from this study may help TB patients to re-engage and adhere to their TB treatment prescribed by healthcare professionals. The study may also be beneficial to TB managers, DOTS supporters and defaulter tracer supporters as the intervention strategies development may help to reduce treatment non-adherence rate and increase the rate of patient’s compliance within the province. The intervention strategies may be applied to other programmes such as HIV/AIDS. The study may benefit many researchers interested in researching related topics in the future. Policy makers may also have informed data which may guide them in developing policies involving treatment adherence. It may also reduce occurrence of MDR-TB, XDR-TB, TB death rate, mortality, and morbidity in the Limpopo Province.

1.6 Purpose of the study

The purpose of the study is to develop intervention strategies to prevent TB treatment defaulter rate, avert TB disease infectiousness, achieve TB treatment cure, prevent emergence of TB drug resistance, patients’ relapse, and death amongst TB patients. The intervention strategies are aimed at improving TB treatment adherence in the Limpopo Province of South Africa.

1.7 Objectives of the study

The objectives of this study will be divided into four according to the phases of the study.

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Phase 1: Explore factors affecting adherence (qualitative and quantitative)

- To explore the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province.
- To determine the perceptions of patients regarding factors affecting adherence to TB treatment in Limpopo Province.

Phase 2: Development of the intervention strategies

- To plan and develop intervention strategies to improve TB treatment adherence in Limpopo Province.

Phase 3: Validate the developed intervention strategies

- To validate the developed intervention strategies.

1.8 Research questions

- What are the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province?
- What are the perceptions of patients regarding factors affecting adherence to TB treatment in Limpopo Province?
- What are the intervention strategies to improve TB treatment adherence in Limpopo province?

1.9 Definition and operationalization of concepts into variables

The following essential concepts are hereby defined and operationalized:

Adherence: Adherence means that a patient is following the recommended course of treatment by taking all the prescribed treatments for the entire length of time necessary (Iacob, Iacob & Jugulete, 2017). For the Purpose of this study, adherence to treatment refers to the extent to which patients comply with the anti-TB drugs for the entire length of time as prescribed by the health care providers.

Intervention: These are plans made to reach a long-term aim. In the Health belief model, the intervention strategy is a cue to action (Jones, Jensen, Scherr, Brown, Christy & Weaver, 2015). In this study, intervention refers to strategies that will be used to prevent non-adherence amongst TB patients.

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Non-adherence: non-adherence refers to failure to take any treatment at all, and discontinuation of treatment prematurely, or deviation from the prescribed treatment in another way, including brief treatment interruptions and under or overdose (Kheswa, 2017). For the purpose of this study, a non-adherent patient is a patient who misses two consecutive visits for medical appointment at the TB clinic and has not obtained any service from any other facility that offers TB services assuming that the patient does not take any TB treatment during that period or later.

Strategies: describes how the ends (goals) will be achieved by the means (Jones, Jensen, Scherr, Brown, Christy & Weaver, 2015). In this study, strategies refer to how TB treatment non-adherence will be achieved by the means.

Treatment: Treatment refers to a drug or other form of medicine that is used to treat or prevent disease (Martin, 2020). In this study treatment refers to anti-tuberculosis drugs prescribed to TB patients by healthcare professionals.

Tuberculosis: Tuberculosis as defined by the WHO (2018) is an infectious bacterial disease which is caused by the *bacillus Mycobacterium tuberculosis* that mainly affects the lungs PTB (pulmonary tuberculosis) although it also affects other sites of the body (extra pulmonary tuberculosis). In this study, TB refers to an infectious disease which has infected patients who are living in the Limpopo Province.

1.10 Organisation of the study

Chapter 1: presents an overview of the study, it elaborates the background of the problem, the statement of the problem, the purpose of the study, the objectives, the research questions, and the significance of the study. The clarification of key concepts is described in details.

Chapter 2: reviews and discusses the literature relevant to TB treatment non-adherence and adherence around the world according to international, African, South African trends and its analysis. The Behaviour Change Wheel was the conceptual framework for this study.

Chapter 3: presents the research methodology including study design, study setting, target population of the study, study sampling, research instruments, data collection and data analysis. The study adopted an exploratory sequential mixed method research design. All phases (phase one, two and three) of the study are discussed into details. Sampling procedures for the districts, and participants for both qualitative and quantitative approaches. Pilot studies were done for both qualitative and quantitative approaches. Methods for data

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collection, ethical considerations, and data analysis are discussed in detail. Measures to ensure trustworthiness and ethical consideration are also presented.

Chapter 4: presents the findings of phase 1a of the study based on the qualitative data analysis. A total number of 53 participants were involved in focus group discussion and key informant in-depth interview.

Chapter 5: presents the findings of phase 1b of the study based on the quantitative data analysis of cross-sectional survey conducted. A total number of 207 respondents were involved in the survey.

Chapter 6: presents the findings of the study by merging the findings from phase 1a and phase 1b of the study to form a more complete picture of the factors influencing TB treatment non-adherence in Limpopo Province. The findings of the study are further linked to the available literature.

Chapter 7: presents the development of intervention strategies to improve TB treatment adherence. Findings of quantitative and qualitative were used as basis to develop strategies to improve TB treatment adherence. A one-day stakeholder workshop was conducted and was guided by stages two and three of the BCW framework. The developed strategy was then validated using a quantitative checklist with the group of TB expects to see if they meet APEASE criteria.

Chapter 8: presents the conclusion and recommendation of the study. This chapter deals with the overall conclusion obtained from the study and highlights the research question and objectives. The focus is to ensure that the purpose and objectives were achieved.

1.11 Summary

TB infection is treatable and curable if patients take and complete their TB treatment. However, despite the implementation of DOTS strategy in the Limpopo Province TB patients still default their treatment. Adherence to TB treatment is crucial to avert disease infectiousness, achieve cure and avoid emergence of drug resistance, relapse, and death. The current study sought to develop intervention strategy to improve TB treatment adherence amongst TB patients in Limpopo South Africa. The next chapter will present the literature review of the study.

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CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

The previous chapter outlined the background and the introduction of the study. This section contains the literature review on the effective strategies to improve medical adherence among TB patients. It will detail known information regarding the factors affecting TB medication adherence across the world. A literature review is a written summary of the state of evidence on a research problem. According to Polit and Beck (2017), the purpose of the review is to familiarise the researcher with the scope of the field of study.

The researcher used systematic review to conduct literature review of the study. It is a research method and process which is used for identifying and critically appraising relevant research, as well as for collecting and analyzing data for the research. Systematic literature review was used in this study as it aims to provide a complete, comprehensive summary of current available literature which is relevant to a research question (Snyder, 2019). It was selected in this study because it identifies, selects, and critically appraises research so that formulated questions can be answered clearlyn (Dewey & Drahota, 2016). The search methodology followed a PICO format (population or patient, intervention, comparison, and outcome). The patients were TB and HIV patients, intervention was drug treatment adherence, comparison was no treatment adherence and outcome was to improve treatment adherence. The review identified the type of information searched, critiqued, and reported within known timeframes. The search terms, search strategies (including database names, platforms, and dates of search) and limits all were included in the review. The search strategy for this literature review involved searching relevant electronic databases (PubMed, CINAHL, PsycInfo), reference lists from key papers, and relevant grey literature sources (medical and research textbooks, Department of Health (DOH) publications, WHO publications and annual reports, the latest relevant journals as well as the internet). The database search strategy included a combination of MeSH headings and keyword searches (treatment adherence, treatment outcome and factors affecting non-adherence) that were applied using the Boolean operators “AND” and “OR”. A date range of 2010-2020 and an English language limit were also applied on each database search to identify relevant literature. Inclusion criteria was studies published in English language, Randomized Controlled Trial and observational studies, studies should have been conducted and published in the journals. Exclusion criteria was old studies conducted before 2010. The literature review included only published literature on this topic, globally. Even though there were not so many studies that tried to improve TB treatment adherence in the rural

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communities specifically; as a result, about 163 relevant literature on the broader treatment non-adherence was found and only 59 were included for analysis in the review, and therefore, the findings such as treatment adherence, global challenges of non-adherence and other themes relevant to the study were identified and will be discussed below.

In this chapter, the discussion of the literature focuses on TB treatment adherence, global challenges of TB treatment non-adherence, importance of adherence, extent of non-adherence, factors affecting non-adherence and strategies to improve treatment adherence.

2.2 Treatment adherence

The benefits of effective treatment use depend on a patient taking their prescribed medication. Historically, this term was referred to as “compliance.” Compliance is the level to which the patient follows the given treatment instructions by the health care providers (Naghavi, Mehrolhassani, Nakhaee & Yazdi-Feyzabadi, 2019). This suggests that the health care providers know what is best for the patient and would prescribe the ideal treatment. It implies that patients play a passive role in their medical management and that deviating from these instructions would put the blame on the patient (Daker-White, Hays, McSharry, Giles, Cheraghi-Sohi, Rhodes & Sanders, 2015). With health care providers adopting a more patient-focused approach, the terms to describe medication-taking behaviours have changed over time from compliance to adherence. The shift from compliance to adherence represents a wish to indicate that patient have now more active role to play in decision-making with regards to their medication taking behaviours (Fiorillo, Barlati, Bellomo, Corrivetti, Nicolò, Sampogna, Stanga, Veltro, Maina & Vita, 2020).

According to the WHO (2015), in medicine, adherence defines the level to which a patient follows correctly the medical guidance provided to them by the health-care providers. Most commonly, it refers to medication or drug compliance, but it can also apply to other areas such as medical device use, self-care, self-directed exercises, or therapy sessions. Both the patient and the health-care provider affect compliance, and a positive physician-patient relationship is the most important factor in improving compliance. In terms of TB control, adherence to treatment may be defined as the level to which the patient's history of therapeutic drug taking corresponds with the prescribed treatment.

Adherence may be measured using either process-oriented or outcome-oriented definitions. Outcome-oriented definitions use the end-result of treatment, e.g., cure rate, as an indicator of success. Process-oriented indicators make use of intermediate variables such as appointment-keeping or pill counts to measure adherence (McKinney, Pearce, Banta,

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Mataya, Muula, Crounse, Mukaire & Matipwiri, 2017). The level to which these transitional outcomes associate with the real quantities of prescribed drugs taken is unknown (Tariq, Vashisht, Sinha & Scherbak, 2021).

Adherence is a key factor associated with the effectiveness of all pharmacological therapies but is particularly critical for medications prescribed for chronic conditions. Poor adherence to medical treatment severely compromises patient outcomes and increases patient mortality. Increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments. Among patients with chronic illness, approximately 50% do not take medications as prescribed. Non-adherence to medication does not only lead to morbidity and death but it also the major cause of high burden of healthcare costs. Patients who are non-adherent can exhibit primary or secondary non-adherence. Primary non-adherence refers to when an initial prescription is not dispensed or when dispensed but the medication never taken. While secondary non-adherence refers to when prescriptions are filled, but the patient later discontinues taking their prescribed medication (WHO, 2015).

2.3 Global and African Challenges of TB Treatment Non-Adherence

This section will present the global, African, Sub-Saharan and South African challenges of TB.

2.3.1 Global Challenges of TB Treatment Non-Adherence

Current TB treatment consists of a mixture of drugs that should be taken over a period of at least 6 months for new patients and 8 months for retreatment patients (National Department of Health, 2016). Treatment interruption is always influenced by the long duration of the therapy, a phenomenon that contributes to prolonged infectiousness, drug resistance, relapse, and death (Gebreweld, et al., 2018). The challenges faced by patients in adhering to the prescribed treatment regimens has raised the awareness of adherence as a complex behavioral issue. Efforts to improve treatment outcomes require a better understanding of barriers to and facilitators of patient's adherence (Martin, Feig, Maksoudian, Wysong & Faasse, 2018).

Despite the availability of effective short course regimen first line drug since 1980s, WHO (2015) shows that globally, 79% of people with TB do not have access to DOTS, the WHO's internationally recognized approach to TB control. It is estimated that up to 50 million people may be infected with drug-resistant TB. Thus far, there are no affordable cures for resources limited setting (WHO, 2015). A study that was conducted to analyze the new trend of multi-

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drug resistance TB (MDR-TB) from 2008-2013 concluded that, at the global level, the proportion of new cases for MDR-TB has remained unchanged, at around 3.5%. The seriousness of such epidemics in some countries endanger the progress against the disease (WHO, 2015). To ensure effective TB treatments, the DOTS is recommended globally as the most cost-effective strategy and is recommended. The DOTS strategy involves that every individual patient should be categorized according to their conditions and TB treatment history, so that appropriate drugs can be managed to individual patients at the time of diagnosis. Patients who have severe TB infection are allocated into category one, and those who have interrupted treatments are allocated to a different category to those who are newly diagnosed (WHO, 2015).

Research shows that, if patients take medication regularly, over a period of a year the cure rate can reach up to 95% or even higher (WHO, 2015). As a part of the DOTS standardized strategy, WHO (2015) recommended that the case detection and treatment success rates are to be at least 70% of case detection of new smear positive and 85% of those detected cases expected to be successfully treated. Study shows that between 20% of MDR-TB patients do not complete their TB treatment successfully or interrupt the regimens by themselves (Nellums, Rustage, Hargreaves & Friedland, 2018).

2.3.2 African and Sub-Saharan challenges of TB treatment non-adherence

In 2016, about 2.5 million people were infected and fell ill of TB in the African region, accounting for a quarter of new TB cases worldwide. An estimated 417,000 people died from the TB disease in the African region (WHO, 2018). The burden of TB in the sub-Saharan Africa is fuelled mostly by HIV pandemic, and numerous socioeconomic conditions (Anochie, Ajogwu, Kalu, Akpan, Onyeneke & Onyeozirila, 2018). In some regions of Africa, about 75% of TB patients are co-infected with HIV (WHO, 2018). People living with HIV are at a higher risk of developing TB than those who are not HIV-infected (Winter, Smith, Davidson, Lalor, Delpech, Abubakar & Stagg, 2020). In sub-Saharan Africa, there is a high rate of TB patient's losses to follow-up that range between 11.3 and 29.6% (WHO, 2015). There is threatening increase of high number of new cases of Multi-Drug Resistant-TB that is being seen globally and majority of them are coming from low- and middle-income countries, which is caused by TB treatment non-adherence (Zumla, Petersen, Nyirenda & Chakaya, 2015). Research shows that socioeconomic factors in the sub-Saharan Africa such as homelessness, lack of food, financial limitation, lack of transportation cost, low education level, gender, poor health care worker-patient communication, joblessness, social supports are highly associated with TB treatment non-adherence and lost to follow up which contribute more to MDR-TB (Anochie, et al., 2018). Other factors identified by research are

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overcrowded living condition, HIV related immunological weakness and malnutrition are factors that facilitate transmission of TB, treatment non-adherence and lost to follow up at in low- and middle-income countries (Tola, Tol, Shojaeizadeh & Garmaroudi (2015).

2.3.3 South African Challenges of TB treatment non-adherence

The WHO estimates that there were about 360,000 cases of active TB in 2019 in South Africa. It is further estimated that about 14,000 people became ill with MDR-TB in 2019 (WHO, 2020). TB continues to be the leading cause of death in South Africa. In 2019 a total of 58,000 people died of TB, and of these, about 36,000 were HIV positive (WHO, 2020). A study shows that patient perception of poor attitudes among HCWs and the patient changing residence during TB treatment were associated with TB treatment disruption among TB patients. It was further associated with low belief in TB curability, low belief in severity of TB in the presence of HIV infection, and low levels of support from family and HCWs. The TB treatment side effects, pill burden, substance abuse, economic constraints, food security, and stigma were associated as risk factors of TB treatment non-adherence (Mazinyo, Kim, Masuku, Lancaster, Odendaal, Uys, Podewils & Van der Walt, 2016).

2.4 Importance of adherence to Anti-TB treatment

Research shows that compliance with prescribed anti-TB treatment has many beneficial roles to play in TB control programme. TB treatment compliance has been associated with high TB cure rates and reduction in the emergence of drug resistance (Koo, Min, Kim, Lee, Kim, Park & Lee, 2020). To achieve good treatment outcome which is a key to achieving and maintain high cure rates, correct and consistent compliance among TB patients receiving treatment through DOTS is required throughout the treatment period (Berry, Rodriguez, Berhanu, Ismail, Mvusi, Long & Evans, 2019). To reduce risk of treatment failure, relapse and development of drug resistant strains, compliance requires patients to take their TB treatment in a regular and consistent way.

According to the study that was done by Tola, et al., (2019), treatment interruptions that occur in the early stages of treatment result in high TB transmission rate, poor treatment outcome and occurrence of drug resistance. This is because the initial stage of treatment is considered as the most infectious stage with many TB bacilli. This is also the stage where resistant bacilli survive if not properly treated, therefore it requires correct and consistent administration of medication to ensure that the majority of TB bacilli are killed, and resistant bacilli have no chance of surviving. To prevent and control the increase in TB cases and the emergence of drug resistant TB, patients with TB need to be encouraged to adhere to their TB medication (Maharaj, Ross, Maharaj & Campbell, 2016). In South Africa and other sub-

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Saharan African countries, poor compliance with TB treatment among patients with TB was reported to be a major problem in TB prevention and control (Marais, Kallon & Dudley, 2019).

A study that was done by Naidoo, Peltzer, Louw, Matseke, Mchunu and Tutshana (2013) on predictors of TB and ARV adherence, the study argues that poor adherence with treatment was strongly associated with low cure rates of TB. It also has negative effects on TB control and prevention and has in most instances led to drug resistance and further spread of TB in the community which increases morbidity and mortality, and it also increase in the health care costs. Many TB programmes have reported an increase in the health care costs related to the negative effects of non-compliance. Therefore, patients with TB are expected to have adherence of greater than 90% to be cured (Nezenega, et al., 2020).

2.5 Extent of Non-adherence to TB Treatment

Poor adherence to treatment of chronic diseases including TB is a global problem. To measure the adherence rate, it is important to consider the cure rate. If cure rate is low this increases the risk of development of drug resistant strains and further spread of TB in the community, which in turn increases morbidity and mortality. Therefore, adherence to TB treatment is crucial to achieve cure and avoid emergence of drug resistance. Research indicated that in sub–Saharan Africa, there is high rate of losses to follow up of TB patients that ranged from 11.3% to 29.6%, and poor counseling and general poor healthcare worker attitudes have been seen to contribute more to patients being lost to follow up (Mwansa-Kambafwile, Jewett, Chasela, Ismail & Menezes, 2020).

Research shows that patients who do not take their TB treatment regularly are at a great risk of treatment failure, relapse, and the development of drug-resistant TB strains. Furthermore, the emergence and spread of MDR and XDR TB further fortifies the complete necessity of helping TB patients to not miss any doses of anti TB (Seung, Keshavjee & Rich, 2015).

A study that was done by Tola, et al., (2015), indicated that regardless of the implementation of DOTS which is internationally recommended strategy in almost all part of the WHO regions and many national and international efforts exerted against TB prevention and control, but still the patients are failing to complete their treatment to declare cure or complete the treatment. The level of TB cure rate remains high regardless of all efforts to reduce TB infection rate. WHO report that was done in 2012 shows that TB cases failed after several treatments, many TB patients' relapse (226, 813) after completion of the treatment, many inter to retreatment (348, 734) after completion of treatment and many cases develop

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MDR-TB among retreatment cases (20%) throughout the world. In most probability treatment non-adherence and lost to follow up are viewed as the main factors that are responsible (Gugssa, Shimels & Bilal, 2017).

Although, in early 2006, WHO reported that DOTS coverage is almost 93% for all population among WHO regions since 2006, however, research findings still indicate that large number of patients from developing countries are still interrupting their treatment due distance from treatment center to their home (Tola, et al., 2015).

2.6 Factors Contributing to Anti-TB Treatment Non-Adherence

Evidence from a variety of literature show that there are many factors affecting adherence to TB treatment. A study that was cited by dos Reis (2016), which examined the willingness of TB patients to adhere to treatment regimens found that many factors were associated with adherence and non-adherence to the DOTS strategy. Influencing social, economic and disease related factors such as poverty, having one or more co-morbid health conditions, alcohol consumption and tobacco smoking were significant predictors of treatment non-adherence and inadequate knowledge about TB and TB treatment.

2.6.1 Patients Related Factors

Patients related factors encompass economic factors, use of traditional healing system, feeling of wellness, nature of the job, and lack of family as well as community support. According to the study that was conducted by Mabunda, Khoza, Van den Borne and Lebese (2016), indicated that some patients stop treatment because they feel better and think that they are cured or sometimes because their symptoms for infection disappear. One study stated that patients who feel worse when they take medication than before treatment are likely to stop with their prescribed treatment, since they see no improvement in their condition (Shringarpure, Isaakidis, Sagili, Baxi, Das & Daftary, 2016).

A study by Gugssa, et al., (2017), indicated that, treatment interruption is also associated to the patients' perceptions about TB as a disease; some patients do not believe that they have TB, they only want a cure for their symptoms and ceased treatment once these lessened. According to the study that was done by Skinner and Claassens (2016), indicated that some patients need help in taking their treatment when they are too weak, while on the others side those with no symptoms delay starting with the treatment, thinking that it could cause them to have side effects and even get sick.

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A study that was done by Gugssa, et al., (2017), indicated that treatment interruption is also influenced by food shortage during treatment and that food availability plays a major role in complementing TB treatment. The study shows that patients indicated that when there was food shortage, they failed to comply with medications. The patients believed that lack of food or inadequate food was associated with more severe side effects and a difficulty to tolerate the drugs. Patients also indicated that the amount and quality of food required must be comparative to the possible side effects of the drugs taken. The study shows that patients indicated that drugs could be harmful on an empty stomach, and that it was better not to take drugs if one had not eaten.

Belief in traditional healing for curing TB is associated with non-adherence to TB treatment. Tuberculosis patients reported that they prefer to use traditional healing systems before starting anti-TB medications, during treatments as well as if their health condition did not improve. They described that traditional healing system is effective, took shorter treatment period, supportive, keeps the patient away from bad spirits and obtained at affordable price (Gugssa, et al., 2017)

The patients also reported that they preferred traditional healing systems because they are more accessible than the healthcare facilities (Gugssa, et al., 2017). Another study shows that patients could not adhere to their prescribed TB medication because they were taking other traditional medicines and professed that there will be some negative consequences if these traditional medications were taken concurrently with TB medication. Cultural beliefs again contribute a lot in adherence to TB medications. Traditional practitioners claim that they can cure TB and they always influence patient to stop taking TB treatment (Mabunda, Khoza, Van den Borne & Lebese, 2016).

Personal behavioral factors such as substance abuse and alcohol consumption were also found to influence treatment compliance in a range of studies in sub-Saharan Africa and beyond. Alcohol and other substances as well as mental illness are believed to alter individuals' behaviour, thus patients may forget to take their medications therefore leading to poor compliance. One study further indicates that beliefs about treatment efficacy, denial, and difficulty in accepting the diagnosis as well as personal interpretation of illness, are some of the personal factors affecting treatment compliance (Shahin, Kennedy & Stupans, 2019).

Side-effects to medications was identified as one of the factors influencing treatment compliance among TB patients. One study found that more serious side-effects such as

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hepatitis, dyspepsia, exanthema, and arthralgia were attributable to the interruption and termination of treatment of up to 23% of patients (Yang, Park, Jang, Yang, Kim, Moon, Byun, Lee, Kim & Kang, 2017). Medication side effects were mostly reported in the initial phase of treatment. Studies in sub-Saharan Africa and elsewhere identified insufficient knowledge, gender, substance abuse and alcohol consumption, patients' beliefs and attitudes and medication side effects as the patients' factors likely to have an influence on treatment adherence regardless of the difference settings and methods used (Zgambo, Kalembo & Mbakaya, 2018). A study that was done by Das, Mathur, Ravi, Meneguim, Iyer, Mansoor, Kalon, Hossain, Acharya, Ferlazzo, Isaakidis and Thakur (2021), indicated that patients indicated pill burden as one of the major challenges of concomitant treatment, as they fear to feel like drug bag or pharmacy, and they used expression such as becoming a drug bag.

Research shows that the other factors that influence compliance or non-compliance are co-morbid conditions such as cardiovascular diseases, diabetes, and HIV. These conditions require patients to take additional medications together with TB treatment. Research shows that patient having this condition may either adhere because they want to get better, or they may decide not to comply because they feel worthless, or they may become tired of taking a lot of medications (Skinner & Claassens, 2016). A study that was done by Nezenega, et al., (2020), shows that non-compliance with anti-TB treatment was considered high in the Ethiopian institutional cross-sectional study and being HIV positive was significantly associated with non-compliance.

Researcher indicated that patients turn not to adhere to anti-TB treatment among ARVs because of the number of pills that TB/HIV co-infected patients must take and the adverse effects of anti-TB medication that are more common in HIV infected patients. Therefore, as a results HIV/AIDS co-infected patient may be less motivated to take their medication. In a South African study, non-compliance with TB treatment among TB patient co-infected with HIV was related to poor incorporation between HIV and TB programmes (Mazinyo, et al., 2016). Another study that was done by Tola, et al., (2015), indicated that demographic factors, older age, and male gender were associated with TB treatment non-adherence and lost to follow up for TB patients.

A study by Mohammed and Mustafa (2016), indicated that, treatment interruption was commonly attributed to lack of sufficient patient knowledge and awareness about TB, TB treatment, treatment duration and the consequences of non-compliance. Research indicated that knowledge and attitudes have played significant roles in preventing the complications and progression of tuberculosis disease. A study that was done by Mbuthia, Olungah and

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Ondicho (2018), revealed that, although TB was a major public health problem, communities have a low knowledge on the causes and the transmission and as a result they are likely to delay in seeking treatment. According to Nyasulu, Sikwese, Chirwa, Makanjee, Mmanga, Babalola, Mpunga, Banda, Muula and Munthali (2018), knowledge of tuberculosis and associated health-seeking behaviours among rural area with a cough for at least three weeks; the result revealed that the lack of TB knowledge limits people's ability to prevent TB spread and early treatment.

A study by Paul, Akter, Aftab, Khan, Barua, Islam, Islam, Husain and Sarker (2015), reported the knowledge, attitudes, and practices on tuberculosis among treatment partners, the results revealed that, most of the participants understood that TB is highly infectious and the fact that it is also curable. However, many patients would not reveal their status for fear of being expelled from the community. Researcher shows that knowledge, attitudes, and practices play a major role in adherence to anti-TB treatment, and thus in the prevention of complications and progression of the disease. According to the study that was conducted by Kigozi, Heunis, Chikobvu, Botha and van Rensburg (2017), to measure the patients' knowledge about tuberculosis and its treatment, revealed that, participant's satisfactory knowledge was statistically significant when associated to respondent's age, gender, and residence, level of education and source of prescription. The study also indicated that, respondents who previously caught the disease knew the duration of the therapy better compared to new cases.

A study that was done by Gorityala, Mateti, Konuru and Martha (2015), indicated that older patients aged 35 to 60 were found to be the ones who default their treatment mostly. And similar results were observed from the study that was done by Shringarpure, Isaakidis, Sagili and Baxi (2015), which indicated that patients between the age of 40 and above were found not to adhere to their TB treatment. This might be because the older generation are less educated than the younger generation; thus, they are less aware of TB and its treatment and the consequences of non-compliance. Education level of the participants was found to be significantly associated with the default rate. Participants with educational level lower than secondary school were found to be the ones who default more frequently compared to those having educational level of secondary school and above. Patients with low level of education are more likely not to understand the information given during health education regarding the treatment (Mohammed & Mustafa, 2016).

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2.6.2 Health Care and Health System Related Factors

Research indicated that for most patients, access to the healthcare facilities depended on the distance, availability of transport and their physical condition. One study indicated that, although the intention was done for a DOT supporter to visit the patient's home, in practice the patient had to walk to the supporter's home. This make it more difficult for patients especially those who are severely sick. Access to healthcare facilities was better in the urban areas than in the rural areas, it also stated that adherence was most likely to be compromised if the distance from patients' homes to the nearest clinic was too long. If patients' homes were close to a clinic, however, the patients could attend regularly (Fried, Harris, Eyles & Moshabela, 2015).

Research indicated that patients expressed the problems of long waiting times, queues, lack of privacy, inconvenient appointment times at the healthcare facilities, and the poor maintenance of clinics. Patients have difficulties of accessing treatment at the healthcare facilities due to the inconvenient opening hours and provider absenteeism. Study also concluded that patients and healthcare providers highlighted poor TB medication that are availability at the healthcare centres as the cause for non-adherence (Mathibe, Hendricks & Bergh, 2015).

Another study reported that a health care worker sold TB medication that should have been freely available. Patient's relationship with the healthcare providers plays a major role in medication adherence. Poor follow-up is influenced by bad treatment of patients by the providers, each time when they miss their appointment providers would scold them, and as a result they end up resulted in non-adherence (Kigozia, et al., 2017).

2.6.3 Medication or Treatment Related Factor

Study reported that influence of medication side effects as the factor that cause patient to interrupt or stop taking their treatment. Patients reported stopping taking their medication due to the adverse effects they cause which they were not informed about and what to do in case they happen. Patients sometimes do not communicate the side effects they are experiencing to the healthcare providers, and those who do communicate they find it pointless since the healthcare worker had not pay sufficient attention what they are experiencing (Kigozia, et al., 2017).

Patients and providers considered an individual's personal character to determine whether they would adhere to treatment or not (Naghavi, et al., 2019). A study by Bhattacharya, Ray, Biswas and Das (2018), reported that, substance abuse is observed mostly as a barrier for

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treatment adherence among TB patients. Patients with mental illness, particular ethnic groups, older and younger age groups, and those who travel a lot are at a higher risk for non-adherence. Religion and personal motivation are regarded as important influences on TB treatment adherence. According to the study that was done by Golin, Knight, Carda-Auten, Gould, Groves, White, Bradley-Bull, Amola, Fray, Rosen, Mugavaro, Pence, Flynn and Wohl (2016), female patients are viewed as being more motivated to adhere to their treatment, even though in some countries they may request for permission from men or heads of household to their attend treatment appointments. Another study indicated that female patients who were, or wanted to be, pregnant were less likely to adhere to treatment as they perceived the medication to be harmful (Twigg, Lupattelli & Nordeng, 2016).

2.6.4 Social Influence associated to TB

The recent study that was conducted by Gugssa, at al., (2017), noted the existing socio-cultural barriers and taboos associated with TB to be factors contributing for poor adherence in the study settings. The study indicated that due to the perceived presence of stigma in the community, patients are afraid to disclose their TB disease state to their friends and community members. In the rural part of the study area, TB patients were not undisclosed about their TB status. The patients initially told only their family and neighbors, but after a while more and more neighbors found out about their 'lung disease'. Sometimes, the whole neighbors knew that the patient had a 'lung disease'. The neighbors and family members were often involved in encouraging and helping the patients with their treatment.

According to the study that was done by Tadesse (2016), the level of stigma had been noted to have a different pattern in rural and urban area. Tuberculosis patients in the rural area were noted to have not being subjected to stigma and discrimination although patients always referred to their disease in their local language instead of tuberculosis such as; 'yanget-biret' or 'yanget-firafira and they believed that the disease comes from the God. In the urban areas, some patients were found to hide their condition, although they would normally inform their family, and as a results patient reported to isolate themselves from their family, the society, and their friends due to the fear of being stigmatized and they also feel guilt and shame because of the disease. Stigma may also make patients afraid to ask for support from their employer to purchase medication, thereby reducing adherence (Azia, Mukumbang & van Wyk, 2016).

TB patients discontinue their treatment because of lack of family and community support. The patients revealed that care and support are immensely important for a TB patient's adherence to treatment especially during the intensive phase. Study highlighted family,

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community members and peers to play a major role on treatment taking behaviour (Nyasulu, et al., 2018). Another study indicated stigma from the families and friends as the cause of TB treatment non-adherence (Tola, et al., 2015). As a result of the fear of being stigmatized TB patients turn to hide their diagnosis and feel guilt and shame because of the disease.

One study indicated that, sometimes a patient's role and responsibilities in the family could motivate them to adhere to treatment to recover and resume those duties, although for some it reduces the likelihood of adherence (Sahile, Yared & Kaba, 2018). Family support, including financial assistance, collecting medication and emotional support, appeared to be a strong influence on patient adherence to treatment, some patients become increasingly demotivated and more likely to become non-adherent as family support weakened (Salifu, 2016).

2.6.5. Socio-economic Factor

Tuberculosis is influenced by poor socio-economic conditions. According to the study conducted by Kashyap, Nayak, Husain, Shekhawat, Satav, Jain, Raje, Daginawala and Taori (2016), indicated that most of the patients suffering from TB are living in poor socio-economic conditions. Tuberculosis usually affects people who are hard to reach such as the homeless, the unemployed and the poor. Lack of effective social support networks and unstable living circumstances are additional factors that create an unfavorable environment for ensuring adherence to treatment. Poverty is the greatest obstruction to human and socio-economic development. In health poverty represents a principal hindrance to health and health care, WHO is committed to integrate the promotion of equity and pro–poor policies throughout its work. Addressing poverty in TB control encompasses the needs of those facing not only economic disadvantage but also all relatively vulnerable, disadvantage, marginalized, stigmatized, and other excluded sections of the population, who are poor and vulnerable.

The first step to reach all poor individuals is to give special attention in improving health and health care to places where relative poverty of assets and living conditions is concentrated. Vulnerability to disease and ill health results from underlying biological factors, socio economic factors affecting individuals, households, and communities. Vulnerability can emerge from massive fronts including exclusion from access to services as results of race gender, residence, or because of underlying lack of education to enable more secure employment, help seeking behaviours by people in their own homes. Vulnerability to disease can also emerge in special situation, as massive population movement caused by living or working condition (Zerbo, Delgado & González, 2020).

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Reduction of TB prevalence among the poor has been identified as a contributor to reduce overall inequity in health and advancing welfare of the poor. Inequities can be measured across income groups, gender, and social group. About 80% of avoidable mortality has been caused by communicable disease in low-income countries. The poor nations carry a burden of avoidable mortality (Raviglione & Sulis, 2016).

Tuberculosis thrives in poverty and can worsen poverty. It is acknowledged that TB is not the disease of the poor but the association between poverty and TB is well established and widespread. In the process of income poverty, the poor lack food security, income stability and access to health care. Tuberculosis may lead to loss to 20-30% of annual wages among the poor and global economic costs. Predisposing factors of tuberculosis are poor housing the researcher stays and work within the community, which is rural, many houses are poorly built due to lack of funds, caused by high rate of unemployment and overcrowding. The problem of poor housing contributes towards poor control of the spread of infection (Raviglione & Sulis, 2016).

There are different factors that cause malnutrition which results from an imbalance between the required amount of nutrient in the body and the actual amount of nutrients introduced or absorbed by the body. Food quantity and quality which relates to quantity of food consumed quality of overall diet, energy density and frequency of consuming. Health and sanitation, safe water supplies, adequate sanitation and good housing are preconditions for adequate nutrition. Inadequate sanitation and hygiene are major contributing factor for anemia. Social and care environment contributes to malnutrition due type of feeding, cultural factors such as income, time, knowledge about nutrients contributes to malnutrition (Raviglione & Sulis, 2016).

2.7 Intervention strategies aimed at improving TB treatment adherence among TB patients

The WHA passed a resolution that recognized TB as a major global public health problem followed by the launch of DOTS as the internationally recommended TB control strategy in 1994 (WHO, 2020). Most National TB Control Programmes (NTCP) experienced major progress in TB control when they implemented the DOTS strategy. The DOTS strategy was later expanded to form the Stop TB strategy, which seeks to build on the successes of the DOTS strategy (WHO, 2020).

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The intervention strategies to improve TB treatment adherence rates may be classified into the following categories: Staff motivation and supervision, which includes training of staff and management processes which are aimed at improving the way in which healthcare providers care for TB patients; Defaulter action, which include the action to be taken to all patients that fail to keep their pre-arranged appointments; Prompts, which included provision of information to all TB patients about TB disease and the need to attend follow ups or treatment center; Incentives and reimbursements, which includes money or cash in order to reimburse the expenses of attending the treatment center or to improve the attractiveness of visiting the treatment center; Contracts, which includes written or verbal agreements to return for an appointment or course of treatment; Peer assistance, which include people from the same social group helping someone with tuberculosis to return to the health center by prompting or accompanying the TB patient; Direct observed therapy, which include an identified, trained and supervised health workers, community volunteer or family member who are directly monitoring TB patients when swallowing their anti-TB treatment (WHO, 2020).

According to WHO (2020), the stop TB strategy have the following six components; Pursue high-quality DOTS expansion and enhancement, Address TB-HIV, MDR-TB, and the needs of poor and vulnerable populations, contribute to health system strengthening based on primary health care, engage all care providers, empower people with TB, and communities through partnership, Enable and promote research. An element of case management that helps to ensure that patients adhere to treatment is directly observed therapy (DOT). The DOT is the most effective strategy for making sure patients takes their medicines. DOT means that a health care worker or other designated individual watches the patient swallow every dose of the prescribed drugs. DOT should be considered for all patients because it is difficult to reliably predict which patients will be adherent. Even patients who intend to take their medicine might have trouble remembering to take their pills every time. Most of the successes in TB control globally have been attributed to the DOTS strategy, especially in high TB burden countries (Sulis, Roggi, Matteelli & Raviglione, 2014).

To address the remaining challenges, especially in areas where the TB epidemic has been worsening (such as sub-Saharan Africa and Eastern Europe), and to achieve the Millennium Development Goal (MDG) and related Stop TB partnership targets by 2015, a new strategy was developed, namely the Stop TB Strategy (Raviglione & Sulis, 2016). According to WHO (2020), with DOTS as the central component, the Stop TB strategy set out steps which national TB control programmes, their partners and stakeholders needed to take to improve TB control. It expanded the DOTS strategy with six additional components such as; Political

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commitment with increased and sustained financing, Case detection through quality-assured bacteriology, Standardized treatment, with supervision and patient support, an effective drug supply and management system, Monitoring and evaluation system, and impact measurement.

End TB strategy is the new strategy stands on three pillars such as; Integrated, patient-centered TB care and prevention; Bold Policies and Supportive Systems; Intensified Research and Innovation. It is based on four cross-cutting principles which is defined as follows: a) government stewardship and accountability, with monitoring and evaluation; b) building a strong coalition with civil society and communities; c) protecting and promoting human rights, ethics, and equity; d) adaptation of the strategy and targets at country level, with global collaboration (WHO, 2015).

According to WHO (2015), the first pillar focuses on care aspects that are specific to TB. It focuses mainly on the patient for their care and prevention, and it also covers the need to clearly identify the most vulnerable individuals in a population to address their needs as a major priority. Active case finding along with drug susceptibility testing for resistance detection are the main elements of this pillar as are the concepts of treatment for all, including drug-resistant cases and children. In this pillar special attention is also given to PLHIV, considering their high-risk condition, which claims for custom-made interventions involving the provision of combined treatments for both diseases as well as the implementation of appropriate preventive measures. Finally, preventive therapy to be administered to people at high risk is motivated as a key tool to prevent disease among the group of latently infected people.

A study that was done by Lönnroth, Glaziou, Weil, Floyd, Uplekar and Raviglione (2014), indicated that the second pillar requires the involvement of strong policies and supportive systems to be based on a strong political commitment, greater financing, extended community engagement, active cooperation with non-governmental organizations as well as the civil society and public and private institutions. Although it is a recommendation that TB diagnosis and treatment are to be provided for free of charge to all people irrespective of their living area and status, but the burden concerning other costs such as travelling to get to the healthcare facilities or those that involve loss of working days must be considered to properly define the financial consequences of TB on affected patients. This pillar also emphasizes the broader policies that must be in place for any disease control effort to succeed.

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According to WHO (2014), the third pillar indicates the importance of intensified research and innovation to make a real change in current TB trends. To achieve the set targets of the End-TB strategy, the rate of decline of global TB incidence should increase to at least 10% per year by 2015. Research shows that similar declining rates were reached in some European countries in the mid-20th century, following the introduction of the first anti-TB drugs compounded with the significant improvement of general living conditions. The development of better diagnostics (including new point-of-care tests), safer, easier, and shorter treatment regimens for active TB and latent TB infection, and effective pre- and post-exposure vaccines are critical to break the trajectory of the TB epidemic and further accelerate the reduction of TB incidence after 2025. Without new effective tools it will not be possible to accelerate incidence decline at 17% per year, which is necessary to achieve the 2035 targets (Schito, Maeurer, Kim, Hanna & Zumla, 2015).

2.8 Evidence for the effectiveness of strategies aimed at improving adherence.

Literature shows the level to which DOT strategy and various individual social support intervention contribute to treatment adherence is unknown. These have shown no difference in adherence between TB patients that were under DOT programme and those that were taking treatment with no support. On the other hand, other study on the effectiveness of the DOTS strategy have shown high rates of treatment success for patients under DOT (McLaren, Milliken, Meyer & Sharp, 2016).

A cross-sectional study done in South Africa by Howell, Kigozi and Heunison (2018), on community-based directly observed treatment for TB patients to improve HIV services, indicated that only most TB patients were not receiving formal DOT support. TB patients who were receiving home-based DOT reported higher rates of HIV counselling than other patients, it is therefore important for health care providers to train DOT supporters to provide HIV prevention and target DOT to those at highest risk of HIV, especially those at greatest socio-economic risk.

Another study that was done on factors influencing patient adherence to tuberculosis treatment in Ethiopia, found that more patient-centered interventions and far greater attention to structural barriers, are needed to improve treatment adherence and reduce the global disease burden attributed to TB (Nezenega, et al., 2018).

The evidence for an independent effect of health education on adherence of patients to treatment is weak. Research indicated of health education for TB treatment shows benefits to adherence. Although some study shows that health education alone was found to be no

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better than routine case management for improving appointment-keeping and the impact of education combined with a monetary incentive was indistinguishable from that of the monetary incentive alone (Lutge, Wiysonge, Knight, Sinclair & Volmink, 2015).

2.9 Theoretical Framework of the Study

This section of the study introduces the Theoretical framework of the study. The researcher has highlighted the problem in the literature review that needs to be addressed. The identified theoretical framework will detail the concepts that will be used to address or make sense of this problem. The theoretical framework of the study is the structure that supports a theory of a research that is being studied. It introduces and describes the theory that explains why the research problem under study exists.

Many theoretical frameworks exist to guide the development of intervention strategies. Davis, Campbell, Hildon, Hobbs and Michie (2015), conducted a systematic review of 19 behaviour change frameworks with theoretical constructs that help to explain and predict health behaviours. The 19 frameworks were evaluated against three criteria: comprehensiveness, coherence, and a clear link to an overarching model of behaviour. The review found that each model focused on different behavioral determinants such as beliefs and perceptions, unconscious biases, social environment. While these determinants are important to understanding behaviour and designing interventions, none of the traditional behaviour change frameworks presented a clear and comprehensive model. This makes it difficult for researchers to choose the most appropriate theory to address their research question. As a result, Davis, et al., (2015), synthesized the 19 frameworks and developed a comprehensive and pragmatic framework for intervention design, known as the Behaviour Change Wheel (BCW).

The BCW was the conceptual framework for this study. The BCW is a comprehensive guide for developing behaviour change interventions. A model of health behaviour, known as COM-B, is at the fundamental of the BCW. The COM-B model predict that behaviour occurs as an interaction between three conditions: Capability (psychological or physical ability to perform the behaviour); Opportunity (physical and social environment that enables the behaviour); and Motivation (reflective and automatic mechanisms that activate or inhibit behaviour). The BCW also includes numerous intervention options and policy considerations, as outlined by the two outer rings of the wheel. The BCW has a three-stage process to intervention design: 1). Understand the behaviour, 2). Identify intervention options, and 3). Identify components and implementation options (Michie, Atkins & West, 2014). Based on this model, the framework for this study was be developed on this three-stage process.

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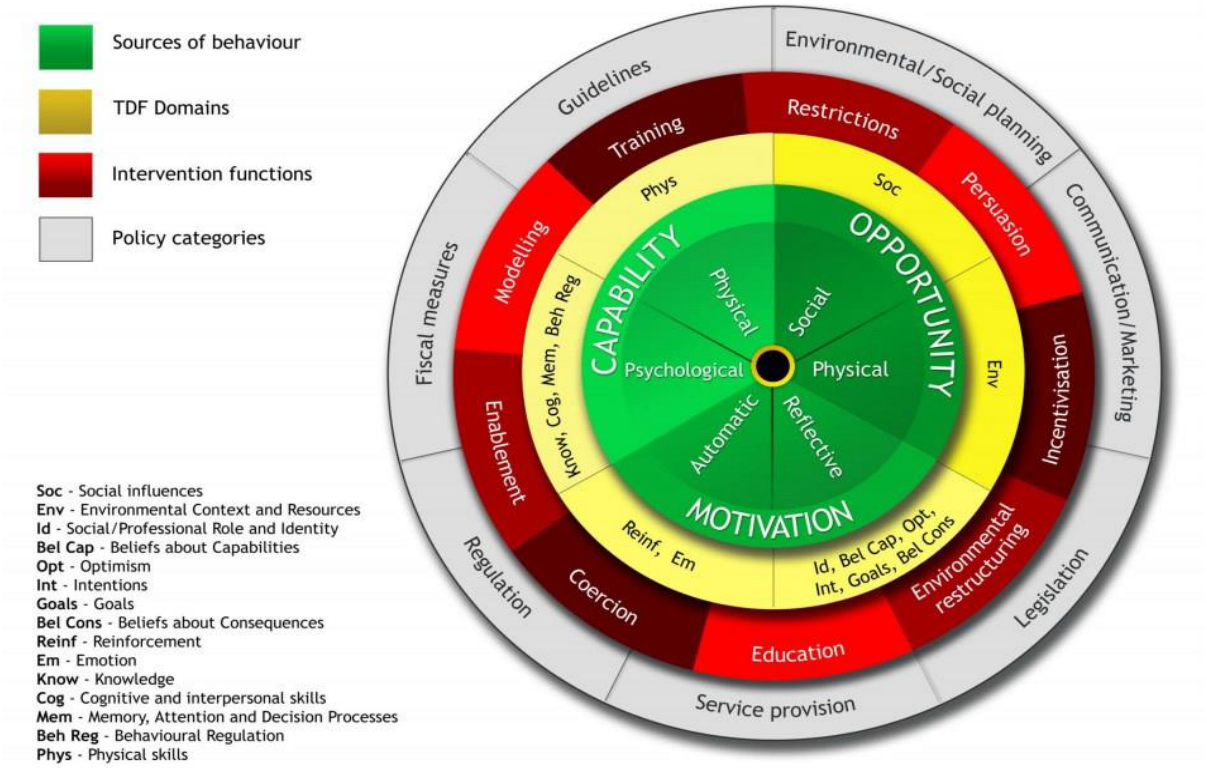

Figure 2.1: BCW with the Theoretical Domains Framework
Source Michie, Atkins & West, 2014:37).

2.9.1 Stage 1: Understand the Behaviour

The first stage includes a behavioral analysis, which aims to understand the target behaviour in as much detail as possible. The COM-B model is used in the behavioral analysis to help understand the behaviour in the context in which it occurs (Michie, et al., 2014). The COM-B model can be further expanded into 14 domains by using the Theoretical Domains Framework (TDF) (Michie, at al., 2014). The TDF is a framework for behaviour change that integrates 33 behaviour change theories and 128 explanatory constructs into an accessible structure of 14 theoretical domains (knowledge; skills; memory, attention, and decision processes; behavioral regulation; social/professional role and identity; beliefs about capabilities; optimism; beliefs about consequences; environmental context and resources; social influences; emotion; intentions; goal; reinforcement) (Cane, O'Connor & Michie, 2014). Figure 2.1 above, illustrates how the 14 TDF domains relate to the three COM-B components (Michie, et al., 2014).

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2.9.2 Stage 2: Identify Intervention Options

In Stage 2, the BCW outlines which intervention functions and policies are likely to be effective in changing the target behaviour. A matrix is used to map the COM-B model with nine intervention functions and seven policy categories that would support the delivery of the intervention (Michie, et al., 2014). The APEASE criteria are used in this stage to ensure the intervention functions and policy categories are: Affordable, Practical, Effective/cost-effective, Acceptable, Safe, and Equitable (Michie, et al., 2014).

2.9.3 Stage 3: Identify Content and Implementation Options

In the final stage, the BCW identifies intervention content, including behaviour change techniques (BCTs), that would best serve the intervention functions and modes of intervention delivery (Michie, et al., 2014). BCTs are the active ingredients in an intervention that have the potential to change behaviour (e.g., goal setting, self- monitoring of behaviour) (Michie, et al., 2014). In this stage, the intervention functions identified in stage 2 are linked with appropriate BCTs using existing guidance from the BCW. Lastly, the APEASE criteria are used to identify the most appropriate and feasible modes to deliver the intervention components (for example, workshop, pamphlets, website).

2.10 Gaps in knowledge

Although the literature has provided a great amount of information on factors affecting TB treatment and recommended strategies to improve medical adherence, but most of the studies were focusing on reviewing the factors affecting TB treatment adherence. Some studies that focused on effective strategies to improve TB medication adherence only focused on DOT as a recommended strategy by WHO and review treatment outcomes in different treatment strategies and factors influencing DOT treatment compliance. Another study focused on patient compliance with DOT treatment for patients receiving home-based DOT which was part of the community-based DOT. However, it is not clear whether the recommended prevention strategies for those that were exposed are followed and implemented correctly in rural communities. Following the recommendations by the WHO (2014) to intensify research and innovation in order to effect change in the current TB trends, this study aims to contribute towards this recommendation through the identification of the challenges and solutions to TB medication adherence among rural communities from perspectives of the patient, health care workers and community-based caregivers. The patient and community-based caregivers' views about ways of dealing with TB non-adherence will be included in the development of the interventions to TB medication adherence strategy.

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2.11 Summary of the Literature

Adherence has been identified as a key element in reducing the likelihood of the emergence of drug resistant TB. The global efforts to increase access to TB treatments through DOTS, especially in resource-limited settings, should equal the availability of TB treatment with successful treatment outcomes to avoid the emergence of drug resistant strains. Though earlier fear of low levels of DOT adherence in resource limited settings has not been founded, adherence may still be a concern in such environments. Identifying contextual factors that affect adherence to DOTS is an important process in designing effective strategies to improve and sustain expected level of medical adherence.

Different people in different settings have their own specific characteristics; these factors or berries are important and relevant to successful implement DOTS to TB patients in any environment or setting. Addressing patient related factors, health system related factors, medication or treatment related factors and also other factors that affect adherence are the hallmark of adherence enhancement. Improving adherence should be carefully done through identification of possible barriers during counselling or education stage and also planning on how to appropriately address them before the first drug prescription is made. Such strategies include those that encourage close patient provider contact, social support and education and anticipating problems that may promote non-adherence. The next chapter outlines the specific objectives of the present study and the methodology that was used in the study to achieve these objectives.

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CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter outlined the literature review of the study. The current chapter presents the methodology of the study. This methodology section aims to describe the methods chosen to execute each phase, and it covers the study design, study setting, population and sampling, method of data collection, validity and reliability, analysis and ethical consideration.

3.2 Study Setting

This study was conducted in selected three districts of the Limpopo Province. Limpopo is the 5th largest province and the northernmost province of South Africa (Figure 3.1). It is named after the Limpopo River, which forms the province's western and northern borders. Limpopo is the gateway to the rest of Africa, with its shared borders making it favourably situated for economic cooperation with other parts of Southern Africa. The province borders the countries of Botswana to the West, Zimbabwe to the North and Mozambique to the East. In the eastern region lies the northern half of the magnificent Kruger National Park. Limpopo Province has five districts namely, Vhembe, Mopani, Sekhukhune, Capricorn, and Waterberg. According to Health System Trust (2015), in 2014, the province had a population of 5 630 467 with 2 649 115 of male population and 2 981 352 of female population. Approximately 80% of the population in Limpopo is based in rural areas. It comprises mainly by Tshivenda, Xitsonga and Sepedi speaking people. The province experiences high numbers of immigrants both legal and illegal from Zimbabwe, Mozambique, and Botswana. According to the Massyn, Pillay and Padarath (2018), Capricorn district had treatment success rate of 77.7%, Waterberg district had 78.7%, Sekhukhune district had 79.4%, Mopani district had 81.5% and Vhembe district had 85.5%.

The traditional health system is very strong in the province and communities are still influenced by their cultures and beliefs which might have a strong influence on non-adherence. That is the reason why the researcher chose to conduct this study in the Limpopo Province. The province has 517 public health care facilities, of these, three (3) are specialised hospitals, 452 are fixed clinics, 25 are community health centres, 30 are district hospitals, five (5) regional hospital and two (2) are tertiary hospital. Vhembe district has one (1) specialised hospital, 116 fixed clinics, eight (8) community health centres (CHCs), six (6) district hospitals and one (1) regional hospital. Capricorn district has one (1) specialised hospital, 96 fixed clinics, four (4) CHCs, six (6) district hospitals and two (2) tertiary hospitals.

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Mopani district has one (1) specialised hospital, 95 fixed clinics, eight (8) CHCs, six (6) district hospitals and one (1) regional hospital. Sekhukhune district has 84 fixed clinics, three (3) CHCs, five (5) district hospitals, and two (2) regional hospitals. Waterberg district has 61 fixed clinics, two (2) CHCs, seven (7) district hospitals, and one (1) regional hospital.

The researcher selected the minimum of two CHCs and the maximum of four CHCs per district. Only CHC that served a high number of communities were selected per local municipality. District that has only two CHCs in all local municipalities, all of those CHCs were then selected. The districts that have more than four CHCs only one CHC per local municipality was selected based on the number of TB patients that are registered at the facility.

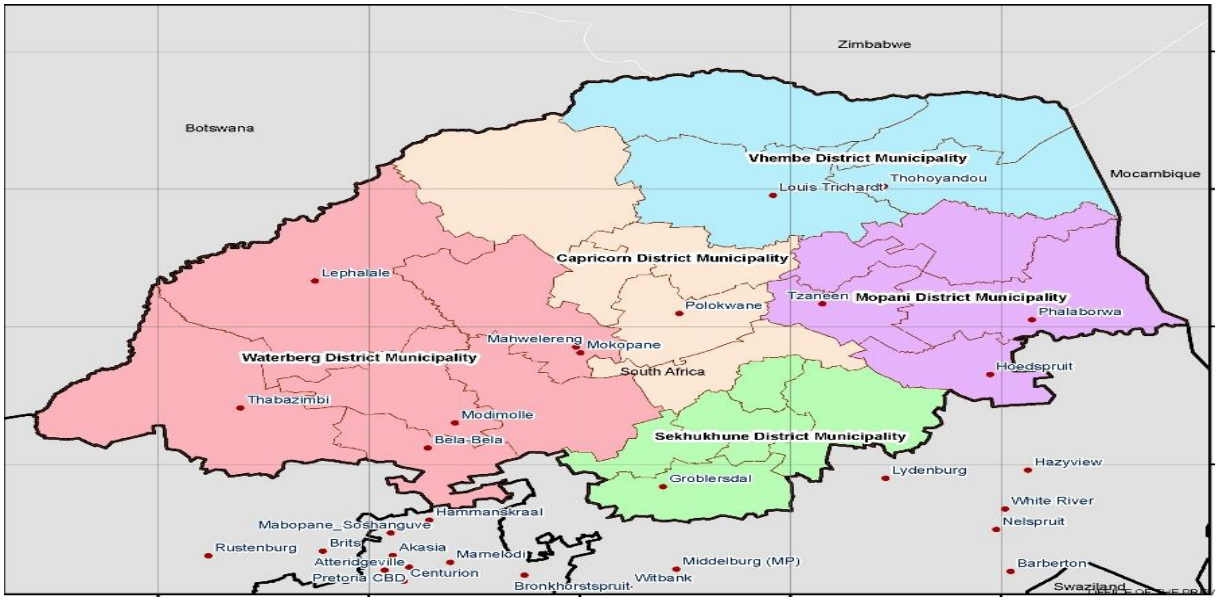

Figure 3.1: Map of Limpopo Province. Source: African special tours (2015)

3.3 Overview of the methodology of the study

The study is guided by the BCW as indicated above. The study will be divided into three phases as shown in Table 3.1 below. Phase one is aligned with stage one (1) of the BCW and will be conducted in two stages or sub-phases to explore and determine factors contributing to non-adherence to TB treatment among TB patients. Phase 1a will use qualitative approach and phase1b will use quantitative approach. In Phase two, the last two stages of the BCW will guide the development of the intervention strategies to address the identified factors. In Phase three, the developed intervention strategies will be validated using APEASE criteria.

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Table 3.1: Overview of the methodology of the study

Phases	Theoretical Framework stage	Approach	Objective	Population	Data Collection
Phase 1	Understand the behaviour	Phase 1a: Qualitative Approach	To explore the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province.	TB patients, HCWs (TB managers, TB focal person, facility operation managers and district DOTS supporters)	In-depth interviews Focus group discussions
		Phase 1b: Quantitative approach	To determine factors affecting patient's adherence to TB treatment in Limpopo Province.	TB patients	Questionnaires
Phase 2	Identify Intervention Options	Workshops	To develop intervention strategies to improve TB treatment adherence.	District TB managers	
	Identify Content and Implementation Options				
Phase 3			Validate the intervention strategies	District TB managers	Checklist based on APEASE

3.4 Phase 1: Understanding the behaviour

3.4.1 Research Design

The study adopted an exploratory sequential mixed method research design (Figure 3.2). The design was chosen as it would assist the researcher to develop a questionnaire that fit the sample by first exploring qualitatively and using the information to design an instrument that can then be evaluated with a large sample (Creswell, 2014). Exploratory sequential mixed method was chosen in this study as it also allows data triangulation which increase the credibility and validity of research findings. It also assists the researcher to develop a comprehensive understanding of phenomena that is being studied. The researcher began with a qualitative research phase (phase 1a) and explored the views of participants.

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Qualitative data were then analysed, and the information was used to build into a second, quantitative phase (phase 1b) of data collection. Then the researcher interpreted the findings of the study (Creswell, 2014).

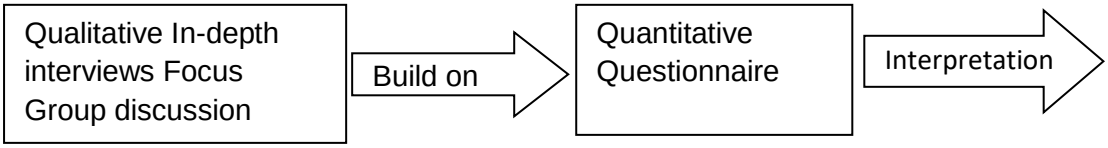

Figure 3.2: Exploratory sequential methods design. Source: Creswell (2014)

3.4.2 Phase 1a: Qualitative approach

This aspect addresses the following objective:

- To explore the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province.

3.4.2.1 Study design

According to Creswell (2014), a qualitative approach is the investigation of a phenomenon, in an in-depth style, through collection of rich, narrated material using a flexible design. An exploratory design was used. A qualitative approach of an exploratory nature was chosen because exploratory studies are qualitative in nature and perceptions are often explored. They are used to gain an understanding of underlying reasons, opinions, and motivations. They also provide insights into the problem. Exploratory designed allowed the researcher an opportunity to consult the stakeholders who shared their perceptions regarding factors that contribute to TB treatment non-adherence.

3.4.2.2 Study population

In this phase, the accessible population was comprised of a forum of stakeholders (TB patients, district TB managers, facility operational managers, TB focal person and DOTS supporters) of the selected districts and CHCs.

3.4.2.3 Study Sampling

Sampling refers to the researcher' process of selecting the sample from a population to obtain information regarding a phenomenon in a way that represents the population of interest (Brink, van der Walt & van Rensburg, 2014). In this phase the multistage sampling was conducted including districts, facilities, and participants.

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3.4.2.3.1 Sampling of districts

The sampling of the districts was done using a purposive sampling method to cover both rural and urban based districts of the province. Three districts; Vhembe, Capricorn and Waterberg district in Limpopo Province, the researcher intended to include two districts with lower TB treatment success rate and one district with higher TB treatment success rate, to understand and compare unique problems impacting those areas. Those three districts were chosen as they best served the purpose of the study.

3.4.2.3.2 Sampling of facilities

The sampling of the CHCs was done using the non-probability purposive sampling technique. This technique enabled the researcher to select only CHCs with high number of TB patients that are registered in the facility TIER.Net (Table 3.2 below). The researcher sampled a minimum of two and a maximum of four CHCs in each selected district. Where the district has only two CHCs then all of them were sampled. The districts with more than four CHCs, only CHC with a high number of TB patients registered in the facility TIER.Net were selected. It was believed that participants found at these CHCs would be able to expose BCW related factors contributing to non-adherence to TB treatment.

Table 3.2: Selected Community Health Centres in each District

District	Local Municipality	Community Health Centre	Number of TB patients registered in TIER.Net
Vhembe District	Makhado	Bungeni CHC	159
	Collins Chabane	Mphambo CHC	138
	Musina	Mutale CHC	89
	Thulamela	Thohoyandou CHC	188
Capricorn District	Polokwane	Rethabile CHC	157
	Blouberg	Blouberg CHC	71
Waterberg district	Mookgophong	Mookgophong CHC	175
	Mogalakwena	Thabaleshoba CHC	98
Total			**1075**

3.4.2.3.3 Sampling of participants

In this phase, purposive sampling was used to select relevant participants for the key informants' in-depth interviews and focus group discussions. These participants possessed quality of the selected information to explore factors that contribute to TB treatment non-

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adherence. Maximum variation sampling, a type of purposive sampling was employed in selecting TB patients who possessed quality of the selected information, were interested in TB issues and were readily available at the time of data collection. TB patients selected were above the age of 18 years and were voluntarily chosen to participate in the study. Non-probability convenience sampling method was used to sample district TB managers, site TB focal person, facility operational manager and district DOTS supporters who were readily available at the time of data collection (Brink, Van der Walt & Van Rensburg, 2014). The key informant and focus group participants were people with information related to TB.

3.4.2.3.4 Inclusion and exclusion criteria

- Tuberculosis patients aged 18 and above who were currently on TB treatment and had completed at least four months on TB treatment and were registered in the facility TIER.Net and TB register of the selected CHCs in the Limpopo Province were included in this study. TB patients who were below the age of 18 were not included in the study.
- District TB managers who are managing TB programmes were included in the study. District Managers who were managing other programmes and not TB were not included.
- Site TB focal person were included in the study based on their work experience. Only TB focal persons who had more than three years' experience had been included in the study. TB focal person with less than three years' experience were not included in the study.
- Facility operation managers who were responsible for the whole operation of the facility and were responsible for TB program were included in the study. Facility managers who were not responsible for TB program were not included in the study.
- DOTS supporters or WHBOTS who were responsible to support TB patients while taking their treatments were also included in the study. Only trained and experienced on TB DOTS supporters or WHBOTS were included in the study. Those who were not trained and with no experience were not included in the study.

3.4.2.4 Sample size

Qualitative data are small enough to allow the deep, case-oriented analysis, therefore fewer participants are needed (Fugard & Potts, 2014). Table 3.3 below indicates the sampling frame used for the qualitative phase of the study and number of participants who participated in each data collection method. For key informant interview, three District managers (one from each district), eight TB focal person (one from each facility), eight TB facility operational managers (one from each facility), and sixteen TB patients (with quality of the selected information and were readily available) were identified. A total of three focus group

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discussion were selected, one for each district. There were six participants per focus group. An estimated total of 18 experienced DOT supporters participated in the three focus group discussions.

Table 3.3: Distribution of participants

Districts	**CHC**	**Participants**				
		TB patients	District TB managers	TB focal persons	Facility operation manager	DOT Supporters
Vhembe	Bungeni	2		1	1	
	Mpambo	2		1	1	
	Mutale	2		1	1	
	Thohoyandou	2	1	1	1	6
Capricorn	Rethabile	2		1	1	
	Blouberg	2	1	1	1	6
Waterberg	Mookgophong	2		1	1	
	Thabaleshoba	2	1	1	1	6
Total		**16**	**3**	**8**	**8**	**18**

3.4.2.5 Data Collection Instrument

An unstructured in-depth interview and focus group discussion guide designed in line with the objectives of the study was used as instrument for data collection (refer to annexure A and B). Section A required participants' socio-demographic information. Section B focused on exploring the perceptions of the participants regarding the factors affecting TB treatment adherence among TB patients. The following central question was asked per identified factor; and was deliberated on as long as the participant could narrate: Opening question: what is your experience regarding patients taking treatment? Follow-up and probing questions will be used to get more information.

3.4.2.6 Pre-Test

Pre-test of the data collection instrument was conducted before the main study to assess if the researcher's questions were understandable or answerable or if adaptations were required. Pre-test was conducted in Vhembe district at William Eadie CHC since it had a high number of TB patients. For the pre-testing of the tool, two (2) TB patients were interviewed, one (1) facility operation manager was interviewed, one (1) TB focal person, and one (1) focus group discussion was conducted with five (5) DOTS supporters to check the quality of all developed data collection tools. However, district TB managers were not selected since their data collection tool was structured in the same way as for the facility operation managers and the quality of the tool was assessed with during pre-test that was conducted with facility managers. Large number of participants was selected during pre-testing to establish the validity of data collection tools, and to improve the questions formats.

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Participants were requested to sign consent forms. Those participants who participated in the pre-test-study were not included in the larger study. Pre-test data were collected in one day and were analysed. Data were presented to the supervisors, and then tools were reviewed, and questions were then revised and improved with the assistance of the supervisors. The pre-test results showed that TB patients lack knowledge about TB which influence other factors impacting TB treatment adherence. The results findings of the pre-test did not form part of the study. The researcher discarded the collected data.

3.4.2.7 Data Collection Methods

The qualitative design employed two data collection methods, namely: key informant interviews and focus group discussions. In-depth key informant interviews were used with a total of 16 TB patients (two from each facility), three (3) district TB managers, three (3) TB focal person and eight (8) facility operation managers. There was one (1) focus group discussion per district comprising six DOTS supporters. Probing questions were also developed to get information from the participants. A voice recorder was used to record the conversation between the researcher and the participants. Field notes were also taken during data collection. Even though the researcher had intended to have research assistance to assist with data collection, however the researcher was the one who collected the whole data to ensure and maintain quality and trustworthiness of the data. Focus group was conducted in the local languages, Xitsonga, Tshivenda, and Sepedi. Details on how data were collected was discussed under data collection procedure.

3.4.2.8 Data Collection Procedure

Qualitative data were collected from January – March 2020 and was extended to June 2020. Data collection took long due to COVID-19 lockdown.

Key informant interviews:

The key informant are individuals with special knowledge and information about the interest to the researcher and with whom the interviewer has developed on-going relationships of information exchange and discussions. The informant interviewed respond in their own and express personal views. Key informants give additional insights into the topic in question (Cossham & Johanson, 2019).

In this study a total of 16 TB patients, three (3) district TB managers, three (3) TB focal person and eight (8) facility operation managers key informant interviews were conducted using a semi-structured interview guide as shown in annexure A (for district and facility TB managers and TB focal person) and annexure B (for TB patient). The discussion was

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recorded using digital voice recorder later the data were transcribed verbatim researcher. Permission to use voice recorder was obtained before the interviews started. Field notes were also taken, and permission was requested from the participants.

Appointments were secured with the key informant and a date and time secured with each informant. The researcher explained the purpose and process that would be followed during the interviews. The purpose of the study was explained to the participants before the interviews began. The participants were informed that they were free to participate in the study and that they could withdraw at any stage of the research if the desired to do so. All participants gave their written consent before the interviews started. No names were used so that individuals would not be linked to the responses. The researcher provided all participants with the interview guide so that they would be familiar with the questions before the interview started.

Focus group discussion:

Focus group discussions explore and uncover perceptions and views of participants regarding the phenomenon in question. A total of one per district focus group discussion was conducted, each with maximum of six participants. A venue, date and time was secured for each focus group. The facility operational managers provided the facility boardroom. Only participants with signed consent forms were allowed into the venue. The researcher explained the purpose of the study before the discussions. The participants were informed that they were free to participate in the study, and they could withdraw at any stage of the research if they desired to do so. All participants gave their written consents before the discussion started. Data were gathered through digital voice recorder and field notes were also taken. Data were later transcribed verbatim by the researcher. Permission to use a voice recorder and to collect field notes was obtained from the participants before the interviews began.

The researcher used his listening and observational skills throughout the research by maintaining eye contact throughout the research process and ask for clarity where there would be a need. The researcher created a non-threatening, comfortable environment which freed participants from interruptions throughout the research study. This encouraged freedom of speech. The researcher allowed participant time to talk until they finished what they were saying. Separate interviews were conducted, and each lasted approximately thirty minutes.

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3.4.2.9 Data Management

Data were transcribed verbatim and stored in a password-protected computer. Access to the database was restricted to the researcher and supervisors. Data were stored as per the university's protocols. Any identifiable information that was collected remain confidential and only accessible to the researcher and supervisor. This information was stored separately from the research related responses of individuals which are anonymized by coding to prevent the identification of individuals whilst retaining the usefulness of the data. The collected data from individuals were referred to using a code number and the codes was stored separately from the collected data.

3.4.2.10 Data Analysis

Data analysis is the systematic organization and synthesis of research data (Polit & Beck, 2017). Data analysis thus entails categorizing, manipulating, ordering, and summarizing the data and describing them in a meaningful way. The purpose of data analysis is to impose some order on a large body of knowledge so that some general conclusions can be reached and communicated in a research report. Qualitative data analysis always takes place concurrently with data collection. The collected data from digital voice recording were transcribed verbatim and entered immediately into an MS Word document and translated into English. The transcripts were then printed for manual analysis. Analysis of qualitative research is a hands-on process. A significant degree of dedication to reading, intuiting, analysis and synthesising is used to analyse the data. The process of data analysis starts when the data collection begins. As the interviews are conducted, records are maintained, and they are reviewed constantly to discover additional questions that need to be used or to offer descriptions of what is found.

Qualitative data were analysed using Colaizzi's (1978) method which comprises the following seven steps:

- Each research participant's verbatim transcript was read to acquire a sense of the whole.
- Significant statements and phrases pertaining to the phenomenon being studied was extracted from each transcript.
- Meanings was formulated from the significant statements.
- Meanings was organised into themes, and themes evolved into theme clusters and eventually into theme categories.
- These results were integrated into a rich and exhaustive description of the lived experience.
- The essential structure of the phenomenon was uncovered.

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- Validation was sought from the research participants to compare the researcher's descriptive results with their lived experiences.

The following procedure was used for data analysis: the researcher read through the transcripts carefully. The ideas that came into mind were noted. The researcher then chose the most interesting, short document and read through it again to make sense of it and noted thoughts in the margin. A list of all the topics was made. Similar topics were then clustered and formed into columns that were arranged as major topics and leftovers. The researcher then compared the list of topics to the data to ascertain if the topics developed were represented by the data. The different topics were abbreviated as codes which were written next to appropriate segments of the notebook to see whether new categories and codes emerged. The researcher found the most descriptive words for each topic and turned them into categories or sub-themes. Topics that related to each other were then grouped to reduce the number of categories and to create themes. The similar categories of data were grouped and analysed using Colaizzi's (1978) method of data analysis.

3.4.2.11 Measures to Ensure Trustworthiness

Trustworthiness refers to the extent to which a research study is worth giving attention to and worth taking note of (Lemon & Hayes, 2020). It also refers to the degree to which others are convinced that the findings are to be trusted. It is also used in the assessment of validity and reliability of qualitative data, based on the model of Lincoln, Lynham and Guba (2018). In this research, the following criteria of trustworthiness were used: truth value, applicability, consistency, and neutrality.

3.4.2.11.1 Truth Value

Truth value or credibility refers to the extent to which those who read a research report can believe and accept the research findings to be true (Lincoln, et al., 2018). According to Polit and Beck (2017), prolonged engagement with the subject matter is essential in establishing credibility, since it builds trust and a rapport with the participants where rich information can be obtained.

In this study, the researcher spent time with participants obtaining a detailed account on the intervention strategies to improve treatment adherence. During this study, the researcher applied persistent observation which refers to the researcher's focus on the characteristics or aspects of situation or a conversation (Polit & Beck, 2017). To ensure credibility in this study, the researcher remained in the field for a prolonged period interacting with the role players in TB. Spending enough time with each participant ensured this. During the first

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contact, the necessary information regarding the research was outlined to obtain consent from the participants.

To confirm the credibility of the findings, member checking was used to assess whether the participants will recognise the findings of the study to be true to their experiences. This helped to validate that the reported findings represent the exact experiences of the participants (Lincoln, et al., 2018). After the findings of this study the researcher met each participant and shared the research interpretations to see if they will reflect their experiences and circumstances.

3.4.2.11.2 Applicability

Applicability is an alternative to external validity in which the burden of demonstrating the applicability of one set of findings to another context rests more with the investigator who would make transfer than with the original investigator (Polit & Beck, 2017). According to Brink, Van der Walt and Van Rensburg (2014), transferability refers to the ability to apply the findings in other contexts or to other participants. Applicability was ensured by providing thick description to ensure validity and reliability. Thick description was used in this study in the presentation of the qualitative research findings where the actual words of the participants were used constantly. The purpose of thick description is that it creates verisimilitude‖, that is, statements that produce for the readers the feeling that they have experienced, or could experience, the events being described in the study. The purpose of reporting the findings using thick description was to provide as much detail as possible for the readers. It also enables the readers to make decisions about the applicability of the findings to other settings or similar contexts.

In this study the researcher involved a selected sample and conduct in-depth interviews. The topic was covered in depth and breadth to ensure that the data that were obtained support the provision of thick descriptions. Data were recorded on audiotape to ensure that participants' narratives are well captured in their original format. Then the researcher requested someone who was experienced in research to read randomly selected transcripts and identify major themes and categories so that readers may have a clear picture of data.

3.4.2.11.3 Consistency

Consistency is an alternative to reliability in which the researcher attempts to account for changing conditions in the phenomenon chosen for the study as well as changes in the design created by increasing understanding of the setting (De Vos, et al., 2011). It involves

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the condition of verification such that if the study is to be repeated with the same or similar participants in the same subject or similar context, whether its findings will be consistent or similar (Polit & Beck, 2017). The concern is on whether the instrument will provide the same measurement over time if there is identical repetition. In this study consistency was achieved by describing the research data, findings, interpretations, and recommendations to confirm that the investigation was supported by data and is internally coherent. The researcher self-collected data and a tape recorder was used for all interviews to increase reliability. In this study, the researcher ensured that the consistency of the results was checked across time, to ensure reliability of the results.

3.4.2.11.4 Neutrality

Neutrality is concerned with confirming whether the data represent the information provided by the participants and that the interpretations of the data are not fueled by the researcher's imagination (Brink, Van der Walt & Van Rensburg, 2014). This is when the findings, conclusions and recommendations are supported by the data and that there be internal agreement between the investigator's interpretation and the actual evidence. In this study, neutrality was ensured by making or providing use of an independent coder. This was reflected by the voice of the participants and not the researcher's perceptions. The technique that enhanced neutrality in this study was enquiry audit in which the researcher clearly describes, explains, and justifies each stage of the research process.

3.4.3 Phase 1b: Quantitative approach

This phase addressed the following objective:

- To determine the perceptions of patients regarding factors affecting adherence to TB treatment in Limpopo Province.

3.4.3.1 Study design

Quantitative research is a systematic empirical investigation of observable phenomena via statistical, mathematical, or computational techniques. Its main goal is to determine or examine the relationships between two or more variables that are being studied within the population. These variables in turn can be measured, using instruments, so that numerical data can be analysed using statistical procedures (Creswell, 2014).

Quantitative research methods were chosen as it collects numerical data from a group of people, then generalize those results to a larger group of people to explain a phenomenon that is being studied (Polit & Beck, 2017). The researcher also believe that quantitative

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research is important as it ensures that a suitable sample size is used to gain accurate and trustworthy results.

3.4.3.2 Study population

In this study, the target population included TB patients aged 18 and above who were on TB treatment and had completed at least one month on TB treatment and were registered in the facility TB registers of the selected CHCs in the Limpopo Province. Table 2.4 shows the population frame of this study.

3.4.3.3 Study Sampling

A sample is a portion of the target population selected to participate in the study (Polik & Beck 2017). The districts and facilities elected during the qualitative study were utilized.

3.4.3.3.1 Sampling of the TB patients

The researcher used systematic random sampling which is a method to select samples at a particular preset interval. The sampling of the respondents was determined by the calculations that were done using Slovin's formula and depended on the total number of TB patients registered in the TB register of CHCs. The calculations were done using Slovin's formula, where N was the total number of TB patients who were registered in the TB register of the selected CHCs during the time of the study, n was the sample size. The propositional sampling sizes were calculated based on the total population of CHCs (table 3.4). After the calculation about 292 sample size was found as shown below under sample size. The total number of the TB registered patients (N=1075) were then divided by the sample size (n=292) to find K^{th} value which was the interval value; K^{th} value =1075/292=3.68 which is 4. The systematic random sampling technique was then employed to sample TB patients from the CHCs TB registers, in order to sample every 4^{th} TB patient registered in the CHC TB register to participate in the study. The researcher then randomly chose the starting number to be patient number one (1) who meet the criteria as appeared in the TB register. Therefore, the researcher then sampled every 4^{th} patient above the age of 18 systematically from patient number one as appeared in the TB register until the total of 292 was reached. About 10% (28) was added to cover for non-response and sample was 320 and was distributed proportionally. However only 207 respondents agreed to participate in the study. Majority of participant were not available during the time of the study due to COVID-19 lockdown. Most of the respondents who agreed to participate in the study were followed at home.

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3.4.3.3.2 Inclusion and exclusion criteria

The target sample was TB patients who were above the age of 18 and had completed at least one month on TB treatment and registered in the CHC TB register. Respondents who had already completed their TB treatment from the date of data collection were excluded in the study.

3.4.3.4 Sample size

The sample size was be calculated using Slovin's formula, where N is the total number of TB patients who are registered in the TB register of the selected CHCs during the time of the study, n is the sample size and e is the accepted level of error. The accepted level of error, e, is 0.05. The estimated overall sample size was 292 of all TB patients drawn from an estimated total population of 1075, with 95% confident interval (refer below on the calculation and table 3.4 below).

$$n = N / (1+Ne^2)$$

$$= \frac{1075}{1+ (1075\times 0.05^2)}$$

$$= \frac{1075}{1+ (1075\times 0.0025)}$$

$$= \frac{1075}{1+2.68}$$

$$= \frac{1075}{3.68}$$

$$= 292$$

Table 3.4: Proportional sample for TB patients

District	Community Health Centre	Number of TB patients registered in TIER.Net	Percentage Sample	Proportional Sample size
Vhembe District	Bungeni CHC	159	14.7	43
	Mpambo CHC	138	13.0	38
	Mutale CHC	89	8.2	24
	Thohoyandou CHC	188	17.1	50
Capricorn District	Rethabile CHC	157	14.3	42
	Blouberg CHC	71	6.8	20
Waterberg District	Mookgophong CHC	175	16.0	47
	Thabaleshoba CHC	98	9.5	28
Total		**1075**		**292**

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3.4.3.5 Data collection instrument

A questionnaire was developed based on the findings of qualitative approach in Phase 1a. For the purpose of the proposal a dummy questionnaire was first developed and refined using the findings of qualitative approach. The instrument was be developed in English based on the constructs of the BCW. A self-administered questionnaire was used to collect quantitative data (refer to Annexure C). The questionnaire contained closed and open-ended questions. The questionnaire was written in English and translated in Tshivenda, Sepedi, and Xitsonga. The questionnaire was divided into eight sections, where Section A was demographic information, Section B was knowledge about TB and patients related factors, Section C was cultural, religious, and traditional factor, Section D was socio-economic factor, Section E was health system related factor, Section F was Default factor, Section G was stigma and discrimination factor and Section H was disease and treatment related factor, as indicated in annexure C**.**

3.4.3.6 Pre-test

Pre-test of the data collection instrument was conducted before the main study to assess if the researcher's questions are understandable and answerable. Pre-test was checked if adaptations of an instrument were required. Testing of the instrument also assisted the researcher to discard confusing questions and poorly worded questions (de Vos, et al., 2011). In this study, pre-test was conducted in Vhembe district at William Eadie Health centre since it has a high number of TB patients as compared to all CHCs that were not selected in the study. Respondents were requested to sign consent form before they participate in the study. Respondents were encouraged to ask any questions that they had as they responded to the questionnaire. Even though the researcher intended to administer a total of 30 questionnaires (to represent 10 percent of the study sample size), however only nine (9) questionnaires were administered as other TB patients were not available and were not willing to take part on the pre-test of the study. The questionnaires were administered in one day by the researcher to find out if they yield the expected information. The questionnaires were analysed using SPSS, and the results were shared with the supervisors, then question formats were improved to establish validity of the instrument. The results of the pre-test showed that even though most respondents indicated to have knowledge about TB they are still visiting religious leaders and traditional healers for help, and some are still defaulting their treatment after visiting the traditional healers and religious leaders for help. The results did not form part of the study, the researcher discarded them together with the tools that were used to collect data.

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3.4.3.7 Data collection process

In this study, data collection started as soon as ethical clearance and permission to enter the district office and the CHCs are obtained. Quantitative data were collected from June - September 2020, following qualitative data collection and analysis. The purpose and the nature of the study was explained to the respondents. Health care facility managers were engaged, and the researcher explained the details of the study to them. Arrangements to call the selected respondents who met the criteria to come to the facility were made with the facility managers. Appointments were made with the respondents and the researcher visited the facility on the day of the appointment. Those who did not make it to the facilities were visited at their homes. Respondents were requested to sign consent forms prior to participating in the study. All respondents who signed consent forms were included in the study. Respondents were given questionnaires to complete and those who could not read were assisted by the researcher and health professionals. Questionnaires were collected same day after completion. The researcher received back 207 questionnaires from the participants who were available during the time of data collection. With the help of the clinicians the response rate was 71% as other patients were not available during the time of the study and were not willing to travel back to the province due to COVID-19 restrictions. Some patients were already transferred out of the facilities and were not from the surrounding villages. Only respondents from the surrounding areas who were transferred out of the facilities were followed home and were requested to participate in the study.

3.4.3.8 Data Analysis

Quantitative data analysis was carried out using Statistical package for Social Sciences (SPSS) version 26.0 (2017). All data from the questionnaire was coded using a code book and was entered into SPSS version 26.0 statistical programmes. The researcher used codes rather than respondents' names and check data by frequency to identify missing or incorrect values. In this respect, the mean, mode, median and standard deviation variables were used to calculate the various descriptive statistics. Results emanating from the analysis were represented in the form of tables and charts.

3.4.3.9 Validity of the instrument

Validity relates to the degree to which the research measures what it is supposed to measure (Singh, 2014). The researcher focused more on the content validity and face validity of the instrument.

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3.4.3.9.1 Face validity

Face validity of an instrument is defined as the judgement that an instrument is measuring what it is supposed to, based primarily on the local link between the questions and study objectives. The questionnaire was presented at the departmental seminars and School of Health Sciences' Higher Degrees Committee at the University of Venda. The supervisors were consulted for comment and opinion as to whether the instrument will be able to collect enough data to develop an effective intervention to improve TB medical adherence. The questionnaire was restructured based on the feedback from supervisors and identified gaps.

3.4.3.9.2 Content validity

Content validity is an assessment of how well an instrument represents all the different components of the variable to be measured (Halek, Holle & Bartholomeyczik, 2017). The researcher reviewed literatures and instruments from similar studies. Several people were consulted including supervisors, TB coordinators, and experts in the field who are familiar with the construct being measured for comments and inputs before finalizing the instrument (Creswell, 2014). In addition, content validity was addressed by extensive literature search for studies which were similar in nature to identify the domain of the construct before developing the questionnaire.

3.4.3.10 Reliability of the instrument

According to Singh (2014), reliability refers to the degree to which an instrument reliably measures whatsoever the tool was intended to measure by giving the same results each time it is applied. To ensure reliability of the instrument, test re-test method was used, re-administering the same instrument to the same set of respondents. Ten percent (n=30 respondents) of the sample size were sampled on day one, and the same set of respondents were given the same questionnaire two days later and the two responses were compared using the Cronbach Alpha correlation technique. A correlation co-efficient was used to compare the two instruments and a score was made on both instruments. A correlation co-efficient of 0.9 which was closer to one (1) indicating a strong positive relationship which showed the reliability of the instrument and the researcher accepted them (de Vos, et al., 2011).

3.4.4 Interpretation

The results from both qualitative and quantitative were then checked for similarities and differences were identified and used to develop intervention strategies.

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3.5 Phase 2: Development of Intervention strategies

This phase addressed the following objective:

- To plan and develop intervention strategies to improve TB treatment adherence in Limpopo province.

The researcher used the findings obtained from Phases 1a and Phase 1b, to develop evidence-based intervention strategies that encompasses Behaviour change techniques aimed at overcoming the identified barriers and factors affecting TB treatment adherence in Limpopo Province. In preparation to the workshop for intervention strategies development, the researcher conducted a systematic literature review.

3.5.1 Conduct systematic literature review to develop evidence-based intervention strategies

The researcher took his time to find out more literatures that were close to the designed strategies by the stakeholders. The researcher also looked at intervention strategies that have been developed for related study problems if they could be adapted for use. The following methodological steps according to Yahya, Saub & Mariani (2018), was used to conducting systemic review of literature:

Step 1: Formulate the review questions: The following questions was asked per identified contributing factor for TB treatment non-adherence:

"*What intervention strategy may resolve this factor to improve TB treatment adherence?"*

What will be the main goal of this intervention strategy in the programme?

What are the possible activities that will make us achieve the set goal?

What is the anticipated outcome?

Step 2: Identifying relevant publications

Several databases and relevant grey literature for all relevant health articles such as the Department of Health Guidelines, PubMed, MEDLINE, health publications, Web of science core collection, and conference proceedings from 2014 to 2020 were searched. The search used key words TB treatment adherence**.** List of limits that were applied to search were: age, years, and language. Primary and secondary research studies were included in this systemic review such as published articles and case reports written in English and have similar information identified in phase one.

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Step 3: Quality assessment and data extraction

All full text studies except for abstract were included for quality assessment. The following information was included from all included studies; author, year of publication, study design, study setting, sample size, demographic characteristic of the subjects, any relevant intervention related to the study and information relating to the factors identified in phase one.

Step 4: Statistical analysis and interpreting the findings

A Prisma flow chart on the selection of studies was used for analysis. The study findings from systemic review of literature were converged with the ones from stakeholder consultative forums to develop intervention strategies to close identified factors contributing to TB treatment non-adherence in the Limpopo Province.

The key points that were found during the systematic literature review regarding strategy to improve treatment adherence and to address factors affecting TB adherence were: the need to educate patients about what to expect when they are on treatment, forming a strong relationship with patients, remind patients about their follow up visits and encouraging patients to make use of the technology when taking treatment. The workshop was then organised with the TB experts to discuss the findings and to develop intervention strategies for the current study to address factors affecting TB treatment adherence.

3.6 Workshop to develop intervention strategies

The intervention strategies were developed through a stakeholder workshop which was guided by stages two and three of the BCW. Stakeholders included TB managers of the three districts where the study was conducted. During the workshop, the researcher presented the findings obtained in phase 1a and phase 1b to the stakeholders and request them to confirm all if they agree with the findings of the study. The researcher then asked the stakeholders to suggest relevant and evidence-based intervention strategies that can overcome identified barriers and factors affecting TB treatment adherence. The researcher also conducted a systematic literature review to develop evidence-based intervention strategies.

3.6.1 Stage One: Identify Intervention Options

The researcher conducted a stakeholder workshop to review phase one findings and identify intervention functions and content. Findings from phase one were presented during stakeholder workshop. During the workshop, a value proposition was developed.

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Stakeholders were requested to identify intervention strategies that addressed each identified factor to move from current to a desired behaviour. Using Behaviour Change Wheel, suitable intervention options were identified from intervention function (means by which intervention will change behaviour) and policy categories (means by which an intervention will be delivered). BCW outlines which types of intervention functions were likely to be effective in bringing about behaviour change in each COM-B (Capability, Opportunity, Motivation – Behaviour Model) component and Theoretical Domains Framework (TDF) (Michie, Atkins & West, 2014). APEASE criteria (affordability, practicability, effectiveness and cost-effectiveness, acceptability, safety, and equity) was applied to each suggested intervention strategy to explore its appropriateness for the TB treatment adherence context (Michie, Atkins & West, 2014). The APEASE criteria were used to guide decision making during intervention development design. Once the intervention functions were identified, the researcher used the Behaviour Change Technique Taxonomy version 1 (BCTTv1) to identify BCTs that best served the intervention function. The BCTTv1 uses a standardized language for describing the active ingredients in interventions (Michie, Richardson, Johnston, Abraham, Francis, Hardeman & Wood, 2014). The researcher used APEASE criteria to consider which intervention strategies was feasible within the context of TB treatment adherence and most useful to address the identified barriers and contributing factors that influence non-adherence.

3.6.2 Stage Two: Identify Content and Implementation Options

Results from the previous stage of the BCW was used to guide selection of appropriate behaviour change techniques, resultant content, and mode of delivery of the implementation intervention. During stakeholder workshop, the researcher requested the stakeholders to further refine the intervention strategies designed in the first stage. Through discussion, the stakeholders were requested to identify potential modes of intervention delivery and apply the APEASE criteria to explore its feasibility. The stakeholders also discussed optimal intervention content, providers, setting, recipient, intensity, during, and fidelity. Following the workshop meetings, the researcher collated the workshop results to produce a summary of the final intervention strategies.

3.7 PHASE 3: Validation of the Developed Intervention Strategies

This phase addressed the following objective:

- To validate the developed intervention strategies

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Validation is a technique which is conducted to determine the credibility of empirical knowledge in relation to a scientific model of a discipline. The developed intervention strategies were presented to the district and sub-district TB managers during this phase for inputs, comments, criticism, and acceptance. All participants were requested to sign a consent form to participate in the study. Validation of the developed intervention strategies was done to have a buy-in from the stakeholders (TB managers and TB expects) who own the programme for ease implementation of the developed intervention strategy. Validation was done to check whether the developed intervention strategies was applicable and able to close the identified factors.

The intervention strategies were validated using the APEASE criteria using a checklist.

The developed intervention strategies were validated by the panel of the stakeholders (district TB managers). Stakeholders were requested to choose a date and time, which was convenient for them without interfering with their work schedules. Developed strategies was presented to a panel of experts. All ethical considerations were adhered to.

A checklist was used for each developed intervention strategy to check if it meets the APEASE criteria. District TB mangers were requested to assess and select all interventions that meet APEASE criteria. Stakeholders also assessed if the intervention was appropriate and practical for implementation. The validated intervention strategies were then finalised. A copy of developed intervention strategies was sent to the district TB managers via email.

3.8 Ethical Considerations

To ensure that participants are not violated, researchers are to adhere to strict ethical standards. The Principle of Beneficence requires the researcher to do good and above all do no harm (Burns & Grove, 2016). The following ethical aspects were discussed into below; permission to conduct a research, informed consent, confidentiality, anonymity, and freedom from harm and exploitation.

3.8.1 Permission to Conduct a Research

The proposal was submitted and presented to the University Higher Degrees Committee (UHDC) of the University of Venda and recommended for ethical clearance by the University Ethical Committee (project number SHS/19/PH/28/0411). The ethical clearance was submitted to the Limpopo Provincial Department of Health, Vhembe, Capricorn, and Waterberg District Department of Health to obtain permission to conduct the study. Letters were written to the TB district managers and CHC operation managers requesting permission to conduct a study. Participants were shown approvals from all levels.

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3.8.2 Informed Consent

The researcher ensured that all the essential information such as purpose of the study and significance of the study, as well as voluntary participation was provided to enable participants to make informed decisions before signing the forms. Participants who were audio recorded were requested to sign consent form before interviews started. The nature of research was described to the subjects participating in the study and they were informed that they had the right to refuse to participate, or to withdraw from participating if they felt that they could not continue. The participants were also informed and assured that the information they provided would not be used against them or shared with other people but would be reported as a finding of this study. The consent forms were given to every patient who agreed to participate in the study to complete it (annexure G).

3.8.3 Confidentiality

Information provided by participants was treated as confidential and under no circumstances, was the information divulged or made available to any third party except as reports and publications (Halek, et al., 2017). Participants were assured that their names and the names of their CHC would be dealt with in the strictest confidence and will be treated as confidential. The researcher assured the participants they he will follow the principle of trust, and the trust of the participants will not be exploited for personal gain or benefit, by deceiving or betraying them in the research route or its published outcomes.

3.8.4 Anonymity

Anonymity is the procedure that is followed in quantitative studies that to all information will be kept hidden from everyone except the primary research team. Anonymity is one form of confidentiality which ensures keeping participants' identities secret (Surmiak, 2018). Anonymity was also ensured since participants did not write down their names or any personality identification on the questionnaires or envelops. This allowed the participants to be anonymous. The research participants had the right to anonymity and the right to assume that the data were kept confidential. Complete anonymity exists if the participant's identity cannot be disclosed, even by the researcher, with his or her individual responses. Data were analyzed in groups not individually to avoid identifying the participants by their responses (Halek, et al., 2017).

3.8.5 Freedom from Harm and Exploitation

The researcher respected the choices and agreements that were made with the participants. The initial agreement was not changed without the knowledge of the participants. The

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participants were not victimized for refusing to participate in the study (Halek, et al., 2017). Participants were assured that they have the rights to withdraw from the study at any time when they do not feel safe. Before seeking approval of the study, the researcher analysed the potential risks and benefits to research participants. The researcher identified that there was no potential harm, physical harm, unforeseen side effects, emotional and psychological distress that could harm the participants. Participants were not expected to lose any monetary costs to participate in the study. The interviews were conducted in a private space to ensure privacy of the participants. All relevant information regarding freedom from harm and exploitation were included in the consent forms and participants were taken through it before they could sign consent forms.

3.9 Dissemination of the results

One soft copy of the thesis will be kept at the University of Venda library whereas one hard copy will be submitted to the Department of Health Limpopo Province. The researcher will also present the findings of the study at the national and international conferences and published them in peer-reviewed, accredited national and international journals.

3.10 Summary

The study was designed to be mixed research design using both qualitative and quantitative approaches utilizing exploratory sequential strategy. This study was conducted in Limpopo Province of South Africa within three selected sub-districts (Capricorn, Waterberg, and Vhembe). The study is guided by the BCW as indicated above. The study will be divided into three phases. Data were collected in two phases arranged in a sequence. The first phase was divided into phase 1a (qualitative approach) and phase 1b (quantitative approach). Qualitative data were collected using focus group discussion and key informant in-depth interview. Quantitative data were collected using self-administered questionnaire. In Phase two, the last two stages of the BCW were used to guide the development of the intervention strategies to address the identified factors. In Phase three, the developed intervention strategies were validated using APEASE criteria. Presentation of qualitative findings has been arranged to be in the next chapter 4.

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CHAPTER 4

THE RESULTS OF PHASE 1a: QUALITATIVE APPROACH

4.1 INTRODUCTION

This chapter presents the findings of Phase 1a: qualitative approach of the study. The previous chapters outlined the research problem, methodology and design used in this study. The main purpose of this chapter is to present qualitative research findings and describe how data were analyzed thematically. The objective for this phase was to explore the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province. The research question was, what are the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province?

4.2 Biographic data of the study

Data were collected through key informant interview with sixteen (16) TB patients, three (3) district TB managers, eight (8) facility TB focal person, eight (8) facility operation managers and focus group discussions with six (6) Home Based care givers per district (see table 4.1 below). Data were audio-recoded and field notes were also taken. All participants were asked open ended questions. The interview dates and times were arranged with participants prior to data collection date. Interviews were conducted early in the morning, as requested by participants, to enable them to perform their duties and avoid distracting them from their normal ward routine work. Separate interviews took place in a private office within District office and CHCs, each lasting approximately thirty minutes. Interviews were completed in four months, due to COVID 19 lock down, the researcher had to book appointments with the participants observing COVID 19 regulations.

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Table 4.1: Participants demographics for qualitative data collection

Key informant interview with three (3) District TB managers (DM)				
Participant number	**Position**	**District**	**Gender**	**Age**
1	TB district manager	A	Female	50-59
2	TB district manager	B	Female	50-59
3	TB district manager	C	Female	Above 60
Key informant interview with eight (8) Facility operational managers (OPM)				
Participant number	**Position**	**Community health center**	**Gender**	**Age**
4	OPM	A1	Female	40-49
5	OPM	A2	Female	Above 60
6	OPM	B1	Female	50-59
7	OPM	B2	Female	50-59
8	OPM	C1	Female	40-49
9	OPM	C2	Female	50-59
10	OPM	C3	Female	Above 60
11	OPM	C4	Female	50-59
Key informant interview with eight (8) facility TB focal (nurse) persons				
Participant number	**Position**	**Community health center**	**Gender**	**Age**
12	TB focal nurse	A1	Female	40-49
13	TB focal nurse	A2	Female	50-59
14	TB focal nurse	B1	Female	50-59

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15	TB focal nurse	B2	Female	40-49
16	TB focal nurse	C1	Female	30-39
17	TB focal nurse	C2	Male	30-39
18	TB focal nurse	C3	Female	40-49
19	TB focal nurse	C4	Female	50-59
key informant interview with sixteen (16) TB patients				
Participant number	**Position**	**Community health center**	**Gender**	**Age**
20	TB patient	A2	Male	18-29
21	TB patient	A2	Male	18-29
22	TB patient	A1	Male	40-49
23	TB patient	A1	Female	30-39
24	TB patient	B1	Male	30-39
25	TB patient	B1	Female	30-39
26	TB patient	B2	Female	40-49
27	TB patient	B2	Female	18-29
28	TB patient	C1	Male	40-49
29	TB patient	C1	Male	50-59
30	TB patient	C2	Male	18-29
31	TB patient	C2	Female	30-39
32	TB patient	C3	Male	18-29
33	TB patient	C3	Male	18-29
34	TB patient	C4	Female	30-39
35	TB patient	C4	Female	40-49

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Focus group discussions (FGD) with eighteen (18) Home based care givers per district				
Participant number	**FGD number**	**District**	**Gender**	**Age**
36	FGD 1	A	Male	18-29
37	FGD 1	A	Male	30-39
38	FGD 1	A	Male	30-39
39	FGD 1	A	Female	30-39
40	FGD 1	A	Female	30-39
41	FGD 1	A	Female	30-39
42	FGD 1	A	Female	40-49
43	FGD 2	B	Male	50-59
44	FGD 2	B	Female	30-39
45	FGD 2	B	Female	30-39
46	FGD 2	B	Female	40-49
47	FGD 2	B	Female	18-29
48	FGD 2	B	Female	18-29
49	FGD 3	C	Female	40-49
50	FGD 3	C	Female	40-49
51	FGD 3	C	Female	30-39
52	FGD 3	C	Female	40-49
53	FGD 3	C	Female	18-29

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Interview Guide

The researcher's central question was*: what is your experience regarding TB patients taking TB treatment?* During the interview, the researcher asked probing questions so that participants could elaborate or clarify their responses (see Annexure A).

Data were analyzed using Colaizzi's (1978) methods of analysis for qualitative data, as detailed in Chapter 3. The researcher moved to a phase of reading to identify and highlight the participants' perceptions regarding factors affecting TB treatment adherence. The researcher then extracted significant phrases and statements from the transcripts that together formed the whole meaning of factors affecting TB treatment adherence. The researcher then analyzed each transcript to identify statements that described each participant's story of their lived experience. The statements were highlighted on each page and then entered into the MS Word document.

4.3 Data Findings

After data organization and analysis, five major themes were developed from the findings of this study and sub-themes were also formulated (See Table 4.2).

4.3.1 Themes and Sub-Themes

Participants shared the same experience regarding TB patients taking TB treatment and the same perception regarding factors affecting TB treatment adherence. Five major themes emerged from the collected data for perceived barriers to treatment adherence and the researcher formulated various sub-themes under each theme (see Table 4.2 below). The major themes were: (1) Social and Cultural factors, (2) Patients related factors, (3) Treatment related factors, (4) Socio-economic factors and (5) Health care and health system factors.

Annexure D of this study shows how the themes and sub-themes were developed during the analysis of data collected based on the tool, key informant, and focus group interviews. These themes were identified and developed based on the statements that appeared frequently in the data collected and sub-themes were developed. Similar themes were then collated to form the overall themes indicated below (Table 4.2). Each of the themes is discussed in detail below.

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Table 4.2: Themes and Sub-Themes for the perceptions of stakeholders regarding factors affecting TB treatment adherence

Themes	Sub-Themes
1. Social and cultural factors	1.1 Strong trust and belief on culture, tradition, or religion. 1.2 Fear to disclose the status. 1.3 Lack of support from the family and community.
2. Patients related factors	2.1 Use of Alcohol and substance abuse. 2.2 Comprehensive knowledge about the disease and treatment. 2.3 Changes of residential address. 2.4 Age factor affecting adherence.
3. Treatment related factors	3.1 Side effect caused by treatment. 3.2 Duration of the treatment. 3.3 Co-morbidities.
4. Socio-economic factors	4.1 High unemployment rate in the community. 4.2 Lack of transport and distance travel to the facility. 4.3 Lack of food while taking treatment.
5. Healthcare and health system factors	5.1 Facilities operating hours. 5.2 Long waiting hours. 5.2 Attitude of health care workers towards the patients. 5.3 Medicine availability. 5.4 DOTS supporter's status.

4.4 THEMES THAT EMERGED FROM THE ANALYSIS

4.4.1 THEME 1: SOCIAL AND CULTURAL FACTORS

In this study, the social context which include family, community, and household support, including stigma and discrimination have influence on treatment adherence. During interviews it was revealed that most patients believed that if they disclose their status to their family members or neighbours, they will suffer discrimination and isolation. Family members and neighbours may also try to restrain their contact due to fear of contracting the disease.

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Some participants indicated fear of losing their jobs since their bosses would not want them to interact with other staff members to avoid transmission of infection. The study shows that due to fear of stigma and discrimination, most patients end up forgetting to take their treatment, as they do not have anyone to remind them. The following sub-themes will be discussed under social factors; Fear to disclose the status and lack of support from the family and community.

Participants articulated that the cultural, religious, or traditional beliefs have an impact on the TB treatment adherence. During the interviews it was revealed that TB patients are affected by their strong religious, cultural, or traditional beliefs. They described visiting traditional practitioners and faith-based churches as the common practice amongst TB patients. However, the practices of visiting the traditional healers are rare in the urban areas within the Province. Participants indicated that cultural and religious beliefs about TB disease in the communities contribute to the issue of stigma, which contributes to treatment non-adherence and as a results patient will only seek help at a later stage when their conditions are worsen. Most of the TB patients in the rural communities do not attribute TB to a bacterial cause. Consulting traditional healers for health care, when they are feeling sick is common and this practice delay diagnosis and treatment initiation.

Sub-theme 1.1 Strong trust and belief on culture, tradition, or religion

Traditional health practitioners are powerful allies in TB and HIV programmes; separation make patients believe that they should choose between western health treatment and traditional culture practices. Participants revealed that TB patients have strong trust in traditional health practitioners and religious leaders. It is reported that belief concerning TB infection ranged from it being a punishment for dishonesty, hereditary or due to witchcraft, overwork, and loss of faith. Participants explained that religious people refuse to take treatment as they have a strong belief that the successful treatment of TB is in the hands of God. Some of them use anointing oils and holy water from the prophets and stop taking treatment. The study shows that TB patients' beliefs have a negative impact on the cure rate, as they stop taking their treatment and use traditional medicine or go to the prophets for prayers with the trust that they will be healed.

Participant 2 said,

"*TB patients go to the traditional healers for help, or they will go to the religious leaders for prayers, they do not believe that TB is a natural disease, some believe that they are bewitched, and some believe they have evil spirits. They only come to the healthcare facilities when their condition is worse"*.

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According to Participant 1:

"*TB patients do not believe that TB is a medical condition, some believe they have badimo or mimuya and they need to be initiated. We had a case where the whole family was sick, and they all believed they have badimo or mimuya and their ancestors are calling them to be initiated. …they all stopped taking their treatment, as they were preparing for their initiation, it was bad because we were trying our level best to educate those people about the importance of taking their treatments"*.

Participant 28 indicted that:

"…*I am on treatment now again, I had stopped because I went to a traditional healer who told me to take traditional herbs as I was having some (dzithunwa) evil spirits, I was even taking immune booster like moringa, and things got worse after there and I was taken to the hospital and luckily I was able to get back on my treatment"*.

Sub-theme 1.2 Fear to disclose the status

This study shows that TB patients are afraid to disclose their status as they are afraid to be discriminated and isolated. Fear of stigma and discrimination, which can also be linked to fear of violence, has been reported to discourage people living with HIV from disclosing their status even to family members and that compromise their ability and willingness to access and adhere to treatment. The study reveals that stigma and discrimination are among the foremost barriers to TB disease prevention, treatment, care, and support within their communities. Stigma and discrimination also make people to be afraid to seek health information, services, and modalities to reduce their risk of infection and to adopt safer behaviours. TB is often associated with factors that can create stigma such as HIV, poverty, drugs and alcohol misuse, homelessness, history of prison and refugee status.

Participant 16 said: "*Most patients are afraid to disclose their status as people always relate TB with HIV, and they are afraid of being discriminated or stigmatized in the community. Some patients will not take their treatment frequently because they do not want people to see that they are sick, they will only take their treatment when they are alone"*.

Other participant 12 said: "*other patients who stay close to the clinic will not prefer to take treatment at home, they will rather come to the clinic because they do not want their family to see those treatments. Some will even give us wrong address and contact numbers, so we do not even find them when we send home-based carers or tracers"*.

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Participant 22 said that: "…*we live in fear of losing our job because we are afraid that if our bosses in the farms know that we are sick they will tell us not to come to work because we will infect others. We cannot even tell them that we are going to the clinics because they would want to know more about our health status if we are frequently going to the clinics, we will rather miss our appointment to protect our jobs so that we can continue to feed our families"*.

It is revealed that most patients do not attend their appointments and do not take treatment on time as they do not get full support and they do not have anyone to remind them as they have not told anyone for fear of discrimination. DOT supporters cannot even provide support to patients who are living in fear of disclosing their status as they make it difficult for them to visit them at their households or workplace as they do not want to be seen with them. The implications of non-disclosure can cause patients to default from taking treatment, or not take treatment on time or even miss their appointments. It is difficult to DOT them, as no family or community member can observe them and support them when taking their treatments.

Sub-theme 1.3 Lack of support from the family and community

Support from family, friends and community plays a major role in patients being adherent to their treatment. TB patients always feel encouraged if their family members or friends are providing support and encourage them to take their treatment. Some patients indicated that they feel more encouraged to take and complete their treatment if someone from their family is even helping them to go with them to the facility to take medication and provide food so that they can take their pills. Support also encourages patients to take their treatment to avoid infecting those they are living with and those who care about them. Lack of support makes patients to feel they are living under the curse and no one wants to come anywhere near them. Some patients must stop working as they are seriously ill, and family support was the only source of encouragement and comfort for them to continue taking their treatment. Below are the comments made by the participants.

Participant 43 indicated that:
"*Some patients complain that ever since they were diagnosed with TB and started taking treatment under the care of the home-based carers, they feel like their friends and family are no longer close to them. So, having home carer givers is bad as you disclose your status unconsciously and people turn to think you are seriously ill with some type of evil disease, and people feel you are dying"*.

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Participant 15 indicated that: "*Some patients have support from their families and they even go with them to the clinics to collect medications and they seems to be happy that they have support from their families, their families even welcome the home-based carers and allow the nurses to screen the family members*. *Those patients with the family support even complete their treatments and when they have side effects their family members always encourage them to go to the clinic. Some even help come to collect treatment for their family members who are sick"*.

Participant 17 said that:
"…*Some patients alluded that their families said they can only support them if they allow them to take them to traditional healers to find out if they really have TB, and if it can be cured by traditional medicine. If they are still taking medical treatments, they will forever be without their support. So, they are left not knowing whether to continue taking treatment or please their family. When they experience treatment side effects their families always mock them and tell them that the treatment does not work"*.

The study shows that some patients do not receive a full support from their family members as they do not disclose their status due to fear of discrimination and stigma and that always cause them to stop taking treatment, especially if they experience side effects. Those families that provide patients with support always encourages them to complete the treatment. Some families do not provide support due to the lack of knowledge about the disease and treatment as they have strong beliefs to the traditional healers.

4.4.2 THEME 2: PATIENTS RELATED FACTORS

Participants revealed that patients related factors affect the treatment adherence. During the interviews participants indicated that patients related factors encompass feeling of wellness, where patients do not see a need to continue taking treatment for six months as they are feeling well, and they are afraid of continuing with treatment due to the fear of side effects. It was also indicated that patients stop taking their treatment due to the lack of comprehensive knowledge about TB in general and the treatment regimen and the length. The following sub-themes will be discussed into details under patients related factors; Substance abuse, lack of comprehensive knowledge about the disease and treatment, changes of residential address and age factor affecting adherence.

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Sub-theme 2.1: Use of Alcohol and Substance abuse

The use of alcohol and substance abuse has an influence on treatment non-adherence. Alcohol and other substances abuse make TB patients to forget to take their medications therefore leading to poor compliance. Patients who abuse alcohol and other substances are less likely to be screened for TB or to begin and complete TB treatment. Those patients have less access to routine medical care, potentially leading to delayed diagnoses, and as the disease progress they become more contagious. Participants indicated that other patients are taking nyaupe and drugs in the village which makes it difficult to monitor if they adhering to their treatment. Patients who are taking alcohol are forever not at home and DOT supporters cannot locate them to support them to take their treatment. They spread the disease in the communities as they spend time in places where it is easy to spread infection, such as overcrowded or poorly ventilated homes or social venues. Participants indicated that some patients who are on nyaupe and marijuana they follow them at their usual place every day and ask them to take treatment. However, some will run away the moment they see DOT supporters coming their way as they indicated that the treatment ruins their day as they do not feel well.

Participant 8 indicated that:

"...*these patients are always drunk, and they are always at the shebeens they do not have time to take their treatment. I think some of them got drunk to a point where they even forget that they are sick, and if they do not remember anything there is no way they will remember to take their treatment. Some of them we don't even get to see them because they wake up very early in the morning and go to shebeens and they come home very late at night, and they do not even allow the home-based care givers to follow them there"*.

Participant 39 added that: "*Bo-Nyaupe (mean people taking drug called Nyaupe) don't want to see us they will agree to have home-based carers to support them, but the moment they see them they run away, they say that their friends will laugh at them and call them weak. Sometimes we are scared to follow them because they will tell us not to follow them as they do not want to be seen with us, as people will know they are sick, they even threaten us to leave them alone"*.

Participant 47 indicated that:

"…*Elderly people who are abusing alcohol will tell us that this TB treatments do not work, they just make one sick as they develop side effects, and they cause them not to enjoy their alcohols as they will not be in a good state of mind. However, during counseling, they are*

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told to stop drinking alcohol, even during home visit they are encouraged to stop taking alcohol, but they tell us that is impossible".

Participant 16 indicated that:

"…*some patients have bad attitude towards the health care workers, once they are drunk, they are short tempered if they come to the facility and find maybe other TB patients waiting to be assisted they get angry and leave the facility, they do not have patience they want to get helped same time and leave the facility and if you tell them to wait they get angry as they want to go to shebeens, especially on Fridays and unfortunately even if we try to give them appointments during the week they do not honor them as a result some even end up stopping coming to collect their treatments"*.

Data reveals that patients who are abusing alcohol and other substances they are more likely not to adhere to their treatment. It is not even easy to provide support to those patients as they are rude and have bad attitude to the healthcare workers and DOT supporters. It was indicated that the attitude of patients also influence adherence.

Sub-theme 2.2: Comprehensive knowledge about the disease and treatment

The study shows that TB treatment non-adherence often results from inadequate knowledge or understanding of the disease and its treatment. Adherence to the long course of TB treatment is a complex process that requires better understanding of the disease and the treatment. During the interview's participants indicated that some TB patients in the rural area lack better understanding of the disease as they still have different believes about the disease. Some patients do not understand why they need to take treatment for so long and as a result they interrupt their treatment due to lack of knowledge. Some do not understand the risk of defaulting they do not understand that they can develop MDR or XDR and even put their families at risk. Even though they are provided with education at the facility they still do not understand as some of them are not educated. Some patients visit the facility whenever they are feeling sick and when they feel better, they stop taking treatment.

Participant 15 stated that:

"…Another challenge that we have is that some patients are not educated and mostly they are ignorant, some of them are old and very stubborn, and not easy to convince, it is hard to make them understand what TB is and why they need to take treatment for six months. Some of them do not have someone who can come with them at the facility that we can educate, at least if someone from their family is telling them about the importance of taking treatment and risk of stopping, they would understand better".

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Participant 16 indicated that:

"Sometimes it become so difficult to talk about TB with uneducated ones, especially the old ones who are rooted in culture. It is hard to educate them on what TB is, what cause it and why they need to take treatment every day on time, it just become difficult you have to explain and repeat, and they still don't understand, sometimes we ask if they can come with someone from their family who can better understand the information. Sometimes even the educated ones make it difficult, I remember this other one was a teacher, and he brought his mom and when we told him about TB, he seems to understand but he never brought her back to collect treatment and she later died".

Participant 17 said:

"I think if the community can understand TB and treatment it will be easy to deal with this disease but unfortunately some people are immigrants they do not have education and they do not fluently understand our languages, some do not understand English either, when you try to explain to them, they will act like they understand what you are saying and immediately when they leave the facility they become worse and the results will show that they did not understand the health education that was provided to them".

Participant 19 indicated:

"…*I remember we once had this other patient who told us that the tablets, we give them are not the correct one as the colour does not look right, he further said no doctor is able to cure this disease and everything is just based on the common sense"*.

Sub-theme 2.3: Change of residential address

Patients who always change their residential address make it hard for healthcare workers to trace them and retain them on treatment. Temporary residential addresses have a negative impact on TB treatment adherence as patients move around a lot, and do not communicate with the facility to be offered a transfer out letter when they change address. During the interview participants indicated the difficulty to monitor and provide DOT support to patients who always change residential address. Some are working in the farms and they are always changing address as they move from one farm to another looking for better opportunities and once, they move far from the facility some of them default while some miss their appointments countless time. The findings show that some patients are not from the surrounding area, they came there as visitors and when they leave, they do not inform the facility to be properly transferred out to the facility next to where they are staying.

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Participants supported the statement that was said by participant 46 that patients who always change address default easily.

"…*Another problem that we have is with patients who do not stay in one address, those who move from one place to another, when we go to check up on them, we do not find them and we will be told that they have moved out and the people will not have their current address, they don't even bother to come and update their address at the clinic"*.

Participant 3 added that:

"Most of the patients who do that are the immigrants, some are coming from the farms and once they get another job in another farm, they are gone you will never see them, and they do not mind as long as they have better opportunity, they do not care that they are sick. Our problem is that we do not know what is happening with those patients, whether they have changed a clinic, or they are not on treatment and they are busy spreading the diseases out there".

According to participant 7:

"…*Another challenges we have is those who are diagnosed maybe they have visited their relatives or friends and when they go back home, they do not bother to come so we can provide them with proper transfer so that they can continue to collect their treatment at the nearest facility"*.

Participant 19 said:

"Immigrants do not even bother to come to the facility to tell us that they are going back home so we can provide them with proper transfer, some of them we only find out when we try to trace them by following them to their respective address that they have moved back to their countries. We are not even sure if they continue taking treatment wherever they are".

Sub-themes 2.4 Age factor affecting adherence

Age is a major factor affecting TB treatment adherence. Participants indicated that age factor is affecting TB treatment adherence within the communities. This study revealed that patients who are older over the age of 55 and 65 are likely not to adhere to treatment, especially those affected by treatment side effects. They are not easy to talk to as they are always negative about the treatment more especially after experiencing side effects. Patients who are younger are also sometimes troublesome especially if they are on drugs (nyaupe) or taking alcohol. During interview it was indicated that old people always forget to take their treatment and if they do not have anyone to support them, they are likely to default.

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Participant 18 indicated that:

"…*Another major problem is the elderly people they do not want to take their treatment; you cannot even convince them they just do not want to listen. If they are staying alone forget about them adhering to the treatment, it is better if they are staying with someone who can support them, they get to understand them better, but they don't want to listen to healthcare workers, so it is hard for homebased carers to provide support to them".*

Participant 12 added that*:*

".. I remember one patient once said that it does not make sense as to why a grown-up man like himself should be given pills, to him it is a sign of weakness. He says it feels very awkward, and it is better he takes medication by himself; he is a man. Unfortunately, most elderly people are forgetful it is not easy for them to adhere to their treatments and to remember the follow-up date especially if they are staying alone".

Participant 43 said that:

"…*hmmm, but you know what*, *sometimes even the younger ones do give us problem but at least this are rare cases, as it is only those who are on drugs and who abuse alcohol who do not want to adhere to treatment. Who do not want to listen even when we give them counselling, they say we are taking forever they have something to do, and you cannot just give them treatment without, ensuring they have a better understanding of the treatment. But anyways than that those who are on drugs and who abuse alcohols, our major challenge is with the elderly people, and one just needs to be patient with them".*

4.4.3 THEME 3: TREATMENT RELATED FACTORS

Participants during the interview articulated that TB treatment has an influence on adherence. Participants indicated that patients do not comply with treatment because tablets are taken for too long. One of the biggest problems with compliance to TB treatment is the required lengthy therapy using multiple drug combinations. This on its own reduces patients' compliance to treatment. Participants indicates that failure to comply with the prescribed TB treatment results in treatment failure and the development of drug resistance. This study finds that TB treatment is still perceived by most patients as long, agonising, and cumbersome, and there are still some doubts as to whether the disease is curable. Some patients stop taking treatment immediately they start experiencing side effect as they perceive treatment as agonising. It was also indicated that some patients who are also taking HIV treatment or treatments for other conditions feel that they are taking too many pills and they are likely to get discouraged and stop. The following sub-themes will be

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discussed into details under treatment related factors; Side effects caused by treatment, duration of the treatment and co-morbidities.

Sub-theme 3.1: Side effects caused by treatment

During interviews participants indicated that some patients due to the lack of comprehensive understanding of the drug, they stop taking treatment immediately they start experiencing side effects related to the treatment. Patients indicated that treatment cause them to experience fever, nausea, pain in the lower abdomen and joints, itchiness, or rash. Some indicated that treatment cause them to experience nausea, vomiting or no appetite. Yellowish skin or eye, dark brown urine. Some indicated that they experience tingling, burning or numbness of the hands and feet even fatigue. Patients express not being comfortable taking TB treatment as they could not perform well on their day-to-day duties and some indicated the fear of losing their jobs as their work require hard labour.

Participant 10 added that:

"…*Patients indicate that they are doing hard labours and they cannot take treatment as they feel weak, sometimes they feel tired or they feel pains in the stomach, sometimes they experience fever and they don't want to lose their jobs since there is no one who can support their families, and if they report sick at work, they will not get paid"*.

Participant 25 indicated that:

"…This treatment causes me to feel dizzy, vomit, loss appetite and even have diarrhoea, I cannot even carry out my day today duties, it even makes me have rashes and I don't want to lose my job. I feel much better when I have not taken them. I only take treatment when I feel pain but if not, I do not bother, and however, sometimes I do take them at night".

Participant 22 added that:

"…ish to be honest this medication makes me very sick; I only feel better if I have not taken them, I feel very tired I cannot do anything and I even get lazy to go to work, sometimes I feel like stopping, I am tired. But I have a family I must be cured if I stop completely, I will die, and my children will suffer".

Sub-theme 3.2: Duration of the treatment

Participants indicated that some patients worry about the length of time they must take TB treatment. They indicated that although they do experience side effects, sometimes they feel like treatment is not effective as they remain sick for a very long period. The findings of this study shows that some patients get better very fast and are likely to stop taking treatment as

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they are feeling better. Patients who take long to feel better, indicated that they do not feel encouraged to continue taking treatment.

According to participant 40:

"…*Patients seems to be more worried about the period or length they have to take the treatment especially if they take long to get better, some feel that medication does not work and some feel that maybe they are not suffering from TB and the diagnosis might be wrong and they stop taking treatment as they don't feel encouraged to take treatment*".

Participant 12 indicated that:

"…most patients appear to be more frustrated if they are not getting better and they are experiencing both side effects and not getting better, they always indicate that they feel like the treatment is not effective and they want to stop as they feel worse than when they are not taking treatment. We always provide them with counselling and even assist to treat side effects and where necessary we even engage Doctors to help treat the side effects".

Participant 35 said:

"I didn't know about the risk of stopping the treatment, I was told I have to complete six months taking treatment daily which is impossible from my side because sometimes I spend days not going home, working and sometimes I don't want to take treatment with me to work as people will see that I am sick, six months is just too long".

Sub-theme 3.3: Co-morbidities

HIV predisposes an individual to developing TB, however there is no consensus on whether HIV is associated with poor TB treatment compliance. Most co-infected patients appear to find it hard to adhere to their TB treatment. Possibilities of increasing the pills burden that increases incidences of side effects and other co-morbid conditions which result from HIV, such as depression and dementia, and may increase the likelihood of poor compliance to TB treatment. During the interviews, participants indicated that patients who are receiving other treatments in addition to TB treatment are less compliant to TB treatment compared to patients who are only on TB treatment. Patients indicated that they find it too difficult to take all the pills every day. Patients appears to be discouraged by the number of pills that they must take daily.

According to participant 14:

"…*TB patients who are co-infected especially with HIV or other chronic diseases are not encouraged, they appear to be tired of treatment. Some indicates that the pills are too many*

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and unbearable as they suffer from severe side effects and they cannot focus on their duties".

Participant 34 indicated that:
"*I have heard that this TB treatment cause gastritis I am not so sure about that though, I am currently even taking HIV treatment and I cannot tolerate all this stress of taking so many pills, sometimes I just feel like I am being punished and I just feel like giving up the fight, this is too much to handle for me, I hope you understand"*.

Participant 23 indicated that:
"…hmm if you have TB and HIV those two infections become too strong, and the symptoms of TB are very strong and they take time to disappear even if you are taking treatment, and the treatment side effects are unbearable. Your body cannot stand two diseases and those two treatments, it is not easy at all".

Participant 32 said:
"…hmm sometimes I ask myself …what if I just take one drug like the HIV drug only…since TB can be cured, I believe my body can fight, however with HIV is a different story as it cannot be cured. So, if I take ART, I believe I will be fine. I hate the smell of those pills".

4.4.4 THEME 4: SOCIO-ECONOMIC FACTORS

Socio-economic factors cover patients' employment status, and cost of transport to clinic while undertaking TB treatment. It was indicated during the interview that most TB treatment interruptions occurs in the continuation phase, when patients are having higher cost of transport to a treatment facility. Others stop taking their treatment when the symptoms disappear, and patients may erroneously believe they are cured. This may encourage them to become reluctant to bear the extra burden of the cost of travel, time, and drug side effects. It was also indicated that some patients stop taking treatment due to the lack of food. The following sub-themes will be discussed into details under socio-economic factors; High unemployment rate in the community, lack of transport and lack of access to health facilities, Lack of adequate food while taking treatment.

Sub-theme 4.1: High unemployment rate in the community

Participants indicated during the interview that South Africa has a high rate of unemployment and as a result most patients are living in poverty, which plays a role in TB treatment adherence in most of the communities. TB patients are given grant as a way of providing support to them while they are taking treatments. The challenge that is experience in the

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communities is that due to the high rate of unemployment and opportunities most patients keep on defaulting so they can continue to receive grant as it is the only way they can support their households. This challenge does not only affect treatment success rate but also TB control and prevention, as patients will spread infection in the communities so that those infected can also receive grant. A probing question was asked if most TB patients are employed. Most participants alluded that there is a lack of jobs in their communities and as a result most patients are not working.

According to participant 2:

"*One challenge that is affecting treatment adherence is lack of jobs in the communities. People are so poor and once they are infected of TB, they do not want to get cured as they receive grant as a way of supporting them while taking their treatments. Most of them when they see that they are getting better they will default so that they get sick again just to keep the grant. They fear to get better as they know that once they are better the grant might be terminated. Some of the patients go around spreading TB so that people around them can also get grant*".

Participant 28 said that:

"…I do piece jobs to support the families, there are no employments, and six months is too long for me to be without any compensation, how my family will survive, and some people will not give me that piece job once they hear that I have TB as they fear that I will infect them too".

Sub-theme 4.2 Lack of transport and lack of access to health facilities

A probing question was asked if treatment adherence can be affected by lack of access to health care centers. Participants indicated that lack of transport money and the distance that patients must travel to collect their treatment mostly affect treatment adherence as patients will be sick and unable to walk for long distance. It was articulated that some patients are staying in the farms where they do not have access to transport, and they must walk for long distance to catch a taxi. Most participants indicated that most patients have challenge in accessing health care facilities:

Participant 47 said:

"*The major challenge we have with access to our health care facilities is that some patients stay far, especially those who are working in the farms, they do not have access to transport, and they have to walk a long distance to catch the taxi. Some patients do not want to take treatment from nearby clinics and they always indicate that they could come collect their*

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medication because they did not have transport money and they could not walk a long distance as they are sick".

Sub-theme 4.3 Lack of adequate food while taking treatment.

During interview participants mentioned that another barrier which is affecting TB treatment adherence is lack of adequate food while patients are taking treatment. Department of social development provide food parcel to patients who are in need as it will be recommended by the doctor. The challenge is most patients will default taking their treatment so that they can continue to receive those food parcels. Other patients indicated that they do not like the food provided to them as they do not have appetite and as a result they struggle while taking their treatment as they do not have food. Majority of patients believed that not having adequate food was associated with the reason why they experience severe drug side effects. They said that it is difficult for them to take treatment on an empty stomach because they experience abdominal pains after doing so. Consequently, this makes them stop taking their treatment. Participants indicated that most patients are poor, and they cannot afford to buy food with good nutrients to take with treatment.

According to participant 11:

"*Most of the patients in the community are poor and as a results they do not have adequate food while they are taking their treatment, the Dr will ensure that those with no adequate food should get food with the help of social workers, but the challenge is many patients will default so that they continue to receive such support and they affect cure rate as they spread the disease and some of them even develop MDR and die"*.

Participant 9 added that:

"…even though the poor patients are being provided with food with the help of social workers, some will tell us that they do not like the food which are provided, and they stop taking their treatment as they make them hungry and give them abdominal pains. Our main worry is most of them only come back when they are feeling worse and unfortunately some do not make it, which is very sad".

Participant 8 added that:

"…I remember there were some who said the drugs give them too much appetite, they tried to seek help from the NGOs for food parcels as they indicated that they do not like what department of social development was offering them, they turned to seek help else where and when they found none, they stopped taking their medication".

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4.4.5 THEME 5: HEALTHCARE AND HEALTH SYSTEM FACTORS

Participants articulated that healthcare and health system affect TB treatment adherence. It was indicated during the interview that patients always complain about the attitude of the healthcare provider and they do not feel comfortable to go to the health facilities. Participants also indicated that patients have concern about some facility operating hours, medicine availability at the facility and long waiting hours at the facilities. The following sub-themes will be discussed into details under healthcare and health system factors, Facility operating hours, long waiting hours, attitude of health care workers towards the patients and medicine availability.

Sub-theme 5.1: Facility operating hours

Participants indicated that facility operating hours affect treatment adherence, even though patients are given appointments to collect their treatment. Some patients are not able to collect their treatment during the day as they are working. Participants indicated that some patients work far, and they only get home after the healthcare facilities are closed. Patients who complain about facility operating hours are working even on weekends. Participants indicated that they cannot even ask for a day off to collect their treatment as they do not want to disclose their status to their bosses due to fear to lose their jobs.

Participant 34 said:

"…I feel that the health center operating hours is a challenge to some of us who are at the farms as we work even on weekends and we do not have time to visit the health care facilities. We cannot keep our appointments as the facilities close before we knock off …I mean we cannot even ask to come to work late because our bosses would want to know the reasons, and we are not ready to share our health status".

Participant 25 added that: *"…sometimes we just say we have family responsibilities, and we ask to be there a bit late, and we pay back those hours by working until late. The problem is when you go to the facility and you find many people in the queue, and they cannot give you first preference as everyone has other responsibilities to take care of after the visit"*.

Participant 15 indicated that:

"Most patients who are working have a challenge, some indicated that they cannot ask from their bosses to come collect their medication as they are afraid to disclose their status, also as they fear to lose their jobs. However, we always tell them to come early in the morning so they can be assisted fast, we even prepare their file a day before, so that we don't delay them at the facility".

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Sub-theme 5.2: Long waiting hours

During interview, participants were asked a probing question, if treatment adherence can be affected by long waiting hours at the health center? They indicated that long waiting hours at the facilities affect treatment adherence as some patients get discouraged to go to the facilities to collect their treatment. During the interviews, many facilities indicated that they have improved waiting hours by giving patients different days for appointments. Even though some facilities are still affected by this factor, participants indicated that they put TB patients on fast queue, the only challenge is that they have one station with one nurse attending to all TB patients. Most participants during the interview indicated that they put TB patients on fast queue.

Participant 14 indicated that:

"*At our clinic we put every TB patient at the fast queue, we also try to avoid spreading of the disease while they are on the queue. The only challenge we have is that we do not have enough staff at the facility, therefore it will only be one nurse attending to those patients, and some of them complain that the queue is not moving, and the nurse has to provide comprehensive service to patients, as it is not just handing over the pills, but the patient has to be attended holistically"*.

Participant 17 indicated that:

"…our *reason why we don't want to mix TB patients with others, is that we are trying to minimize the spread of infection …however some patients are not comfortable with this system as they are afraid of stigma, but this gives them privacy as they are attended to in private"*.

Participant 18 said:

"…even though we have a fast queue system, and we give patients different appointments, but some patients do not honor their appointment dates and as a results we end up having a long queues ….as a results some feel discouraged to come again and collect their treatment. I think …hmm as we all know TB patients are just short tempered".

Sub-theme 5.3 Attitude of health care workers towards the patients

There was a consensus among the participants that the health workers contribute significantly to patient adherence or non-adherence to TB treatment. According to the participants, the major factors that are required for patient to adhere to their treatment were centred on patient-health workers relationships.

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Participant 13 said: *"The attitude of the nurse is very important as an unfriendly attitude will chase those TB patients away. I believe nurses should be friendly with the TB patients because if we are not friendly with them each time, they come to take their drugs they will not be free, and they might not come back"*.

Participant 17 added that: *"If we become arrogant and angry at the TB patients, they will interrupt their treatment and we will be responsible to trace them promptly as failure to do so will affect the cure rate and increase the defaulter rate"*.

According to participant 4:
"I don't think healthcare workers attitude is much of a problem, the issue is that TB patients are very impatient if something is not done according to their way, they get angry easily, we are not sure if the anger is from the treatment, they are taking but majority of them are very short tempered".

According to participant 33: "*My experience at the health center is not good at all, because, I found that the nurses are rude especially if they have to attend a staff member or someone, they do not even ask you for permission, they just allow such person to walk in and you will be told to stay outside while they discuss and sometimes they spend 20 minutes or more while you are waiting outside, I feel not motivated to go for my appointment".*

Sub-theme 5.4 Medicine availability

During the interviews, participants described how a shortage of medicine would affects TB treatment adherence. Health care professionals further indicated that they are aware that if they keep medicine un-available at the facility, patients indicated would resort to using medication from traditional health practitioners because when they go there, they always get treatment. They also indicated that patients would complain about not having enough transport money to come several times to collect their treatment. In their previous experience they indicated that patients used to complain as they had to use public transport and said that they get tired of visiting the health facilities when they are not sure of the exact date when treatment would be available.

Participant 15 said, "*We know our patients, we know who is due for their appointments and we prepare everything a day before to avoid disappointing the patients, if we realized we don't have enough medicine, we request from the nearby facilities"*.

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According to Participant 16:

"…. *we have learned from our previous experience where we were only preparing patients files on the day of their appointments, the system was not working for us as sometimes we would find we don't have enough medication and patients would complain and some would refuse to come back as they indicated they don't have transport money".*

Participant 6 said: *"we used to have a huge challenge with MDR treatment, we would communicate with the hospital while a patient is waiting, from morning until 14:00hrs and the hospital would tell us they won't be able to deliver treatment and the poor patient would leave without any treatment, but now we do arrangements before patients come if we see that we are having shortages"*.

Sub-theme 5.5 DOTS supporter's status

When a probing question was asked namely: How is the DOT supporter status of TB patients? Participants indicated that most TB patients do not have DOT supporters. It is also indicated that some patients who do not have DOT supporters do not even have any family member supporting them to take their treatment as some are staying alone and others did not disclose their status. Participants indicated that most patients stated that they do not want DOT supporters as that will draw attention of the community, people will think they are sick to death.

Participant 50 indicated that; *"Some TB patients indicated that they do not want to take treatment under home-based carers supervision because, having DOT supporters around you each day is not a good idea people will think you are dying"*.

According to participant 30: "*I do not trust the DOT supporters they talk bad about people's status in the communities, I do not want people to start thinking I am having an evil disease and I am about to die. Those DOT supporters gossip a lot".*

The findings of this study revealed that most TB patients do not have DOT supporters, as they are afraid that people will see that they are sick and that could cause them to carry stigma.

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4.5. Suggested specific strategies to improve TB treatment adherence

Participants were asked to identify effective strategies to improve TB treatment non-adherence. Most of the participants interviewed suggested more than one strategy. Some of the strategies suggested by participants were the same, and hence the results from all participants have been combined and presented together.

Intervention 1: Engage NGOs and other community stakeholders for support.

It was revealed from the key informant interviews that, some facilities problems cannot be resolved without a dedicated TB facilitator who will follow up on patients regularly when they miss their appointments. Participant indicated that the facility facilitators are responsible for all programmes and it is important to have a dedicated one for TB.

Participant 1 said. "*Unfortunately, our problem cannot be resolved without a dedicated TB facilitator, our facilities have facilitators responsible for all programme and it is not easy to keep track with all patients, most of the patients are missed over the weekends and holidays".*

Participant 5 said; "*we had facilitators, and everything was working well but due to funding that positions were terminated and now there is a challenge, if we can get funding things can be better".*

Participant 3 also added that; "*another TB facilitator within their district do not have transport and it is hard for them to be effective".*

Intervention 2: Provide comprehensive initial and ongoing counselling and TB education

The study revealed the importance of engaging family members to provide supervision and support. Participants indicated that one gap that makes family members to reluctant is that they lack knowledge about TB and its treatment. This also cause patients not to disclose their status.

Participant 18 indicated that; "*family members can play a very important role in providing support, however some of them are unwilling to do so. One major gap is that they lack knowledge and I wish it were easy to get them for counselling".*

Participant 39 said; "*some families do not want DOTS supporters, and this is because they do not have knowledge on the role of DOTS. It is important to engage family members so*

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they can have better understanding of TB, they can assist the patient in proper decision making".

Participant 15 added that; "*we want patients to utilize the resources and information given, but most of them forget so it is important to engage their family members for support".*

Intervention 3: Conduct health promotion campaigns

Participants indicated that TB carry a high level of stigma in the community, because majority of people have wrong perception about TB. Participants suggested that it is important to provide TB information to the community in order to close the gap.

Participant 11 indicated that*; "we do not have time to even engage with the communities because of the workload. It is important that we capacitate the community health workers to conduct door-to-door TB campaigns that will empower the community with knowledge".*

Participant 12 added that; "*the stigma in the communities is because of how people think of TB so the strategy that can close that gap is if people have the right knowledge. The right messages like TB are a disease that can happen to everyone and it can be cured will help improve also health seeking behaviour".*

Participant 19 added that; "*if we can increase visibility of TB around our communities with proper messaged like together, we can beat TB, this can assist to convey a better message. People need to have better knowledge about the disease, and this will reduce fear in the communities".*

Intervention 4: Educate traditional and religious leaders

The study revealed that another major barrier that is causing delay in TB diagnosis and also cause patients to default their treatment is cultural and religious belief. Participants during data collection suggested that educating the traditional healers and religious leaders will benefit the TB programme.

One key informant participant indicated that: *"more educations to traditional healers and religious leaders are needed, for them to know the TB symptoms and be able to advice the patient better to seek medical attention. This will increase early diagnosis and improve treatment adherence as patients trust them a lot".*

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Participant 18 added that; "*if need be, we can even request the traditional healers or faith-based healers to DOT our patients, if they have knowledge, they will know what to do".*

Intervention 5: Engage community engage TB ambassadors

The study also discovered that patients feel not motivated to take their drugs once they develop treatment adverse events. Another group of patients that find it hard to comply with their treatment are these patients with TB co-morbidities. Participants indicated that involving those patients who have been cured can have a positive impact.

Participant 13 indicated that; "*patients who are co-infected have a difficult treatment journey, however if we can engage those patients who are cured from TB their messages can motivate patients to continue taking their treatment".*

Participant 14 added that; "*having a community TB ambassador is crucial for the programme, their message carry weight and since everyone knows them with the community it will be easy for people to listen to them and to trust them".*

Participant 46 added that; "*TB ambassadors play an important role within the communities. They can be utilized to write strong messages of hope to support the patients. Messages like together we can beat TB are important to show patients that they are not alone. They can also do home visits with DOTS supporters and share their stories of hope to the patients".*

Intervention 6: Induce comprehensive home-based TB care programme

Participants indicated that to deal with the socio-economic challenge within the rural communities, it is important to introduce the comprehensive home-based TB programme. They further indicated that it is a promising treatment model to expand capacity and achieve improved outcomes in rural, resource-poor, and high TB and HIV prevalent settings.

Participant 3 indicated that; "*since patients miss their appointment due to lack of transport money to go to the facility, it is important to introduce a model that will enable them to receive treatment while at home, they will have community health workers to monitor their progress. Clinicians can use the report for proper decision making, to see if patient has to be referred back to the facility or not".*

Participant 14 added that; "*comprehensive home-based TB care programme is promising and can help us to achieve the intended outcomes in the rural setting where there is poverty. Patients are missing in the system because they are affected highly by the level of poverty in*

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the communities. If comprehensive services can be taken to their doorsteps, this can improve the service".

Intervention 7: Patient satisfaction survey

Participants indicated that poor service could affect treatment adherence, as most patients can be missed in the system because of how they were treated at the facility. It is important that each facility introduce patient satisfaction survey dedicated specifically for TB services at the facility. Patient satisfaction is an integral part of the health care delivery system. It is important that facility analyze the data from the survey regularly for proper decision making regarding improving the service.

Participant 3 indicated that; "*introducing a dedicated TB patient satisfaction survey will have impact in improving the TB services within the health facilities. Where patients are not fully satisfied with the service, means to improve such service should be sort after and where necessary training can be motivated using the results from the survey".*

4.6 Summary

This chapter dealt with presentation of findings of qualitative approach. The qualitative approach was conducted in the form of key informant interview with sixteen (16) TB patients, three (3) district TB managers, eight (8) facility TB focal person, eight (8) facility operation managers and focus group discussions with six (6) Home Based care givers per district. These themes were identified and developed based on the statements that appeared frequently in the data collected and sub-themes were developed. Related sub-themes within each tool were then grouped to form themes. Similar themes from the different tools were then collated to form the overall themes as indicated (annexure H). Five major themes emerged from this study: religious and cultural factors, social factors, patients related factors, treatment related factors, socio-economic factors and health care and health system factors. Data revels that participants have strong trust in their culture and religion, and that affects treatment adherence. Participants indicated that TB patients do not disclose their status due to fear of stigma, some of them even end up defaulting due to the lack of support and some default due to treatment side effects, lack of adequate food to take with treatment and some are affected by health system related factors. Participants were requested to suggest intervention strategies to improve TB treatment adherence. Some of the strategies suggested by participants were the same, and hence the results from all participants have been combined and presented together. The next chapter presents quantitative findings of the study.

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CHAPTER 5

THE RESULTS OF PHASE 1b: QUANTITATIVE APPROACH

5.1 INTRODUCTION

The previous chapter presented qualitative findings of the study. This chapter presents the findings of phase 1b of the study. The results are presented as follows: demographic profile of the participants, participants' knowledge about TB and patients related factors, participants views about cultural, religious and traditional factors, participants views on socio-economic factors, participants views on health system related factors, participants views on default factors affecting adherence, participants views on stigma and discrimination in relation to TB and participants views on the disease and treatment related factors.

5.2 RESULTS OF QUANTITATIVE DATA

Quantitative data were collected using self-administered questionnaires amongst 207 TB patients who were taking TB treatment in eight selected CHCs in Limpopo province. Data were analysed using SPSS and information were compiled and presented into data tables and graphs for easy reference as seen below. The researcher also included the multiple regression analysis that was significant.

5.2.1 Demographic profile of the participants

This section presents the results on the demographic information of the participants as it is an essential element in describing the characteristics of participants. Demographic information includes participants' age, nationality, race/ethnicity, marital status, educational level and religious background.

Age of the participants

The ages of participants in this study ranges from 18- over 60 years. The frequency and percentage differ with age. Data shows that about 42.0% of the participants were between the age of 18-29 and only 5.3% of participants were over the age of 60. Table 5.1 presents the details of age distribution.

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Table 5.1: Demographic characteristics of the participants by age (n=207)

		Frequency	Percent
Valid	18-29	87	42.0
	30-39	43	20.8
	40-49	46	22.2
	50-59	20	9.7
	over 60	11	5.3
	Total	207	100.0

Nationality of the participants

The majority (84.1%) of participants were born and living in South Africa, only 15.9% were born in Zimbabwe and living in South Africa (see table 5.2).

Table 5.2: Frequency and percentage of nationality of the participants (n=207)

		Frequency	Percent
Valid	South African	174	84.1
	Zimbabwean	33	15.9
	Total	207	100.0

Race of participants

Participants were asked about their race and data shows that 100% of them were Africans (see table 5.3).

Table 5.3: Race of the participants (n=207)

		Frequency	Percent
Valid	African	207	100.0

Marital status of the participants

Participants were asked about their marital status; only 16.4% were married, 45.4% were single, 25.6% were living with the partner and 12.6% were widowed (see table 5.4).

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Table 5.4: Marital status of the participants (n=207)

		Frequency	Percent
Valid	Married	34	16.4
	Single	94	45.4
	Living with a partner	53	25.6
	Widowed	26	12.6
	Total	207	100.0

Education of participants

The participants were asked the highest education they have; 3.9% said they had no schooling, 33.3% said they had only primary school education, 47.3% said they had secondary school education and 15.5% said they had tertiary level education (see table 5.5).

Table 5.5: Education of participants according to school level (n=207)

		Frequency	Percent
Valid	No schooling	8	3.9
	Primary	69	33.3
	Secondary	98	47.3
	Tertiary	32	15.5
	Total	207	100.0

Religious background of the participants

A total of 207 participants answered the question on religious background, 93.7% of them were from the Christian background, 2.4% was from African (Ancestors) religion, 3.9% had indicated that they had no religions or belonged to any other religion (see table 5.6)

Table 5.6: Religious background of the participants (n=207)

		Frequency	Percent
Valid	Christian	194	93.7
	Ancestor	5	2.4
	No religion/others	8	3.9
	Total	207	100.0

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5.2.2 Participants' knowledge about TB and self-related factors

This section presents the results on the knowledge of participants about TB and self-related factors. The knowledge and self-related factors were presented using different topics as shown below. This results strengthen the qualitative findings.

Participants aware they were having TB before diagnosis

A total of 193 (93.24%) of the participants confirmed that they were not aware that they could be having TB before diagnosis. A total of 7 (3.38%) confirmed that they were suspicious that they could be having TB even before diagnosis due to the symptoms they were showing. A total of 3.4% confirmed that they were aware they are having TB because of the symptoms were showing (see figure 5.1 for details).

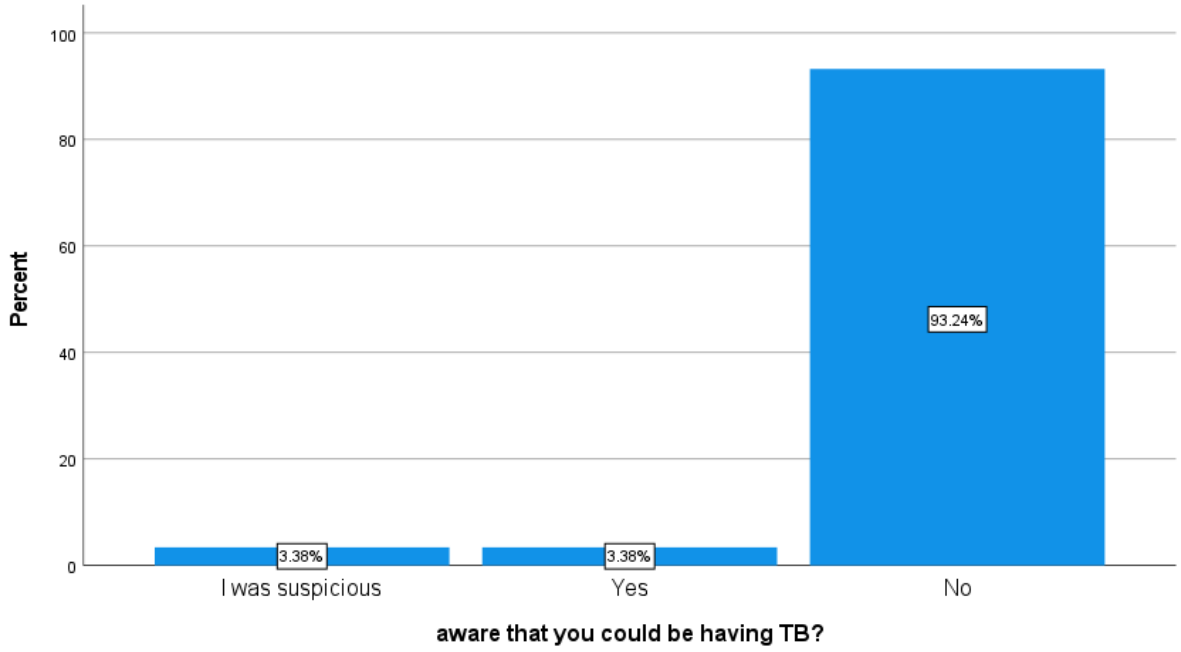

Figure 5.1: Participants aware they were having TB before diagnosis (n=207)

Participants' first time to learn about TB

In response to the question on when the first-time participants was heard or learned about TB, majority (72.95%) of the participants confirmed that they have learned about TB after diagnosis, 17.87% confirmed that they have learned about TB during diagnosis, and only 9.18% confirmed that they have learned about TB before diagnosis (see figure 5.2 below for details).

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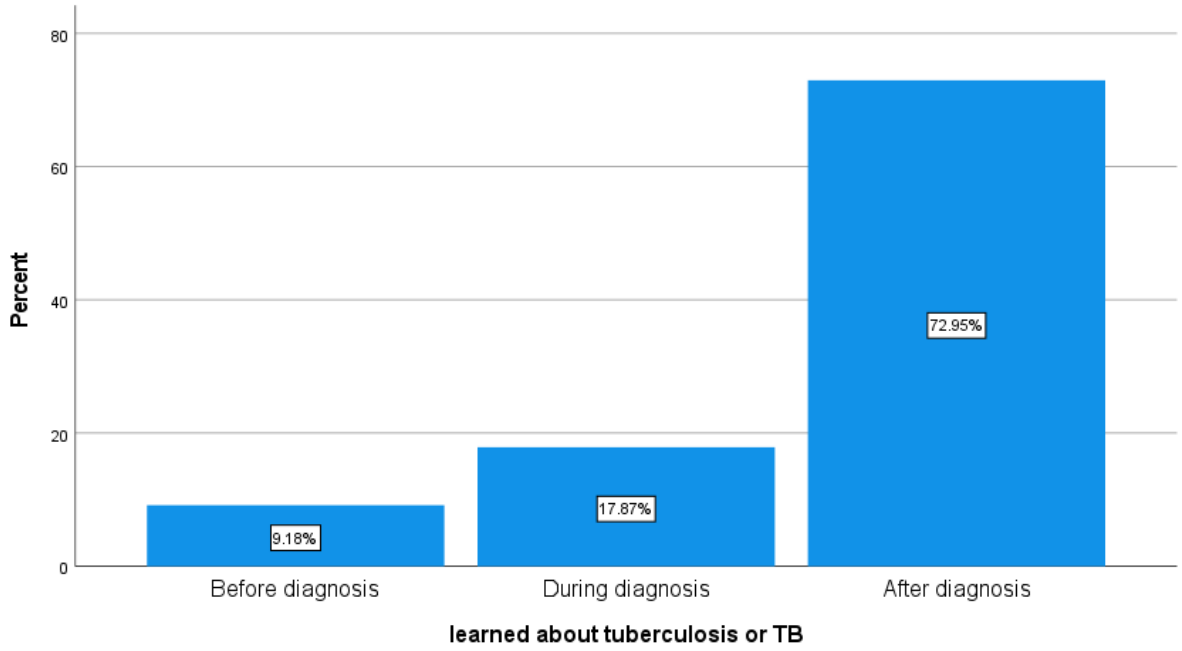

Figure 5.2: Participants' first time to learn about TB (n=207)

Knowledge about the cause of TB

All 207 participants answered the question regarding the cause of TB. Majority (73.91%) confirmed that TB is caused by bacteria, only 26.09% confirmed that they do not have an idea of what cause TB (see figure 5.3 for details).

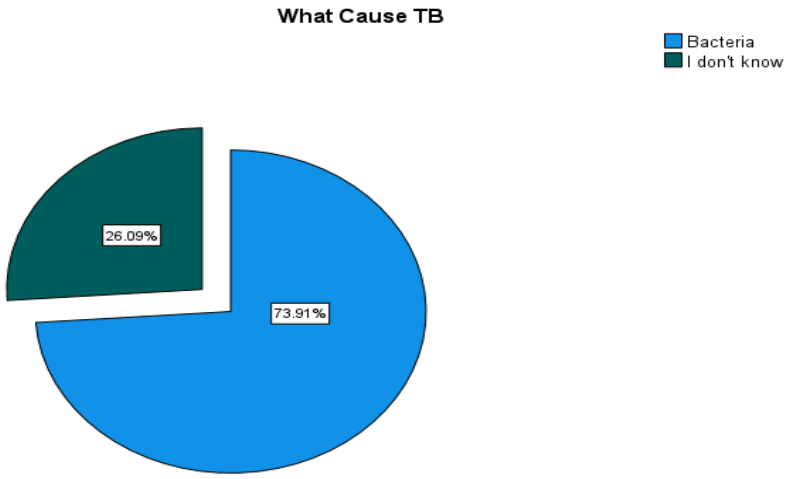

Figure 5.3: Knowledge about the cause of TB (n=207)

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Knowledge about how TB spreads

Only 65.70% of the participants confirmed that TB spreads through cough and the route of transmission is airborne, 9.18% of the participants confirmed that TB is spread through unclean food and water, 25.12% of the participants confirmed that they have no idea on how TB is transmitted from person to person (see figure 5.4).

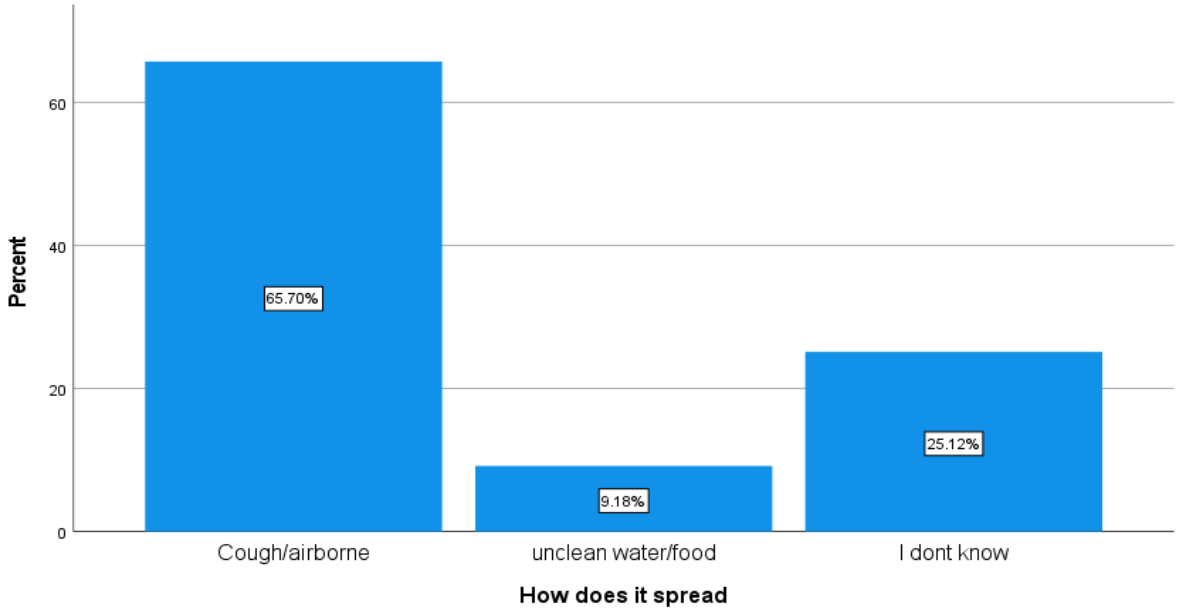

Figure 5.4: Knowledge about how TB spreads (n=207)

TB can be cured if treated correctly

All 207 participants answered the question that seek to understand if they know whether TB can be cured if treated correctly, 97.58% confirmed that TB can be cured if treated correctly, and 2.42% confirmed that they have no idea on whether it can be cured or not (see figure 5.5 for details).

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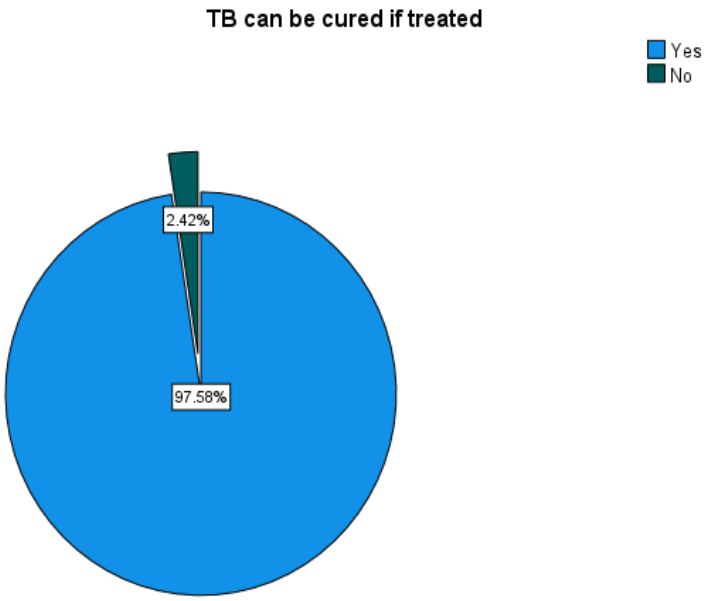

Figure 5.5: TB can be cured if treated correctly (n=207)

Participants' perception if TB can be cured by using traditional medicines

The majority (92.27%) of participants confirmed that TB cannot be treated using traditional medicine, while 7.73% were not sure if traditional medicine can be used to treat TB or not (see figure 5.6)**.**

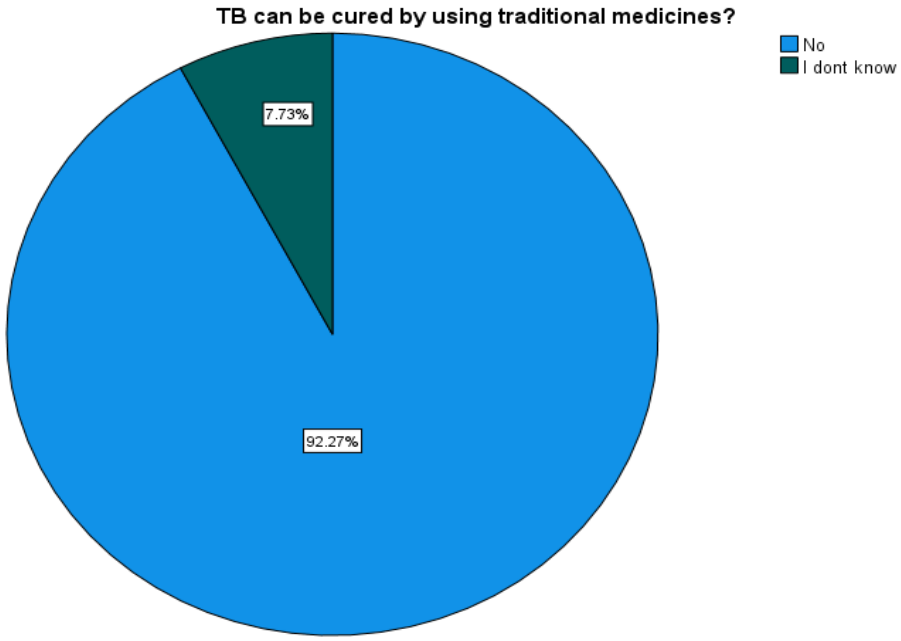

Figure 5.6: Participant's perception if TB can be cured by using traditional medicines (n=207)

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TB can result to death if not treated

About 97.58% confirmed that TB can result in death if not treated, only 2.42% shows uncertainty on whether it can result to death or not if not treated (see figure 5.7).

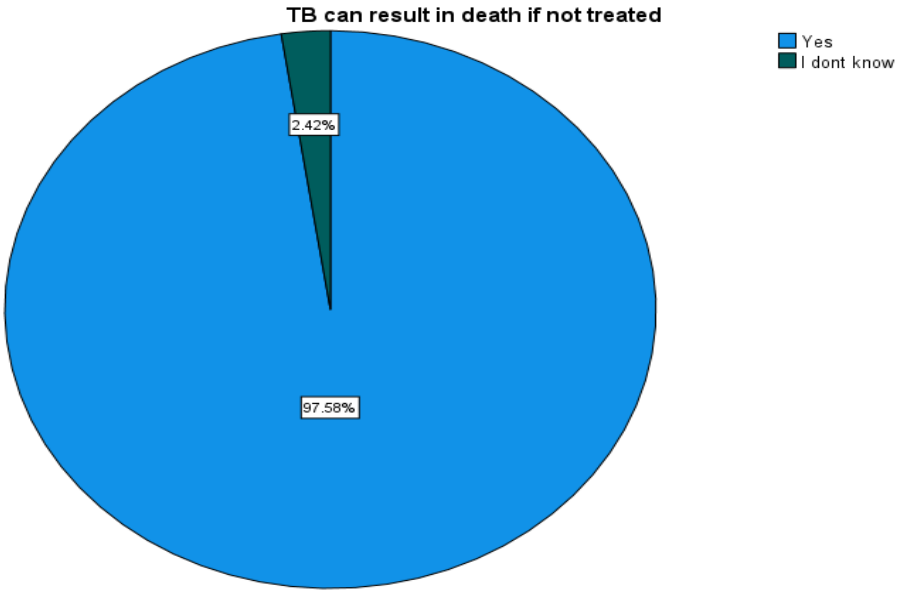

Figure 5.7: TB can result to death if not treated

Importance of completing TB treatment

Participants were asked what they think it is important to complete their TB treatment, 93.24% indicated that it is important for one to be cured, 4.83% indicated that it is important so that one prevent death as TB can results to death, and 1.93% indicated that it is important so that we prevent drug resistance (see figure 5.8).

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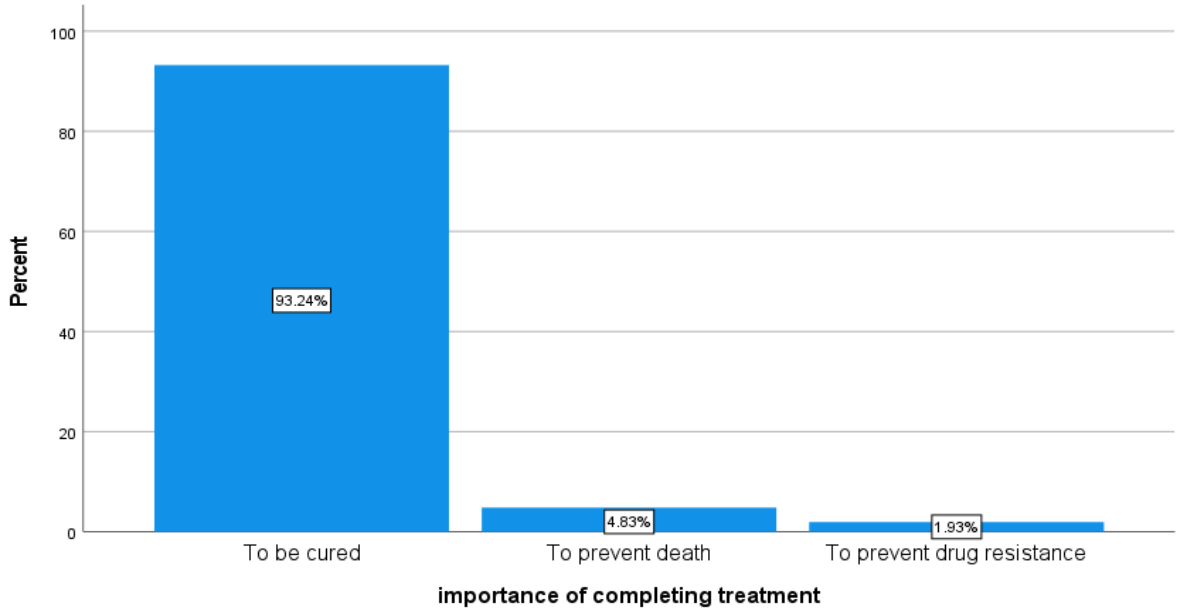

Figure 5.8: Importance of completing TB treatment (n=207)

Participants' view on getting more information about TB

Participants were asked to confirm if they would like to get more information about TB or not. 91.30% shows interest on getting more information or education about TB, 7.73% confirmed that they will not be interested to get more information about TB, and about 0.97% indicated that they have enough information (see figure 5.9 for details).

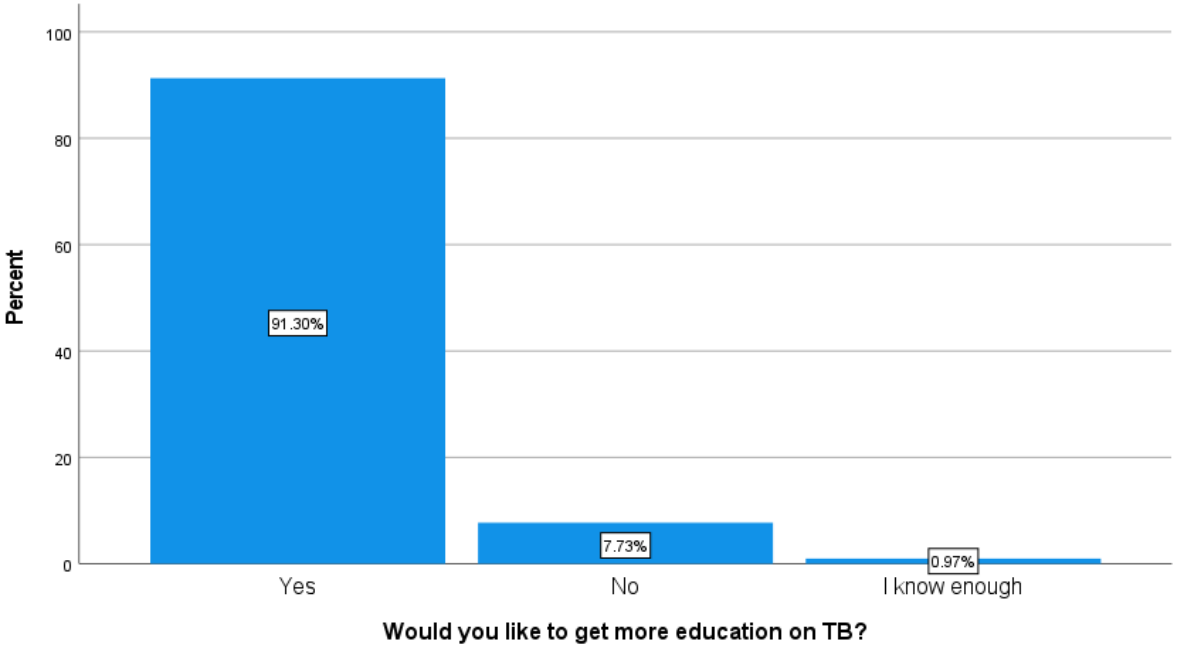

Figure 5.9: Participants' view on getting more information about TB (n=207)

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Views on alcohol consumption when taking TB treatment

Participants were asked if they if they had taken alcohol when taking TB treatment to assess their views on alcohol consumption when taking TB treatment. Majority (68.12%) of participants indicated that that they had not taken alcohol, while 31.88% confirmed that they had taken alcohol during while on treatment (see figure 5.10 below).

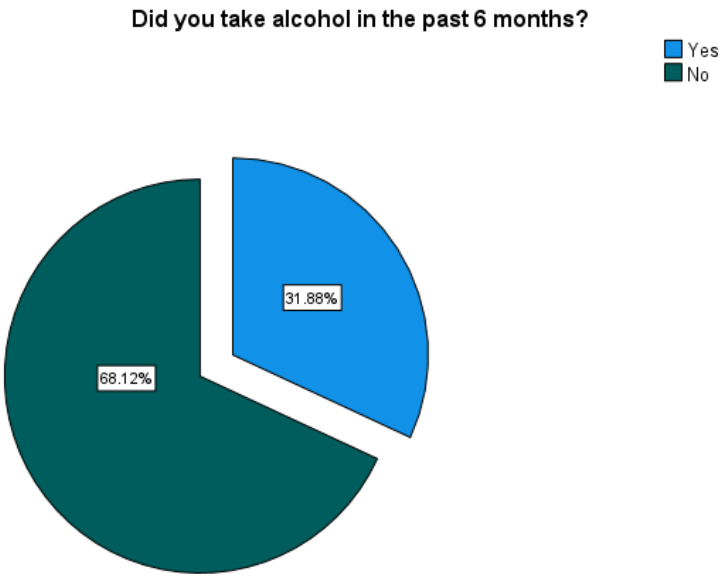

Figure 5.10: Views on alcohol consumption when taking TB treatment (n=207)

Participants views on smoking tobacco while on TB treatment

Participants' view on smoking tobacco while taking TB treatment was assessed, 82.61% acknowledges that they had smoked tobacco while taking TB treatment, while only 17.39% indicated that they never smoked during the time they were taking TB treatment (see figure 5.11).

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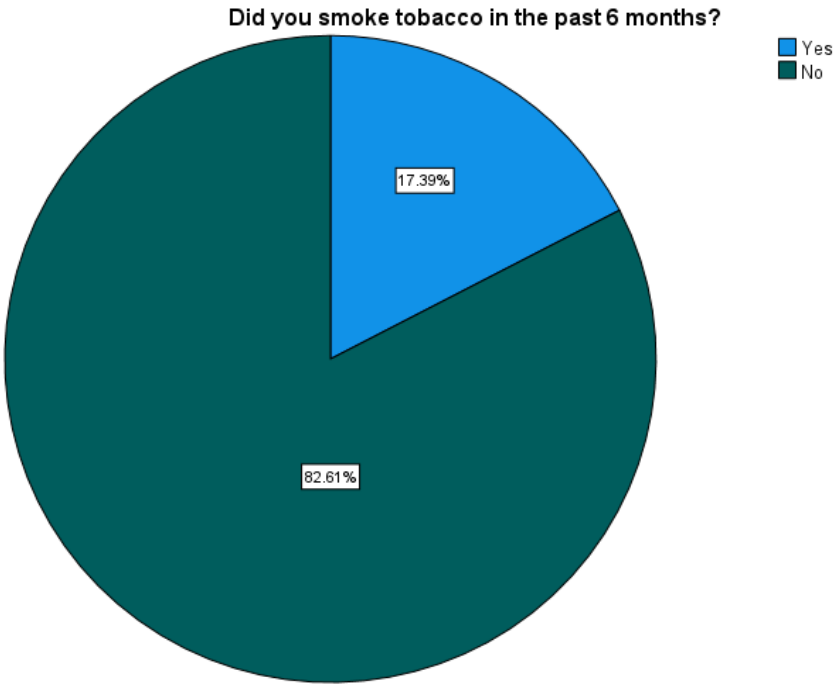

Figure 5.11: Participants views on smoking tobacco while on TB treatment (n=207)

Participants views on taking illicit drugs while on TB treatment

Participants views were assessed regarding taking illicit drugs while on TB treatment, 97.10% indicated that they never taken any illicit drugs including nyaope while on treatment, while 2.90% acknowledge that they had taken drugs including nyaope while on TB treatment (see figure 5.12 below for details).

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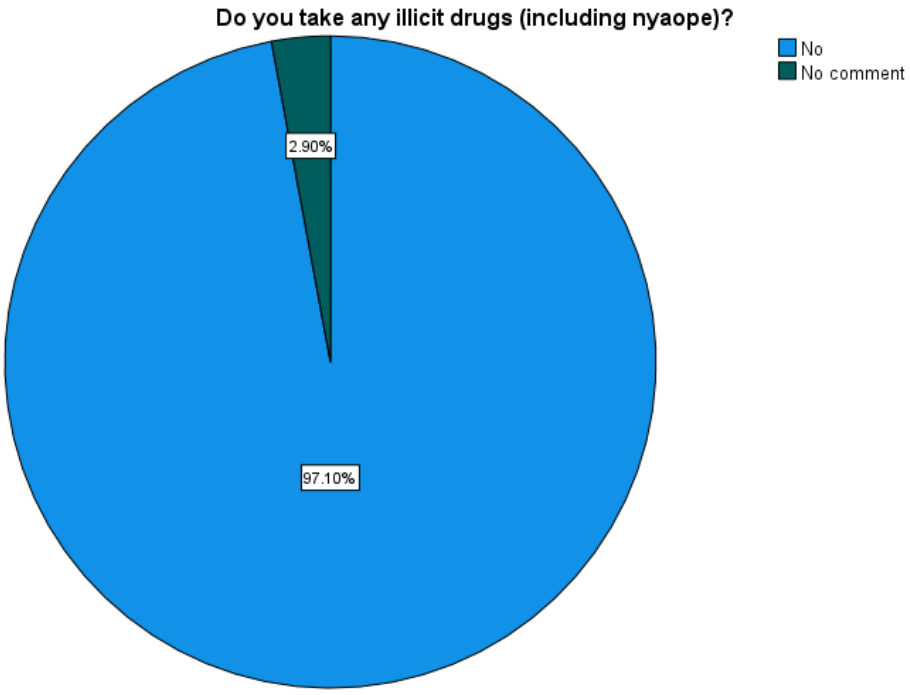

Figure 5.12: Participants views on taking illicit drugs while on TB treatment (n=207)

5.2.3 Participants' views about cultural, religious, and traditional factor

This section of the study presents results on the participants' views about cultural, religious and traditional factors affecting TB treatment adherence.

Places where participants went after feeling sick

Participants were asked to comment on the first place they went for help after feeling sick. Majority (73.43%) of the participants indicated that they went to health care facilities, about 23.1% confirmed that they went to faith healers or churches, while only 3.38% acknowledged that they first went to the traditional healers (see figure 5.13 below).

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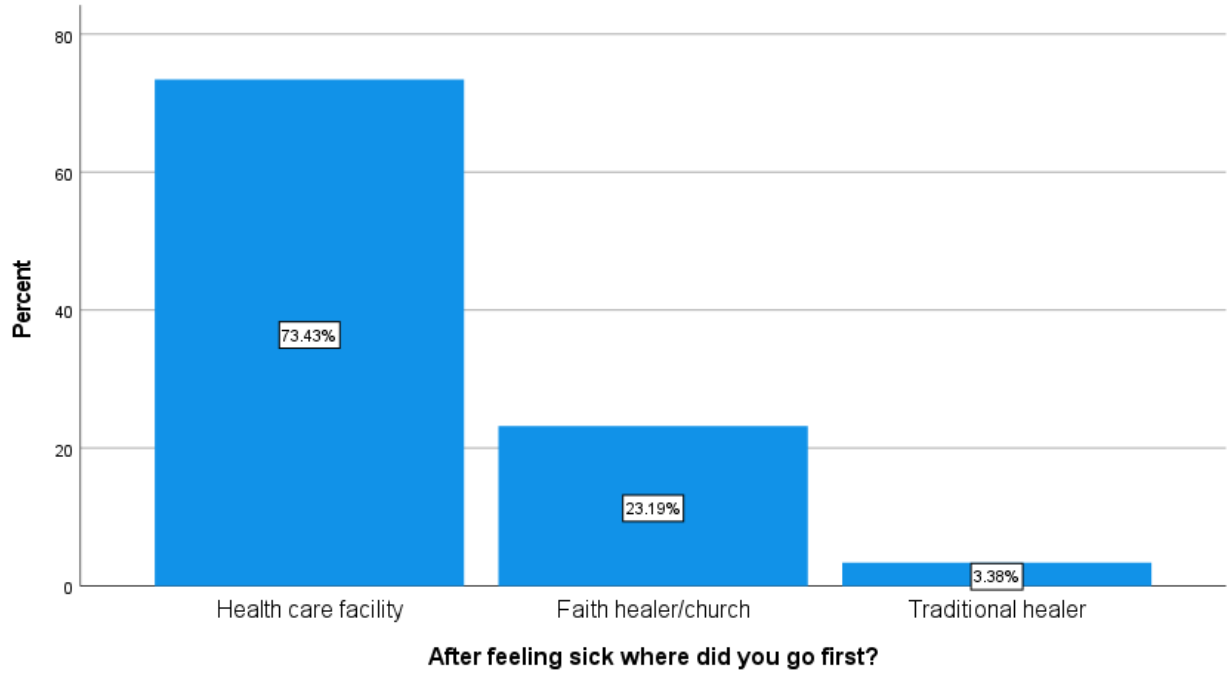

Figure 5.13: Places where participants went after feeling sick (n=207)

Participants visited traditional healer after TB diagnosis

Participants were asked if they had visited traditional healers after diagnosis. Majority (98.07%) of participants indicated that they never visited traditional healers, and only about 1.93% acknowledged that they had visited traditional healers after they were diagnosed with TB (see figure 5.14 for details).

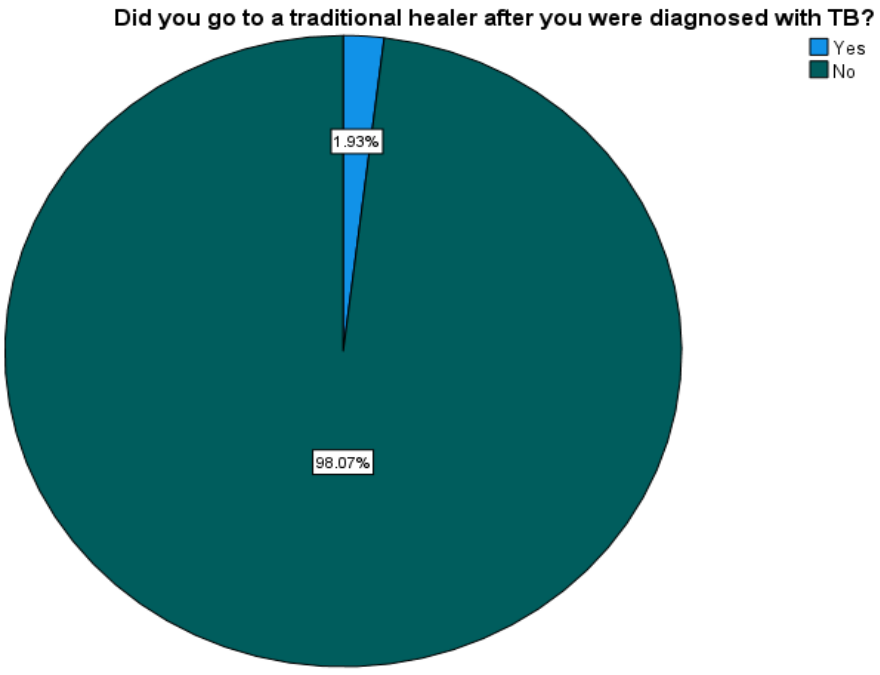

Figure 5.14: Participants visited traditional healer after TB diagnosis (n=207)

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Participants visited faith healers after TB diagnosis

Figure 5.15 below illustrates in percentages participants who had visited faith healers after TB diagnosis. A total of 75.36% acknowledged that they had visited faith healers for help after they had been diagnosed with TB, about 24.64% indicated they had never visited faith healers for help after they had been diagnosed with TB.

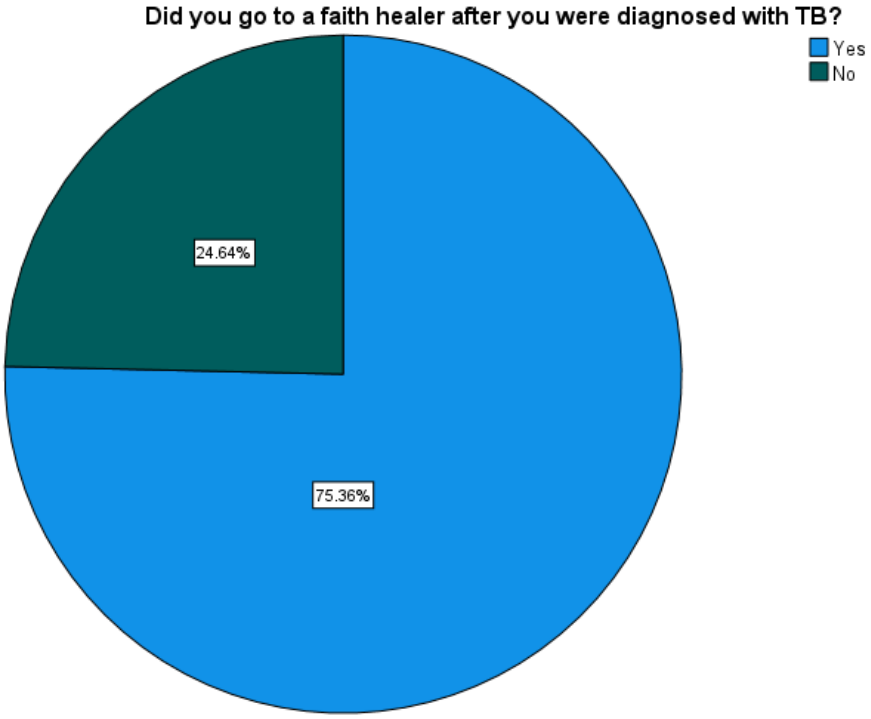

Figure 5.15: Participants visited faith healers after TB diagnosis (n=207)

Exploring participants' reasons for visiting faith healers or traditional healers after TB diagnosis

Participants' reasons for visiting traditional healers or faith healers for help after they were diagnosed with TB were explored. All participants (76.81%) who visited traditional healers or faith healers acknowledged that they have strong faith in their culture or religion. Participants (23.19%) who never visited traditional healers or faith healers for help indicated that the question was not applicable (see figure 5.16 below).

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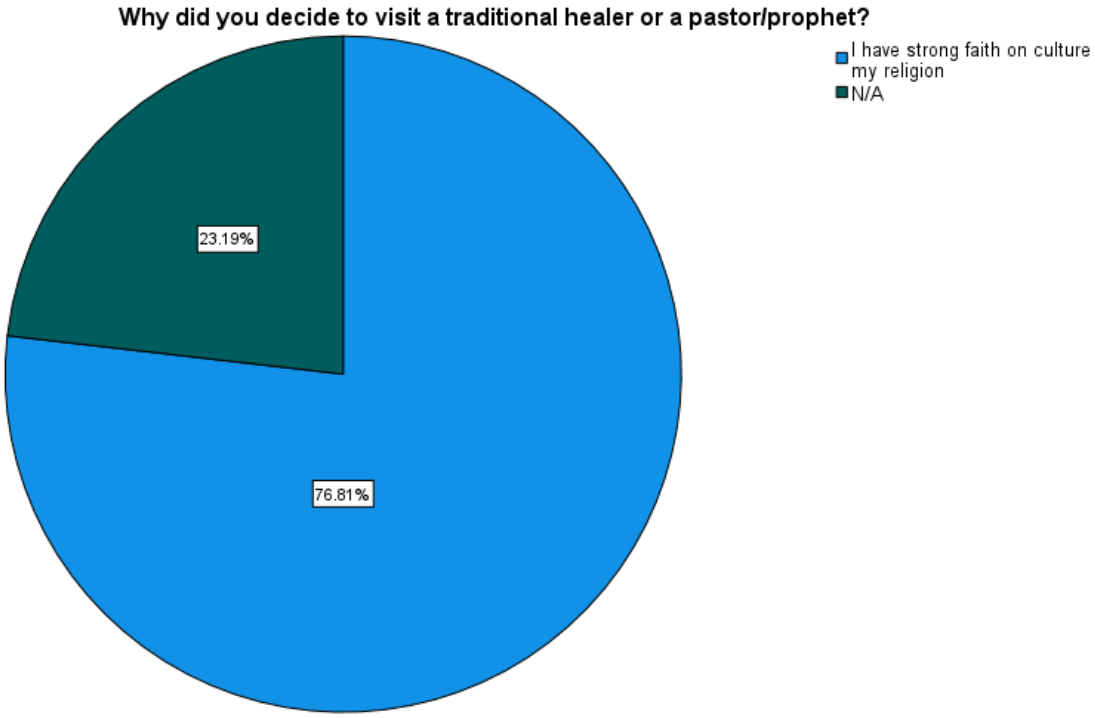

Figure 5.16: Exploring participants' reasons for visiting faith healers or traditional healers after TB diagnosis (n=207)

Explore how participants felt after visiting traditional healers or faith healers

Figure 5.17 below illustrated how participants felt after visiting traditional healers or faith healer. All participants (76.81%) who visited traditional healers or faith healers for help acknowledged that they felt still sick after their visit. About 23.19% who never visited traditional healers or faith healers for help indicated that this question was not applicable to them.

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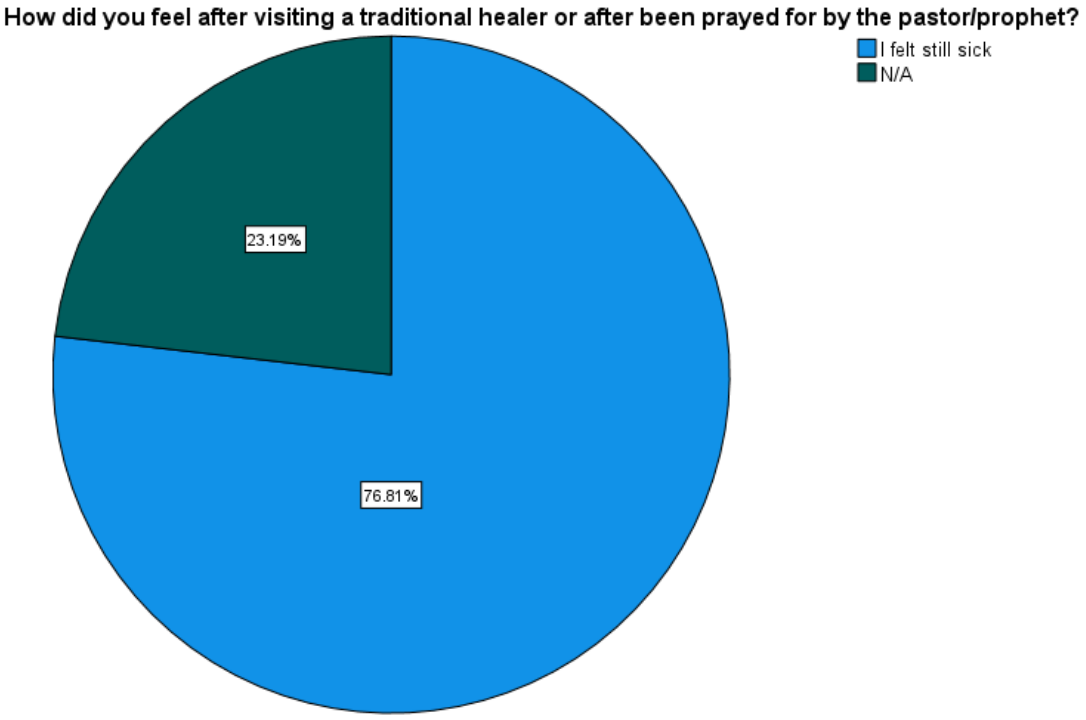

Figure 5.17: Explore how participants felt after visiting traditional healers or faith healers (n=207)

Explore if participants were ever told to stop taking treatment by traditional healer/faith healer

TB patients who participated on the study were asked if they were ever told to stop taking TB treatment after visiting the traditional healers or faith healers for help after been diagnosed with TB. About 10.63% acknowledged that they were told to stop TB taking treatment, 66.18% indicated that they were never told to stop taking TB treatment, and 23.1% indicated that this question was not applicable to them (see figure 5.18 below).

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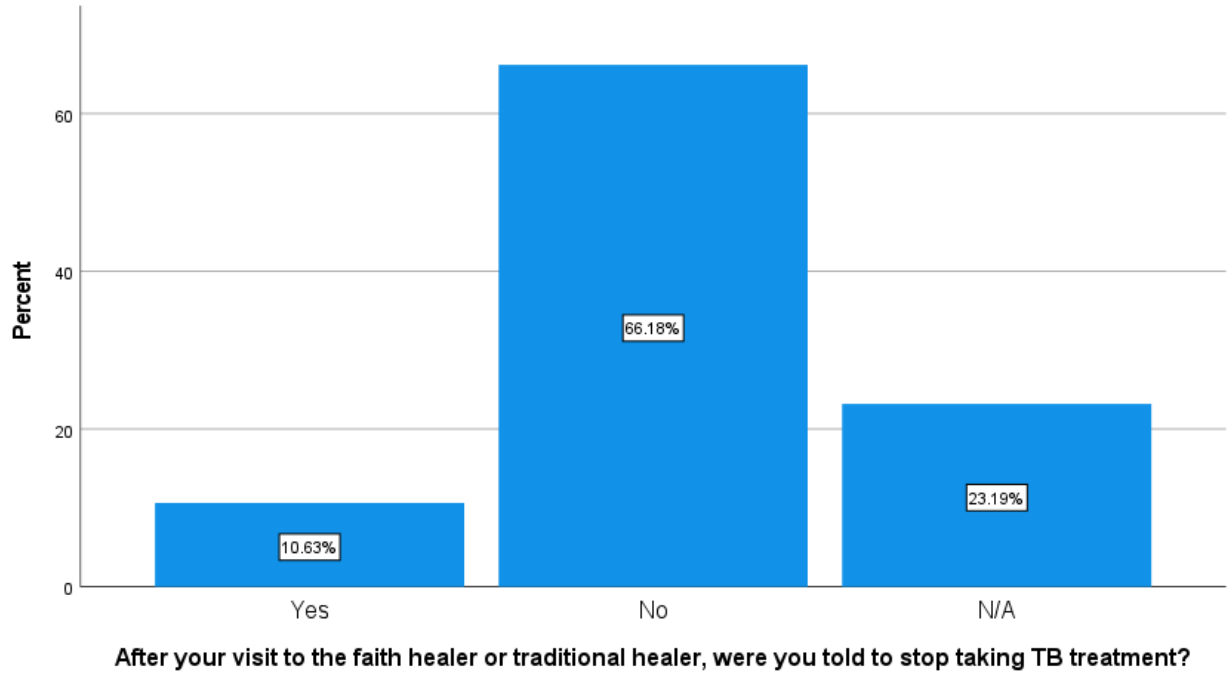

Figure 5.18: Explore if participants were told to stop taking treatment by traditional healer/faith healer (n=207)

Check why participants never stopped taking TB treatment after being told to stop by traditional healer or faith healers

Participants were asked the reason why they never stopped taking their treatment even after they were told to stop by traditional healers or faith healer, about 76.33% indicated that they never stopped because they were still feeling sick regardless of their trust to their culture and religion. About 23.67% indicated that this question was not applicable to them (see figure 5.19).

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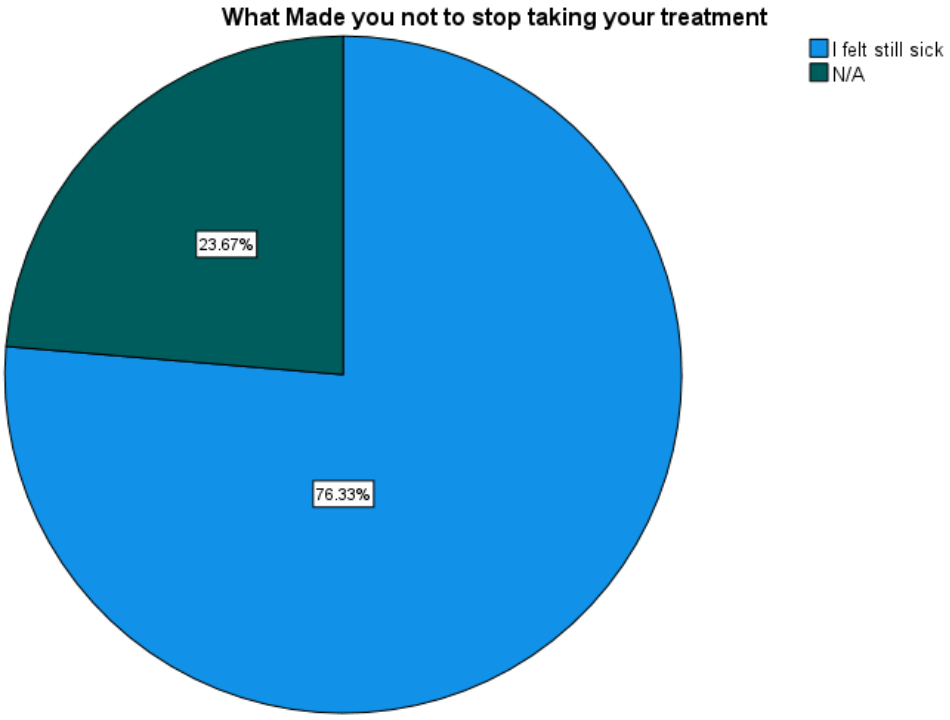

Figure 5.19: Check why participants never stopped taking TB treatment after being told to stop by traditional healer or faith healers (n=207)

5.2.4 View on socio-economic factor

This section of the study presents the results on the participants' views on socio-economic factors affecting TB treatment adherence.

Participants' employment status

Participants were asked to disclose their employment status. About 70.0% of the participants confirmed that they are unemployed, 18.4% indicated that they are self-employed and only 11.6% indicated that they are employed (see table 5.7 below).

Table 5.7: Participant's employment status (n=207)

		Frequency	Percent
Valid	Employed	24	11.6
	Self-employed	38	18.4
	Unemployed	145	70.0
	Total	207	100.0

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Participants' income

Majority (65.70%) of participants confirmed that they do not have any income, about 27.54% indicated that they have a monthly income of between R400-R3000, 4.35% indicated that they have a monthly income of between R3500-R15000 and only 2.42% indicated that they have monthly income of R16000 and above (see figure 5.20).

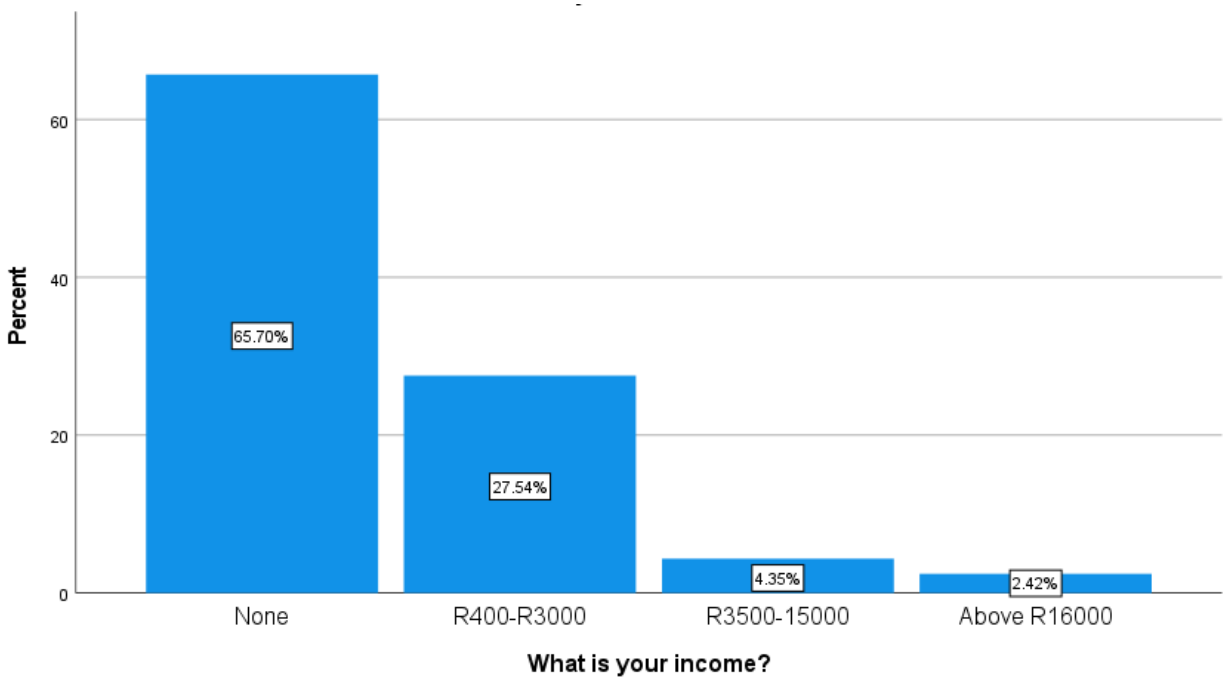

Figure 5.20: Participant's income (n=207)

Distance participants travel to collect TB treatment

Participants were asked the distance they travel to collect their TB treatment. About 49.28% confirmed that they were traveling between 0-5kms, 38.16% confirmed that they were traveling between 6-10kms, 4.35% said they travel between 11-20kms and only 8.21% indicated that they travel above 20kms to the health care facility to collect their TB treatment (see figure 5.21 for details).

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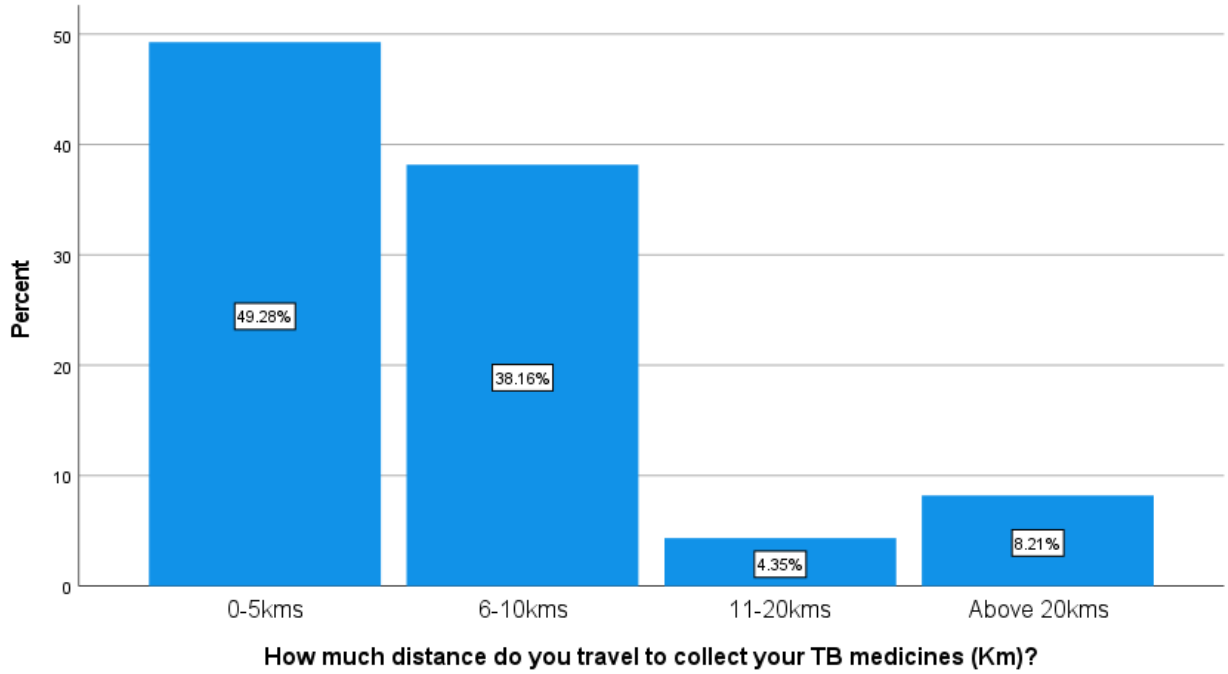

Figure 5.21: Distance participants travel to collect TB treatment (n=207)

Places where participants get the transport money

Figure 5.22 below shows the places where participants get their transport money. About 58.45% of the participants confirmed that they do not need the transport money since they walk to the facility, 28.99% indicated that they get the transport money from family and also their friends, only 12.56% indicated that they use their salaries to provide for their transport.

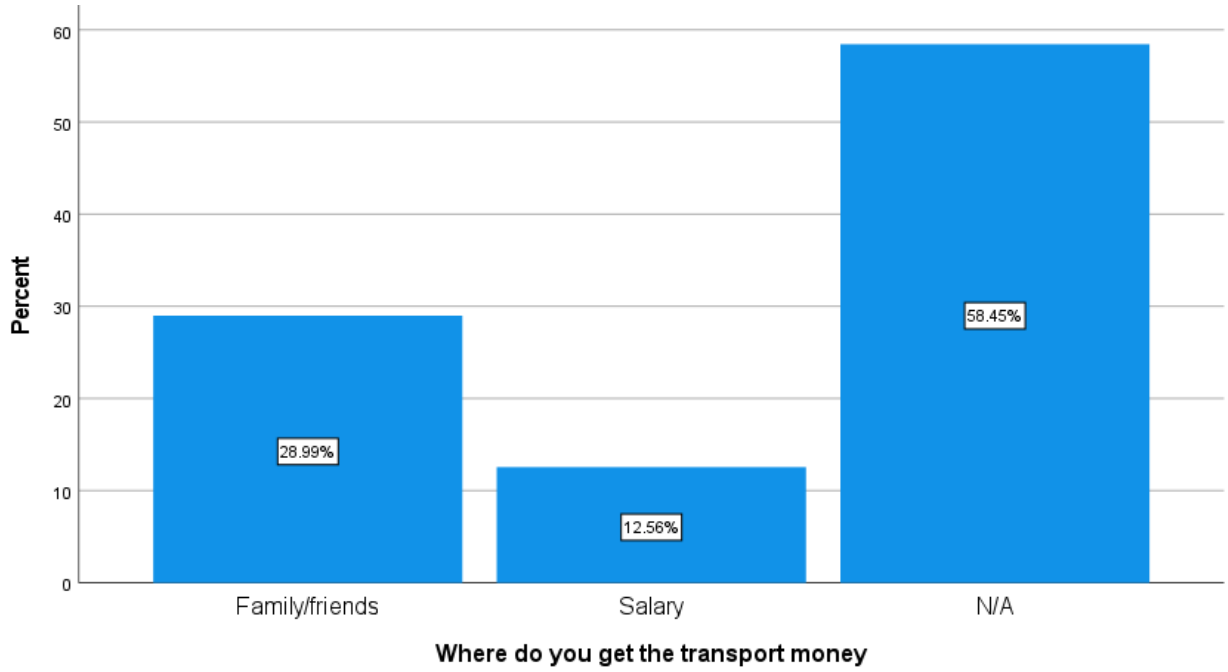

Figure 5.22: Places where participants get the transport money (n=207)

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Transport cost to get to the healthcare facilities

A total of 58.45% indicated that it cost them nothing to get to the healthcare facilities for their check-ups or medication collections as they walk to the facilities. About 41.55% confirmed that it cost them between R10-R50 for their visits to the healthcare facilities (see figure 5.23 below).

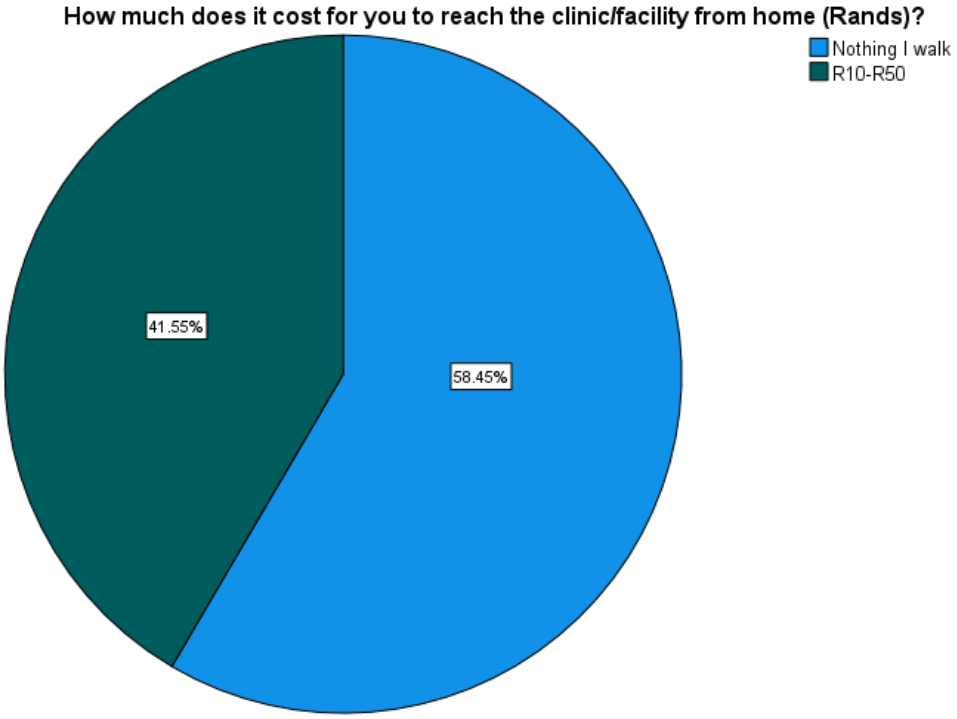

Figure 5.23: Transport cost to get to the healthcare facilities (n=207)

Explore if participants lack transport money

About 58.45% participants indicated that they do not need transport money to go for their check-ups or medication collection, therefore this question was not applicable to them, 36.71% confirmed that they do not always have transport money, only 4.83% indicated that they always have transport money (see figure 5.24 below).

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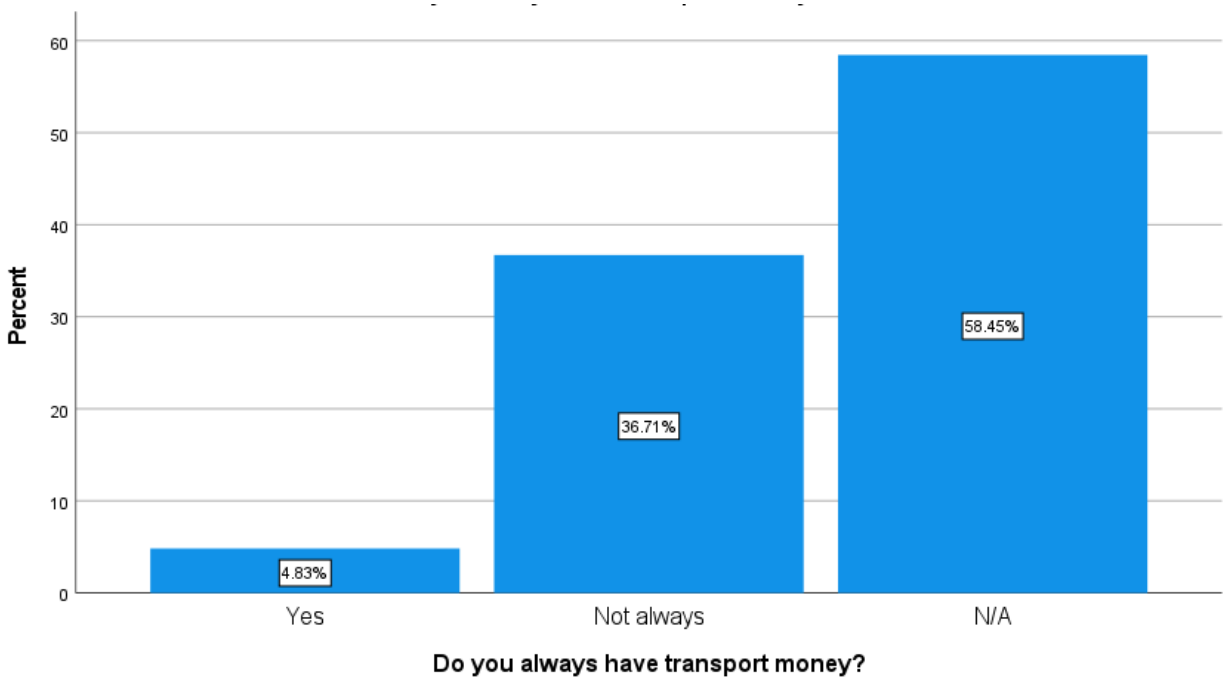

Figure 5.24: Explore if participants lack transport money (n=207)

Food availability when taking TB treatment

A total of 92.27% indicated that food is available most of the time at their households, 5.80% indicated that food is always available, about 1.93% confirmed that they do not always have food available at their households to take with TB treatment (see table 5.25).

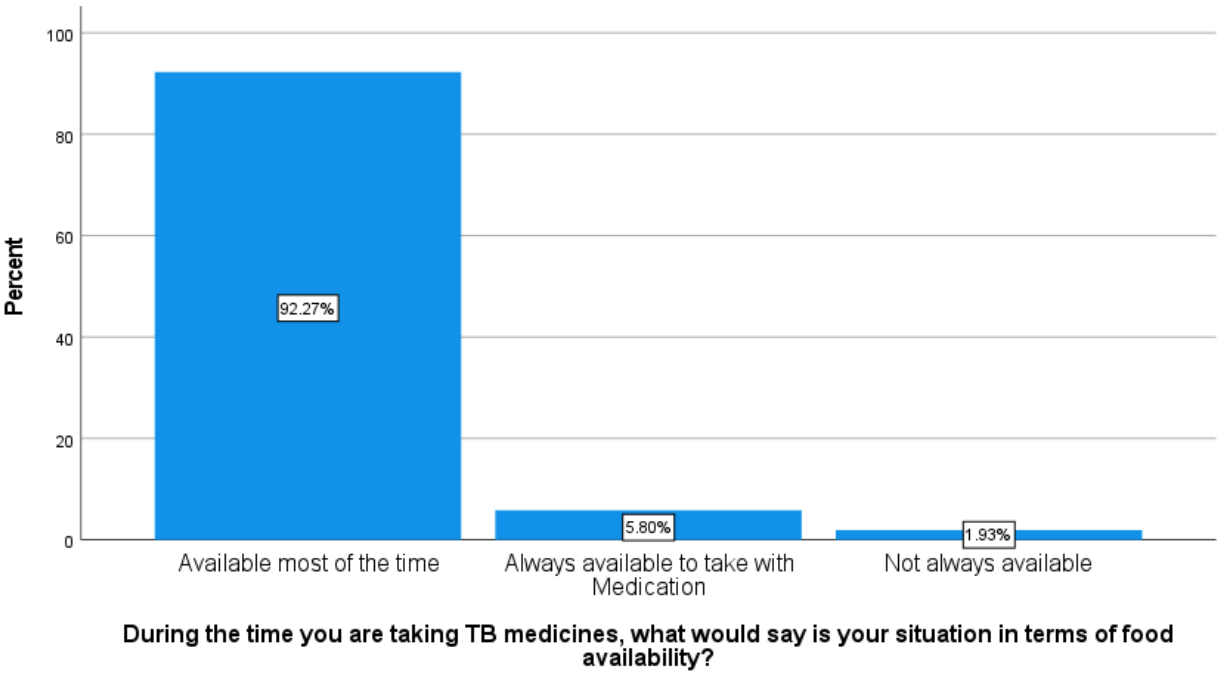

Figure 5.25: Review participants' food availability to take with TB treatment (n=207)

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Review if participants receive food packages

Majority (75.36%) of participants confirmed that they do not receive food packages, only 24.64% indicated that they do receive food packages (see figure 5.26 below).

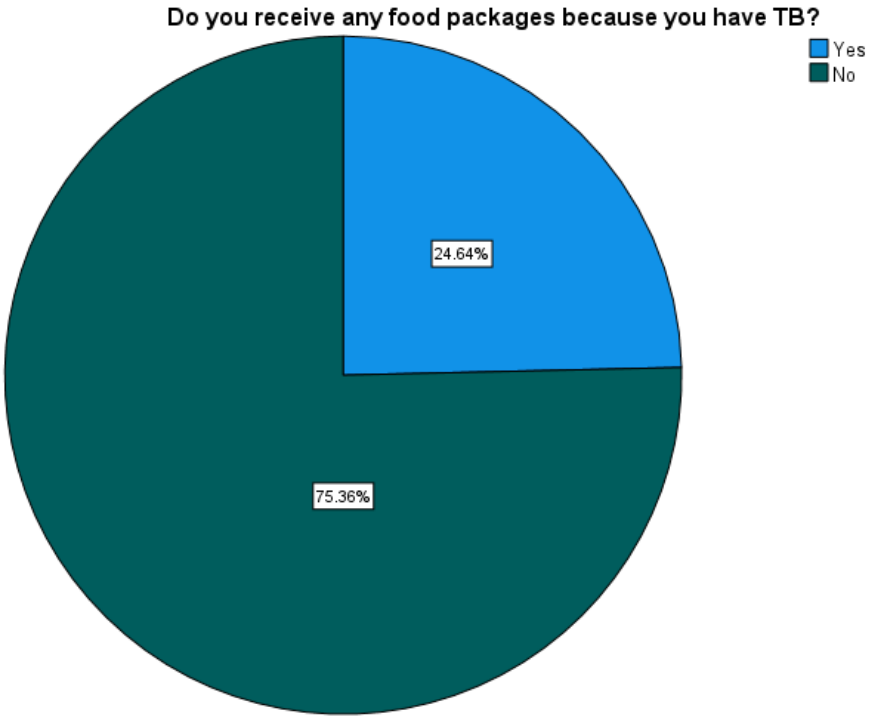

Figure 5.26: Review if participants receive food packages (n=207)

5.2.5 Health system related factor

This section of the study presents results on the health system related factors affecting TB treatment adherence.

DOT status of the participants

Figure 5.27 below illustrate the DOT status of the TB patients who participated on the study. About 43.96% of the participants confirmed that they do not have anyone to supervise them when they are taking treatment, about 24.64% indicated that their families are the ones supervising them, 24.64% said their friends or neighbours help supervise them and only 6.76% said they are supervised by home-based care giver or healthcare workers.

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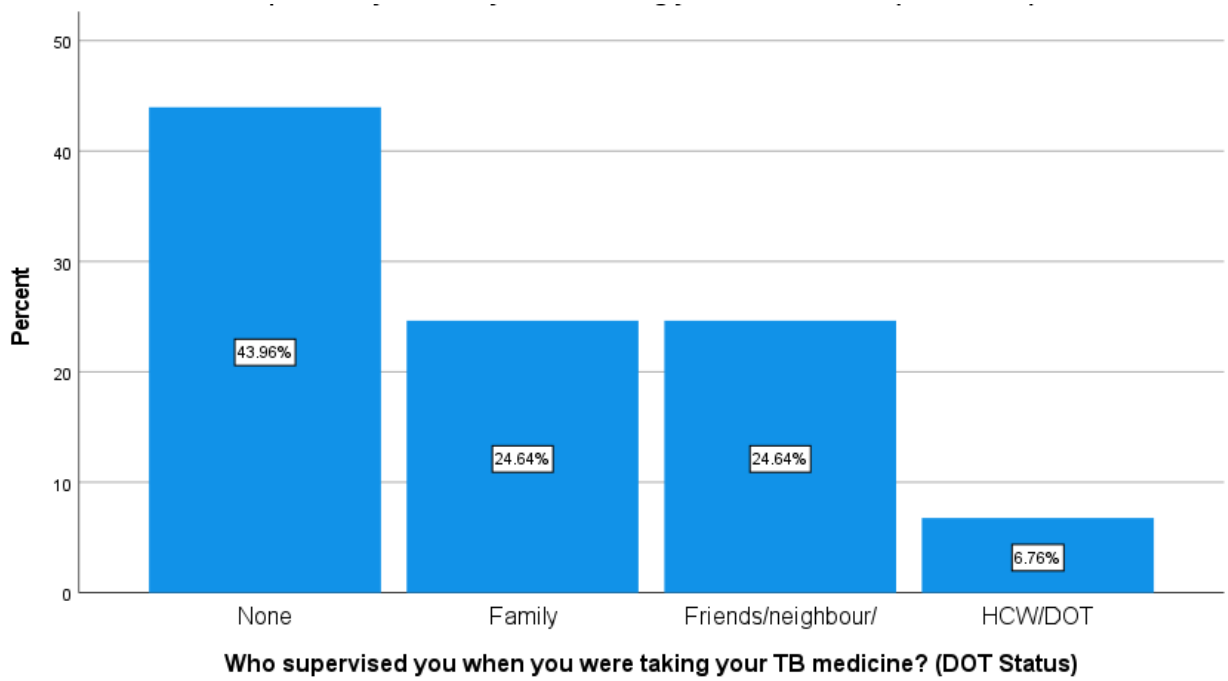

Figure 5.27: Review DOT status of the participants (n=207)

Participants view on the attitude of those who support them when taking treatment including DOT supporters

A total of 43.96% of the participants indicated that this question is not applicable for them since they do not have anyone supporting them when taking their treatment. About 27.05% indicated that they are caring, 23.67% said they are friendly and only 5.31% said they are rude (see figure 5.28).

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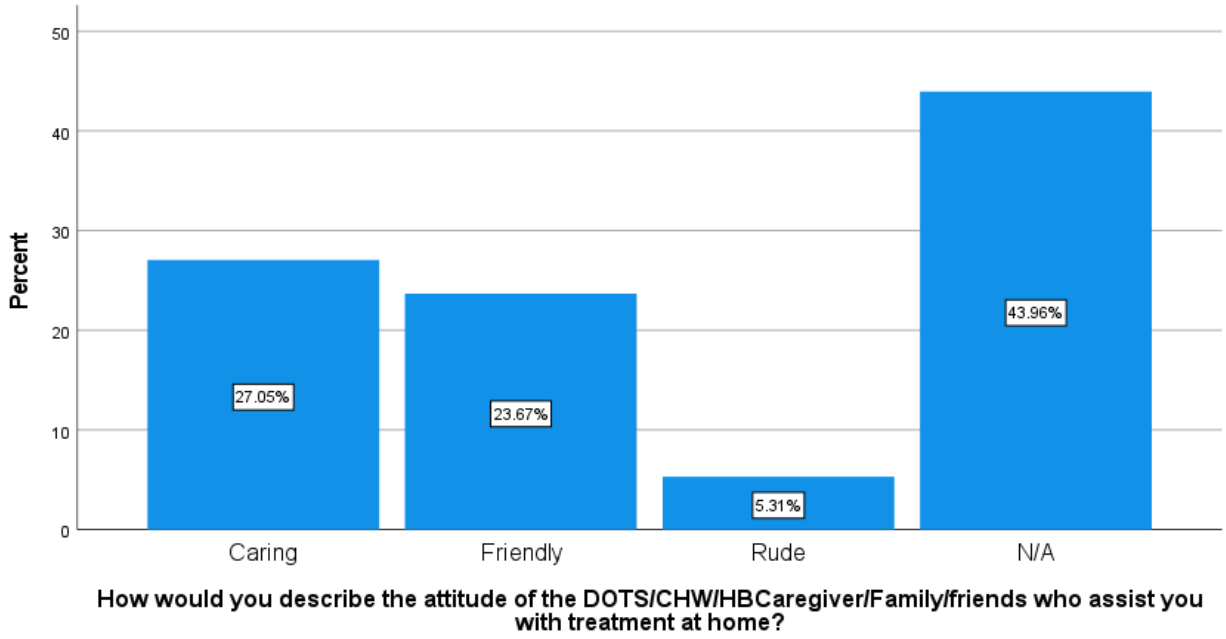

Figure 5.28: Participants view on the attitude of those who support them when taking treatment including DOT supporters (n=207)

Participants view on healthcare workers' attitude

Participants were asked to give their views regarding the attitude of the healthcare workers when they go for their appointments. About 57.49% indicated that healthcare workers are very caring, 31.40% indicated that they are very friendly and only 11.11% confirmed that they are rude (see figure 5.29).

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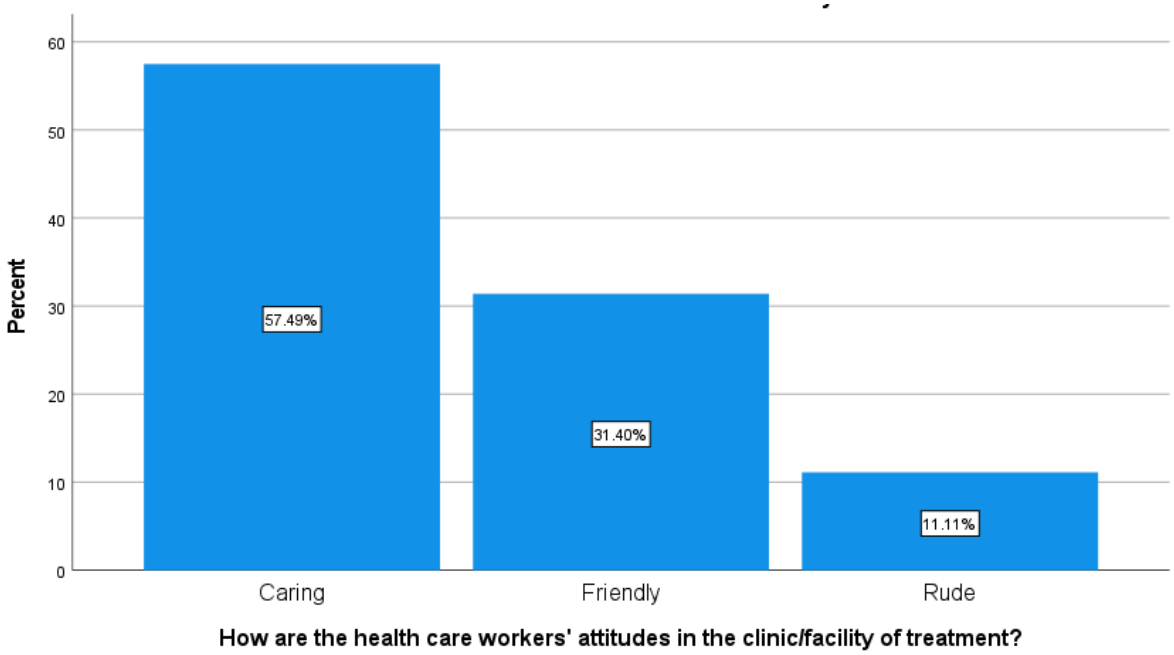

Figure 5.29: Participants views on healthcare workers attitude (n=207)

Rate the quality of service provided at the CHC

Majority (93.24%) of the participants said the service provided at the CHCs are good, 2.42% indicated that the services are average and 4.35% refused to rate the service they receive at the CHCs (see figure 5.30 for details).

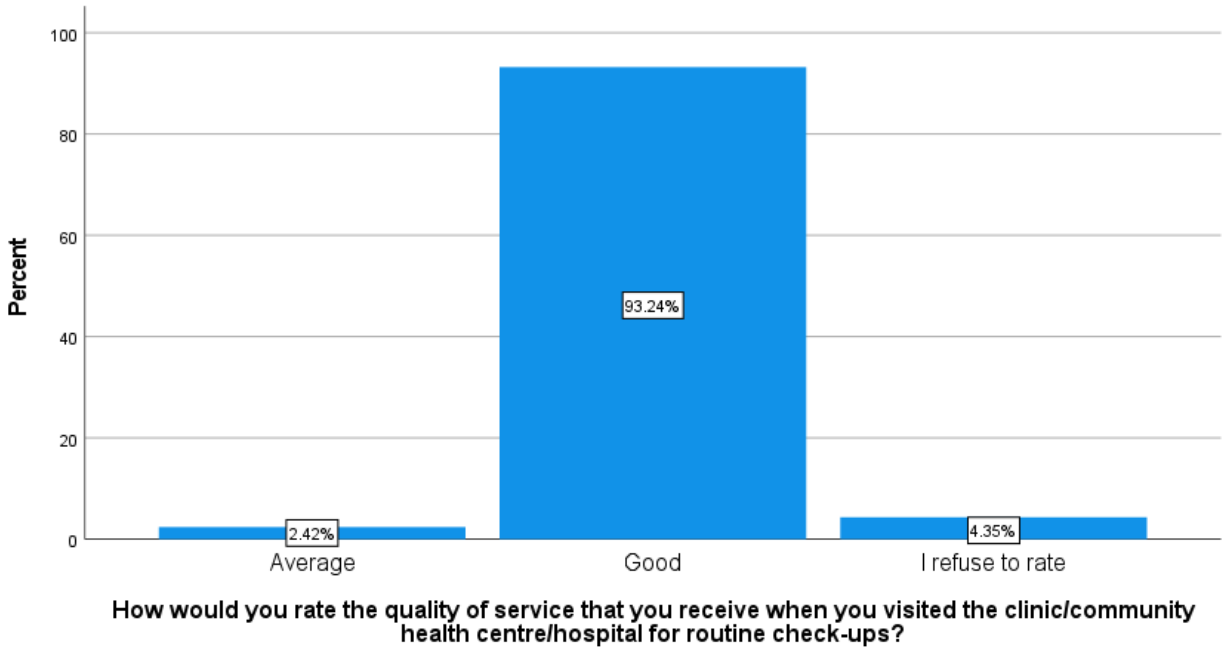

Figure 5.30: Rate the quality of service provided at the CHC (n=207)

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Participants' views on the most convenient CHCs to operating hours

About 47.83% participants said that the most convenient CHCs operating hours can be 6:00am-17:30pm, 37.68% said that 8:00am-20:00pm is the most convenient operating hours, and only 14.49% said 5:30am-16:30pm is the most convenient time for CHCs to operate (see figure 5.31).

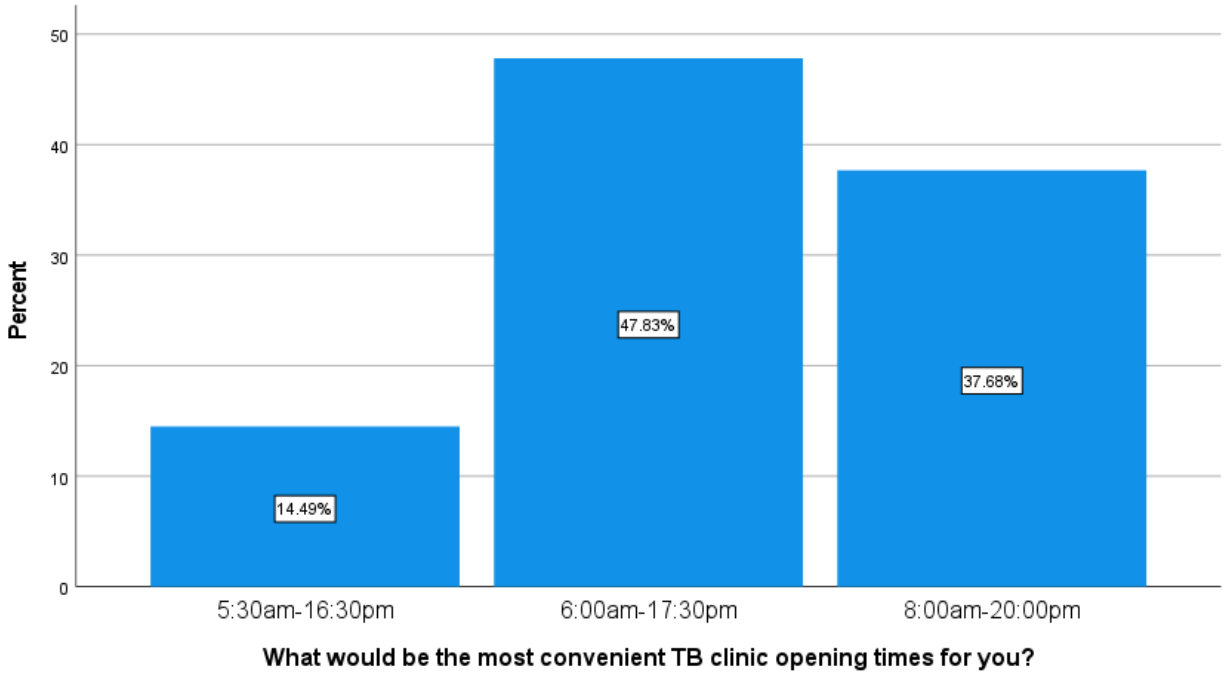

Figure 5.31: Participants' views on the most convenient CHCs operating hours (n=207)

Time participants spend at the CHCs on their visits

Participants were asked to indicate the time they spend at the CHCs on their visits, 75.36% indicated that they spend only an 1hr, 17.39% said that they spend 2-3hrs and 7.25% said that the spend 3hrs and more (see figure 5.32).

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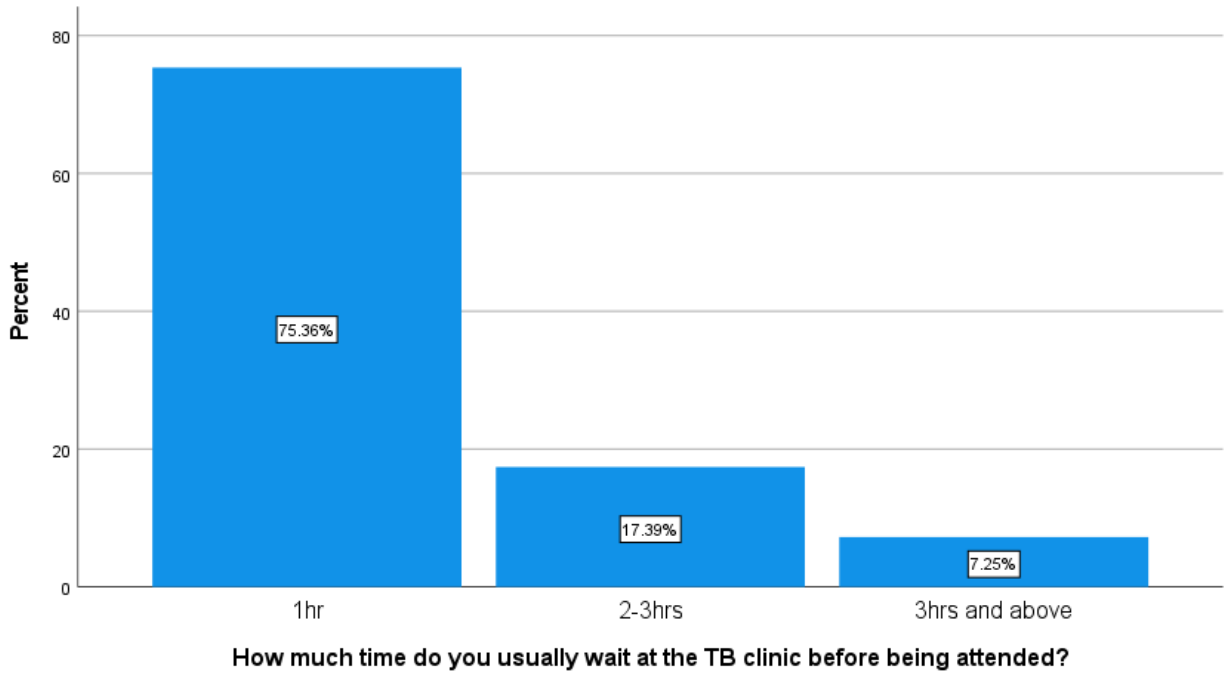

Figure 5.32: Time participants spend at the CHCs on their visits (n=207)

What discourages participants to go to the CHC for their appointment

Participants were asked to indicate things that discourages them not to go to the CHCs for their check-ups. About 56.04% of participants said they have never missed their appointments, 39.13% confirmed they don't like the health education given to TB patient as it takes long, about 3.36% were scared to because people think if one has TB they also have HIV, 0.97% were scared that people will talk about their visits, only 0.48% said that health care workers don't give medication to treat TB as the one given to them causes them to experience side effects (see figure 5.33).

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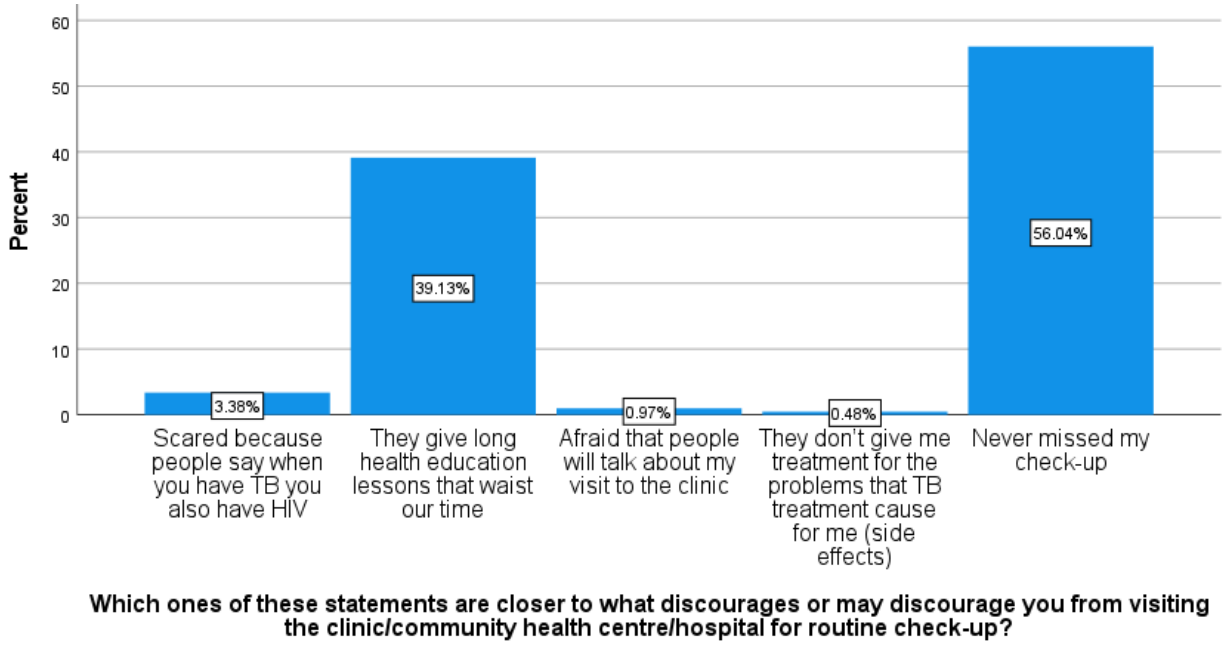

Figure 5.33: What discourages participants to go to the CHC for their appointments (n=207)

5.2.6 Participants views on default factor affecting adherence

This section of the study presents the results under participants' views on the default factors affecting TB treatment adherence.

People that participants live with

Figure 5.34 below illustrate people that TB patients live with. Majority (82.61%) of participants said that they stay with their family, 13.05% acknowledged that they stay alone, and 4.34% said that they stay with their friends.

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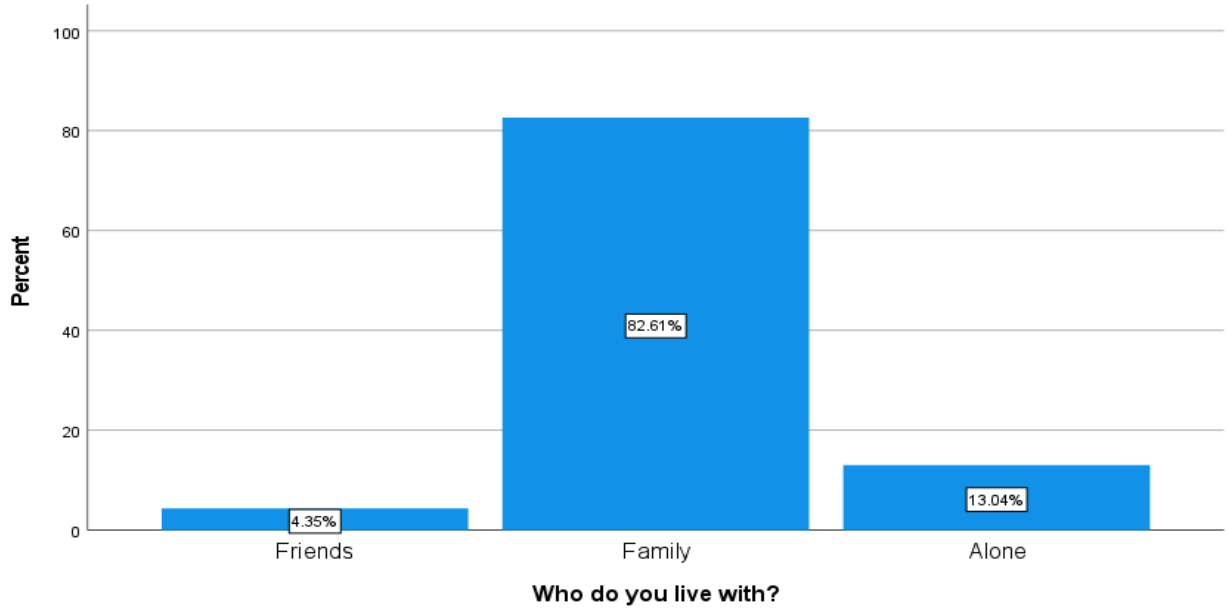

Figure 5.34: People that participants live with (n=207)

Family or friends support to ensure patients take TB treatment

Participants were asked to indicate if their family, friends, or people they live with fully support them when they are taking their TB treatment to ensure that they take their treatment correctly. About 79.23% said that they receive full support from the people they live with, 8.21% confirmed that they do not receive full support, and 12.56% indicated that this question was not applicable to them as they have no one to support them (see figure 5.35).

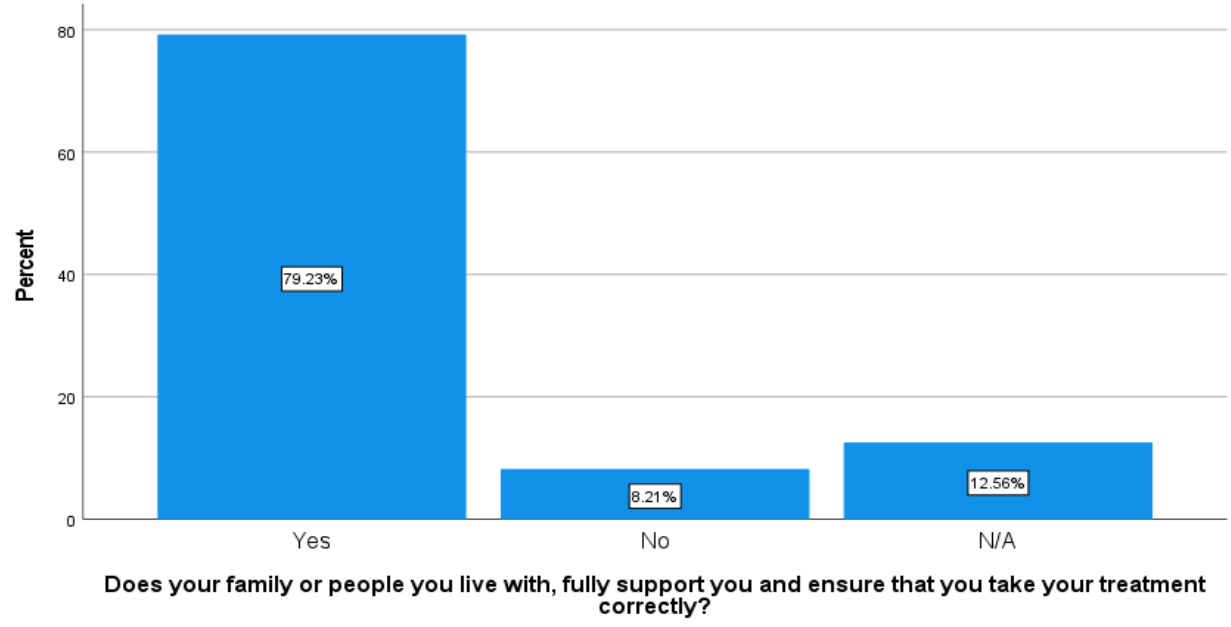

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Figure 5.35: Participants' perception on family or friends support to ensure they take TB treatment correctly (n=207)

Explore if participants ever missed their check-ups

Participants were asked to confirm if they had ever missed their check-ups ever since they were diagnosed with TB, 84.06% said that they have never missed their check-ups, 13,04% said they were not sure if they had ever missed their check-ups as they do not remember, only 2.90% said they had missed their check-up (see figure 5.36).

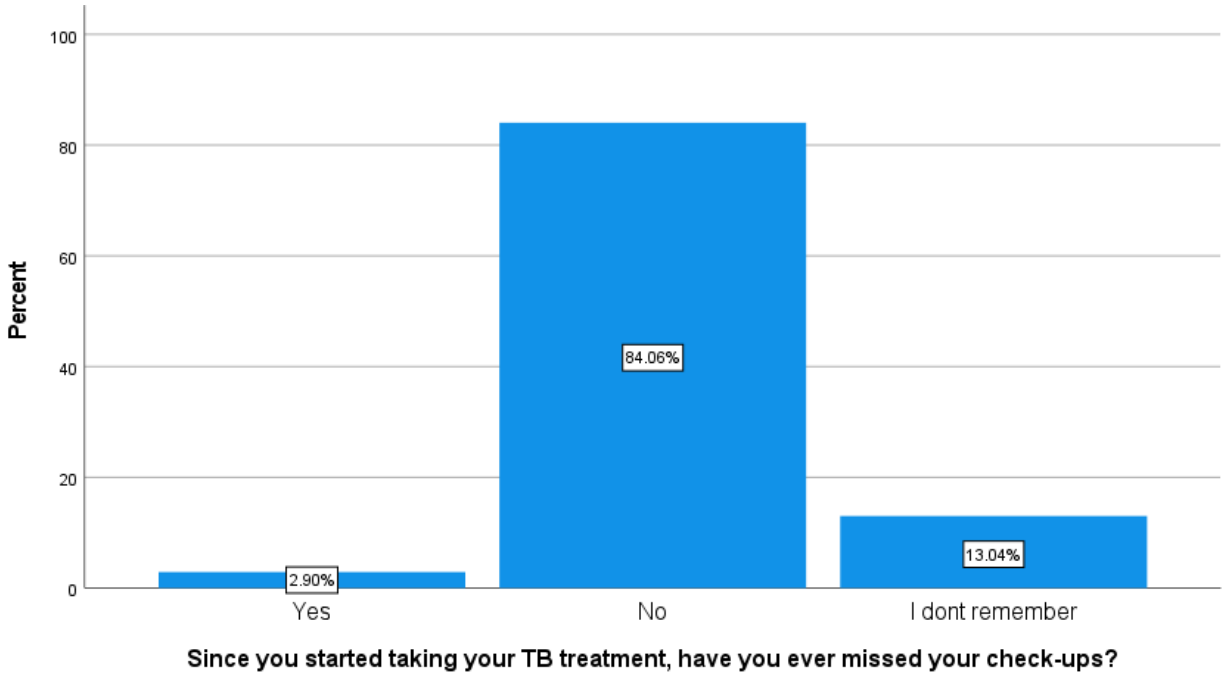

Figure 5.36: Explore if participants have ever missed their check-ups (n=207)

Number of times participants missed their check-ups

Participants were further asked about the number of times they had missed their appointments, 84.06% said they had never missed their appointments, 13.04% said that they do not remember, and only 2.90% confirmed they had only missed their appointments once (see figure 5.37 below).

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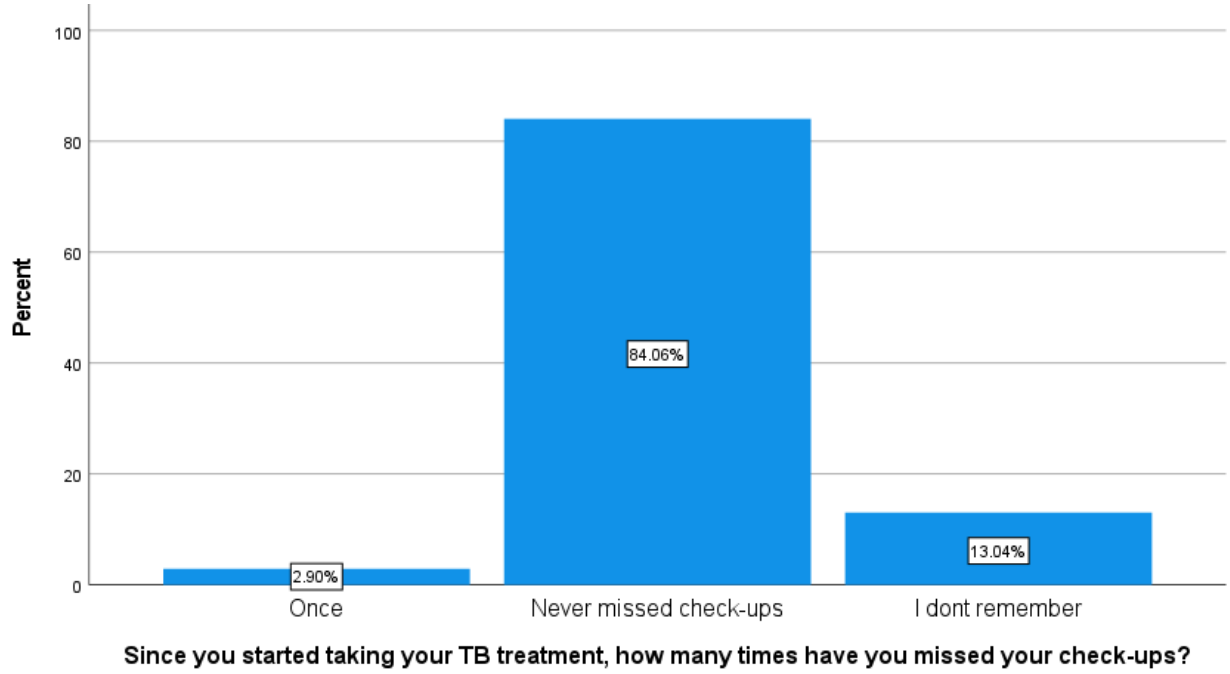

Figure 5.37: Review number of times participants missed their appointments (n=207)

Explore reasons that cause participants to miss their appointments

Reasons that cause TB patients to miss their appointments were explored, 84.06% indicated no reasons as they said they had never missed their appointments, 6.76% confirmed lack of transport sometimes caused them to miss their appointments, 5.31% confirmed they did not want people to notice that they had TB, 3.86% confirmed they were busy with some other things on the day of their appointment (see figure 5.38 for details).

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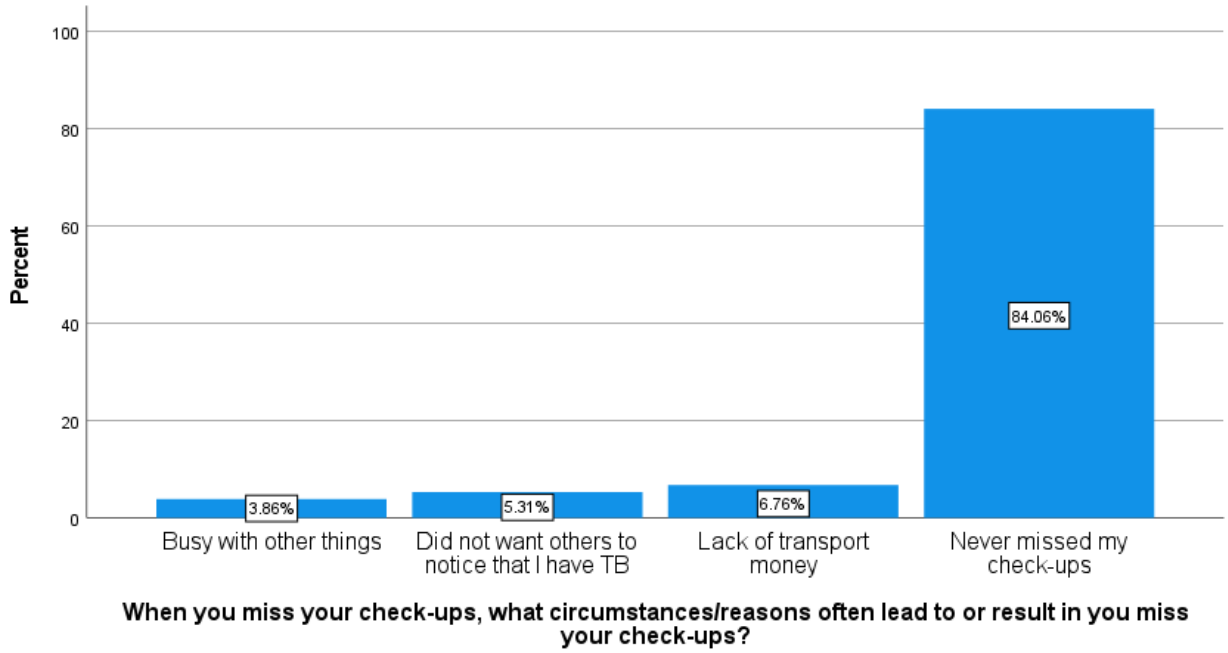

Figure 5.38: Explore reasons that cause participants to miss their appointments (n=207)

Explore if participants ever missed taking treatment

Majority (82.13%) of participants indicated that they had never missed taking their treatment, 11.59% said they do not remember if they had ever forgotten to take their treatment, only 6.28% confirmed that they have missed taking their treatment (see figure 5.39).

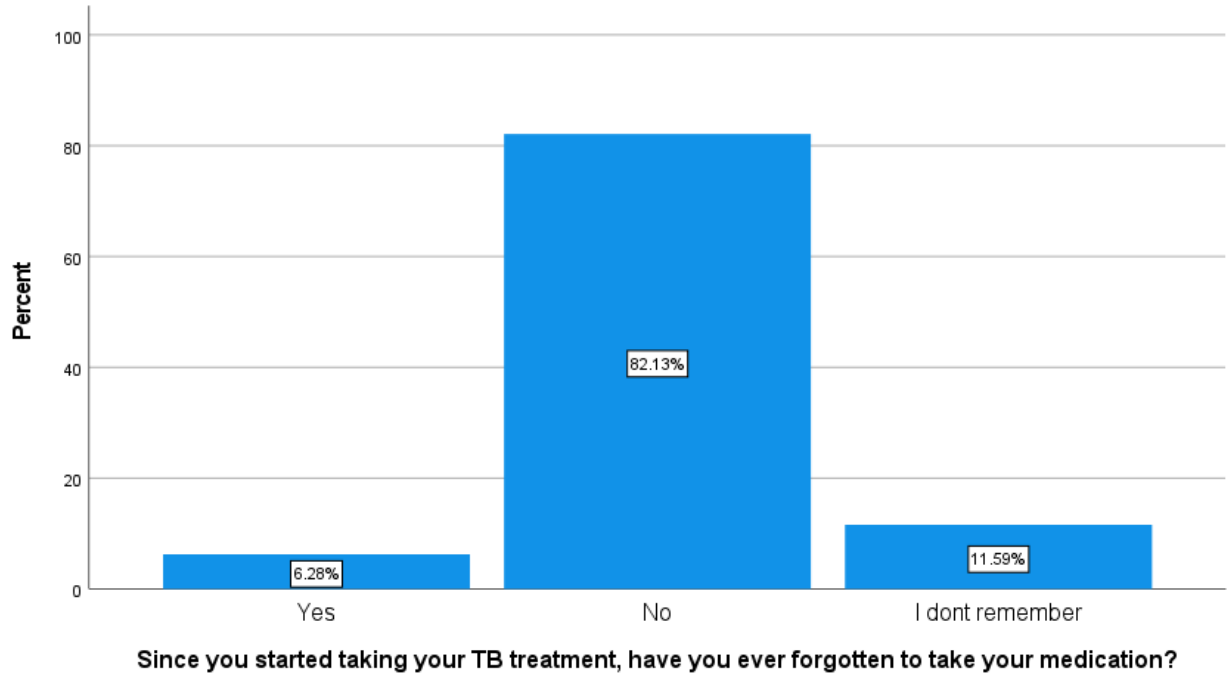

Figure 5.39: Explore if participants ever missed taking treatment (n=207)

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Number of times participants ever forgotten to take their treatment

A question was asked about the number of times TB ever forgot to take their treatment, a total of 85.99% said they had never forgotten, 7.25% said they do not remember, 3.38% confirmed that twice and 3.38% said only once (see figure 5.40).

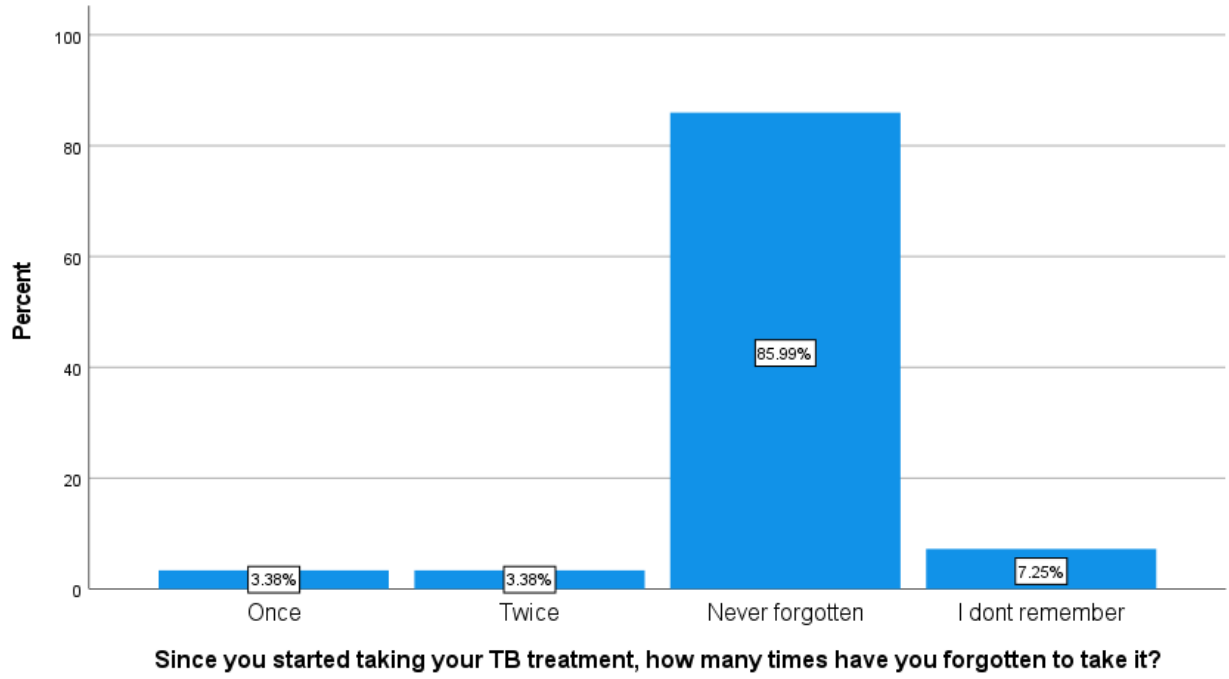

Figure 5.40: Number of times participants ever forgotten to take their treatment (n=207)

Explore reasons that caused participants to forget taking their treatment

Reasons that caused participants to miss their treatment were explored, about 72.95% said they had never forgotten to take their treatment, 2.90% confirmed that when their family had forgotten to remind them, they also forget to take their treatment, 9.18% confirmed that when they had been drinking they forget to take their treatment, 11.11% confirmed that they had forgotten to take their treatment when they were away from home, and 3.86% acknowledged that they just simply forgot (see figure 5.41 for details).

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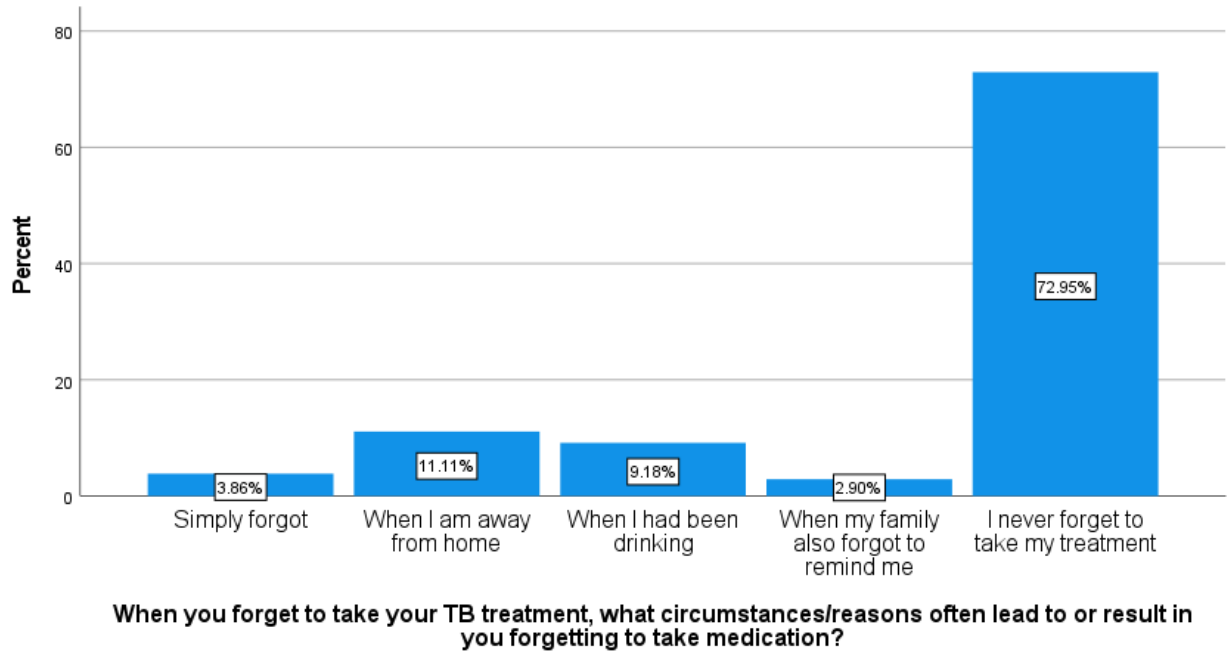

Figure 5.41: Explore reasons that caused participants to forget taking their treatment (n=207)

Explore if participants had ever been admitted at the healthcare facilities since they started treatment

A question was asked to see if participants have ever been admitted at the healthcare facilities ever since they started taking treatment, majority (76.81%) of participants said they had never been admitted, only 23.19% acknowledged that they had been admitted to the healthcare facilities before during the time they were taking treatment (see figure 5.42 below for details).

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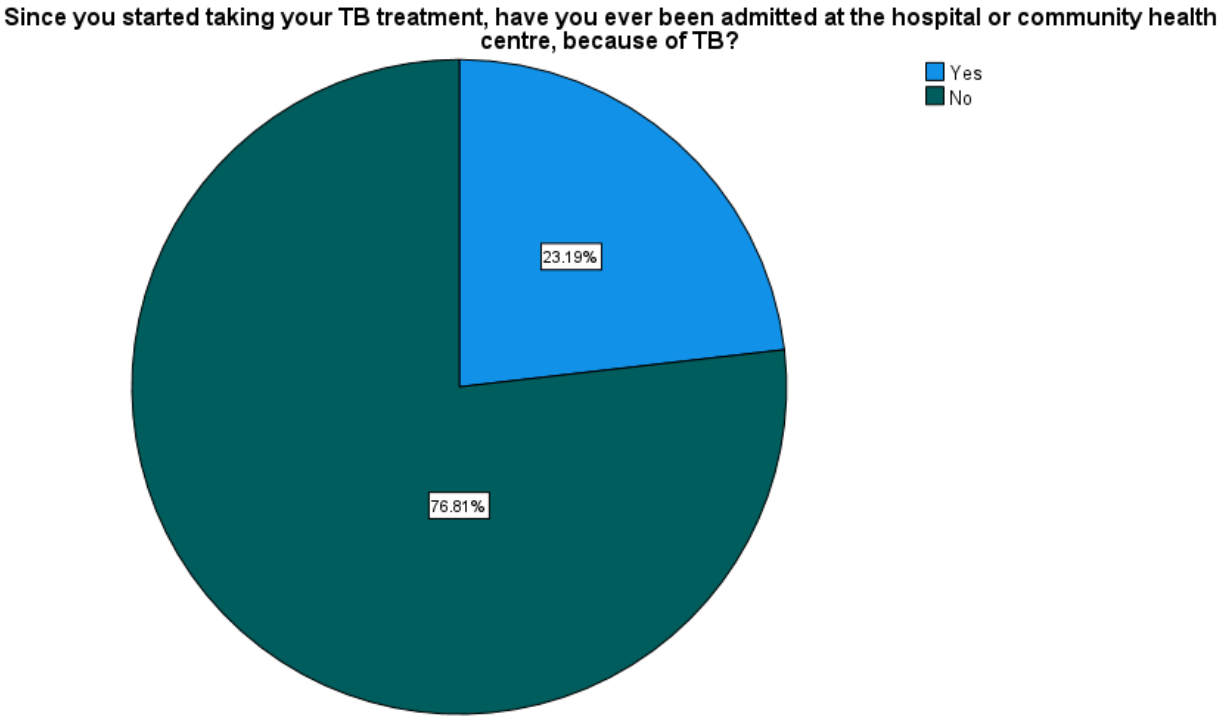

Figure 5.42: Explore if participants had ever been admitted at the healthcare facilities since they started treatment (n=207)

5.2.7 Stigma and discrimination factor

This section presents the results of the study on stigma and discrimination factors affecting TB treatment non-adherence.

Explore if participants have disclosed to their family or friends that they are on TB treatment

Participants were asked to confirm if they had disclosed to their families or friends that they are on TB treatment, 56.52% indicated that they had disclosed to their families or friends, only 43.48% confirmed that they did not disclose to their families and friends even though some know they are on treatment, but they are not sure of the condition (see figure 5.43).

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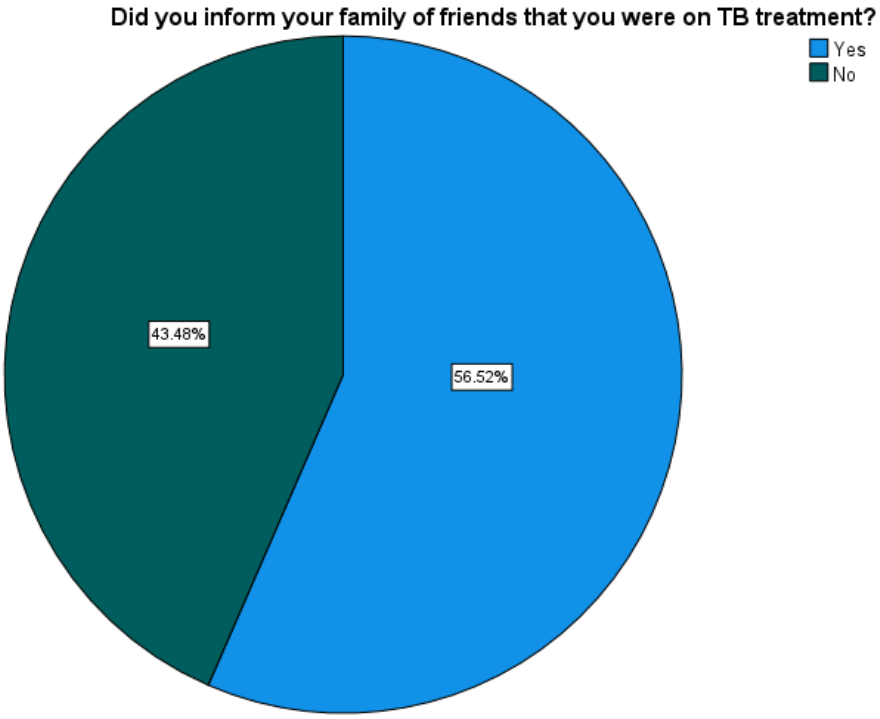

Figure 5.43: Explore if participants disclosed to their family or friends that they are on TB treatment (n=207)

Explore if participants do inform their families or friends about their appointments at the CHCs

When participants were asked to confirm if they do inform their families or friends about their appointment at the CHCs, only 56.52% confirmed that they do inform them, about 43.48% acknowledged that they do not inform them (see figure 5.44).

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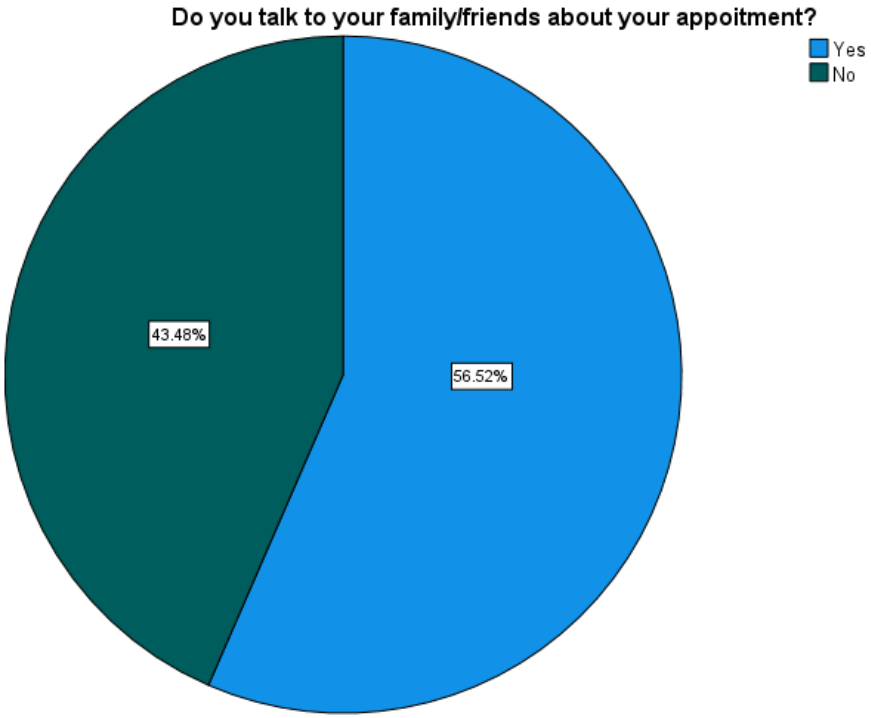

Figure 5.44: Explore if participants do inform their families or friends about their appointments at the CHCs (n=207)

Explore reasons why participants do not inform their families or friends about their TB status or appointments at the CHCs

A total of 36.23% acknowledged that they are afraid of being isolated by their friends or families, about 7.25% confirmed that they do not trust anyone, and 56,52% said this question is not applicable to them (see figure 5.45).

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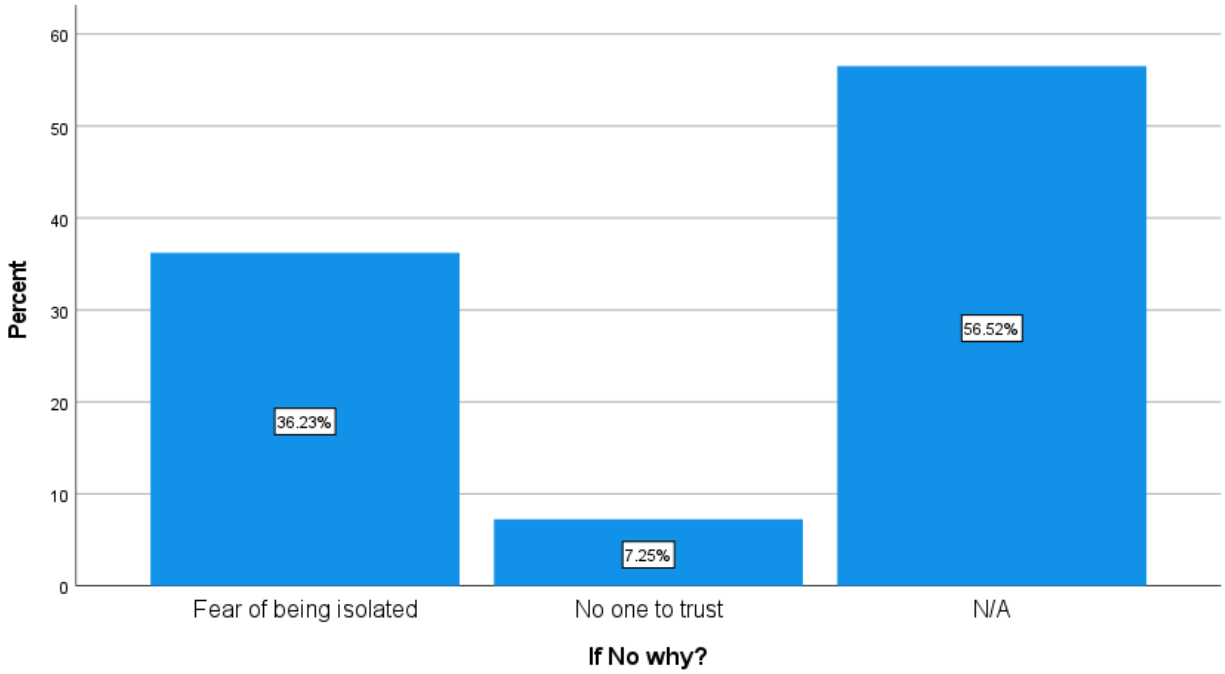

Figure 5.45: Explore reasons why participants do not inform their families or friends about their TB status or appointments at the CHCs (n=207)

Explore how participants feel they are treated at the community ever since they had TB

When participants were asked how they feel they are treated at the community since they had TB, 43.96% confirmed that they feel most people are friendly, but they just generally try to avoid any contact with them, 50.24% said they are mostly supported, and only 5.80% confirmed that they feel most people reject them (see figure 5.46).

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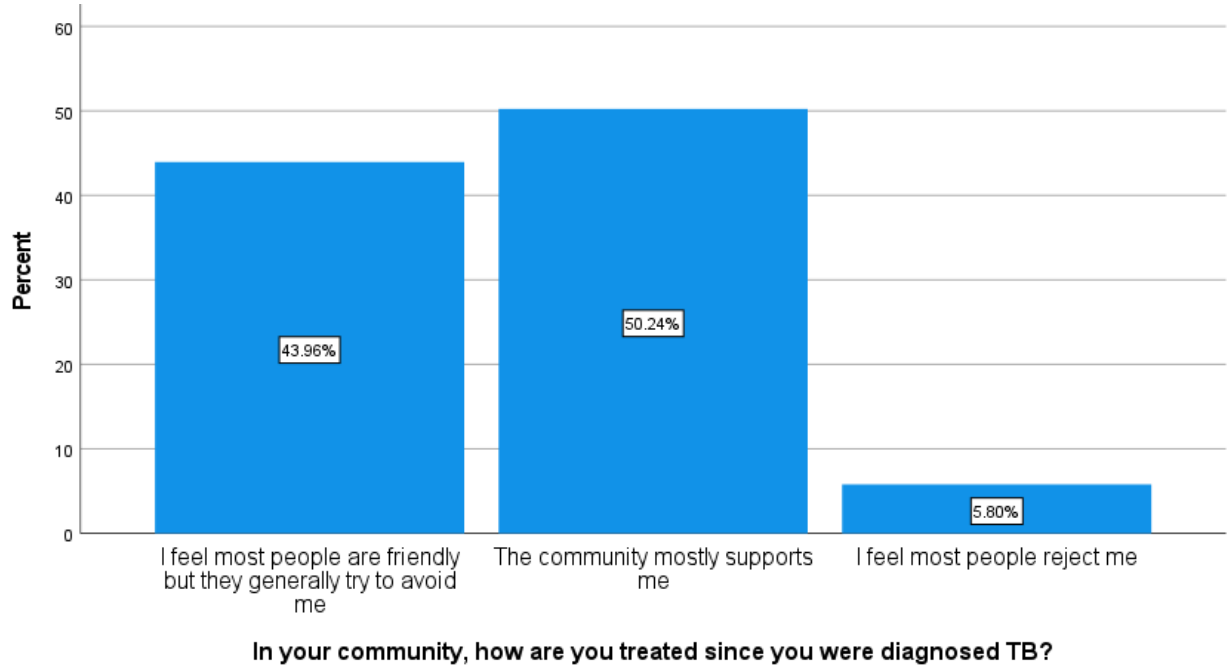

Figure 5.46: Explore how participants feel they are treated at the community ever since they had TB (n=207)

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5.2.8 Participants views on the disease and treatment related factor

This section presents the results on the participants' views on the disease and treatment related factors affecting TB treatment adherence.

Explore reasons for not completing TB treatment

Participants views regarding reasons that could make one not to complete TB treatment were explored, 48.31% confirmed that treatment side effects can make one not to complete their treatment, 13.53% confirmed that the fact that TB treatment takes long can discourage one to complete their treatment and 38.16% said that they feel there is nothing that can cause one not to complete their treatment (see figure 5.47)

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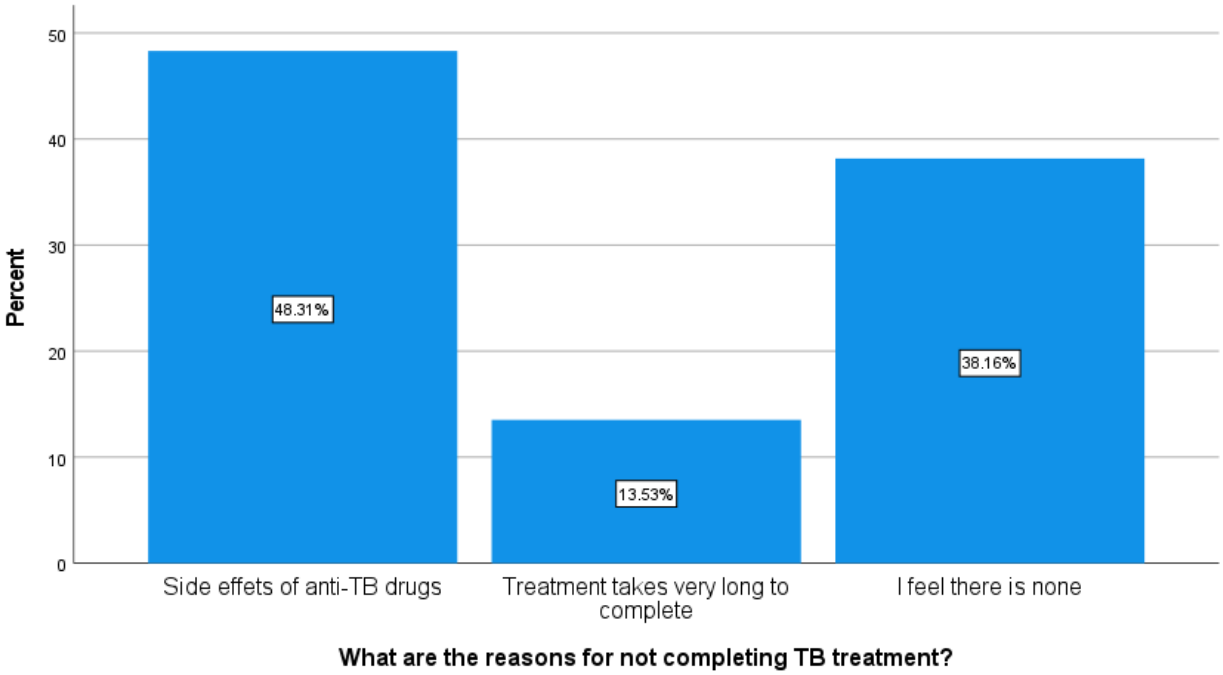

Figure 5.47: Explore reasons for not completing TB treatment (n=207)

Views on how participants feel after taking TB treatment

Only 44.44% said they feel very well after taking TB treatment, and 55.56% confirmed that they feel sick and not well at all after taking their TB treatment (see figure 5.48).

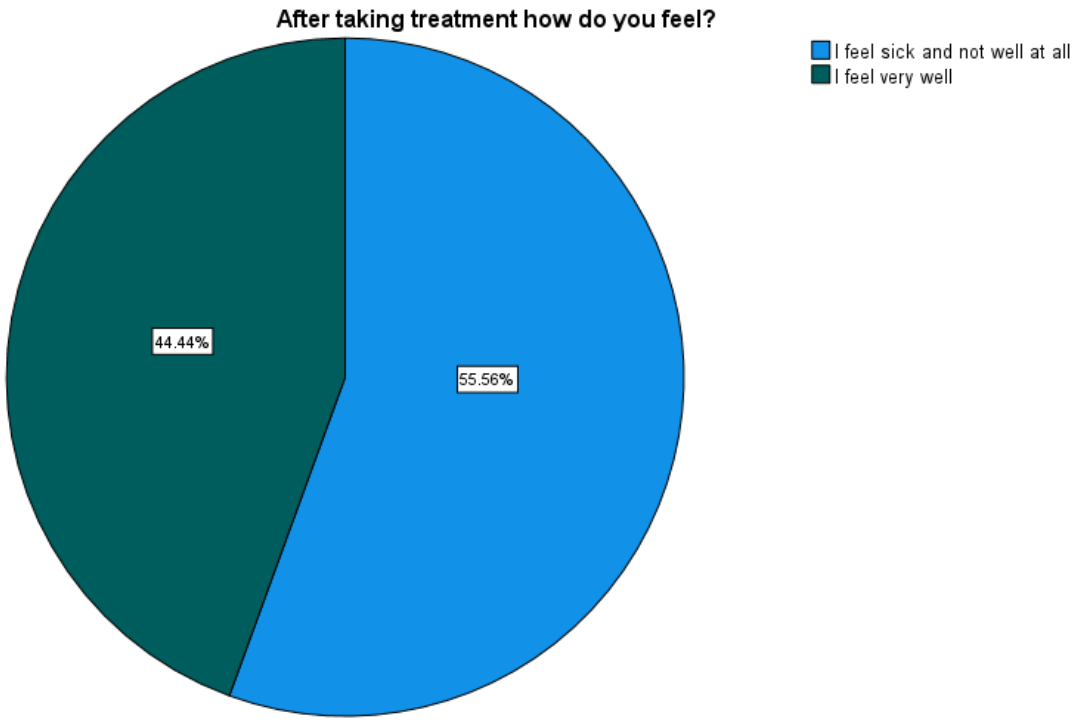

Figure 5.48: Explore views on how participants feel after taking TB treatment (n=207)

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Informed and educated on anti-TB drug side effects

A total of 72.95% said that they were informed about anti-TB drug side effects, 13.04% confirmed that they were not informed, and only 14.01% said they were only informed about the side effects when they had already experienced them (see figure 5.49).

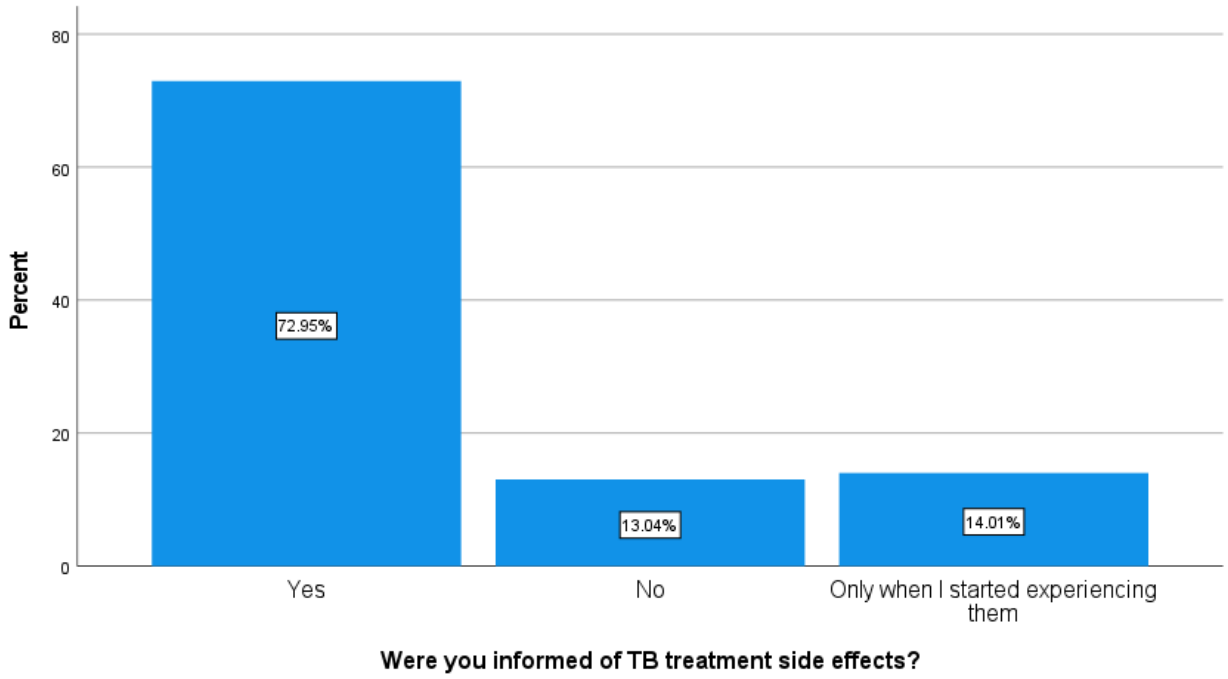

Figure 5.49: Explore if participants were informed about anti-TB drug side effects (n=207)

Anti-TB drug side effects management

Participants were asked if they were informed on what to do when they experience medication side effects, about 72.95% said they were given information on what to do, 13.04% confirmed that they were not given any information on what to do if they experience treatment side effects, 14.01% said that they were only given information when they had already experienced side effects (see figure 5.50 below).

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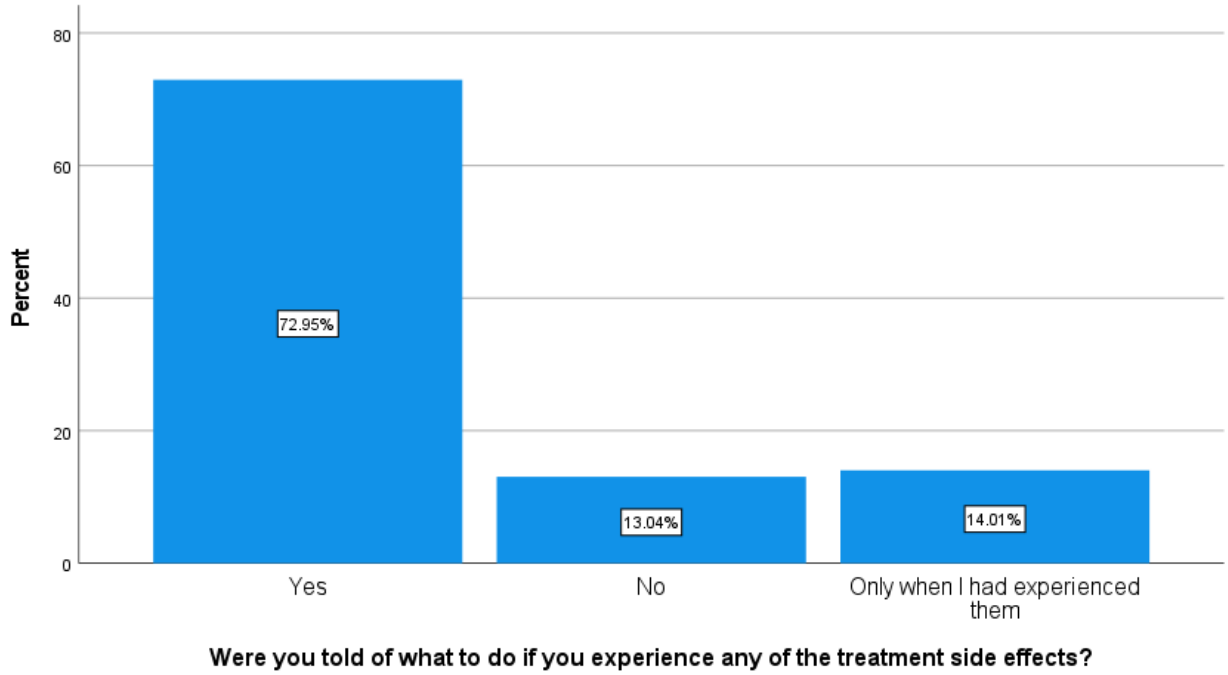

Figure 5.50: Explore if participants were informed of anti-TB drug side effects management (n=207)

Anti-TB drug side effects

Participants were asked if they had ever experienced any treatment side effects. Majority of the participants confirmed that they had experienced treatment side effects. A total of 58.94% said that they had experienced itchy skin, skin rashes, bruising and yellow skin. A total of 13.04% said they had experienced upset stomach, nausea, vomiting, diarrhoea, and loss of appetite. About 9.66% said they had experienced lack of feeling or tingling in the hands or feet. A total of 5.80% said they had experienced yellow eyes, 5.80% said they had experienced dark coloured urine. Only 6.76% said that they had not experienced any side effects (see figure 5.51).

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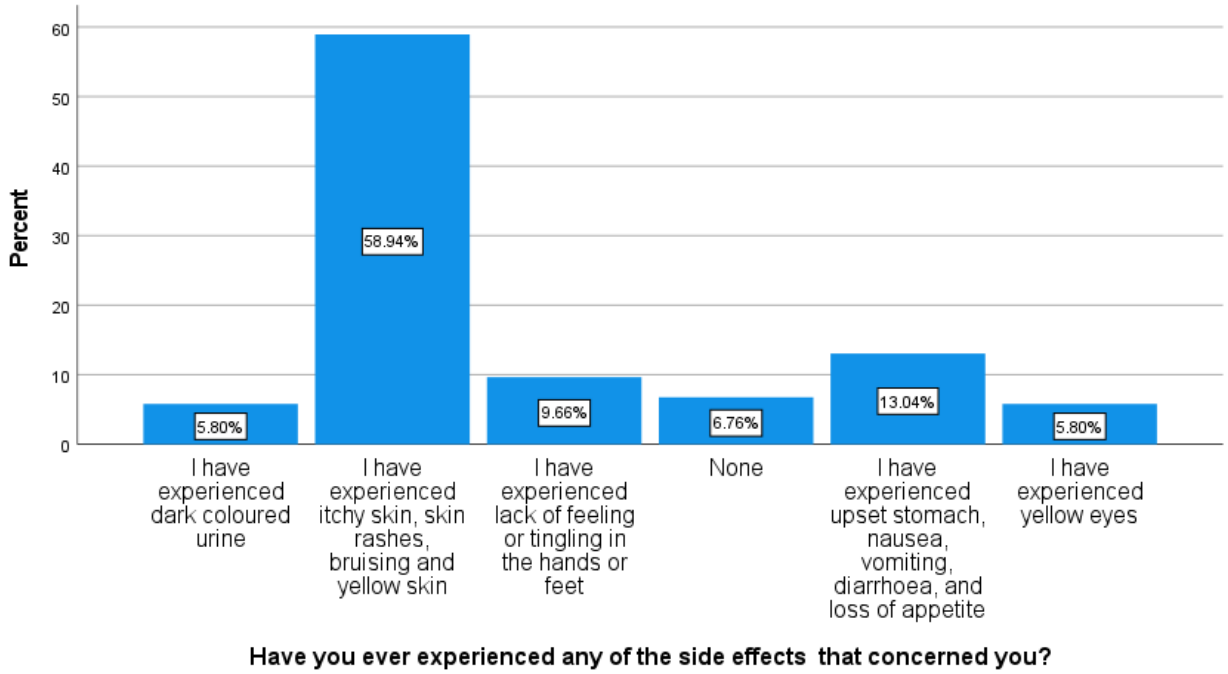

Figure 5.51: Review if participants ever experienced any TB treatment side effects (n=207)

Healthcare workers support on the management of TB treatment side effects

Participants were asked to comment if healthcare workers were helpful with the management of TB treatment side effects. A total of 66.67% said that healthcare workers were helpful. About 19.81% said they were not helpful, 6.76% said this question was not applicable to them, and about 6.76% said that they were not interested in commenting on this question (see figure 5.52 below for details).

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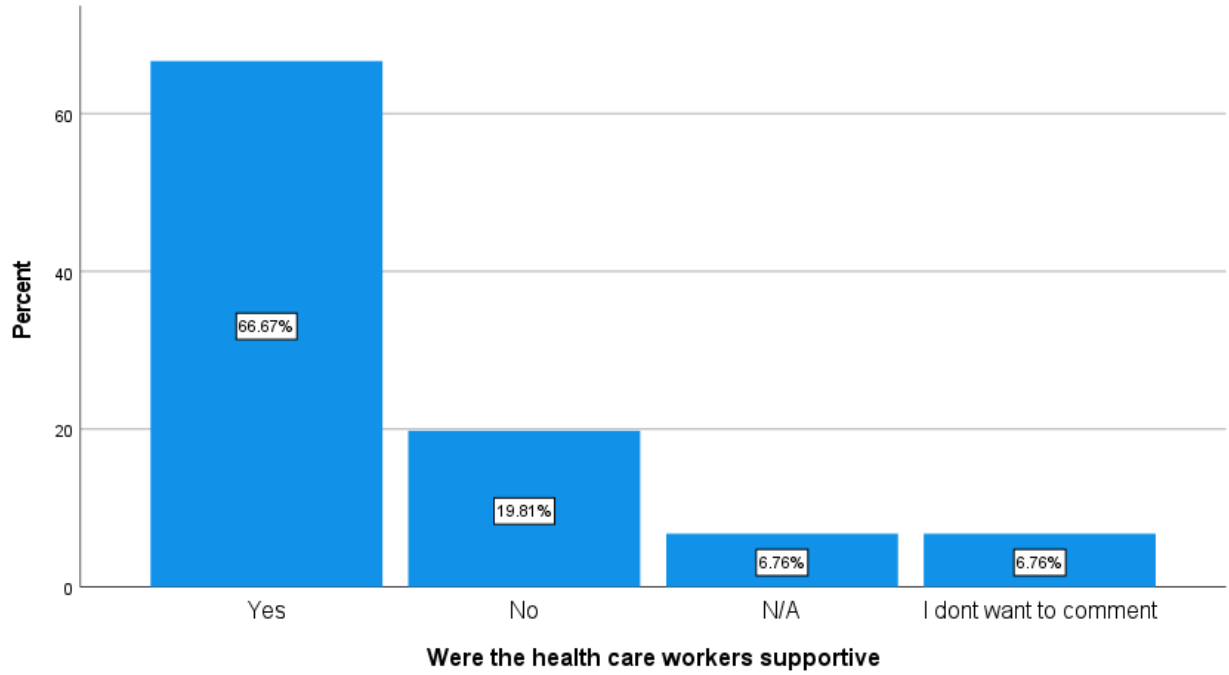

Figure 5.52: Review if healthcare workers were supportive on the management of TB treatment side effects (n=207)

Review if participants were satisfied with the healthcare workers' support

Participants were asked to confirm if they were satisfied with the kind of support provided by the healthcare workers on the management of TB treatment side effects. A total of 65.22% said that they were satisfied, 28.02% said they were not satisfied, and about 6.76% said that this question was not applicable to them (see figure 5.53 below).

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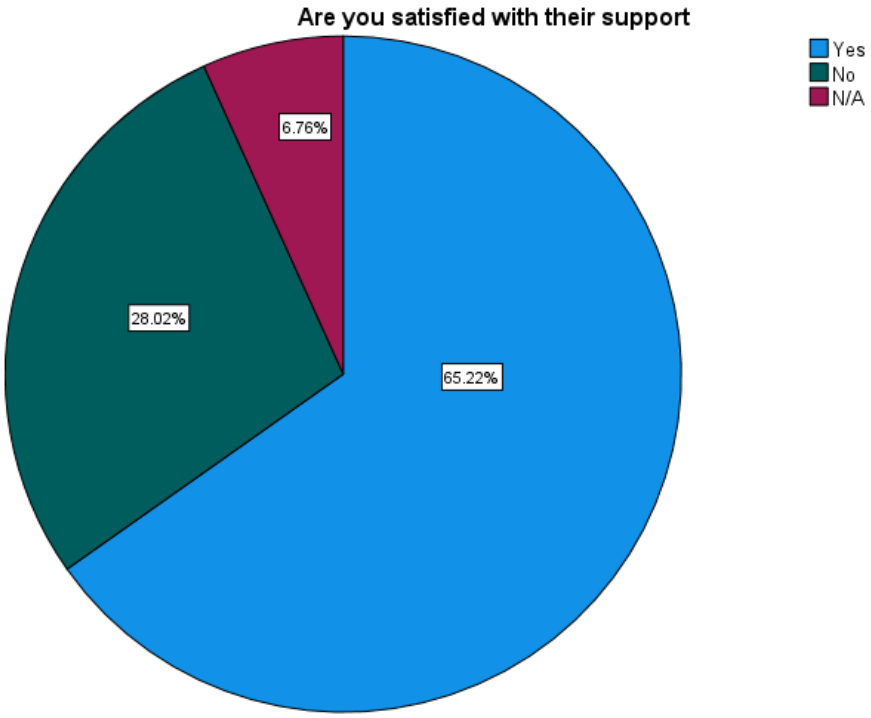

Figure 5.53: Review if participants were satisfied with the support provided by the healthcare workers on TB treatment side effects management (n=207)

5.3 Regression analysis

The researcher conducted a multi regression analysis, on the influential factors of TB treatment non-adherence to accurately determine their significance. The statistically significant associations and non-significant trend associations between factors affecting TB treatment adherence and patient characteristics ($P \leq 0.2$) were included in a multiple linear regression analysis. The researcher then removed out non-significant associations from the model and only leave the closely related contributory associations in the final model as shown in table 5.8 below. Factors that were found to be significantly associated to influence TB treatment non-adherence in the multiple linear regression analysis were; lack of knowledge before diagnosis by gender (*P=0.136)*, lack of knowledge before diagnosis by limited education lower than secondary (*P*=0.973), and patients strong belief in faith healers (religion) by gender (P=0.832).

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Table 5.8: Multiple regression analysis of factors affecting TB treatment adherence

Factor	Coefficient	*P* value
Lack of TB knowledge before diagnosis **Female gender; % (number)**	0.13	0.136
Patients visited faith healers after diagnosis. **Female gender; % (number)**	0.03	0.832
Were you aware you could be having TB? **Limited education lower than secondary; % (number)**	0.99	0.973

5.4 Summary

TB patients who were taking treatment in Limpopo Province were involved in the cross-sectional survey as participants. All the questions answered were analysed using SPSS version 26. The researcher was assisted by a qualified biostatistician to bring about all the findings in this chapter. Views and perceptions were presented in the form of tables and graphs illustrating frequencies and percentages. Data reveal that about 65.7% of the participants had knowledge on how TB spread from person to person. Participants who had visited the faith healers for help were about 75.3%. Participants (70.0%) confirmed that they were unemployed and indicated that socio-economic factor has impact on TB treatment adherence. About 43.9% of the participants acknowledged that they were taking treatment without supervision. Participants (39.1%) acknowledged that they do not like to visit health care centres because they hate health education as it takes their time. About 43.4% confirmed that they did not disclose their status because of fear of stigma. Participants (48.3%) acknowledged that treatment side effects can make one to default. Multi regression analysis show significant association between lack of TB knowledge, gender, and limited education lower than secondary, and strong belief in religion by gender. The next chapter presents the discussion of the study findings.

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CHAPTER 6
DISCUSSION OF FINDINGS

6.1 INTRODUCTION

The previous chapter presented the results of the qualitative approach. This chapter discusses the results of the study by merging the findings in phases 1a and 1b to form a more complete picture of the issue of TB treatment non-adherence in Limpopo province. The discussion will follow the themes that emerged from both phases. The themes developed in chapter 4 are supported by the quantitative findings and are discussed in detail as follows. Social and Cultural factors, Patients related factors, Treatment related factors, Socio-economic factors and Health care and health system factors.

6.2 SOCIAL AND CULTURAL FACTORS

This study discovered that the practice of visiting faith healers of traditional healers for help were common among TB patients. Participants revealed that TB patients have strong belief in their tradition or religion. Furthermore, there are still patients who would visit traditional healers or faith healers the moment they feel sick, and this would delay their TB diagnosis and affect their health care seeking behaviors. Both phases of the study revealed that some TB patients would still visit traditional healers or faith healers after their diagnosis and that behaviors were likely to affect their treatment adherence. Multi regression analysis shows that female gender was significantly associated with strong belief in religion.

The findings of this study discovered that most TB patients live in fear of disclosing their status to their family members, friends, colleagues, or neighbors, as they are afraid to be disposed to stigma and discrimination due to TB. Many had seen other TB or HIV patients being discriminated or stigmatized and they are afraid to be treated the same. The study discovered that some patients fear to lose their jobs since their bosses would not want them to interact with other staff members to avoid transmission of infection. This study revealed that due to fear of stigma and discrimination, most patients end up forgetting to take their treatment, due to lack of support.

6.2.1 Strong trust and belief on culture, tradition, or religion

These findings concur with those of Koskei (2016), who indicated that patient's belief in traditional medicine complicate their health seeking behaviour and the TB contact tracing actions. Traditional healers justify patronage of the TB patients to traditional healers because the cause is witchcraft. In both phases of this study, it was revealed that TB patients are

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affected by their strong religious, cultural, or traditional beliefs. They described visiting traditional practitioners and faith-based churches as the common practice amongst TB patients. This was echoed by participants in the key informant interviews and focus group discussions on this study who indicated that TB patients have strong belief in culture and religion. TB patients were indicated to go to the traditional healers for help or religious leaders of faith-based churches for prayers, as they do not believe that TB is a natural disease, some believe that they are bewitched, and some believe they have evil spirits. In phase 1b of this study researcher explored TB patients' reasons for visiting faith healers or traditional healers, a little above 76.8% of the participants confirmed that they have strong faith in their culture or religion.

The finding of this study discovered that TB patients did not believe that they had TB as they believed they had ancestral spirits, and they needed to be cleansed, therefore they visit traditional healers for cleansing. This study also revealed that some TB patients believed that they were being punished by gods for having bad sexual immorality. These findings concur with those of Viney, Johnson, Tagaro, Fanai, Linh, Kelly, Harley and Sleigh (2014), who concluded that majority of the TB patients interviewed in the study about their knowledge and belief on TB did not attribute TB to a bacterial cause. Therefore, consulting a traditional healer for health care was common and may have delayed diagnosis to many. This is because aetiological beliefs strongly influence choice of care, and if witchcraft is considered the cause of a disease, a traditional healer will likely be sought first. A study by Verhagen, Kapinga and van Rosmalen-Nooijens (2010), indicated that, TB patients that had visited a traditional healer said they had thought they were punished by witches, which was why they approached a traditional healer. Some thought they had been cursed by acquaintances. Patients who initially thought they were cursed, after they were diagnosed with TB in the hospital, they perceived it as a proof that TB is a punishment of God rather than caused by witchcraft forces.

According to the results from phase 1b, a total of 75.3% participants acknowledged that they had visited faith healers for help after they had been diagnosed with TB. Only 3.3% participants acknowledged that they first visited traditional healers before they were diagnosed with TB and only about 1.9% participants acknowledged that they had visited traditional healers even after they were diagnosed with TB at the healthcare facilities. However, in phase 1a most participants of key informant interview and focus group discussion revealed that consulting a traditional healer among TB patient is a common practice. According to Viney, et al., (2014), in their study cited a report from Kenya which has suggested that participants in the study may be reticent to admit to consulting traditional

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healers. It is believed that group discussions were more revealing than interviews with individual patients about the sensitive issues involving traditional rules, sex, and TB. Mugoni (2019), indicated in their study that some participants denied using traditional remedies at all. However, this evidence should be treated with caution, because participants might have been reticent to share intimate information about their cultural practices with an 'outsider' researcher who was not related to their culture. Viney, et al*.,* (2014) cited a study which stated that worldwide, many people with symptoms of TB consult traditional healers, often before seeking western medical care. The current study further discovered a slightly high probability of females who have visited faith based churched for help even after diagnosis. Even though there was no high significant association as the *P* value was at 0.832 but compared to the male gender, female were the most concerning group. These findings agree with the findings of the study by Dalmida, Holstad, DiIorio and Laderman (2012), which indicates that about 95% of the black, predominantly Christian women with HIV in the Southeastern U.S., considered spirituality as very or extremely important in their lives.

This study discovered that visiting traditional healers or faith-based churches delayed diagnosis and influenced TB treatment non-compliance. These findings concur with the findings of the study done by Cremers, Gerrets, Kapata, Kabika, Birnie, Klipstein-Grobusch and Grobusch (2016), which indicated that many TB patients did not start with a clinic visit when they were feeling sick, but rather used locally available herbal treatments in Kanyama to treat their cough. Generally, the second step was going to a market or Kantemba, a cheap unlicensed pharmacy which has delayed their diagnosis. In one study participants were described to be moving between different treatment options, including herbal, biomedical, religious, and sorcery, in search of effective treatment. Use of herbal or natural remedies was reported before, during, and after TB treatment (Diefenbach-Elstob, Plummer, Dowi, Wamagi, Gula, Siwaeya, Pelowa, Siba & Warner, 2017).

In phase 1b of this study majority of the participants were identified as Christians. In phase 1a, it was revealed during key informant interviews and focus group discussions that TB patients have strong belief in their religions, therefore they would not take their treatment as they believe in prayers. According to participants from the key informant interviews and focus group discussions, patients were reported to visit prophets for prayers where they were told to have demons or evil spirits and they needed to be delivered through prayers. Some are provided with anointing oils and holy waters to use at home to get rid of the evil spirits. A study that was done by Diefenbach-Elstob, et al*.,* (2017) indicated that beliefs have a negative impact on the cure rate, as they stop taking their treatment and go to the prophets for prayers with the trust that they will be healed.

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A study by Nyasulu, et al., (2018), indicated in their study that patients' beliefs have effect on their health care-seeking behaviours. According to Eh, McGill, Wong and Krass (2016), participants in one study who had stronger beliefs in the effectiveness of traditional Chinese medication and traditional Chinese health beliefs were found to be less likely to be acculturated and less adherence to self-management and medication. Cultural beliefs may influence the actions of the individual of taking treatment (Shahin, Kennedy & Stupans, 2019). A study by McQuaid and Landier, (2017), concluded that, there is a need for healthcare providers to understand how cultural context influences patient beliefs as it impedes adherence among patients.

The findings of this study discovered that about 10.6% of the patients were told to stop TB treatment, after visiting traditional healers or faith healers as they were given anointing oils or water or traditional herbs to use. According to Aziaet al., (2016), a culturally related factor that was found to have been negatively affecting adherence to antiretroviral treatment (ART) was the simultaneous use of concoctions from traditional healers while on ART. The study reported that some patients were still using concoctions prepared by traditional healers for cleansing their bodies internally. A study by Mugoni (2019), indicated that, MDR-TB patients in eThekwini Metro demonstrated strong cultural beliefs and practices and there was poor treatment adherence.

6.2.2 Fear to disclose the status

In both phases of this study, it was discovered that some TB patients had not informed their family members or friends or neighbors about their TB status. The study further revealed that fear of stigma and discrimination was the main reasons why patients were reluctant to disclose their status. This was echoed by participants from the key informant interviews and focus group discussion that fear of stigma and discrimination plays a role in making TB patients to miss their follow up visits at the healthcare facilities which further impact treatment adherence. The study also revealed that patients did not inform anyone about their appointment at the health care facility as they do not trust anyone, and they were afraid of being isolated. This study concurs with the study by Cremers, de Laat, Kapata, Gerrets, Klipstein-Grobusch and Grobusch (2015), which stated that stigma is one of the many factors hindering TB control by negatively delaying disease diagnosis and affecting treatment compliance.

In phase 1b the researcher explored how participants felt they have been treated in their communities after they were diagnosed with TB. About 43.9% of the participants confirmed

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that that they felt that people generally try to avoid them, while 5.8% confirmed that they felt that people reject them because they have TB. Patients appeared not to be comfortable as they self-stigmatize themselves and fear to associate themselves with others in the community because of their status, which could increase risk of treatment non-adherence. TB is primarily a disease of poor people and is associated with high stigma in the communities. TB stigma affect patients' will to seek care and adhere to their treatment. TB stigma is also affected by the association of TB with HIV in the communities. This study agrees with the study that was conducted by Dias, de Oliveira, Turato and de Figueiredo (2013), which revealed that friends and colleagues of the TB patients had distanced themselves from them for fear of contagion and/or prejudice. A study by Cremers, et al., (2015), have shown that, higher stigma is among the poor, the less educated, women, and socially disadvantaged communities. Datiko, Habte, Jerene and Suarez (2019), report high fear of TB and stigma in the general population of Ethiopia, which were reflected by the community's perception of TB patients and self-stigmatization by patients.

6.2.3 Lack of support from the family and community

The findings of this study revealed that some patients lacked support when taking their treatment. Participants from phase 1a revealed that most patients were not receiving family support as they had not disclosed their status to their family members or people they were staying with. Participants showed that patients who were supported were showing improvement. Most TB patients discontinue their treatment because of lack of family and community support. Family support was stated to be important for TB patient to adhere to their treatment especially during the intensive phase, where they need someone to collect medication for them at the healthcare facility. According to the literature, stigma make patients afraid to ask for support from their employer to purchase medication, thereby reducing adherence (Azia, et al., 2016).

Phase 1b of the study revealed that, about 43.9% of the participants confirmed that they had no one supporting during the time they were taking treatment. About 13% of TB patients revealed that they were staying alone while taking their TB treatment. The study discovered that some TB patients that had participated in this study had once forgotten to take their treatment more than once. Patients who had family support indicated that they had forgotten to take their treatment when their family members had not reminded them, or when they were away from home. Family support plays a major role in improving TB treatment adherence. Participants from key informant interviews and focus group discussion alluded that good support and care in terms of helping them in routine activities, monetary help, emotional and moral support, can motivate patients to complete their treatments. The study

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discovered that those patients who are supported and accompanied for treatment, reminded to take medicines, also provided with food, and other necessary support were doing well. This study concurs with the finding of the study by Saqib, Ahmad and Panezai (2019) which concluded that to cure TB, there should be a coordinated approach that includes not only clinical services to address this issue but also a strong social support system based on family and community necessary throughout the treatment process.

6.3 Patients related factor

The current study identified that patients related factors affect TB treatment adherence in the community. Key informant and focus group participants echoed that the use of alcohol and substance abuse, comprehensive knowledge about the disease and treatment, change of residential address, including age factors affect patients' ability to complete TB treatment which result in poor patient outcomes.

6.3.1 Use of alcohol and substance abuse

The findings of this study revealed that the use of alcohol and substance abuse is problematic in the community as it poses more risk for TB patients not to adhere to their treatment. Phase 1b of this study revealed that about 31.8% of patients confirmed that were still take alcohol even when they were on treatment. Health care workers indicated that during counselling they do indicate to patients not to use alcohol while they are on treatment. About 17.3% confirmed that they still smoke tobacco while they are on treatment. Patients were not willing to disclose if they do take illicit drugs including nyaupe during their treatment. However key informant participants disclosed that were not adherent to their treatment because of the behaviors and attitude which makes it easy for them to forget to take their treatment.

The study further discovered that it was not easy to DOT those patients as they spent most of their times at the shebeens where they did not want anyone to follow them. Some would hide immediately they see DOT supporters as they did not want people to know that they were sick. Key informant interviews and focus group discussions revealed that alcohol and abuse substance does not only affect TB patients, but it also affects those around them. Patients were identified to spread the disease in the communities as they spend time in overcrowded places that are poorly ventilated like shebeens clubs, or social venues where it is easy to spread infection.

The findings of this study agree with the findings of the study by Pasipanodya, Srivastava, and Gumbo (2012) which indicated that patients who do not consume alcohol are likely to

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adhere to their treatment compared to those who do consume alcohol. Patients who engage in heavy episodic drinking, have been shown to have delayed culture conversion and higher rates of treatment failure, relapse and death. Literature shows that heavy alcohol use impacts retention in care and is associated with missed follow up visits as it is not easy to monitor such patients (Theron, Peter, Zijenah, Chanda, Mangu, Clowes, Rachow, Lesosky, Hoelscher, Pym, Mwaba, Mason, Naidoo, Pooran, Sohn, Pai, Stein & Dheda, 2015). Furthermore, another study by Barr, Helms, Grant and Messaoudi (2016) suggested that chronic alcohol use has a greater detrimental effect on the immune response to TB. The study also supports the concept that problem alcohol users who consistently take their medications will have worse treatment outcomes compared to those without problem alcohol use.

6.3.2 Comprehensive knowledge about the disease and treatment

According to the findings of this study, it was revealed that lack of knowledge about the disease and its treatment affect adherence. This study discovered that patients' lack better understanding of TB as they still have different believes about the disease. As a result, some patients do not understand why they need to take treatment for the period of six months or more. The researcher explored the knowledge of TB patients in phase 1b of the study. Both phases discovered that there are patients who still do not understand TB and its treatment. The researcher has identified association between education and knowledge. Only about 15.5% of the patients had tertiary education. Key informant interviews and focus group discussion discovered that majority of patients have limited knowledge about TB and as a result they delay seeking care and increase the risk of transmission in the communities.

About 93% of the patients acknowledged that they were not aware they could be having TB before their diagnosis. Regression analysis shows that female was found to be slightly not having no knowledge of TB before diagnosis compared to male. Men had better knowledge about TB compared to women, and this could be due to access to better, education and wealth, which in turn increased their access to health information and care. In addition (Datiko, et al., 2019). About 73.9% only learned about TB after they were diagnosed. While 26% indicated that they had no knowledge of what causes the disease. Regression analysis further showed that TB knowledge before diagnosis was low among patients who had education level lower than secondary school. This agrees with the patient-level study in that was done in Ethiopia which showed that knowledge about TB among TB patients was low and it was affected by education status of the patients. A patient-level study in Ethiopia showed that knowledge about TB among TB patients is just as low as in the general population (Gelaw, 2016). Only 65.7% had knowledge of how TB spread from person to

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person. Literature shows that patients' understanding of the disease and treatment including the duration required to take treatment and the consequences of defaulting has influence on adherence (Fernandez-Lazaro, García-González, Adams, Fernandez-Lazaro, Mielgo-Ayuso, Caballero-Garcia, Racionero, Córdova & Miron-Canelo, 2019).

The current study revealed that patients had inadequate knowledge about TB even though they were provided with counselling and health education. Key informant participants revealed that majority of patients are not educated, and it was not easy for them to understand the disease and the treatment comprehensively. Treatment adherence appeared to be facilitated where patients had better understanding. Friis, Lasgaard, Osborne and Maindal (2016) found that individuals with long-term diseases had more difficulties in comprehending provider health information compared to the general population. Low education level was identified as one of the multiple commodities that contribute to difficulties in comprehending health education. Fredericksen, Gibbons, Brown, Edwards, Yang and Fitzsimmons (2018) stated that there is a lot of misconceptions and lack of understanding of the purpose of medications among the chronically ill. Other study has shown that inadequate level of health literacy is related with underutilization of preventive healthcare services (Goto, Ishikawa Okuhara & Kiuchi, 2019).

6.3.3 Change of residential address

This study discovered that change of residential address had impact on treatment adherence. The study revealed that there are patients who frequently change their residential address and not inform the facility. Patients who were working in the farms were addressed to be forever changing their address because they were looking for better opportunities. Immigrants were identified to move back home without communicating with the facility for proper transfer out. Some homeless people would not disclose to the facility their status. Some patients would provide the facility with a wrong address and it was not easy to trace them when they default so they can be returned to care. It was also discovered that some patients would change address and have a difficulty of accessing the health facility because of the distance they must travel, and travel cost required for them to get to the facility.

Participants from the key informant interviews and focus group discussion also echoed that the proportion of people living in a temporary residence is high amongst the immigrants. This proposition is also affected by the fact that most of them do not have permanent jobs, they seek accommodations whenever they get a piece jobs in certain location. The findings of this study concur with the study by Ruru, Matasik, Oktavian, Senyorita, Mirino, Tarigan, van der

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Werf, Tiemersma and Alisjahbana (2018), which stated that patients with a history of changing residential addresses were independent risk factors for non-adherence during TB treatment.

6.3.4 Age factor affecting adherence

Age was found to be affecting treatment adherence as independent variable. Key informant interviews and focus group discussions discovered that elderly patients were likely not to adhere to their treatment especially if they experience side effects. They were identified as stubborn people who do not want to listen. It was hard for them to understand the health education. Participants indicated that their family members are the ones who are likely to influence their adherence, but than that it was difficult for the health care workers to influence them. Attitude and behaviour of the old age was discovered to play a role in treatment non-adherence. Participants further stated that older patients often find medication adherence difficult, as the use of multiple medications create challenges.

The findings of this study agree with the finding of the study by Shruthi, Jyothi, Pundarikaksha, Nagesh and Tushar (2016) which stated that elderly patients may not be fully compliant to long term medications due to different reasons such as drug adverse effects, drug interactions, forgetfulness, and lack of family support. Another study stated that approximately 90% of older adults suffer from more than one chronic disease, and over 69.7% of those aged 65 years and older have multiple chronic conditions, which may result in difficulty in the medication regimen (Ministry of Health and Welfare, 2014).

6.4 Treatment related factors

Treatment related factors were among the cause of poor adherence to TB treatment. Treatment side effects, duration it takes to complete full course of treatment and co-morbidities were reported to contribute for poor adherence in this study. Phase 1a of the study revealed that due to those factors, most patients do not feel the need to continue with the treatment.

6.4.1 Treatment side effects

According to the results of this study, it was discovered that treatment side effects cause's patients to stop taking treatment immediately they start experiencing side effects related to the treatment. Patients revealed that treatment burden makes them not to cope with their day-to-day activities at work. In both phases of this study patients revealed different kinds of drug side effects they have experienced. The researcher further explored reasons that could make one to stop taking treatment, about 48.3% indicated that treatment side effects can

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cause one to stop taking treatment. The study further revealed that there is poor communication between the health care providers and patients as soon patients indicated that they were not informed of the treatment side effects, however they were only informed after they had experienced them. The study discovered that some patients felt that health care providers were not supportive during the time they were experiencing side effects, however some acknowledged the support provided to them with management of side effects. The study shows that some of the patients who were provided with support revealed that they were not satisfied.

This is supported by the similar findings which stated that patient's adherence was affected by treatment side effects which often happen during the intensive phase of treatment, therefore patients did not feel the need to continue with their treatment (Gugssa, et al., 2017). Gebreweld, et al., (2018) in their study revealed that patients stopped taking their treatment after they had experiences of drug side effects which made some of them to believe that the treatment was worsening their condition. A stud by Aibana, Dauria, Kiriazova, Makarenko, Bachmaha, Rybak, Flanigan, Petrenko, Becker and Murray (2028) alluded that treatment side effects compounded patient's negative experience with treatment and served as a barrier to adherence. The findings of the current study agree with the study by Gugssa, et al., (2017) which stated that were not fully informed about the treatment side effects and there was a poor interpersonal communication between the patient and their health care providers as there was a gap in addressing clear and accurate information related to the treatment.

6.4.2 Duration of the treatment

This study discovered that patients were more concerned about the duration of the treatment required for one to complete the course of the treatment. Patients who did not get well were more discouraged to continue, they appeared to be more demotivated. This was stated by participants from key informant interviews that patients who got well very fast were likely to discontinue their treatment as they are worried about the duration it takes. In phase 1b of the study the researcher explored the reasons that could make one stop taking treatment, some patients indicated that the duration it takes to complete the course of the treatment is very discouraging and could make one to discontinue the treatment. The study discovered that the duration of the treatment was a concern to some patients as they did not want to take treatment with them at work, and they indicated that they wished the duration could be shortened so they could take leaves and take treatment at home. Prolonged duration of TB treatment impact negatively patients' adherence as it affects their daily routine activities. This factor could cause challenges for the patients and their families because it exhausts them

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financially, physically, and psychologically as they are likely to lose their jobs because they could not deliver positive results for a long period of time.

These findings are concurring with the findings of the study by Dueñes and Cardona (2016) that found that the lengthy course of TB challenges both patients and their families financially and emotionally, resulting in non-adherence to treatment. Similar study found that long treatment period posed as barriers to treatment adherence (Gebreweld, et al., 2018). Another study stated that prolonged treatment has psychological impact to the patients as they remain isolated from their families for long time (Aibana, et al., 2018). The study further found that prolonged treatment risks the family's income as some had lost their jobs and remained unemployed for the duration of their treatment.

6.4.3 Co-morbidities

The study discovered that co-morbidities have negative effects on adherence to TB medications. It was revealed in phase 1a that patients who are co-infected are more likely not to adhere to their TB treatment. Patients revealed that the increase in pills burden poses more risk of developing treatment side effects, which is why they fail to adhere to their treatment. The study revealed that there is association between adherence and co-infection, as co-infected people have difficulty in adhering to their treatment. The findings of this study concur with the study by Adane, et al., (2013) which found that co-morbidity raise concerns as they have negative effects on adherence to TB medications. Kigozi, et al., (2017) cited a similar study which found that there is association between clinical factors and treatment default. The study further reported that HIV co-infected patients and those with an unknown HIV status are at a higher risk of treatment default compared to other general patients.

6.5 Socio-economic factor

The analysis of this study to examine socio-economic factors associated with adherence to TB treatment. The study revealed that high unemployment rate, lack of transport and distance patients travel to the facilities, and lack of food were associated with poor adherence. The study further revealed that low income, were associated with an increased risk of treatment interruption.

6.5.1 High unemployment rate in the community

The study revealed that there is poverty in the community as people are not working due to high level of unemployment rate in South Africa. The findings of phase 1b of the study shows that about 70% of the TB patients who participated in the study confirmed that they were unemployed. About 65.7% disclosed that they had no source of income, the number was low

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compared to those who were unemployed since some were on social grants even though they were unemployed. The study discovered the association between poor living standards due lack of employments and non-adherence as echoed by key informant participants. The findings of this study agree with other similar study that revealed that poor patients lack basic resources for day-to-day survival which is a likely consequence of poverty that led to non-adherence (Ndwandwe, Mahomed, Lutge & Knight, 2014). A study by Tola, et al., (2015), stated that, financial burden was the main cause of treatment interruption as most TB patients disrupted their treatment due to poverty.

The study further revealed that, patients who were living in poverty-stricken background were assisted to get social grant to assist them while on treatment. These findings discovered that, patients were dependent on the grant as it met their needs and did not want to complete their treatment as they did not want the grant to be discontinued. These findings concur with similar study by Lutge, Lewin and Volmink (2014), which stated that, social grants are an important, and even crucial, means of survival for the poor. The study raised concern about the impact of social grant as patients would develop dependency on the grant which is a widespread concern in the country.

6.5.2 Lack of transport and distance travel to the facility

Inaccessibility of health services, due to lack of transport and distance required for patients to get to the facility especially for those who came from remote areas or working in the farms, was reported to have profound effects on adherence to TB treatment. The study discovered that TB treatment non-adherence and lost to follow up were affected by lack of transportation cost where there was a need for patients to use transport to visit the health care facility for their follow up visits. Key informant interviews and focus group interviews disclosed that majority of patients do not want to take treatment at the nearby facilities. They further disclosed that most of the patients miss their follow up visits due to lack of transport money. Patients who are taking treatment at the nearby facility do not have a challenge of transport as they walk to the facility unless they are not well.

The study further revealed that about 49.2% of TB patients travel between 0-5kms, 38.1% travel between 6-10 kms, 4.3% travel about 11-20kms and only 8.2% were traveling above 20kms. Due to high level of unemployment rate in the communities, about 28% who required transport cost to go to the facility depended on family and friends, while only 12.5% had a source of income. About 41.4% disclosed that it cost them between R10-50 to get to the facility. Although some patients indicated that they had sources of income, but the study

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discovered that about 36.7% did not always have money to go to the facility for their appointments.

The study agrees with the similar study which shows that lack of opportunity to work which pose a subsequent financial difficulties and transport problems to access to health services influence treatment adherence of TB patients (Gugssa, et al., 2017). A study by Gebreweld, et al., (2018), stated that, majority of the TB patients who participated in the study reported that distance to the clinic acted as enabler to follow their treatment regimen. The study further indicated that some patients indicated that there were no means of transport in their villages, they had to walk a long distance to the nearest village to get transport. Patients are also worried about being able to get transport money for the period of six month as it is challenging. This study revealed that 41.5% of the patients incurred high costs for transport to reach the clinic, and those problems make it difficult to take TB treatment readily because they are unemployed, and their family or relatives cannot always provide them with financial support. A similar study found that TB patients experience problems concerning shortage of funds for transport because they are too weak to reach the facility on foot (Widjanarko, Gompelman, Dijkers & van der Werf, 2009).

6.5.3 Lack of food while taking treatment

Although it is important for patients to adhere to their TB treatment, but the study revealed that some patients were unable to adhere to their treatment because of lack of adequate food while taking treatment. Both phases revealed that some patients do not always have adequate food available all the time, even though only 5.8% indicated that they always have food available to take with medication. Lack of adequate food has impact on treatment adherence, as participants indicated that the drug make them hungry. The study shows that patients believed that lack of inadequate food was associated with more severe side effects and a difficulty to tolerate the drugs. Participants from key informant interviews mentioned that participant who are from poverty-stricken backgrounds are assisted to get food parcels. Although the study revealed that some patients do not like the food parcel that is provided, however there are some who interrupt their treatment so they can continue to get those food parcels.

The findings of this study are concurring with the findings of the study by Gugssa, et al., (2016) which revealed that majority of patients believed that the amount and quality of food that should be provided must be proportional to the possible side effects of the drugs taken, as they believed that drugs could be harmful on an empty stomach. Patients mentioned that it was better not to take treatment if one had not eaten. A study by Gugssa, et al., (2017),

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stated that, non-adherence was also worsen by the lack of food security whilst taking TB treatment.

6.6 Healthcare and health system factor

The findings of this study discovered that healthcare and health system such as facility operating hours, long waiting hours, attitude of health care workers towards the patients and medicine availability. Participants revealed that health system and the attitude of the healthcare provider act as barrier to some of the patients to adhere to their TB treatment.

6.6.1 Facilities operating hours

According to the findings of this study, patients had a concern regarding facility operating hours, as some of them were working. About 47.8% stated that the convincing facility operating hours is from 6:00am to 17:30pm, while 37.6% indicated that the best operating hours should be from 8:00am to 20:00pm, only 14.4% stated that, the most convincing operating hours should be from 5:30am to 16:30pm. Some patients raised concern that they were unable to collect their treatment during the day as they are working. The study discovered that some patients were working far, and they only get home after the healthcare facilities were closed. Similar study supported this finding by showing that some patients were referred for treatment, but because facility operating hours which clutches with their working hours, they could not access care. Patients were concerned that if they waited for care, they would be late for work and they would lose their employment. Those patients were even afraid to tell their employers about their diagnosis due to fear of losing their positions (Skinner & Claassens, 2016).

6.6.2 Long waiting hours at the facility

This study revealed that even though TB patients are put in a fast queue, however some patients do not honour their appointments due to various factors, as a result when they visit the facilities, they make the queues to be long and also impact the waiting time. The study further revealed that the waiting time is also impacted by health education provided to the patients. Healthcare workers indicated that it is important to attend their patients holistically so they do address any challenges they might be experiencing. On a normal day about 75.35 indicated that their waiting time can be just an hour. The study also discovered that some patients appreciated the effort the health care workers put for them to give their treatment quickly and efficiently, to reduce their waiting time. Similar study supports this finding that long waiting time does affect treatment adherence even though it might not result in lost to follow up (Van den Boogaard, Msoka, Homfray, Kibiki, Heldens & Felling, 2012).

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6.6.3 Attitude of health care workers towards the patients

This study discovered that attitude of health care workers contributes to patients' adherence to their treatment. Participants from the key informant interviews revealed that positive attitude of health care workers is important as it motivates patients to adhere to their treatment. However, it was revealed that unfriendly attitudes towards the patients is a major barrier to patients' adherence to treatment. Phase 1b of the study revealed that even though some patients revealed that health care workers are caring, there were those who indicated that health care workers are rude, and that might affect their level of adherence.

This study shows that relationship between the health care workers and the patients are critical to improve TB treatment adherence. TB patients feel motivated to continue with their treatment if they are loved, respected, and treated with care. Patients would not feel confident to visit the health facility if the attitude of the health care provider is bad, this will drive them away and they will not follow any instruction given to them. Similar study supported this finding as it stated that negative attitudes make patient to lose confidence in the health care workers and make them to feel threatened, not loved, or respected and this could drive them away and not continue with their treatment leading to interruption and eventually failure or default from the treatment (Ibrahim, Hadjia, Nguku, Waziri, Akhimien, Patrobas & Nsubuga, 2014).

6.6.4 Medicine availability

Even though this study revealed that medication shortage would influence treatment adherence, but there was not challenge identified regarding TB treatment shortage at the facilities. In both phases the study discovered that health care workers put more effort to ensure that TB treatment is available at the facilities. Key informant interviews disclosed that they check medication availability a day before patients' appointments. Clinicians further revealed that they are aware that medication unavailability can affect TB treatment adherence. Similar study revealed that drug supply appeared to be consistent at the facility as none of the participants reported non-availability of medicines as a barrier in this study (Shet, DeCosta, Heylen, Shastri, Chandy & Ekstrand, 2011).

6.6.5 DOTS supporter's status

The findings of this study revealed that most patients do not have DOT supporter. Furthermore, the study revealed that those patients with no DOT supporters had no one supporting them to take treatment. Key informant interviews and focus group discussions revealed that patients would hide their DOT status from the health care provider. Patients were not comfortable to have DOT supporters as they were afraid that they would draw

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attention to them. Phase 1b of the study revealed that about 43.9% of the patients had no one supporting them while taking their treatment, as they do not trust DOT supporters from the facility. About 6.7% disclosed that they have DOT supporters who assist them to take their treatment. Only 5.3% of the patients who had people supporting them while taking their treatment including DOT supporters indicated that the attitude of those who are supporting them is bad as they are rude to them. The study shows that those supervised patients can complete their treatment, as providers give proper care and are able to detect treatment interruption. Providers are also able to identify any challenges and address them on time.

DOT supporters are important as they observe intake of every dose to ensure that TB patient takes the right anti-TB drugs, in the right doses, at the right intervals. Regular DOT support help to maintain a proper communication between the patient and a health worker or DOT supporter, which provides more opportunities for TB education, identification, and resolution of treatment side effects. This study shows that the challenge of DOT support package was due to the lack of trust. The stud further discovered that unsupervised patients were likely to disrupt their treatment. Similar study emphasized that DOT support should be targeted to the most vulnerable patients as they are more likely to discontinue their treatment (Getahun, Wubie, Dejenu & Manyazewal, 2016).

6.7 Conclusion of the findings

The findings of the study further revealed that even though the adherence level differ in three districts where the study was conducted (Capricorn and Waterberg district had the low adherence level and Vhembe district had highest adherence level), however, the factors affecting TB treatment adherence among TB patients are similar in all three selected districts where the study was conducted.

6.8 Summary

In this chapter the researcher discussed the findings of both qualitative and quantitative designs. The results of this study showed that TB treatment adherence is affected by the following factors: social and cultural factors, patients related factors, treatment related factors, socio-economic factors and healthcare and health system related factors. These factors were discovered to affect patients differently and they are likely to lead into treatment disruption. The study showed that TB treatment interruption can be affected by the patient's perception about the disease and treatment, knowledge of the disease and treatment, patients' behaviour such as substance and alcohol abuse, patients' beliefs, stigma, lack of support, attitude of care giver, lack of food, employment, and transport money. Co-infection can also affect adherence even though the association differ from patient to patient. The

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major factor affecting treatment adherence in this study was lack of knowledge about TB and its treatment. There is a need for health care worker to further understand more factors that might affect adherence as some of them differ in specific settings and address them on time to improve adherence. TB is a complex health problem and there is a need to develop multilevel components intervention that will address different factors affecting treatment adherence identified in this study to meet desired cure rate. The intervention strategies should also be able to meet community needs. The next chapter presents the development of intervention strategies to improve TB treatment adherence.

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CHAPTER 7

DEVELOPMENT OF INTERVENTION STRATEGIES TO IMPROVE TB TREATMENT ADHERENCE

7.1 Introduction

The preceding three chapters have presented the results and the discussion of the study. This chapter presents the development of intervention strategies to improve TB treatment adherence in Limpopo Province. The intervention strategies are aimed at solving the problems, improving, or changing a situation. Findings of qualitative and quantitative were used as basis to develop strategies to improve TB treatment adherence. A one-day stakeholder workshop was conducted and was guided by stages two and three of the BCW framework. In preparation to the workshop for intervention strategies development, the researcher conducted a systematic literature review with four methodological steps as shown in chapter 3 of the study. COM-B was used to analyse the results to identify what needs to change, with those data the researcher used the taxonomy BCTv1 to identify the most appropriate strategies for facilitating behaviour change in the intervention. Delphi technique was used to reach at the group opinion or decision by surveying a panel of TB experts within the province. The developed strategy was then validated using a quantitative checklist with the group of TB expects to see if they meet APEASE criteria. This section covers the following discussions: workshop with the stakeholder, approach used to develop the strategy, validation of developed strategy, implementation and evaluation of the study, and limitation of the study.

7.2 Workshop with the stakeholder

A one-day workshop was conducted with three district TB managers from Capricorn, Waterberg, and Vhembe district as they are leading the TB programme within the districts where the study was conducted. The main purpose of the stakeholder workshop was to develop the evidence-based intervention strategy which is feasible or practical in typical community settings. However, because of COVID-19 restricts the team conducted a virtual workshop. A presentation was sent to the district TB managers, the researcher then presented the research findings of phase 1a and phase 1b to the stakeholders who confirmed the research findings to be correct as they were included during data collection. Through stakeholder engagement and review of the literature, the team then generated a list of potential target behaviours that addressed the problem of TB treatment non-adherence amongst TB patients. The district managers then assessed the suggested strategies and

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confirmed the availability of the resources within the communities to carry out the suggested strategy to improve TB treatment adherence.

7.2 Approach used to develop intervention strategy

The purpose of the current study is to develop intervention strategy to improve TB treatment adherence. Several theories exist which explain or predict health behaviours, for example the Health Belief Model (Coulson, Ferguson, Henshaw, & Heffernan), the Theory of Planned Behaviour (Kan & Fabrigar 2017), Social Cognitive Theory (Shamizadeh, Jahangiry, Sarbakhsh & Ponnet, 2019) and the Theory of Reasoned Action (Nguyen, Hens, MacAlister, Johnson, Lebel, Tan, Nguyen, Nguyen & Lebel, 2018). Most of these theories are insufficiently broad to explain all the determinants of health behaviour, and most of them have overlapping constructs, and choosing one among many theories may be problematic for those involved in designing interventions (Lipworth, Taylor & Braithwaite, 2013). To address this issue, Michie, et al*.,* (2014) developed the BCW, a synthesis of 19 frameworks of behaviour change, specifically to guide the design of behaviour change interventions. The development of intervention strategies to improve TB treatment adherence was guided by BCW and its functions to enhance the development of the intervention as detailed in chapter 2 of the study.

The reason for using BCW was because, improving the implementation of evidence-based practice and public health depends on behaviour change. Thus, behaviour change interventions are fundamental to the effective practice of clinical medicine and public health (Michie, et al*.,* 2014). The utilization of the Behaviour Change Wheel Framework enabled a systematic and theory-driven approach to be taken to the development of a behaviour change intervention to improve TB treatment adherence within the community. The researcher believed that this framework is effective in designing the intervention that is appropriate to bring a change. According to Mangurian, Niu, Schillinger, Newcomer, Dilley, and Handley (2017), public health administrators should consider using BCW systematic frameworks in addressing some of the most major complex systems-level problems, as it proved to be a practical way of using theory to inform the development of an evidence-based integration of care solution that may result in significant public health implications. BCW was developed to help researchers transition from the behavioural diagnosis of a problem to the design of an intervention (Michie, et al., 2014).

The BCW is a comprehensive framework for designing interventions by explicitly integrating behaviour theory to understand and target mechanisms of action within the intervention. The wheel has three layers as shown in Figure 2.1; at its core, it has the COM-B model

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comprising Capability (physical and psychological), Opportunity (social and physical) and Motivation (automatic and reflective) (Table 7.1 displays the full definition of each sub-component). Michie, et al., (2014) proposed that people need these three factors to enhance the likelihood of performing the behaviour in question. The COM-B is supported by the Theoretical Domains Framework (TDF) which describes 14 factors from 33 theories of behaviour change that fall under the categories of Capability, Opportunity, and Motivation. This allows for a more parsimonious organization of potentially influencing behaviours than having to deal with multiple, and often complex, theories.

The second layer of the BCW comprises nine intervention functions (Education, Persuasion, Incentivisation, Coercion, Training, Enablement, Modelling, Environmental Restructuring and Restrictions) (see Table 7.1 below for definition of each intervention function). These are how an intervention might change behaviour and have been linked to a taxonomy of 93 replicable behaviour change techniques (BCTv1) which are considered 'active ingredients' of behaviour change. Each intervention function is likely to consist of several BCTs and any one BCT may serve several functions.

Matrices linking COM-B with intervention functions allow intervention designers to be systematic in their selection of intervention functions depending on the results of the COM-B analysis of behaviour (see Table 7.2 below). For example, to change physical capability-related factor influencing TB treatment non-adherence, education, training, or enablement can be used as intervention functions. To address automatic motivation-related factors influencing treatment non-adherence, persuasion, incentivisation, coercion, environmental restructuring, modelling, or enablement are appropriate intervention functions.

The final layer of the wheel comprises seven policy categories that can be used to support the delivery of the intervention functions (see table 7.3 below). Using the structured approach of the BCW, starting with the COM-B model, offers clarity to the process of intervention development and facilitates its subsequent implementation and evaluation.

This stage of the study describes the development of the intervention strategies using the COM-B model, the BCW functions and the BCT-Taxonomy (v1). BCW (including COM-B) provide a comprehensive eight stage process to intervention design: i) define the problem, ii) select the target behavior, iii) specify the target behavior and identify iv) what needs to change, v) intervention functions, vi) policy categories, vii) behavior change techniques (BCTs) and viii) mode of delivery. This study followed these eight-stage process to develop the intervention strategy.

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7.2.1 Step 1: Define the problem to be addressed in behavioural terms

Although there are multiple factors that influence TB treatment non-adherence amongst TB patients, the first step according to the BCW model is to identify a specific problem and define it in behavioural terms. According to the findings of this study, TB factors contributing to TB treatment non-adherence identified through qualitative and quantitative study were defined and described in this step using COM-B (capability, opportunity, motivation) components. Even though the study has discovered various factors affecting TB treatment adherence, however the forum focused on the specific problem affecting TB treatment adherence that can be addressed in the current study.

Capability: The capability component refers to whether the person or persons identified as carrying out the targeted behaviour change is physically and psychologically capable. The capability' related factors influencing TB treatment non-adherence identified were lack of comprehensive knowledge about the disease and its treatment, cultural and religious factor, alcohol and substance abuse, treatment side effects and patients' denial. The findings of this study revealed that patients lack knowledge of TB and its treatment. About 72.9% of patients who participated in this study indicated that they only knew about TB after their diagnosis while 17.9% indicated that they only knew about TB during their diagnosis and only 9.2% said they knew about TB before their diagnosis. Therefore, there is a major gap in terms of TB knowledge in the communities. TB patients indicated to be afraid to disclose their status due to fear of discrimination which is influenced by wrong perception about TB and its treatment in the communities. The study further identified that lack of knowledge affect health seeking behavior as patients indicated to seek help from the religious and traditional healers before they could visit health facilities. This problem also causes TB transmission and incident rate to increase in the communities, as patients default their treatment while the treatment success rate drops. The behavioral diagnosis indicated that in order to achieve the target behavior of TB treatment adherence, there was a need for change in psychological capability, physical and social opportunity, and reflective and automatic motivation for the target behavior.

The study discovered that patients visit traditional healer or religious healers such as the prophets, before and after their TB diagnosis, which is influenced by lack of knowledge. Patients who visited traditional or religious healers indicated that they have strong trust in their culture or religion or tradition. The study indicated that some patients are in denial regarding their TB status, they do not believe that TB is a natural disease. Some believe that they are bewitched, and some believe they have evil spirits. Some patients believe that they are being punished by the gods for having bad sexual immorality. Other patients related

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factors identified in this study were substance abuse and alcohol consumption. Alcohol and other substances abuse such as illicit drugs were found to alter individuals' behavior, thus patients may forget to take their medications therefore leading to poor compliance. Another factor identified in this study is treatment side effects. Patients indicated that they find it hard to continue with their treatment as their families that believe in tradition always mock them when they experience treatment side effects and tell them that the treatment does not work. Patients who are co-infected indicated that treatment side effects are unbearable. Adults between the age of 55 and 65 are not easy to convince to continue taking their treatment once they experience treatment side effects. About 48.3% indicated that treatment side effects can make one not to complete their treatment.

Opportunity: represents environmental factors that affect the capability to perform a behaviour and has physical (e.g., time, physical environment) and social (e.g., interpersonal influences, social cues, cultural norms) domains. The study identified that social factors are affecting TB treatment adherence. Lack of information when patients visit the health facilities, where health care workers are not utilizing the opportunity to give enough TB information as they are using consent form to provide TB counselling represents a social opportunity barrier. Enough TB information is crucial to change perception about TB within the community. Lack of information concerning the potential treatment side effects and consequences of not completing TB treatment that will motivate patients to continue taking their treatment. The social factors identified in this study influence fear to disclose one's status to the family, and lack of support from the family and community. This study shows that TB patients are afraid to disclose their status as they fear to be discriminated and isolated. The study reveals that fear of stigma and discrimination are among the foremost barriers to TB disease prevention, treatment, care, and support within their communities. They also impact health seeking behaviour as patient are afraid to be isolated.

Motivation: The motivation component is defined as the intellectual processes that lead to the behaviour change and includes habitual processes, emotional responses, and decision-making. The findings of this study identified that patients are affected by TB treatment duration. Patients indicated that they were not motivated to continue with their treatment because the treatment duration is long and at times, they feel like the treatment is not effective especially if they develop treatment side effects. Another factor identified affecting treatment adherence is TB co-morbidity, as patients who are co-infected indicated that they find it hard to cope with multiply drugs that need to be taken every day. The study also identified that patients were also embarrassed to be seen at the healthcare facility or carrying around own medicine due to high level of stigma and wrong perception about TB in

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the communities. Poor quality communication with healthcare providers were perceived by participants to be the main motivators of treatment non-adherence. Patients indicated that the attitude of the healthcare workers caused them not to be motivated to return to the facility to collect their treatments. In addition, poor-quality communication between patients and healthcare providers, was identified as the driver of non-adherence.

7.2.2 Step 2: Select the target behaviours most likely to bring about change to address the problem

After defining the problem, the next step was to select the target behaviours that is likely to bring the change to address the identified problem that is affecting TB treatment adherence. Since behaviours do not happen independently but rather in a system. The main important task in this study was to understand the situation of other behaviours relevant to change the behaviours of TB treatment non-adherence amongst TB patients.

The team then used a list of BCW criteria to estimate the likelihood and promise of each potential targeted behaviour. These criteria involved assessing the likely impact of the behaviour change, the likelihood of the change occurring based on the capability, opportunity and motivation of the target group, the spill over effect of the behaviour change, and the ease of measuring the behaviour. The team independently reviewed the various criteria, and any disagreements were resolved through discussion and group consensus. The prioritization process maintained the target behaviour identified in Step 1: intervention strategy that can ensure that TB patients have comprehensive TB education and information is important. In this study the researcher used COM-B components to describe what needs to change to improve TB treatment adherence in Limpopo province.

Capability: The forum indicated that to improve TB treatment adherence, it is important to target self-efficacy and skills. The team also indicated that self-efficacy can be enhanced through verbal persuasion or improving physical and emotional state of the patient and motivate patient self-monitoring themselves.

Opportunity: The study identified that in terms of opportunity the target behaviour that is most likely to bring change is family and community support as well as minimizing the stigma and discrimination in the community.

Motivation: The findings of this study revealed that patients were not motivated to adhere to their TB treatment. The team identified rewarding in terms of praising of the patients,

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reinforcement to strengthen future behavior and modelling through involvement of TB ambassadors.

7.2.3 Step 3: Specify the target behaviour in as much detail as possible

Capability: Due to lack of knowledge patients lack required skills to perform the task of TB treatment adherence. Targeting self-efficacy and the social skills is important as it make patients to focus on the task of treatment adherence and completion rather than worrying about the disease. Enhancing self-efficacy cause patients to believe on their capacity to carry out the task. To achieve self-efficacy, it is important to give patients confidence through health education messages that they can perform the tasks of treatment adherence until they complete their treatment. Patients will also be assisted to observe the success of other patients as that can enhance self-efficacy. The study identified that patients require verbal persuasion to bring the change to the problem. Verbal persuasion will involve health care workers or community health workers convincing TB patients that they have the capability to perform a task of treatment adherence successfully. Clear messages will be provided to patients with instructions, and they will be encouraged to put that into practice to increase self-efficacy and skills. It is important to improve physical and emotional state of the patients. Patients will be empowered to value themselves and be able to care for their emotional state. Patients will also be empowered to self-monitor themselves. They will be motivated to make use of the diary when taking their treatment every day, this will help them to see when they miss their treatment and identify what makes them miss their treatment. For example, if patients miss their treatment when they go to shebeens on weekends, they will be able to see and ask what can be done better to minimize the risk of missing their treatment. This will also assist patients to gain problem solving skills and decision-making skills.

Opportunity: The identified target behaviour under opportunity was to enhance family and community support as well as reduction of stigma and discrimination within the community. The study identified that patients were not supported while taking their treatment. Some of the reasons why they were not provided with support was because family lack knowledge about TB, and as a result they do not understand what is expected from them. The study shows that patients who were supported showed good clinical progress and that it is also important for patients to be supported. To reduce stigma and discrimination within the community and improve family and community support, it is important to empower the community with knowledge to be able to carry out the task.

Motivation: The findings of this study revealed that patients were not motivated to adhere to their TB treatment. The study identified rewarding of the patients as one of the targeted

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behaviours that is most likely to bring change. Rewards can be in a form of praise, where patients are praised for adhering to their treatment for a month. Facility can also recognize those patients who have been consistence to their treatment as TB champions. Another target behaviour identified under motivation is reinforcement as it will strengthen future behaviour. TB patients who were not coping well when they started their treatment, but adjusted and show improvement, can be used to share their story with other patients, as it will motivate them. It is important to make use of real stories and real people known in the community as this will bring about a real change. Another target behaviour identified is modelling where TB ambassadors will be involved as models for TB patients to learn from them.

7.2.4 Step 4: What needs to change to achieve the targeted behaviors?

To identify ways to facilitate the targeted behaviors change, this step was aimed at examining the current condition regarding the activities of the performers. While the study defined the problem as TB treatment non-adherence influenced by various identified factors, and the target behaviour as enhance self-efficacy, social skills, change feelings associated with adopting behaviour, change beliefs about other peoples' behaviour and approval of recipients' behaviour, prompt and elaborate goals and goal priority, establishing behavior using rewards, foster a positive behavior related identity and facilitate behavior change by prompting environmental change, we had to specify who would be engaging in this behaviour and determine whether it was feasible for those identified to be completing the behaviour. To do that the team applied the study findings to the three broad BCW components to be examined to achieve a target behavior: (1) capability, (2) opportunity, and (3) motivation (COM-B). These components affect one another. For example, opportunity can influence motivation as can capability; enacting a behavior can change capability, motivation, and opportunity.

Capability

To achieve the target behaviour, there is a need to enhance self-efficacy and social skills amongst TB patients. It is also important to change the risk perception of the patients about the treatment. If patients believe they have the capacity to change behaviour, this will help them to take TB treatment regularly. It will also empower them with problem solving skills and decision-making skills. They will know what to do when they experience treatment side effects, and they will be at a better position to make adequate decision.

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Opportunity

The opportunity of environmental context and resources were discussed, and the team agreed that to achieve target behaviours there is a need to change the beliefs about the benefits and costs of behaviour. There is also a need to change feelings associated with adopting behaviour and change beliefs about other peoples' behaviour and approval of recipients' behaviour. To achieve those behaviour, change there is a need to provide comprehensive TB information to the community to reduce stigma and wrong information about TB at the community level. Traditional healers and religious leaders must be prioritized so that they will be able to refer TB patients to the health care facility and provide them with support while taking their treatment.

Motivation

Participants reported that both automatic (e.g., desires, habits) and reflective (e.g., conscious planning) motivation were important to target in the intervention for behavior change to occur. In terms of automatic motivation, the team reported that patients lack motivation to take treatment regularly. Reinforcements (TDF domain) such as prompt and elaborate goals and goal priority, establishing behavior using rewards, foster a positive behavior related identity and facilitate behavior change by prompting environmental change were important to improve TB treatment adherence. Modelling will be applied in this component, where TB ambassadors will be appointed to share their experiences on how they managed to adhere to their treatment until they completed treatment duration. Patients will be able to ask questions regarding issues related to their personal experiences. TB ambassadors will be able to share experiences that will assist patients to make appropriate decisions.

The current study applied then TDF in this step to integrate relevant theoretical constructs to further inform the development of the current intervention. Since each domain of the TDF correlates to a COM-B component, using the two together allows for an expansion of the COM-B components into very specific domains. Using the COM-B model and the TDF, the researcher together with stakeholders performed a behavioral diagnosis to determine what needed to change to enable TB patients to adhere and complete their prescribed TB treatment to improve treatment success rate and reduce TB treatment defaulter rate and TB death rate in the community.

The team during data collecting asked participants to suggest what needs to be done to impact behaviors change amongst TB patients. The researcher further conducted systematic literature review and engaged TB expects within the districts to suggest the intervention

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strategy to improve TB treatment adherence. The information for this behavioral diagnosis came from key informant interviews, focus group discussion, quantitative survey findings, peer-reviewed literature, and stakeholder workshop discussion with TB expects. A key factor identified was that knowledge was an important TDF domain to target in the intervention. Nurses repeatedly expressed concerns about insufficient time for structured and comprehensive TB education for patients due to the overwhelming workload. Additional concerns raised were inadequate numbers of staff and a lack of TB expertise amongst staff (Marais, et al., 2019). Poor quality of counselling has impact on knowledge which further impact TB treatment adherence.

According to the South Africa Department of Health (2016), nurses should be on the frontline of educating patients about TB and supporting them to adhere to their treatment. Nurses who participated in this study, however, reported being overwhelmed by expectations that they should counsel patients, in addition to providing biomedical TB services. Nurses do complain about not having enough time to provide comprehensive health education to the patients during counselling as they are not only caring for TB patients but all other chronic patients.

7.2.5 Step 5: Identify intervention functions

Having identified the relevant COM-B components related to TB patient's behaviour that needed to change in Step 4, the team then explored how to address each of the barriers by focusing on specific intervention functions. Intervention functions are categories that more exactly describe routine activities (see table 7.4). For example, "education" can include "training," but for the purposes of facilitating behaviour change, it is important to differentiate between education and training with initial emphases on the transfer of knowledge and development of understanding and then latter emphasize more on the building of skills. The team first prioritized the intervention functions based on the previous organization of behaviour change activities (see Step 4) as any given intervention strategy could in principle cover more than one behaviour change function. Thus, the intervention categories identified from the 19 existing frameworks were better conceived of as non-overlapping functions: a given intervention may involve more than one of these. The researcher reviewed the findings of the study during stakeholder workshop with TB district managers and learned that the participants indicated the need to provide TB patients with more information about TB and its treatment. TB district manager also indicated the need to provide comprehensive health education as TB patients lack knowledge about TB and its treatment which in turn influence other contributing factors to TB treatment non-adherence.

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The researcher during data collection also discovered that nurses during counselling were using consent form to provide counselling, as they indicated that they are overwhelmed, therefore there is a need to use standardised material for counselling. The researcher also discovered the need to provide health care providers with regular training to support them while caring for TB patients. Therefore, the team openly identified intervention functions which is patient-centred, that would help support health providers while caring for TB patients, to ensure that all TB patients are provided with comprehensive TB information, counselling, and health education together with their family members who are supporting them while taking treatment.

There is a need to differentiate training from “modelling.” In common practice, modelling is a method used in training, but in this study the term was used more specifically to refer to simulated of an authority figure as a motivational driver. A third example is the use of the term “enablement.” In everyday use, this could include most of the other intervention categories, but here the term refers to forms of enablement that are either more encompassing (as in, for example, ‘behavioural support’ for treatment management) or work through other tools (as in, for example, physical decision support aids to provide guidance on medication dosage for TB).

Table 7.1 below outlines different potential intervention functions associated with the corresponding COM-B components identified in Step 4 to facilitate the target behaviour. For example, the study identified patients’ lack of transport money to go to the healthcare facilities to collect treatment. From an intervention development perspective, this problem was identified as a barrier related to the enablement. The intervention function that was selected to help patients or other staff overcome the barriers that was to enforce home-based TB care programmes to reduce catastrophic costs due to attending health facility. However, the team agreed that this is beyond this study. Then, specific strategies suggested by participants and identified from various literature were classified as corresponding to one (or more) of the BCW intervention functions. For example, strategies intended to empower patients were classified as ‘enablement’, and strategies aimed at changing patients’ attitudes were classified as ‘persuasion.’ Finally, the intervention functions comprising the specific strategies mapped to the COM-B model (see Table 7.4 below). During the stakeholder workshop, the team then evaluated whether these interventions met BCW APEASE criteria (affordable, practicable, effective, and cost effective, acceptable, safe, and equitable) to maximize capability, opportunity, and motivation to achieve the desired behaviour change. The team agreed that this intervention meet all APEASE criteria.

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Table 7.1: Definitions of interventions functions

COM-B component	Definition	Example
Physical capability	Physical skills, strength or stamina required to perform the behaviour	Instruct on how to perform the behaviour. Behaviour practice.
Psychological capability	Knowledge, psychological skills, strength or stamina required to perform the behaviour	Inform about the health consequences of not performing the behaviour
Physical opportunity	Opportunity afforded by the environment involving time, resources, locations, cues, physical 'affordance'	Demonstration of behaviour
Social opportunity	Opportunity afforded by interpersonal influences, social cues and cultural norms that influence the way that we think about things, e.g., the words and concepts that make up our language	Use TB ambassador to demonstrate the behaviour
Automatic motivation	Automatic processes involving emotional reactions, desires (wants and needs), impulses, inhibitions, drive states and reflex responses	Social support Goal setting Feedback on behaviour Action planned. Set graded task
Reflective motivation	Reflective processes involving plans (self-conscious intentions) and evaluations (beliefs about what is good and bad)	Demonstration of behaviour and provide social support
Interventions		
Education	Increasing knowledge or understanding	Providing information to promote treatment adherence
Persuasion	Using communication to induce positive or negative feelings or stimulate action	Using imagery to induce the desire for compliance
Incentivisation	Creating expectation of reward	Using self-prize draws to induce attempt to change

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		behaviour
Coercion	Creating expectation of punishment or cost	Loss of self-prize if found to be non-compliant
Training	Imparting skills	Provide initial and on-going TB information
Environmental restructuring	Changing the physical or social context	Provide support to encourage social influence
Modelling	Providing an example for people to aspire to or imitate	Engage ambassadors/ champions to share their stories for inspiration
Enablement	Increasing means/reducing barriers to increase capability or opportunity	Provide behaviour support for TB treatment adherence
Restriction	Using rules to reduce the opportunity to engage in the target behaviour (or to increase the target behaviour by reducing the opportunity to engage in competing behaviours)	Restrict patients for taking treatment without comprehensive counselling

All definitions represent original definitions given by Michie et al., (2014).

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Table 7.2: Example of a matrix of links between COM-B and intervention functions, adapted from Michie, et al., (2014)

COM-B components	Education	Persuasion	Incentivisation	Coercion	Training	Restriction	Environmental Restructuring	Modelling	Enablement
Physical capability									
Psychological capability									
Physical opportunity									
Social opportunity									
Automatic reflection									
Reflective reflection									

7.2.6 Step 6: Identify policy categories

During the development of the intervention strategy, the team considered what changes in the policies that are required to support the change in behaviour. The team also evaluated what policies will support the delivery of the intervention functions. For this study about seven policy categories to help support and endorse the interventions were considered, including communication/marketing, legislation, service provision, regulation, fiscal measures, guidelines, and environmental/social planning. The team identified which of the seven policy categories were most applicable to the identified intervention function (Table 7.3 below). The team then agreed that the policy categories that will support the delivery of the intervention function is beyond this study. For example, in this study the team intends create a patient information leaflets materials that will be delivered to all recipient of the intervention. However, the researcher intends to evaluate and implement the strategies to in a small scale to get a buy-in of policy and decision maker to consider adopting these strategies.

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Table 7.3 Definition of Policy categories

Policies	Definition
Communication/marketing	Using print, electronic, telephonic or broadcast media
Fiscal	Using the tax system to reduce or increase the financial cost
Regulation	Establishing rules or principles of behaviour or practice
Legislation	Making or changing laws
Environmental/social planning	Designing and/or controlling the physical or social environment
Service provision	Delivering a service
Guidelines	Creating documents that recommend or mandate practice. This includes all changes to service provision

All definitions represent original definitions given by Michie et al., (2014).

7.2.7 Step 7: Identify behavioural change techniques

After selecting the intervention functions and policy categories that might help deliver the intervention, the researcher identified behavioural change techniques to develop the final strategy to improve TB treatment adherence. A behavioural change technique is defined as "an active component of an intervention strategy designed to change behaviour" (Michie, *et al.,* 2014). The techniques are active elements within the intervention and leads to detectable and replicable behaviour change. The researcher determined the following behavioural change techniques which is most appropriate for this model based on the results of phase 1a and phase 1b and then reviewed by the district TB managers during the workshop who then agreed. Furthermore, the following identified behaviour change techniques are thought best to serve the previously identified intervention functions that were linked to the BCW components:

Information about health consequences

A face-to-face health education was identified as the most effective way to target knowledge about the risks of not adhering to TB treatment behaviour and the benefits of taking TB treatment regularly. Recommendation to use standardized counselling material was made to benefit the patient through comprehensive health education. Patients will be able to

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understand what to expect if they decide to stop treatment, which might make them to make informed and better decision.

Social support (non-specific) and social comparison and identification as self as role model

The intervention was designed so that patients will be able to encourage one another to adhere to treatment regularly. Patients who were not coping well during the beginning of their treatment might be asked to share their experience with patients on similar condition to encourage them by self-modelling behaviour.

Goal setting and action planning

To support behaviour change, information about how to set goals to improve TB treatment adherence and on action planning, must be explained to patients during health education and counselling. At the individual level, each participant must be provided with a paper-based diary (small A6 ring bound booklet) where they could note their goals, set an action plan of how to achieve these goals and review them regularly.

Feedback on behaviour

To motivate participants in their progress, the clinicians must provide each patient with at least face-to-face coaching sessions before and after each treatment phase and checked their progress, reviewed action plans and goals, discussed personal and social/group barriers and how to overcome them, reiterated the benefits of adhering to TB treatment.

Feedback on outcome or performance

Giving regular feedback to patients on their outcomes and progress, is important to encourage them to continue to take their treatment regularly. The clinicians must monitor patients to look for physical signs if the patient is improving and that the active tuberculosis disease is being destroyed. They must do tests to look for signs that the body is responding to tuberculosis treatment. Patients must be given feedback on overall improvement to encourage the patients. Feedback must be delivered at the individual level.

Teach to use environmental prompts/cues

Most often the environment prompts one to undertake motivated behaviour. This is mostly true of habitual behavioural routine. During the development of behaviour routines patients can be instructed on how to create and pay attention environmental prompts. Patients can

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be instructed to put a note reminder to take treatment at the bathrooms where they brush their teeth, or at the kitchen by the door fridge or next to the kettle where they make tea.

Prompt self-reward

If health care promoters cannot reward the patient for the good work their doing of adhering to the treatment, it is important to encourage patient to reward themselves for their own success. Patients can use a diary to evaluate if they have managed to adhere to treatment for the whole month, and they can take themselves. This will make them feel that they are celebrating some sort of an achievement and will boost motivation to do it every month.

Prompt organisation of social support

Social support can facilitate behaviour change. Patients must be prompt to seek for social support in their environment. Patients must be encouraged to join the TB adherence clubs around their areas or accept DOT supporters to provide them with support while taking their treatment. This will help them to remove social barriers to their planned activities.

To achieve the targeted behaviours, change of providing comprehensive TB information and education including counselling to the TB patients and their family members including the whole community at the community level. It is important for patients and their family members, including the entire community to receive comprehensive information about TB and its treatment, for support and to improve adherence. In addition, TB patients also require support while taking their treatment, so empowering their family members with knowledge will help reduce stigma and discrimination and will also improve patient status disclosure. Further monitoring of patients will help reduce the development of moderate to severe adverse events. Having regular patient satisfaction survey will help improve the services provided to the patients.

7.2.7.1 Suggested specific strategies to improve TB treatment adherence

The team identified suggested strategies to improve TB treatment non-adherence. The team identified that majority of the participants interviewed suggested more than one strategy. Some of the strategies suggested by participants were the same, and hence the results from all participants have been combined and presented together.

This list of suggested facilitating strategies to improve TB treatment adherence included:

- Providing comprehensive initial and ongoing counselling and TB education to TB patients and their close contact or family members to improve knowledge, appropriate support, and disclosure.

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- Increase the visibility of TB programmes in the communities to increase knowledge and reduce wrong perception of TB.
- Increase support from family, peers, and social networks through engaging them on TB health information.
- Provide TB education to religious leaders and traditional healers to improve their knowledge on TB so they can identify TB patients for proper referral and support.
- Conduct door-to -door TB campaign to improve knowledge regarding TB.
- Engage community TB ambassadors to educate and identify TB suspects.
- Enforce adoption of positive attitude through educating health care workers to improve quality of service.
- Utilize patient satisfaction survey to improve quality of service.
- Identification and engagement of other stakeholders within DOH working at the community level to play a key role

The team then organized and prioritized all the potential target behaviours to determine which behaviours was dependent on other behaviours, which behaviours were practical and relevant to be performed by the target group and ultimately which.

Behaviours or set of behaviours were likely to bring change. The research team then used a list of BCW criteria to estimate the likelihood and promise of each potential targeted behaviour. These criteria involved assessing the likely impact of the behaviours change, the likelihood of the change occurring based on the capability, opportunity and motivation of the target group, the spill over effect of the behaviours change, and the ease of measuring the behaviours. The stakeholder workshop reviewed the various criteria, through discussion until agreement was reached. The discussion also considered matching the needs with the capacity available to identify changeable behaviours. The discussion concluded that the major impact that is influencing patients not to adhere to their treatment is lack of knowledge, therefore it was agreed that the intervention strategy that can ensure that TB patients and the community have information is important.

The prioritization process maintained the target behaviour identified in Step 1: Provide initial and ongoing counselling and health information to TB patients and close contact or family members. However, the nurses repeatedly expressed concerns about insufficient time for structured and comprehensive TB education for patients due to the overwhelming workload. It is therefore important to develop intervention strategy that will alleviate the overwhelming

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workload from the nurses caring for TB patients. The strategy must however ensure that patients are provided with high quality service.

Table 7.4: Linking COM-B components, factors influencing TB treatment non-adherence behaviour, intervention functions and specific intervention strategies suggested by participants

COM-B Components	Factors influencing treatment non-adherence	Intervention function of the BCW	Example of a specific intervention strategy suggested by Participants	Does the specific intervention strategy meet APEASE criteria?
Psychological Capability:	Lack of knowledge about TB and treatment. Strong cultural and religious beliefs Fear to disclose the status due to stigma and discrimination. Denial about their TB status.	Education, training, and enablement	Providing comprehensive initial and ongoing counselling and TB education.	**Yes**
	Strong cultural and religious beliefs	Education	Provide TB education to religious leaders and traditional healers.	**Yes**
Physical opportunity:	Lack of information concerning the potential treatment side effects and risk of not completing TB treatment. Alcohol and substance abuse.	Environmental restructuring, Enablement	Providing comprehensive initial and ongoing counselling and TB education.	**Yes**
Social opportunity	Lack of family and community support.	Enablement	Increase support from family,	**Yes**

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			peers, and social networks	
Reflective Motivation	Perception and belief about TB. Perception about treatment duration. Co-morbidity. Old age.	Education, enablement	Conduct door-to-door TB campaign.	**Yes**
	Embarrassment to be seen at the healthcare facility or carrying around own medicines.	Enablement	Engage community TB ambassadors to educate and identify TB suspects.	**Yes**
Reflective motivation	Facility operating hours. Long waiting times at health facilities.	Education, enablement	Conduct door-to-door TB campaign. Provide comprehensive initial and ongoing counselling and TB education.	**Yes**
	Attitude of the healthcare workers. Poor quality communication with healthcare providers	Enablement	Enforce adoption of positive attitude. Utilize patient satisfaction survey.	**Yes**

7.2.8 Step 8: Identify mode of delivery

In specifying the behavioural change techniques and focusing on TB treatment adherence behaviours, the team then identified potential modes of delivering the intervention and then the team agreed that the intervention will be delivered through face-to-face using door to

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door campaign. Door to door mode of delivery was selected as it is specific to TB patients and family and community members as they also lack knowledge about TB. The selected mode of delivery was found to be appropriate for this intervention as it will encourage patients to participate during health information giving. This mode of delivery is familiar to the patients have been shown to be effective and met the APEASE criteria. Interpersonal communication is important during the adoption of behaviours therefore face to face communication will be used for delivery allowing real-time interpersonal communication. This can be achieved by giving out patient information leaflets material with detailed information about TB, TB transmission, prevention, and adherence to TB treatment. It is agreed that the researcher must educate the community health workers who will be responsible to deliver the intervention to the patients. A one-week training will be organised per district and community health workers will be provided with comprehensive training on how to deliver the material to the patients.

7.2.8.1 Patients information leaflet material

The strategy will be facilitated and delivered using Patients' Information Leaflets material" "called knowledge is power" (see Annexure H) as it was found to be more effective to close identified factors impacting TB treatment adherence. The team agreed that Community health workers will be engaged to deliver the patient information leaflets material to the community. Sustersic, Gauchet, Foote and Bosson (2017), indicated that when patient's information leaflets are well written and used at the appropriate time, they can improve patients' knowledge, patients' satisfaction and induce better adherence to treatment for patients with all clinical conditions. Patients' information leaflets are well-thought-out to be very beneficial and useful, especially for acute conditions where the patient is the first to suffer from lack of information. A study by Karuniawati, Putra and Wikantyasning (2019), aimed to analyze the effectiveness of counseling with and without leaflets, indicated that, leaflets make things easier for patients to obtain information about their treatment and has impact on patient's adherence to their treatment. A study that was conducted by Kassahun and Mekonen (2017), indicated that, patient education complemented with suitably designed information leaflet has much impact to improve patients' knowledge, attitude, and practice towards their disease management.

A study by Bekker, Naghani, Natsch, Wartenberg and van den Bemt (2020), indicated that, patients are more interested to receive and use patient information leaflets. During stakeholder workshop the forum indicated that majority of health care workers believe that, after providing patient with oral health information, it is important to provide them with written information. Written information has various advantages: it improves patients' satisfaction, it

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increases their knowledge of the condition, and it helps patients remember what was said during the consultation and limits the number of unnecessary medications requested by patients. The teams also agreed that this will limit the need to visit traditional healer and religious leaders.

The major problem that was identified in this study was that TB patients lack comprehensive knowledge about TB and its treatment which led to TB treatment non-adherence. The study discovered that, health care workers are not giving enough information during counselling as they do not use standardized counselling material. It was discovered that the material utilized during counselling is patient consent form only. Providers indicated to be overwhelmed by the workload and the number of chronic patients they must care for. Providers also mentioned that they are concerned about the time patients must spend at the facility. The use of consent form put patients at high risk of not adhering to their treatment as they lack information and knowledge to motivate them. It is therefore, important to develop patients' information leaflets material which will be utilized by the community health workers when they go to the communities.

The research forum understand that sometimes even when people have good information, they may not be motivated to change their behavior. A theory of reasoned action and planned behavior emphasizes that sometimes it is not lack of information, motivation, or behavioral skills, that inhibit action, but rather the way in which the environment impact on motivation or feasibility of action (Kan & Fabrigar 2017). What is relevant in the environment will vary according to the target behavior. It is important to counsel patients about importance of adherence, reinforced with written instructions on leaflets. It is important to use an interactive approach in education and counselling, by using open-ended questions and active listening skills, eliciting the patient's knowledge, attitudes, and practices. It is also important for this study to not only provide TB information to the patients, but also the whole community and family members to capacitate them for sustainability support. The whole support structure is important for patient to adhere to their treatment. A structured patients' information leaflets contain relevant information that encourages support from different structures such as community health workers, healthcare providers, family members and the entire community.

The reason for selecting community health workers (CHWs) to facilitate the leaflets material is because they have been selected in trust by their communities to enter their homes and assist them to improve their health status. CHWs' role is an extension of the Primary Health Care Services, which reaches out to the people at household level. They are multi-skilled in their training to be able to manage problems in their field when rendering services. CHWs

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also have a good situation analysis skill, trained on TB and treatment support. Manage acute and chronic diseases including communicable and non-communicable diseases at home. They play a major role in HIV and AIDS programme, as receive monthly in-service education to be able to perform multiple functions such as providing health education and promotion, referring patient for HIV testing, linking patients to care, and providing psychosocial support to the patients (Thomson, Rich, Kaigamba, Socci, Hakizamungu, Bagiruwigize, Binagwaho & Franke, 2014).

Community health workers will conduct regular door-to-door campaign to improve knowledge regarding TB, transmission, prevention, treatment, and the benefits of completing the treatment including the risk of not adhering to the treatment using the leaflets material. It is important to provide more TB information to the community members to capacitate them with TB knowledge. If community members including TB patients are capacitated with knowledge this will close the identified gap and improve TB knowledge, and skills which will be able to improve health seeking behavior and improve TB treatment adherence. The patients' information leaflets material will help reduce stigma and wrong perception that the community have about TB and its treatment as they will be provided with comprehensive information and they will be able to engage the community health workers on questions regarding TB and its treatment. The strategy will be able to answer some unanswered questions about TB that communities had. A study by Busza, Dauya, Bandason, Simms, Chikwari, Makamba, Mchugh, Munyati, Chonzi and Ferrand (2018), indicated that, dependence on community health workers for HIV care continues to increase, mostly in resource-limited settings. The study further indicated that community health workers can improve HIV service use and adherence to treatment, and the effectiveness of these programmes relies on providing an enabling work environment for community health workers, including reasonable workload, supportive supervision and adequate training and supplies. It is from this reason that the researcher believes that, if community health workers can be provided with leaflets and adequate training on how to use it, this will have impact in the TB programme.

Patients' information leaflets material contains information about TB, transmission, prevention, and adherence to TB treatment. The information will benefit both TB patients and the community including the family members who are supporting patient while taking treatment. The messages targets to change behaviors identified in this study. It was designed to attract the readers so that, they can engage more to get TB information, and any unclear questions can be addressed by the community health workers. The use of the leaflet material also targets to improve communication between health care workers and patients. It was thought that, it will make patients to feel free to ask any questions regarding TB, and if

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they spend more time with community health workers, it will improve trust on the health system. The administration of the material to the patients and the community also target will be encouraged to do door-to-door visit and not only target TB patients, as TB is a community problem. It is important to provide information to the entire community to improve knowledge and correct the perception that the community have about TB.

Patients' information leaflets material will assist to relief a post diagnosis health education workload to the clinician as patients will be provided with comprehensive and interacting TB education by the community health workers during community visits. Most patients will have more information about TB even before their diagnosis. Community health workers will collect data for registered patients at the health facility and arrange a visit with the patient and family members who are supporting TB patient. During the visit they will use the leaflet information to provide TB education and support. This will improve TB status disclosure and support as family member will be required to participate during the visit. To reduce stigma, community health workers will also visit the nearby household to provide TB education. This will help improve TB knowledge within the community and reduce TB stigma. If TB message is well articulated at the community, this will reduce the issue of cultural and religious belief as everyone would know what TB is and how it is treated. The message must be clear that, TB is a disease which is caused by a bacterium and is curable if patients take their treatment consistently, correctly, and adequately. Community must also know that, everyone can contract TB infection, however patients who are on treatment do not transmit the disease.

The patients' leaflets information is patient-centeredness, it ensures that, community health workers provide support and care that, is respectful of, and responsive to, individual patient preferences, needs and values. While benefiting the patient and the community it is important to embrace their values and seek patient and family consent. The leaflets information includes the contact details of the community health workers for the specific community. Patients and family member will be able to reach out to the community health workers for more advice regarding what they do not understand. Patients and family members will use the leaflets as a guide in case of treatment adverse events and they can contact the community health workers who will further give advice and refer them to the healthcare facility for proper management. This will assist to decongest the facility as information will be available for use and also a proper support structure, and patients will not frequently go to the health care facility for anything unless it is serious. Patients understanding of treatment side effects will make them to not stop treatment when they develop any side effects. Knowledge of TB will improve health seeking behaviour which in return will reduce treatment complication and transmission rate at the community level.

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7.2.9 Final intervention

The team then structured the strategy to improve TB treatment adherence called Adherence improvement management strategy (AIMS). AIMS is the strategy that is derived from or informed by objective evidence, since the research team conducted the study, analyzed the data collected from affected individuals, and with the involvement of the TB experts use objective evidence to inform the design the intervention strategy. AIMS intends to improve TB treatment adherence through improving TB knowledge of the patients, family members and the community to increase support and reduce stigma. The basic components of AIMS are: Improve knowledge about TB and TB treatment, promote timely health seeking behaviour, improve patient status disclosure and promote patient support. AIMS is patient-centred strategy that promote comprehensive patients care and support, it is also coordinated, accessible, and safe and of a high quality. AIMS will be delivered using patient's information leaflets materials by the community health workers. The developed strategy will be delivered at patient level, family level and community level.

7.2.9.1 Basic components of AIMS

The AIMS comprise of four Basic components that are aligned to the BCT selected in this study at each level of implementation (patient, community, and family members) and are discussed below as follows:

Improve knowledge about TB and TB treatment.

The study discovered that, TB patients lack comprehensive knowledge about TB, transmission, prevention, and adherence to treatment. Comprehensive knowledge about TB and its treatment was identified as crucial in this study to improve TB treatment adherence among TB patients. To carry out this component of the strategy the developed patient information leaflet will be utilized. By the community health workers to conduct door to door campaign at the community level. Community health workers will utilize TB register to identify patients registered at the facility and set up an appointment with them. Patients will be followed at home, where they will be provided with TB education to together with their family members, using the developed leaflet. Door to door campaign will be conducted at the nearby households in other to improve community knowledge about TB, transmission, prevention, diagnosis, treatment, and treatment adherence. This component is important as it is aligned to the following BCT at all level; information about health consequences, encourages goal setting and action planning, teach to use environmental prompts/ cues, and prompts self-rewards.

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Promote timely health seeking behaviour

Early TB diagnosis is crucial, as patients are put on treatment early and that reduce TB transmission at the community level. Late detection of TB increases their risk of transmitting the disease to others. Patients who have late diagnosis are likely to have poor health outcomes. Late diagnosis also impacts patients who are living in poverty as their family suffer distress and economic hardship. The study developed good messages that promote timely health seeking behaviour. Affected community, family members and patients must be prioritized. Regular campaigns and support must be conducted to the affected communities. Involving community and family members was identified as crucial to stop TB and improve treatment adherence. This component is important as it is aligned to the following BCT, information about health consequences. This will shape knowledge, attitudes and intentions of the patient, family, and community members to act in future.

Improve patient status disclosure

The study discovered that, majority of patients did not disclose their status to their family members, friends, or anyone close to them. Non-disclosure of TB status by TB patients to all household members is a setback to TB control efforts. It reduces the likelihood that household contacts will seek early TB screening, initiation on preventive or curative treatment. Disclosure of TB diagnosis to household members, friends or any close contact could influence patient adherence. However, TB status disclosure may be hindered due to TB-related stigma within the community, the association between TB and HIV infection, perceived incurability of TB, and myths about TB etiology. The other influencing factor can be Negative consequences of disclosure like patient isolation, neglect, withdrawal of social support, and even divorce as people think patients with TB are cursed by the gods or are being punished for immoral sexual behaviors. This strategy will ensure that, close members of the family, community members including the patients are provided with correct information about TB including support to improve TB knowledge and reduce stigma around TB within the community. This component is important as it is aligned to the following BCT, social support and social comparison and identification as self as role model,

Promote patient support

The study discovered that, most patients were not supported while taking their treatment, however those patients who were supported showed good progress. Supporting patients to take their TB medications regularly and to complete TB treatment is crucial as it reduces treatment interruption. The study discovered that, if family members and community

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members are provided with comprehensive TB knowledge and messages that promote patients support, they will be able to support them. Patients will also accept DOT supporters to supervise them while taking their treatment. Regular supervision and support help to maintain frequent communication between the patient and a health providers or DOT supporters, or treatment supervisor. This provides more opportunities for frequent TB education, and questions for clarity where patient does not understand. It also provides opportunity for early identification and resolution of obstacles to treatment, and early identification of treatment non-adherence. Supervised patients can be returned to treatment early whenever they default. Regular supervision also allows the prompt detection and management of adverse drug reactions and clinical worsening of TB. This component is important as it is aligned to the following BCT, prompt organization of social support, feedback on behaviour, feedback on outcome or performance.

Strength: The strength of the AIMS is that, it was developed through the group of the experts to address specific problem identified. The strategy will be incorporated with the patients' information leaflets material to increase knowledge at the community level. Any information that can be missed during TB counselling at the facility will be covered by the community health workers during the community visit using patients' information leaflets. Community health workers will have standardized material that they can use to refer to when providing information to that patients, family members and the community. It will increase TB knowledge and awareness in the community. If community have knowledge that will help reduce wrong perception about TB and will also reduce TB stigma as the community will have better understanding of TB. The strategy will also improve status disclosure as the close contacts or those supporting the patient will be provided with TB education and counselling, which will make patients will feel free to talk to them about TB. This will also improve support as the family members will have better information. This will also increase acceptance of DOTS support which will impact on TB cure rate. Once AIMS is fully functional, the idea is to roll it into the cell phone APP which will be downloaded by the patients and family members including community members. The APP will include but not limited to all the information in the patient's information leaflets.

Limitation if the strategy is not implemented correctly where community health workers are the ones who do the home visits and door-to-door campaign, and provide TB information, education and counselling using the leaflets, this might result to missed information. If patients are provided with leaflets and not have anyone to take them through the whole information with their family members, they might not even read it. If communities are just handed over the leaflets, they might discard them without even looking at the content.

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Therefore, there should be a proper training that must be provided to the community health workers and a proper buy-in from the department to implement this strategy correctly.

7.3 Phase 3: Validation of developed strategies

The aim of this phase was to validate developed intervention strategies. In this study the developed intervention strategies were validated by the panel of the TB district managers who are TB experts within the district. All ethical protocols were observed as detailed in chapter 3 of this study. The rationale behind the communicative validation was to have a stakeholder buy-in from the programme leads and to ensure that the developed intervention strategies will be effective. The target population was district TB managers from Vhembe, Waterberg, and Capricorn district where the study was conducted. The sample size was three district TB managers from Vhembe, Waterberg, and Capricorn district. The setting for this intervention strategies validation was Vhembe District TB management offices but however due to COVID-19 regulation, the researcher provided the district TB managers with the summary of the study findings and the developed intervention strategies.

The researcher developed a checklist with open ended questions which was used for each developed intervention strategies to check if they meet the APEASE criteria (see annexure E). District TB mangers were requested to assess and check if the intervention meet APEASE criteria. All the stakeholders were sent this strategy via emails and were given enough time to review the strategies and comment regarding whether they meet the APEASE criteria. The researcher further analysed the comments from the district TB managers. The findings from the comments were compared to compare if there were any significant overlaps between those comments regarding the strategy. The findings revealed that, there was no difference identified in the findings (see table 7.6 below). Comments were considered and the validated intervention strategies were then finalised. A copy of developed intervention strategies was sent to the district TB managers via email.

7.3.1 Comments on the intervention strategy validation

Participants were asked to validate the AIMS if it meets the APEASE criteria. Below are the comments from three district TB managers regarding the strategy.

Affordability: Affordability of the strategy include how far it can be afforded when delivered at the scale intended? Participants indicated that, the strategy the strategy is affordable.

One participant said, "*The AIMS will not require patients to buy the leaflets as they will be delivered to them by community health care workers for free".*

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Another participant added that, *"the department of health can also afford to print the leaflets and be able to distribute them at the health facilities. The health facilities will then link with community health workers for proper distribution, this strategy is affordable. And it is important for each household to benefit on TB information".*

It was therefore agreed that this strategy meets the affordability criteria.

Practicability: Participants were requested to check if the strategy can be implemented as designed within the intended context, material, and human resources? Participants indicated that, the strategy will not require department of health to added human resource or have added structure.

One participant said, "*This strategy will fit well within the existing initiatives of the department of health, as it will be rolled out by the community health workers at the community levels. Community health workers are already working at the communities, it will make their work easy as they will have structured information as they provide support".*

Participants then agreed that this strategy meet the practicability criteria.

Effectiveness: Effectiveness of the strategy include how effective and cost-effective is it in achieving desired objectives in the target population? The strategy was also assessed to check if it is effective to resolve the existing gap or challenge. After discussions around the strategy there was an agreement that this strategy is effective and cost-effective as its implementation will not cost patients to spend on it.

One participant said, "*The strategy is designed to improve TB treatment adherence, and if patients and those supporting them are provided with enough information this will improve their knowledge and will have positive outcomes".*

Another participant added that, "*consistence support of the community health worker in providing knowledge will also help reduce stigma in the community as people will benefit more from the information that will be provided to them, so this strategy can be considered".*

It was agreed that this strategy will meet the effectiveness criteria.

Acceptability: The researcher engaged participants to review how far the strategy is acceptable to all key stakeholders? Participants indicated that, the strategy would increase trust in the health care system, and it does not go against people believes as it provides information and answer question that community and patients had about TB.

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District TB managers indicated that, this strategy is acceptable, it within the community as there are some similar implementations already in place at the community levels. It is going to increase the level of trust to our healthcare system.

Another district TB manager said, "*If more information can be prioritised at the community level then this can reduce a workload that nurses. It is crucial to prioritize the whole community from the most affected one as this is important".*

Participants agreed that this strategy meet the acceptability criteria.

Safety/ side effects: How far does it lead to unintended adverse or beneficial outcomes? This strategy was said to be safe to the community and to the patients as it has no harm or any side effects to the patients.

Another participant said that, "*I am certain that this strategy is safe as no one can be harmed by being provided with information. This will help reduced wrong perceptions and attitude that people have about TB".*

One participant added that, "*I see no one being harmed by this strategy, however it will even reduce treatment side effects as patients will be monitored regularly and using correct information".*

It was therefore agreed that the strategy is safe and has no side effects to the community, patients, or any individual at the community level.

Equity: How far does it increase or decrease differences between advantaged and disadvantaged sectors of society? Participants stated that this strategy does not discriminate against people, and it covers everyone within the community. They further indicated that it is fair among both patients and everyone at the community.

One TB district managers said, "*the strategy is fair to all the individual, I do not think there will be a time where knowledge or leaflets will be provided to a certain group of people and discriminate among others as community health workers work very well within the communities. Comprehensive information and support will benefit the entire community".*

The team agreed that this strategy is fair, and it meets the equity criteria.

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Table 7.5: Validation of intervention strategies to improve TB treatment adherence

Intervention strategy	Target population	Sample size	Methodology for validation	Does the intervention strategy meet APEASE criteria?
Adherence Improvement Management Strategy	District TB manager	Three TB manager from three districts	Quantitative Checklist	Yes. The overall agreement was that the strategy meets the APEASE criteria

7.4 Implementation and Evaluation of the study

Implementation and evaluation of the implemented strategy is beyond this study; however, the researcher intends to implement the study in three districts where the study was conducted. The study will be roll out at a smaller scale where community health workers will be trained for 5 days in each district to conduct the implementation of the study. The DOH buy-in will be sort first as they will be the custodian of the strategy. During implementation stage the researcher will ensure that the intervention strategy is supported by management and is align with the health policies. The strategy will then be evaluated to see if it has impact at the community level. Evaluation method will be selected, and the tool will be developed and utilized with the group of TB experts as well as TB patients. During evaluation process, the researcher will assess the feasibility and acceptability of the intervention. The researcher will also evaluate the intervention outcome.

7.5 Limitation of the study

The study has some limitations. First, the study focused on the TB patients who were taking treatment during the time of data collection not those who has already completed their treatment and were cured of TB. Second, this study was conducted in the predominately rural province of South Africa, if other predominately urban provinces were included, where there may be different healthcare systems, cultural practice, and/or healthcare access, it could have led to different data findings. Another limitation of this study which is linked to this consideration is that the study focused on TB in general not specifically MDR-TB or X-DRT which is why majority of patients who participated in this study indicated that they had not defaulted their treatment. Despite these limitations, this study had strengths. This is, to the

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lead researcher's knowledge, about factors affecting TB patient's treatment adherence in the rural province, the study applied a behaviour change theory to conceptualise the factors influencing treatment non-adherence and proposed potential interventions to improve treatment adherence, therefore it offers a better way of thinking about treatment non-adherence behaviour.

7.6 Summary

The intervention strategies were developed through a stakeholder workshop which was guided by stage two and three of the BCW. Capability, opportunity, and motivation related factors were identified that are affecting TB treatment adherence. BCW offered insights into the personal (such as knowledge, attitude, or motivation) and environmental factors (such as cost, socio-cultural, or health system) influencing TB treatment non-adherence behaviour. Intervention strategies were developed through stakeholders' workshop. Stakeholders were requested to identify intervention strategies that addressed each identified factor to move from current to a desired behaviour. Developed intervention strategies were validated using APEASE criteria. The next chapter presents the overall conclusion and recommendation of the study which include the highlights of the study objectives and research questions.

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CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 INTRODUCTION

The previous chapter presented the discussion of the study. This chapter presents the overall conclusion of the study, which include the highlights of the study objective and research questions. Technical intervention strategy to improve TB treatment adherence is highlighted in the conclusions and recommendations.

8.2 SUMMARY OF THE STUDY

The purpose of the study is to develop intervention strategies to improve TB treatment adherence in the Limpopo Province of South Africa.

The objectives of the study were all met. The objectives included the following:

- To explore the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province.
- To determine the perceptions of patients regarding factors affecting adherence to TB treatment in Limpopo Province.
- To plan and develop intervention strategies to improve TB treatment adherence in Limpopo Province.
- To validate the developed intervention strategies.

Research questions were as follows:

- What are the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province?
- What are the perceptions of patients regarding factors affecting adherence to TB treatment in Limpopo Province?
- What are the intervention strategies to improve TB treatment adherence in Limpopo province?

8.3 THE PRESENTATIONS OF CONCLUSION

Conclusion of this study will be presented based on the objectives of the study to see if the objective were met or not.

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8.3.1 To explore the perceptions of the relevant stakeholders regarding factors affecting TB treatment adherence in Limpopo Province.

Exploring the perception of the relevant stakeholder regarding factors affecting TB treatment adherence was in the form of an exploratory qualitative approach, as it allowed the researcher an opportunity to consult the stakeholders who shared their perceptions regarding factors that contribute to TB treatment non-adherence. Unstructured face to face in-depth interviews and focus group discussions were used to explore the perception of the participants. In-depth interviews were used with 16 TB patients, three (3) district TB managers, three (3) TB focal person and eight (8) facility operation managers. There was one (1) focus group discussion per district comprising six to seven DOTS supporters. Five major themes emerged in the findings of the study after extensive qualitative data organization and analysis. The major themes were: (1) Social and Cultural factors, (2) Patients related factors, (3) Treatment related factors, (4) Socio-economic factors and (5) Health care and health system factors.

8.3.2 To determine the perceptions of patients regarding factors affecting adherence to TB treatment in Limpopo Province.

The perception of TB patients regarding factors affecting TB treatment adherence were determined in a form of a quantitative cross-sectional survey. Data were collected through self-administered questionnaire that was divided into 7 sections, and participants answered 74 closed ended questions together with multiple follow-ups closed ended questions and 5 open ended questions where their perceptions were determined. After constructive data analysis the study revealed similar factors that emerged from qualitative approach influencing TB treatment non-adherence.

8.3.3 To plan and develop intervention strategies to improve TB treatment adherence in Limpopo Province.

The intervention strategy was developed based on phase 1a and phase 1b findings of this study which were presented in chapter 4 and 5 and were discussed in chapter 6. The development of intervention strategies to improve TB treatment adherence was guided by Behaviour Change Wheel framework and its functions to enhance the development of the intervention. The results of the study were applied to the overarching BCW, a systematic and theory-driven approach that incorporates the COM-B model (capability, opportunity, motivation, and behaviour), to build an intervention to improve TB treatment non-adherence for TB patients. The BCW provided a theory-based procedure for linking factors influencing TB treatment non-adherence behaviour, identified by COM-B analysis, with intervention functions of BCW and specific intervention strategies that were suggested by the

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participants. It allowed intervention designers to be systematic in selection of interventions. The intervention strategy that was developed is called AIMS. AIMS has four basic components: improve knowledge about TB and TB treatment, promote timely health seeking behaviour, improve patient status disclosure and promote patient support. It is a well organised strategy that will ensure care that is comprehensive, patient-centred, coordinated, accessible, and safe and of high quality. The strategy will be delivered by community health workers through door-to-door campaign using the developed patient information leaflet to provide TB information to the TB patients, family members and the whole community. Community health workers will collect the list of the registered TB patients and set up an appointment with them and their family members, they will also visit the nearby households for support. Patients will be provided with initial and ongoing counselling using the leaflets material. Patients will be provided with ongoing support and care, which include close monitoring, goal setting and adverse events monitoring and management. Patients will be supported while taking their treatment and they will be able to reach out to the facility, TB focal person, DOTS supporters and community health workers for support regarding any issues related to TB. This will reduce the number of patients failing to attend follow-up visits and reduce treatment defaulter rate including TB death rate.

8.3.4 Satisfaction of aims and objectives

The satisfaction of the aim/purpose of the study has been achieved. The purpose of this study was to develop an intervention strategy to improve TB treatment adherence that will reduce defaulter rate, death rate, patients lost to follow up rate, and improve patient's support and quality of service. The goal of the intervention strategies is to improve TB treatment adherence, by improving TB treatment success rate from 80% to 90%. The objectives of the study were met as discussed above.

8.4 Recommendations

Based on the findings of this study, the following recommendations are made based on each theme from the research findings respectively, to improve TB treatment adherence amongst TB patients. The recommendations are referred to the Limpopo Provincial Department of Health, Vhembe, Capricorn and Waterberg District Department of Health, Community health center operational managers, Community Health center Human Resources and nursing staff in general. Recommendations are divided according to the service providers:

Department of Health:

- DOH to ensure that they revisit and review the counselling materials and ensure that facilities are offering IEC materials to patients.

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- DOH to reinforce for a TB legal framework that will protect TB patients who are employed from losing their employment because of TB.
- Integrate services within the community to ensure that patients collect their treatment at the nearby facility or pharmacy to decongest the facility and reduce queues, waiting hours and stigma.

Health care workers:

- Health care workers to provide initial and ongoing counselling to TB patients and their close contacts.
- Enforce the use of client satisfaction survey to improve the service delivery at the health centres and ensure that health staff attitude and behaviour does not reinforce stigma.
- Attention should be given to psychology and social implications of TB and treatment to patients and their families as it carries a social stigma.

Implementation of the strategy:

- Department of health to adopt and implement the developed intervention strategy and engage NGOs and other stakeholders for support to roll it over in one district to see its effectiveness.
- Leaflets must be utilized and be distributed when conducting 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.

Policy makers:

- Develop guidelines and policies that recommend traditional healers and religious leaders should be provided with TB training and be incorporated in the program as DOT supporters.
- Develop guidelines that encourages family members who are providing support to the patients should be trained on patient supervision. E.g., Supervise taking of medication, and early detection of adverse events.
- Develop an appropriate community and home-based based TB care model, e.g., form or reinstate community support groups to enable patients to share their experiences about the disease, to make TB suffers feel belonging to others, thus reducing the impact if stigma related to TB. Also make use of TB champions or ambassadors from the previous groups to advocate for TB services and help with community mobilization.

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Further research:

- Further similar studies in this communities are needed to increase data on the development of intervention to improve treatment adherence and follow up studies are needed to evaluate and implement developed intervention strategies.

8.5 UNIQUE CONTRIBUTION TO THE BODY OF KNOWLEDGE

The main purpose of this research study was to develop intervention strategies to improve TB treatment adherence in Limpopo Province. There are lot of intervention strategies that are already developed to improve adherence to treatment. However, to have a unique contribute to the body of knowledge, the researcher checked the gaps among existing strategies to improve development of intervention strategies. The Researcher addressed TB treatment non-adherence based on participants lived experiences not the perception of the researcher. To ensure that, the researcher involved the key affected individuals who shared their experiences related to TB treatment non-adherence. The researcher was interested to understand the depth of the problem from individuals who were coming from different communities and also individuals who share different cultural, religious, and traditional beliefs. Data were then collected using different tool from district TB managers, facility managers, TB focal person, DOT supporters, community health workers and TB patients. Participants then shared their lived experiences regarding the problem, and how they felt the problem could be well resolved.

The researcher together with the help of the TB experts within the districts looked at the problem into more detail using the research findings and build them into BCW constructs and COM-B components to fill the existing gap of TB treatment non-adherence. The study identified that major existing problem that is affecting TB treatment adherence is, lack of TB knowledge amongst TB patients, family members and community members, cultural and religious belief, alcohol and substance abuse, treatment side effects, duration of treatment, TB co-morbidity and sigma and discrimination and staff attitude. Then BCW constructs and COM-B components were used to develop intervention strategies, and stakeholders were involved during the development of the strategies which makes the study unique. The study through one day stakeholder consultative workshop with three TB district managers developed intervention strategies that has a unique name called AIMS which will be delivered through door-to-door campaign by community health workers using patients' information leaflet material. The developed unique patients' leaflets materials are aligned to COM-B and are formulated to address identified local problems. The forum then looked at the availability of the human resources to carry out the ideal developed strategy and they identified community health workers as the most important candidates to facilitate the

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strategy. Candidate will be using family and community members to support TB patients, disseminate information about TB and be able to identify early signs of TB and encourage their members to seek assistance. The developed intervention strategy was then validated by the stakeholder forum to check if it is feasible and if it meets APEASE criteria which makes the study unique. Linking strategy to meet the APEASE criteria and has encouraged buy-in and acceptance of the developed intervention strategies by the stakeholders. The study will be piloted and implemented during postdoctoral degree. Therefore, the researcher confirm that this study is unique, and it adds value to the body of knowledge. The researcher is confident that the developed intervention strategies will work as they were developed and evaluated with the involvement of TB district managers.

8.6 SUMMARY

In this chapter, presented the overall conclusion of the study which include the highlights of the study aims, objectives and research questions. The overall impression indicated that all the objectives were met. The development of intervention strategies to improve TB treatment adherence was guided by Behaviour Change Wheel framework and its functions to enhance the development of the intervention. The aim of the intervention strategy is to improve TB treatment adherence amongst TB patients in Limpopo Province. The satisfaction of the aim/purpose of the study has been achieved. The researcher of this study recommended the implementation of the developed intervention strategy as the next step to be followed in Limpopo province.

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ANNEXURE A: Interview guide for in-depth and focus group discussion (Stakeholders)

Total interview time: 30 minutes + 10 minutes (Introductions)

Title of the Study: Intervention strategies to improve tuberculosis treatment adherence in Limpopo Province, South Africa

This is a confidential interview that seeks to explore intervention strategies to improve tuberculosis treatment adherence amongst TB patients who are taking treatments in Limpopo Province, South Africa.

Introduction (10 minutes)

- Welcome respondent and introduce yourself.
- Explain the purpose of the discussion broadly, outlining why the respondent was recruited into the study.
- Discuss the purpose and process of key respondent interviews and explain that the interview will last approximately thirty minutes.
- Explain the presence and purpose of audio recording equipment.
- Go over ground rules and discussion guidelines, such as being prepared for the researcher to interrupt to ensure that there is time to cover all questions.
- Address the issue of confidentiality, inform the respondent that information discussed will be reviewed as a whole, and that names will not be used in any analysis of the discussion or in the thesis.
- Go through the informed consent form and ask the respondent to complete and sign the form indicating their informed consent to participate in the interview, and for discussions to be audio recorded.
- Ask the respondent to introduce themselves using their name, gender, age (18-29, 30-39, 40-49, 50-59 or over 60 years) and begin the interview.

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Key respondent interview questions – District TB Programme Manager, TB focal person, Facility operation managers and DOT supporters. (30 minutes)

Opening question: what is your experience regarding TB patients taking TB treatment? In your position.

A. What are the factors affecting TB treatment adherence? And what is your perception or view regarding those factors? ***Follow up questions (discuss more on)***

1. Cultural and religious factors affecting adherence to treatment.
2. Social factors (Family and community) affecting adherence to treatment.
3. Patients related factors affecting TB treatment adherence.
4. Treatment related factors affecting TB treatment adherence.
5. Socio-economic factors affecting TB treatment adherence.
6. Health care and health system related factors affecting adherence.

B. Suggest the intervention strategies to improve adherence to treatment:

1. In your own opinion is there any major gap with the implemented strategies for treatment adherence?
2. What other strategies do you think can be better accepted and acted upon by TB patients to improve TB treatment adherence? ***Probe (how, why, what)***
3. Is there anything that I have not asked that you would like to share?

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ANNEXURE B: Interview guide for in-depth with TB patients

Total interview time: 30 minutes + 10 minutes (Introductions)

Title of the Study: Intervention strategies to improve tuberculosis treatment adherence in Limpopo Province, South Africa

This is a confidential interview that seeks to explore intervention strategies to improve tuberculosis treatment adherence amongst TB patients who are taking treatments in Limpopo Province, South Africa.

Introduction (10 minutes)

- Welcome respondent and introduce yourself.
- Explain the purpose of the discussion broadly, outlining why the respondent was recruited into the study.
- Discuss the purpose and process of key respondent interviews and explain that the interview will last approximately thirty minutes.
- Explain the presence and purpose of audio recording equipment.
- Go over ground rules and discussion guidelines, such as being prepared for the researcher to interrupt to ensure that there is time to cover all questions.
- Address the issue of confidentiality, inform the respondent that information discussed will be reviewed as a whole, and that names will not be used in any analysis of the discussion or in the thesis.
- Go through the informed consent form and ask the respondent to complete and sign the form indicating their informed consent to participate in the interview, and for discussions to be audio recorded.
- Ask the respondent to introduce themselves using their name, gender, age (18-29, 30-39, 40-49, 50-59 or over 60 years) and begin the interview.

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Key respondent interview questions – TB patients. (30 minutes)

Opening question: what is your experience regarding taking TB treatment?

A. What is your perception regarding factors affecting TB treatment adherence? In your view, what makes it difficult to take TB treatment regularly? ***Follow up questions.***

1. Cultural and religious factors affecting adherence to treatment
2. Social factors (Family and community) affecting adherence to treatment.
3. Patients related factors affecting TB treatment adherence.
4. Treatment related factors affecting TB treatment adherence.
5. Socio-economic factors affecting TB treatment adherence.
4. Health care system related factors that is affecting treatment adherence. (e.g.) Operation time, medication shortage, treatment of patients by health workers?

B. Suggest the intervention strategies to improve adherence to treatment

1. What would make it easier for you to take treatment regularly?
2. Is there anything that I have not asked, that you would like to share?

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ANNEXURE C: TB Patients questionnaire on TB Awareness / Perceptions

Title of the Study: Intervention strategies to improve tuberculosis treatment adherence in Limpopo Province, South Africa

Individual Patient's Questionnaire Number**:** _____

Date of Interview: _____

INSTRUCTIONS TO INTERVIEWER

1. Record the answers by circling a response or by writing the answer in the space provided.
2. Make sure that the participants sign a consent form first before completing this questionnaire.
3. Please note that only one response is allowed per question unless another instruction is given.
4. Please note that coding categories should NOT be read to the participant unless another instruction is given

SECTION A: DEMOGRAPHIC INFORMATION

No	Questions	Coding categories
A1	What is the name of the area/ village/ township/ town/suburban that you come from?	…… …… …… ……

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A 2	Age	18 to 29 years ……..1 30 to 39 years……..2 40 to 49 years ……3 50 to 59 years …….4 Over 60 years …….5
A 3	How do classify yourself in terms of gender?	Male ..... 1 Female 2
A 4	How do you classify yourself in terms of race?	African ..... 1 White ..... 2 Coloured..... 3 Indian/Asian..... 4 Other (Specify) 5
A 5	What is your nationality ?	South African Citizen ..... 1 Mozambican ……..2 Zimbabwean ..... 3 Botswana……..4 Non - citizen (permanent resident)..... 5 Non-citizen (refugee) ..... 6 Other (Specify) 6

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A 6	What is your marital status?	Married ……1 Single ……2 Living with partner ……..3 Widowed……....4 Divorced……...5
A 7	What is the highest level of education that you have completed ?	No schooling ……1 Lower primary level……2 Higher primary level……3 Secondary level……4 Matric……5 Tertiary level ……6
A 8	How far do you live from the nearest health clinic or community health centre?	0-5 Kilometres…….1 6-10 Kilometres……..2 11-20 Kilometres…….3 More than 20 Kilometres……..4

SECTION B: KNOWLEDGE ABOUT TB AND PATIENT RELATED FACTOR

No	Questions	Coding categories	

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B1	When you had these signs and symptoms were you aware that you could be having TB?	Yes ……1 No ……..2 I was suspicious/not sure ……..3 I did not know……4	
B2	When did you first hear or learn about tuberculosis or TB	Before I was diagnosed with TB ……1 During the time I was diagnosed with TB……2 After I was diagnosed with TB ……..3	
B2	Do you know what causes TB?	Bacteria……1 Evil eye / Satan or witchcraft……..2 Don't know……3	
B3	Do you know what causes TB? Do you believe you have TB?	Yes.....1 No.....2	
B4	How is it spread?	Cough (Air) ……1 Unclean food or water / Public area……2 Hereditary ……..3 Sexual contact with TB patient ……4 Don't know ……5	
B5	Since you were diagnosed with TB, have you ever been given information or taught about TB?	Yes…… ..... 1 No……2	

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B6	TB can be cured if TB treatment is taken daily for the correct treatment duration (6-8 months)	Yes……1 No……..2	
B7	TB treatment should be taken until?	6 months; Yes……1; No……2 One feels better then stop on your own: Yes……..1; No…….2 6 months completed and health worker tells you to stop: Yes…….1; No…….2	
B8	TB can result in death if not treated	Yes……1 No……..2	
B9	Why is it important to take TB treatment for the prescribed duration (6-8 months)? **(Tick all that applies)**	To prevent drug resistant T8: Yes…….1; No……2 To be cured: Yes……1; No……2 To prevent the spread of TB: Yes……1; No……2 To prevent death: Yes……..1; No……..2 Other (specify)…… ……..	
B10	Would you like to have more information about TB?	Yes .....1 No.....2 Don't know……3	
B11	Did you take alcohol in the past 6 months?	Yes ……..…1 No ……2	
B12	TB can be cured by using traditional medicines?	Yes……1 No……..2 I don't know……..3	

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B13	Did you smoke tobacco in the past 6 months?	Yes ……..1 No ……..2	
B14	Do you take any illicit drugs (including nyaope)?	Yes ……..1 No ……..2	

SECTION C: CULTURAL, RELIGIOUS AND TRADITIONAL FACTOR

No	**Questions**	**Coding categories**	
C1	After feeling sick where did you go first?	Clinic/health care facility or doctor……..1 Faith healer/church…….2 Traditional healer……..3	
C2	Did you go to a traditional healer after you were diagnosed with TB?	Yes……..1 No……..2	
C3	Did you go to a faith healer after you were diagnosed with TB?	Yes……..1 No……..2	
C4	Why did you decide to visit a traditional healer or a pastor/prophet?	I do not believe I have TB…….1 I have strong faith on culture or my religion……2 I believe TB is a curse that needs prayer or traditional medicine……3	
C5	How did you feel after visiting a traditional healer or after been prayed for by the pastor/prophet?	I felt ok and healed……1 I felt still sick……3	

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C6	After your visit to the faith healer or traditional healer, were you told to stop taking TB treatment?	Yes……1 No……2	
C7	Did you stop taking your treatment after what you have been told?	Yes……1 No……2	
C8	Were you told the reason why you feel sick? And if yes specify?	……	

SECTION D: SOCIO-ECOMONIC FACTOR

No	**Questions**	**Coding categories**	
D1	Employment status	Employed .....1 Unemployed .....2 Self-employed.....3	
D2	What is your income?	R400-R3000……1 R3500-R15000……2 R16000-and above……3 None……4	
D3	How much distance do you travel to collect your TB medicines (Km)?	<5kms……1 5-10kms……2 >11kms……3	

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D4	How much does it cost for you to reach the clinic/facility from home (Rands)?	<10……1 10-50……2 >50……3 Nothing since it is a walking distance……4	
D5	Do you always have transport money?	Yes……1 No……2 Not always……3 N/a……4	
D6	Do you receive any food packages because you have TB?	Yes…….. 1 No……2	
D7	During the time you are taking TB medicines, what would say is your situation in terms of food availability?	Always available to take with medication……1 Available most of the time……2 Not always available……3 Never available……4	

SECTION E: HEALTH SYSTEM RELATED FACTORS

No	**Questions**	**Coding categories**	
E1	How are the health care workers' attitudes in the clinic/facility of treatment? **(Tick all that applies)**	Friendly: Yes…….1; No ……..2 Caring: Yes……1; No……2 Rude: Yes……1; No……..2 Uncaring: Yes…….1; No……2	

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E2	What would be the most convenient TB clinic opening times for you?	5:30am-16:30pm……1 6:00am-17:30pm……2 8:00am-20:00pm……3	
E3	How much time do you usually wait at the TB clinic before being attended?	1hour……1 2-3hours……2 4hours and above……3	
E4	Which ones of these statements are closer to what discourages or may discourage you from visiting the clinic/community health centre/hospital for routine check-up? **Read the Options** **Choose the <u>THREE most</u> appropriate responses**	Afraid that people will talk about my visit to the clinic……1 Don't want to cough into the specimen bottle……2 There are long queues at the clinic……3 Afraid that I will lose my job/ income……4 Ashamed to be seen in the TB clinic by people who know me, because I have lost too much weight ……5 My family refuses to accompany me to the health facilities……6 They give long health education lessons that waist our time……7 They don't give me treatment for the problems that TB treatment cause for me (side effects)……8 Scared because people say when you have TB you also have HIV……9 Never missed my check-ups……10	

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E5	How would you rate the quality of service that you receive when you visited the clinic/community health centre/hospital for routine check-ups?	Very good ……..1 Good ……2 Average……3 Poor ……4 Very poor……..5 Refuse to rate……6	
E6	When you went to pick your medicines at the TB clinic, what would you say about the availability of medicines there?	Always available……1 Sometimes not available……..2	
E7	Who supervised you when you were taking your TB medicine? (DOT Status)	None……1 Health care workers at the facility/DOT supports……..2 Family member……3 Community member……4	
E8	How would you describe the attitude of the DOTS/Community health worker/Homebased who assist you with treatment at home?	Friendly ……..1 Caring……2 Uncaring……3 Rude ……4 Don't know……..5 Refuse to comment……6	

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SECTION F: DEFAULT FACTORS

No	Questions	Coding categories	
F1	Who do you live with?	Family……1 Friends……..2 Alone……3 Others……..4	
F2	Does your family or people you live with, fully support you and ensure that you take your treatment correctly?	Yes……1 No……..2 N/A……..2	
F3	Since you started taking your TB treatment, have you ever missed your check-ups?	Yes…….. 1 No……2 Don't remember……3	
F4	Since you started taking your TB treatment, how many times have you missed your check-ups?	Once .....1 2-3 times.....2 3-4 times.....3 I don't remember .....4 Never missed check-up……5	
F5	Since you started taking your TB treatment, have you ever forgotten to take your medication?	Yes……1 No……..2 Don't remember 3	

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F6	Since you started taking your TB treatment, how many times have you forgotten to take it?	Once .....1 Twice .....2 3-4 times.....3 I don't remember .....4 Never forgotten……5	
F7	When you miss your check-ups, what circumstances/reasons often lead to or result in you miss your check-ups? **Read the Options** **Choose the <u>THREE most</u> relevant circumstances or reasons**	Lack transport money……..1 Did not want others to notice that I have TB ……2 Busy with other things ……..3 Tired of the uncaring attitude of the staff at the health facility ……4 Felt well and did not see the need for check-up……..5 Tired of the long queues at the health facilities ……6 Believed that health professionals just want us to the health facilities over and over again……7 Hate to be forced to produce a sputum and collect it in the specimen bottles……8 Hate to spend the whole day at the clinic waiting to be seen by a doctor……9 Never missed my check-ups ……10	
F8	In your view what needs to be done to encourage you or ensure that you attend and not miss all your check-ups?	**Write down all the inputs from the patient.**	
F9	Who often reminds you to take your treatment daily?	No one.....1 DOT supporters/ health care workers .....2 Family member/friends/neighbour.....3	

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F10	When you forget to take your TB treatment, what circumstances/reasons often lead to or result in you forgetting to take medication? **Read the Options** **Choose the <u>THREE most</u> relevant circumstances or reasons**	Simply forgot……1 When I am away from home……2 When my family forget to remind me……..3 When I had been drinking……..4 When I fall asleep through the time for taking treatment……5 When watching TV at home……..6 I never forget taking my treatment…….7	
F11	In your own opinion what should be done to ensure you don't forget to take your treatment	…… …… …… ……..	
F12	Since you started taking your TB treatment, have you ever stopped taking your TB medications without been advised by a doctor or nurse or pharmacist?	Yes …… 1 No ……2 I don't remember …….....3	
F13	Since you started taking your TB treatment, how many times have you stopped taking your TB medications without been advised by a doctor or nurse or pharmacist?	Once .....1 Twice.....2 3 times.....3 4 times.....4 5 times.....5 Never stopped treatment……6	
F14	In your own opinion what needs to be done to ensure that you don't stop taking treatment?	…… …… …… ……	

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F15	Since you started taking your TB treatment, have you ever been admitted at the hospital or community health centre, because of TB?	Yes ……. …….. 1 No ……. ……2 I don't remember ……. .....……..3	
F16	In your view are you going to complete your TB treatment?	Yes…… …….. ..... 1 No…… …….. ..... 2 I completed my TB treatment……3 I don't know…… ……4	
F17	What should be done to ensure that you complete your treatment?	**Write down all the inputs from the patient.**	

SECTION G: SOCIAL FACTOR

No	**Questions**	**Coding categories**	
G1	Did you inform your family of friends that you were on TB treatment?	Yes…… ……1 No…… ……..2	
G2	If no, why?	Fear of being isolated by friends or relatives……..1 No one to trust…… ……..2 Other (specify)…… ……3	
G3	In your community, how are you treated since you were diagnosed TB? **Multiple responses possible**	I feel most people reject me.....1 I feel most people are friendly but they generally try to avoid me.....2 The community mostly supports me .....3 Other (Specify)…… ……4	

SECTION H: DISEASE AND TREATMENT RELATED FACTOR

No	**Questions**	**Coding categories**	

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H1	What are the reasons that could make one not completing TB treatment? (Tick all that applies)	Treatment takes very long to complete:……1 Side effects of anti-TB drugs:……2 Too many pills to take daily:……3 TB can still be cured even if treatment is not completed: ……..4 None……5	
H2	Have you *ever* missed your dose(s) of TB drugs before?	Yes……1 No……2	
H3	After taking treatment how do you feel?	I feel very well……..1 I feel sick and not well at all……..2	
H4	Were you informed of TB treatment side effects?	Yes……1 No……2 Only when I started experiencing them……3	
H5	Were you told of what to do if you experience any of the treatment side effects?	Yes……1 No……2 Only when I had experienced them……3	

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H6	Have you ever experienced any of the side effects that concerned you?	I have experienced upset stomach, nausea, vomiting, diarrhoea, and loss of appetite……1 I have experienced itchy skin, skin rashes, bruising and yellow skin…….2 I have experienced lack of feeling or tingling in the hands or feet…….3 I have experienced changes in my eyesight……4 I have experienced dark coloured urine……5 I have experienced yellow eyes……6 None……7	
H7	Were the health care workers supportive?	Yes……1 No……2 N/A……3 I don't want to comment……4	
H8	Are you satisfied with their support?	Yes……1 No……2 N/A……3	
H9	Dou you feel you need more support? Please specify the kind of support you need. …… …… ……		

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ANNEXURE D: PRESENTATION OF FINDINGS FROM QUALITATIVE DATA ANALYSIS

Tool	**Key informant interview with three (3) District TB managers**		
Theme	**Sub-theme**	**Code from participants response**	**Frequency**
Social and cultural factors	Strong trust on culture or religion	Religious people do not believe TB is a natural disease, they believe they have demons. Some believe in using anointing water and oil from fire fire churches. They refuse to take treatment as they say they must have strong faith to be cured. Cultural people do not believe they are sick, they go to traditional healers believing they are bewitched, some believe they have Tshiliso, badimo, evil spirits and they get initiated. They only come back when they are sick. Even when they are taking TB treatment they still go to the prophets and traditional healers, and they turn to stop taking treatment and this affect the cure rate, some even die, and we will think they have defaulted while they are dead. it is the issue of trust; they have strong trust in traditional herbs and anointing waters	111 111 111
	Fear to disclose the status	Most patients are afraid to disclose their status as people in the communities always relate TB with HIV. People assume that TB and HIV are the same. Most patients are afraid of the stigma, we have high stigma within communities some will not even disclose to their family members due to the fear of stigma and discrimination, and they do not want	111 111

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		anyone to hear that they have TB.	
	Lack of support from family and community	TB patients do not disclose their status, as a result they do not get support from their families or friends, they do not want anyone to hear that they have TB. Professional do not want to be supervised; they believe their status will be affected. Self-supervision is dangerous as they get demotivated.	111
Patients related factors	Use of alcohol and substance abuse	TB patients who are taking traditional beer especially elderly people they are stubborn, and they tell nurses where to get off. Some patients feel they are better and start taking drugs and alcohol. They wake up very early and they are always drunk they do not have time for treatment as they spend the whole day at the shebeens.	1 1 11
	Comprehensive knowledge about the disease and treatment	Some non-adherence issue is based on their knowledge about the disease. It should be in school curriculum – via children's homework. Churches – pastors should talk about it. Even in most gatherings.	1 1 1
	Change of residential address	Most immigrants do not provide correct or traceable residential address, some use popular addresses and once they default it is not easy to trace them, they turn to shop around. They do not communicate with the facility	111

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Treatment related factors	Side effects caused by the treatment	They default due to treatment side effects, especially if it was not cleared well during counselling, although some do come back and nurses are able to treat those side effects using the guideline, and even refer them to the doctors. Some run away from us because of side effects. There is a need to educate patients to understand treatment side effects, it is the causative factor for non-adherence.	11 1 11
	Duration of the treatment	patients get to be confused if they are not getting better and are experiencing side effects, they turn to lose hope on treatment as it takes long and does not show any improvement	1
Socio-economic factor	High unemployment rate in the community	Unemployment rate is high, TB patients who are not working are referred to social workers for assessments, and those who meet criteria are given social grant for 6 months grant. Social grant is now a problem as people do not want to finish their treatment as they are afraid to lose them. Those who do not get the social grant start to shop around.	111
	Lack of transport and distance travel to the facility	Patients staying at the farms do not always have transport money, they cannot walk as they stay far from the CHCs	1
	Lack of adequate food while taking	TB patients who are poor are referred to social workers for food parcels. Some patients do not want to finish treatment as they want to secure food parcels, they	111

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	treatment	even infect others within the community so they can also get food parcels.	
Healthcare and health system factors	Attitude of health care workers towards TB patients	There is a need to educate nurses more on the issue of attitude. We must engage them, maybe they will open to us why they behave the way they do. We know some are different as people are different but if this left undone TB patients will not come back to our facilities.	1
	DOT supporters' status	The way patients default it is clear they do not have DOT supporters, even when they lie that they have someone at home supporting them, but that is not true they have some much fear that people will know they are sick.	1
Key informant interview with eight (8) Facility operational managers			
Theme	**Sub-theme**	**Code from participants response**	**Frequency**
Social and cultural factors	Strong trust on culture or religion	TB patients go to pastors, for help, get prayed for and believe they are healed. Patients do not mind stopping taking treatment after visiting traditional healer and use traditional herbs as they believe they will work, they only come back to the health care facilities when their situations are deteriorating. They do not believe they have TB; some believe they are bewitched; some are told they have evil spirit (tshiliso, vhadzimu, badimo). After diagnosed with TB they go to faith healer for prayers, anointing oil, anointing water to use and they stop taking TB treatment as they have faith.	11111111 11111111 111

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		They even pay money to see those prophets as they have strong faith.	
	Fear to disclose the status	Patients are afraid to tell anyone about their status. Status disclosure is the problem. They cannot even take their treatment in the presence of anyone sometimes even their family members as they do not want anyone to know they are sick. Patients who stay close to the PHC even request to take their treatment at the facility in fear that their family members will see their treatment at home. TB patients only take treatment when they are alone in fear of being stigmatized. They do not want the branded tracers' car to come to their homes	11111111 11111111 1111 1 11 1
	Lack of support from family and community	Those who have support from their families turn to do well. Some patients are told by their families they will only support them if they consider traditional herbs. Majority of patients do not have support	11111 111 11111111
Patients related factors	Use of alcohol and substance abuse	Patients are forever drunk especially the ones who are not working. They go to shebeens in the morning and go home at night, they do not have time to take treatment. Elderly people say that TB treatment does	11111111 11 1

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		not work, and it makes them not to enjoy their alcohol. Drunk patients are rude to the health care workers they tell them where to get off	11111
	Comprehensive knowledge about the disease and treatment	Lack of knowledge about TB is a major problem. Most patients are illiterate, and some are old, it is not easy to educate them about the disease. Sometimes even the educated ones do not understand TB. If community can have a better understanding of TB it will be easy to adhere to treatment.	11111111 111111 1 1111
	Change of residential address	Immigrants do not update the facility when they go back home. Most immigrates do not give correct address and it is not easy to trace them once they default. Patients who are working at the farms once they get a new job they do not bother to come for proper transfer, even those who were staying with their relatives when they go home, they fail to update the facility.	11111111 11111111 1111
	Age factor affecting adherence	Elderly people forget about them they do not listen at all and no one can convince them. Some even say it does not make sense to them that a grown-up man can be supervised, it is a sign of weakness to	1 1

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		them	
Treatment related factor	Side effects caused by the treatment	Some patients default the moment they experience side effects without even informing the facility about them. Some indicate that they are doing hard labors and the treatment make them not to feel well and they cannot work	11111111 11111111
	Duration the treatment takes	Some patients are concerned about the period they must take their treatment every day, without skipping a day. Some are frustrated when they start experiencing side effects as they think they will feel like that for whole 6 months.	1 1
	Co-morbidity	Patients with chronic diseases are not encouraged to take their TB treatment. Chronic patients appear to be frustrated and tired of the number of pills they must take.	11111111 111
Socio-economic factor	High unemployment rate in the community	Unemployment rate is a major challenge as many people are not working, poor patients who are not working are referred to social workers for assessments, and those who meet criteria are given social grant for 6 months grant. Social grant has been a problem for long as patients do not want to finish their treatment as they are afraid to lose the grant. Patients who do not get the social grant start to shop around.	11111111
	Lack of transport and distance travel	Patients working at the farms do not always have transport money they sometimes miss their appointment; they	111

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	to the facility	cannot walk as they stay far from the CHCs	
	Lack of adequate food while taking treatment	Poor patients are referred to social workers for food parcels. Some patients do not want to finish treatment as they want to secure food parcels, they even infect others within the community so they can also get food parcels. However, others indicate they do not love the parcels and they cannot take treatment without adequate food.	11111111
Healthcare and health system factors	Facility operating hours	Working patients have a challenge of missing their appointments as they are at work during the day and they cannot ask for a day off or time off at work, especially those working at the farms.	111
	Long waiting hours	TB patient are put at the fast queue, even though sometimes we assess them holistically, especially if they are not showing any improvement, we even engage the Dr we cannot miss any information we have to assess to resolve the issue or any side effect. Some do not honor their appointments and when they do come, they make the queue long.	11111111 11111
	Attitude of health care workers towards the patients	The attitude of the healthcare workers is very important, Nurses must not be arrogant; they should be friendly and have a good relationship with patients.	11111111 11 11111

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		If nurses are arrogant, they will chase patients away	
	Medicine availability	We always ensure medicine is available, we communicate with hospital and nearby clinic if we have shortage. We know all our patients, we pull patients files a day before their appointments, and check if medicine is available and enough	111 111
	DOTS supporter's status	Patients do not have DOT supporters they lie to say their families are supporting them. Some say they do not want DOT supporters because people will think they have HIV or other chronic disease	1111 11
Key informant interview with eight (8) facility TB focal persons			
Theme	**Sub-theme**	**Coded participants' responses**	**Frequency**
Social and cultural factors	Strong trust on culture or religion	There are patients who do not believe they have TB, they think they are bewitched, some are told they have evil spirit (tshiliso, vhadzimu, badimo). After their diagnosis go to traditional or faith healers for help and they even stop taking their treatment they only come back when they are worse.	11111111
	Fear to disclose the status	Patients are afraid to tell anyone about their status which is a problem. Some do not even take their treatment in the presence of their family members or friends. They take their treatment only when they are alone in fear of being stigmatized.	11111111 11111111

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	Lack of support from family and community	Those who have support from their families turn to do well. Majority of patients do not have support as they hide away from their family	11111111 1111111
Patients related factors	Use of alcohol and substance abuse	Patient's smoke and are always drunk, they spend all day at the shebeenss, they do not have time to take treatment. They do not want DOT supporters to follow them at the shebeens as they say people will know they are sick	11111111 1
	Comprehensive knowledge about the disease and treatment	Lack of knowledge about TB and the treatment is a major problem. What is TB, MDR-TB & XDR-TB	11111111 11
	Change of residential address	Immigrates do not give correct address and it is not easy to trace them once they default, when they go back home, they don't even update the facility. Farm workers do not update the facility when they change their jobs to work in other communities far from the facility	11111111 111111
	Age factor affecting adherence	Elderly people easily forget to take their treatment unfortunately they do not listen to anyone they tell us where to get off. Age is a problem.	1 1
Treatment related factor	Side effects caused by the treatment	Some patients default the moment they experience side effects without even informing the facility about them, those who come we do assist them and refer them to the doctors for further assistance.	11111111 11111111

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		Farm workers and those who do hard labors are not consistence due to side effects.	
	Duration the treatment takes	Majority of patients are concerned about the period they must take the treatment until they become better, some say it takes long until they get better as they experience side effects.	11111
	Co-morbidity	HIV patients are often frustrated as they say they cannot cope with the number of treatments they have to take.	111111
Socio-economic factor	High unemployment rate in the community	Majority of our patients are not working, some only do piece jobs which require hard labors, and you find that there is no one working at their homes, they are breadwinners therefore since they are sick they cannot do that hard labor. Majority of them are poor so we involve social workers to assist them with the help of the doctors, they will be given 6 months grant. The problem is he grant is only for six months, most of them default so they can continue to get the grant.	111 111 111
	Lack of transport and distance travel to the facility	Patients working at the farms do not always have transport money they sometimes miss their appointment; they cannot walk as they stay far from the CHCs. Some do not want to take treatment closer to home as they fear that people will see them, as time goes on, they lack	111111 111

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		transport money and always miss their appointments, some are staying near but they are sick and cannot walk	
	Lack of adequate food while taking treatment	Poor patients are referred to social workers for food parcels. Some patients do not want to finish treatment as they want to secure food parcels, they even infect others within the community so they can also get food parcels. However, others indicate they do not love the parcels and they cannot take treatment without adequate food.	11111111
Healthcare and health system factors	Facility operating hours	Working patients have a challenge of missing their appointments as they are at work during the day and they cannot ask for a day off or time off at work, especially those working at the farms.	1
	Long waiting hours	TB patient are put at the fast queue. Some do not honor their appointments and when they do come, they make the queue long. We must attend patients holistically and they complain about waiting hours. TB is too serious to communicate in only 2 sentences with patient	11111111 11 11111111 1
	Attitude of health care workers towards the patients	The attitude of the healthcare workers is very important, we have to be nice so that they feel supported. Some say they are scared if they miss their appointment that we will be rude at them but we always encourage them to	11111111 11111 1

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		open to us so we can help them. We do not want to chase them away because at the end we must account for cure rate.	
	Medicine availability	We always ensure medicine is available, we communicate with hospital and nearby clinic if we have shortage. We know all our patients, we pull patients files a day before their appointments, and check if medicine is available and enough	11111111 11111111
	DOTS supporter's status	Patients do not have anyone supporting them, those who have are doing well, some lie but we see by the results that they are not taking treatment under any supervision	111111
Key informant interview with sixteen (16) TB patients			
Theme	**Sub-theme**	**Response**	**Frequency**
Social and cultural factors	Strong trust on culture or religion	After diagnosis I went to traditional healer, I was told I have evil spirit and I was given traditional herbs, I have strong believed in my tradition and had stop taking TB treatment. TB is a hidden something, it has spirits. I went to church for help I was told to have strong faith to be healed, I do have faith, but I did stop taking treatment. The pastor never told me to stop taking treatment, I was just told to have faith.	111111 11111111111 1111111
	Fear to disclose the	We are afraid to lose our jobs should our bosses know about our status as they will	111111111

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	status	be afraid that we will infect other. If I disclose my status to my family, I am afraid the community will know about it. Cannot drink alcohol or go to clubs as people will see that I am sick, I do not want that.	11111 1
	Lack of support from family and community	I am renting where I am staying if the owner know I am sick they might ask me to leave. Close relatives are judgmental we do not want them. I am staying alone, and I do not want DOT supporters to even come support me because people will know am sick. Partner left as soon as I was diagnosed, now I am staying alone	11111 1 11 1
Patients related factors	Use of alcohol and substance abuse	Yes, I do take alcohol. I was told not to take alcohol and smoke during the TB treatment	111111 111111111
	Comprehensive knowledge about the disease and treatment	I do not understand TB treatment properly. I was provided with education during counselling, I believe it is important to be provided with education and the benefits of taking treatment. We have lot of taxies they can be branded with TB information; this thing is a killer disease, and we don't know anything about it until we have it.	111 11111111111 1

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	Change of residential address	I do not have a permanent address, I am renting where I am staying, and if the rent goes higher, I must look for another affordable place.	111
Treatment related factor	Side effects caused by the treatment	Medication makes me worse, I feel dizzy, vomit, loss appetite, I have diarrhoea, I cannot work, I lose pay because sometimes I cannot go to work. Morning treatment causes nausea and ruins your day, I am afraid to throw up in a taxi better I take them in the evening. Whole body painful ' Treatment is not child's play	111111111 111 1 1
	Duration the treatment takes	Six months taking is too long for taking treatment and not miss or skip. They make me fatigue and impacts my work, for how long? it is a long uncomfortable journey. I wish they can reduce the duration of treatment as they did before. TB treatment, when HIV has one drug. Co-morbid conditions TB, HIV, diabetes, hypertension	111 1 1 1 1111
	Co-morbidity	Taking both drugs for HIV and TB is like a punishment I do not think my body can tolerate the side effects of both drugs. I think it could be possible to just take one drug for both diseases.	1 1 1 1 1 1

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		19 tablets it is not easy to take them. 31 tablets it feels like a punishment. Brown tablet smells bad I do not like them, brown pill made me turn black in complexion and I feel people avoid me.	
Socio-economic factor	High unemployment rate in the community	There are no employments when you are sick no one will employ you. We depend on piece jobs, where no work no pay. People will not give us piece jobs if they hear we are sick. No decent jobs, no sick leave.	111111 11 1 1111
	Lack of transport and distance travel to the facility	Sometimes if you are sick you cannot walk to the facility. We do not stay far from the health care facility. I stay in the farms we do not have transport that side, we hike.	111 1 1
	Lack of adequate food while taking treatment	We do not always have food to take with treatment, they make one hungry, and give us appetite. No healthy food, we have poor nutrition, healthy food is expensive we have no jobs and no money. Empty stomach.	111111 1 111
Healthcare and health system factors	Facility operating hours	Transport in the farms is a challenge it is available in the morning and late in the afternoon and by then the health centre will be closing, we cannot always come in	111

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		the morning as our boss wants us to be at work. Sometimes we ask for half day at work, but it is not guaranteed, and we knock off late and must wait for transport, by then facilities are closing.	11111
	Long waiting hours	Waiting hours depend on some days it is better as there are few patients. Sometimes we wait for long because they are so busy providing necessary assistance to other patients and there have not enough staff. TB information is 'boring'. TB information is time consuming	1 1 1 11
	Attitude of health care workers towards the patients	My experience at health centre is not good. I found that the nurses are rude. The have unprofessional attitudes.	1 1 1
	Medicine availability	I have never come here and told there is not treatment, not what I remember	1111
	DOTS supporter's status	I do not trust DOT supporters, I would rather get a stranger, they do not judge us. I do not trust anyone; I do not want people to be talking about my status.	11 1111
Focus group discussions with eighteen (18) Home Based care givers per district			
Theme	**Sub-theme**	**Response**	**Frequency**
Social and cultural	Strong trust on culture or	Patients believe in witchcraft, whenever they get sick, they think they are	1

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factors	religion	bewitched. We have patients who believe TB is demons, or evil spirits or they think they are bewitched, they go to fire fire churches or traditional healers for help.	 111111111
Social factors	Fear to disclose the status	After testing positive they do not want to be seen at clinic for fear that people will know they are sick. Gossip about patients, Stigma kills people, not TB & HIV. They do not want DOT supporters and they do not tell anyone about their status.	11 1 111111
	Lack of support from family and community	Some blame the support DOT supporter give, they say it will make them to be discriminated. Some are pushed by their families to go visit traditional healers, and if not, they do not provide them with support, and whenever they experience side effects, they mock them.	11 111
Patients related factors	Use of alcohol and substance abuse	Those using nyaope do not want to be seen with us. There are some who are on nyaupe who appreciate our support. Elderly people who abuse alcohol (traditional beer) will tell you where to get off.	11 1 1111
	Comprehensive knowledge about the disease and	Lack of knowledge about TB is a major problem, they must teach TB in schools. Most people take TB for granted because	11111 1

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	treatment	of lack of knowledge. Not many know what TB is, so they will not even take treatment seriously. I wish the facility can play DVD of TB information in waiting area for knowledge. We must have beat TB adverts on social media, TV and radio.	1 1 1
	Change of residential address	We have people who do not stay in one address, and when you look for them you won't find them. Homeless people do not disclose as they fear to be mistreated and they give wrong address, when you look for them you will not find them.	111 11
	Age factor affecting adherence	Elderly people do not listen, they are stubborn. Sometimes even the young ones who are abusing drugs and alcohol are also stubborn.	1 1
Treatment related factor	Side effects caused by the treatment	Some patients default the moment they experience side effects without even informing the facility about them.	11
	Duration the treatment takes	Patients are mostly worried about the length the treatment take to be completed	11111111
	Co-morbidity	Chronic patients need serious support as they have indicated the stress of coping with multiple drugs.	11111
Socio-economic	High unemployment	Majority of patients in the community are not working, some only do piece jobs	1111111

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factor	rate in the community	whenever they are available, sometimes they work far from home, and this affect adherence.	
	Lack of transport and distance travel to the facility	Majority of patients do not want to take treatment from the facilities that are closer to where they are staying, it is an issue of stigma. Some are working in the farms and there is no transport there, they mostly hike to get to the facility.	11111 111
	Lack of adequate food while taking treatment	Nurses and Drs do assess the situation and refer them to the social workers to get food parcels. Some do not like the food parcels; they say the food is not nice.	111 111
Healthcare and health system factors	Facility operating hours	Some who are working from far says the operating hours are not in their favors as they are at work throughout the day.	11
	Long waiting hours	Patients do not wait for long in the facility, it is only if they must be checked or assessed, but they are in fast queue even though they still complain to say they want to go somewhere and they cannot spend the whole day here. The priority in chronic is given to TB patients from what we know.	1 1111
	Attitude of health care workers towards the	Some told us that they are scared of the nurses especially if they miss their appointments, they do not want to come back, they will rather move to another facility, and from our side we won't have	11

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	patients	information of their whereabout.	
	Medicine availability	We ask for medicine from the nearby facilities, and we also have hospital that assist us if we have shortage. Medicine availability is a challenge, but nurses do their best to get it for the patients.	1 1
	DOTS supporter's status	Patients are just taking treatment on their own and they will not tell the truth. They do not involve anyone. Those who are being assisted are recovering. They do not want us; they say we will make them to carry stigma. Some we follow them at home, and they start hiding immediately they see us, they say we are policing them, some we follow them at shebeens.	1 111 11111 111

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ANNEXURE E: CHECKLIST TO VALIDATE THE INTERVENTION STRATEGY (Stakeholders)

Title of the Study: Intervention strategies to improve tuberculosis treatment adherence in Limpopo Province, South Africa

Purpose: The purpose of this checklist is to validate the developed intervention strategy to check if it meets the APEASE criteria. This strategy is aligned at BCT at all levels (patient, community, and family members). The strategy allows provision of information about health consequences, encourages social support and social comparison and identification of self as role model, goal setting and action planning, feedback on behaviour, feedback on outcome or performance, teach patient to use environmental prompts/cues, prompt self-reward, and prompt organisation of social support.

Instruction: indicate your assessment of each component with a tick (√)

COMPONENT	**CRITERIA**					
	Affordability	Practicability	Effectiveness	Acceptability	Safety	Equity
Improve Knowledge about TB and TB treatment						
Promote timely health seeking behaviour.						
Component: Improve patient status disclosure						
Promote patient support.						

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ANNEXURE F: LETTER SEEKING PERSMISSION TO CONDUCT RESEARCH FROM THE DEPARTMENT OF HEALTH LIMPOPO PROVINCE

University of Venda

Department of Public Health

Private Bag x 5050

Thohoyandou, 0950

Limpopo Provincial Department of Health

College Ave

Hospital Park

Polokwane

0700

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

My name is Hulisani Matakanye, I am conducting a research study titled titled "**Intervention strategies to improve tuberculosis treatment adherence in Limpopo Province, South Africa"**. The research study is undertaken towards the fulfillments of the requirements of Doctor of Philosophy Degree in Public Health under the supervision of Prof T.X Maluleke, Prof T.G Tshitangano, Dr. J.T Mabunda. The main purpose of this study is to develop intervention strategies to improve tuberculosis treatment adherence at the rural communities of Limpopo province, South Africa. The participants for the study will be TB patients registered on district TIER.Net, TB district managers, DOTS supporters and facility operation managers. The findings from this study will help to address the gap contributing to TB treatment non-adherence among TB patients. Data will be collected from the participants from December 2019 – February 2020.

Upon completion of the study, I undertake to provide the Department of health with a copy of the full research report. If you require any further information, please do not hesitate to contact me on 073 8868 949, email hmatakanye1@gmail.com.

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I therefore request permission to conduct my study in Limpopo Province. My respondents for this study are TB patients registered at the district TIER.Net, district TB managers, DOTS supporters and facility operation managers.

I look forward to your positive response. Thanking you in advance for your assistance.

Yours faithfully,

Hulisani Matakanye

……

PhD Public Health Student

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ANNEXURE G: INFORMED CONSENT

RESEARCH ETHICS COMMITTEE

UNIVEN INFORMED CONSENT

A. LETTER OF INFORMATION

Title of the Research Study: I**ntervention strategies to improve Tuberculosis treatment adherence in Limpopo Province, South Africa**

Principal Investigator/s/ researcher: Hulisani Matakanye

Co-Investigator/s : Prof. T.G. Tshitangano

: Dr. J.T. Mabunda

External Co-investigator: Prof. T.X Maluleke

Brief Introduction and Purpose of the Study: This is a research project that will be conducted for the degree of Doctor of philosophy in the Public Health (PHDPH) in Limpopo Province. The project aims to develop intervention strategies to improve TB treatment adherence in Limpopo Province.

Outline of the Procedures: In this study, you (TB patients) will be required to complete a questionnaire to solicit information regarding factors contributing to TB treatment non-adherence and intervention strategies can improve adherence among patients. You will be expected to complete all applicable questions in full and independently. Other participants (DOTS supporters, District TB managers and facility operation managers) will be expected to attend focus group discussion or key informant in-depth interview. The whole procedure may last between 40 and 60 minutes. There will not be any follow-up done once the completion of questionnaire has taken place.

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Risks or Discomforts to the Participant: There are no foreseeable risks or discomforts for participants in this study.

Benefits: As a participant, you will not benefit directly from this study, however, the information received from you and the findings of the study may assist TB patients in adhering to their TB treatment and to gain more knowledge on the factors contributing to non-adherence. Department of health benefit with the intervention strategies that will assist TB patients to adhere to their treatment.

Reason/s why the Participant May Be Withdrawn from the Study: Non-compliance to the instructions or the choice of the participant to withdraw may lead to participant being withdrawn from the study, however, there will be no adverse consequences for the participant as a result thereof.

Remuneration: You will not receive monetary or any other form of remuneration by choosing to participate in this study.

Costs of the Study: You will not be expected to cover any cost related to the study.

Confidentiality: The researcher will ensure that all the information you provide in this study will be kept confidential. Your identity will not be revealed as you will not be required to write your name anywhere on the data collection tools. In addition, your identifying information will not be linked to you. Data will be analysed in group and not individually.

Research-related Injury: There are no foreseeable research-related injury in this study.

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

Please contact the researcher (073 8893 206), my supervisor (082 9793 035) or the University Research Ethics Committee Secretariat on 015 962 9058. Complaints can be reported to the Director: Research and Innovation, Prof GE Ekosse on 015 962 8313 or Georges Ivo.Ekosse@univen.ac.za

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that, I have been informed by the researcher Hulisani Matakanye, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number:

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

Full Name of Participant	Date	Time	Signature
.....	.....	.....	.....

I, Hulisani Matakanye, herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Full Name of Researcher

..... Date.....

Signature.....

Full Name of Witness (If applicable)

..... Date .....

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Signature……

Full Name of Legal Guardian (If applicable)

…… Date……

Signature……

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Annexure H: Patients' Information Leaflet Material– "Knowledge is power"

Save your life – Take your TB treatment.

TB is one of the top 10 causes of death and the leading cause from a single infectious agent globally. **Play your part, take your treatment, and save your life.**

What is Tuberculosis?

Tuberculosis is a disease caused by a germ which commonly affects the lungs. TB germs spread from person to person through air. The germs are put into the when a person with TB disease coughs, sneezes, laugh or sing. Common TB symptoms are; couching for more than 2 weeks, loss of appetite, night sweats even when it is cold, fever, weight loss, chest pain and fatigue. If you have any of this symptoms, get tested at your local clinic for free.

Who gets TB?

TB is not caused by witchcraft, or curses, or bad luck, or evil spirit/demons or sleeping with cursed person. Anyone can get TB regardless of their religion or culture. You can get TB in the taxi, or any public area. People with compromised immune system you are at higher risk like: People living with HIV, chronic disease, malnutrition, substance abusers and children under 5 years and older people.

Can TB be treated?

Yes, **TB** can be **cured**, even in people living with **HIV** or any chronic disease. TB Treatment is achieved using TB medicine only. You need to take treatment correctly for the full course.

TB treatment non-adherence is a barrier to TB control. Curing TB infection reduce TB transmission, development of new cases, TB drug resistance and risk of death**.** You can die of TB if you don't take treatment correctly or if you stop and not finish full treatment course. You can even develop TB drug resistance which is difficult to treat.

Can I treat TB with traditional medicine?

No, only TB medication can kill TB germ. Immune booster or traditional herbs cannot treat TB. Anointing oil or holy water cannot treat TB. TB cannot be treated by prophets or traditional healers. Avoid taking TB treatment with traditional medicine as this may cause other unbearable side effects or make the TB treatment not to work or even worsen your condition.

Can TB Treatment cause side effects?

Yes, TB drugs can cause side effects, but they are safest and most effective. If you experience any side effect do not stop taking treatment. Report them as early as possible to healthcare provider or DOT supporter for proper management. Side effects include fever for 3 or more days, pain in the lower abdomen, itchiness or a rash, nausea, no appetite, yellowish skin, or eye, dark or brown urine, numbness of hands and feet, fatigue, and dizziness.

Can TB patient drink alcohol when taking TB treatment?

No avoid drinking alcohol. Alcohol abuse increase risk of TB by 3-fold and will cause you not to take treatment regularly and correctly which pose more risk to your health.

Can TB patient smoke tobacco when taking treatment?

No avoid smoking as it increases the risk of TB by 2-3-fold and is associated with poor TB treatment results. If you smoke, talk to your health provider for further advice about smoking cessation.

What can patient do if they do not have transport money to go to the clinic? Take treatment at your nearest or local clinic to reduce high travelling costs.

What can patient do if they are travelling or relocating? Do not just relocate, inform your health provider for proper transfer out. If you are travelling for a longest time, inform your health provider about your travel location and length of your travel time so they can give you a referral letter and sufficient treatment supply. If you have any emergency that caused you to travel unplanned, then go to the nearest facility in the travel area immediately to ensure that you access treatment. You must carry evidence of your TB treatment.

What can TB patient do if they do not have food when taking treatment? Talk to your health provider, they will do proper referral to the social services to assist you with food parcels.

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What can patient who are working do if they do not have time to go to the facility on their appointment date? If are working and you know you don't have time during the week to go to the facility, tell your health provider they will give you suitable follow up dates that will not interfere with their work.

What can patient do if they miss their follow-up appointment? Go back to the clinic as soon as you remember and you will be assisted. Make a good decision and keep all your follow up appointments. Tell your family member about your clinic follow up dates so they can remind you. Honoring your appointment will help you not to wait in a long clinic queue.

Why do patient need to disclose their TB status? You must disclose your TB status to your family members and friends so they can better support you. Fear to disclose your status increase chances of treatment non-adherence. One of the best ways to fight TB stigma and discrimination is by speaking out openly about your status.

Importance of family and community support? Social support will encourage you to take and complete full treatment course. Then you will not spread TB disease to people you love. Social support will then reduce stigma and discrimination in the community.

How can family and friend support TB patients to complete their treatment? Family can support you in many ways, by going with you to collect your treatment. By helping you with transport or taxi fee fare which will help you not to miss your follow up appointment. Tell them about your clinic follow up date, so they can remind you.

Accept directly observed therapy (DOT) supporter to support you:

It is important that you accept DOT supporter: DOT is a program to help cure and prevent TB. DOT may be community health workers, or health workers. They help supervise patients to take treatment correctly and regularly until they finish full treatment course. They monitor any treatment side effects for proper management. It is important that you accept DOT supporters' supervision.

You can even be supported by TB ambassadors: TB ambassadors are available to share their experience and TB related challenges and how they overcame them. You can request for their support at the clinic.

Stay Motivated, finish your TB treatment and be cured. Even though TB is a threat to millions of people. Millions of people have experienced it and overcame it by adhering to their treatment. Remember you are not alone, by taking your treatment you are joining hands with millions of people globally, to kick TB right off the block. Always remember you are never alone.

Remember you can beat TB. Be positive TB is not a death sentence. Always think of how you are going to use your TB experience to help others once you get cured. Once you get cured you can step up your TB club or create a website or Facebook page where you can share your story to inspire others. When you finish your treatment course and get cured you encourage others to do the same.

Together we can beat TB: Your TB struggle must not demotivate you, but it must motivate you to take up the cause of advocating and helping others. Stand out and achieve your goal of being TB free.

Remember to talk to your healthcare provider and community health workers for more information about TB and TB treatment and any issues related to your health.

Call the nearest healthcare facility, healthcare providers or community health workers on the following number for any information related to TB.

Facility name……

Nearest health facility contact details……

Contact of health care providers dedicated for TB……..

Contact of community health workers……

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ZEROTB

Deaths/Infections/Suffering

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RESEARCH AND INNOVATION
OFFICE OF THE DIRECTOR

NAME OF RESEARCHER/INVESTIGATOR:
Mr H Matakanye

Student No:
11550359

PROJECT TITLE: **Development of intervention strategies to improve Tuberculosis treatment adherence in Limpopo Province, South Africa.**

PROJECT NO: **SHS/19/PH/28/0411**

SUPERVISORS/ CO-RESEARCHERS/ CO-INVESTIGATORS

NAME	INSTITUTION & DEPARTMENT	ROLE
Dr TG Tshitangano	University of Venda	Promoter
Dr JT Mabunda	University of Venda	Co - Promoter
Prof TX Maluleke	HSRC	Co - Promoter
Mr H Matakanye	University of Venda	Investigator – Student

ISSUED BY:
UNIVERSITY OF VENDA, RESEARCH ETHICS COMMITTEE

Date Considered: November 2019
Decision by Ethical Clearance Committee Granted
Signature of Chairperson of the Committee: .....
Name of the Chairperson of the Committee: Senior Prof. G.E. Ekosse

UNIVERSITY OF VENDA
DIRECTOR
RESEARCH AND INNOVATION
2019 -11- 04
Private Bag X5050
Thohoyandou 0950

University of Venda
PRIVATE BAG X5050, THOHOYANDOU, 0950λ LIMPOPO PROVINCEλ SOUTH AFRICA
TELEPHONE (015) 962 8504/8313 **FAX** (015) 962 9060
"A quality driven financially sustainable, rural-based Comprehensive University"

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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Department of Health

Ref : LP-201911 - 004
Enquires : Ms PF Mahlokwane
Tel : 015-293 6028
Email : Kurhula.Hlomane@dhsd.limpopo.gov.za

Matakanye H

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

Development of intervention strategies to improve Tuberculosis treatment adherence in Limpopo Province, South Africa.

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
   a. Present this letter of permission to the institution supervisor/s a week before the study is conducted.
   b. In the course of your study, there should be no action that disrupts the routine services, or incur any cost on the Department.
   c. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   d. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   e. The approval is only valid for a 1-year period.
   f. If the proposal has been amended, a new approval should be sought from the Department of Health
   g. Kindly note that, the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated

Head of Department **Date** 25/11/19

Private Bag X9302 Polokwane
Fidel Castro Ruz House, 18 College Street. Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.
Website: http/www.limpopo.gov.za

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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OFHEALTH
VHEMBE DISTRICT

Ref: S5/6
Enq: Muvari MME
Date: 20/01/2020

Dear Sir/Madam. MATAKANYE H

Permission to conduct a research on the
"DEVELOPMENT OF INTERVENTION STRATEGIES FOR TB".

1. The above matter refers.

2. Your letter received on the 20/01/2020 requesting for permission to conduct a research is hereby acknowledged.

3. The District has no objection to your request.

4. Permission is therefore granted for the study to be conducted within Vhembe District. You are expected to submit the results to the District.

5. You are however advised to make the necessary arrangements with the facilities concerned.

Wishing you success in your endeavors.

.....
CHIEF DIRECTOR: DISTRICT HEALTH

28/01/2020
DATE

Private Bag X5009 THOHOYANDOU 0950
OLD parliamentary Building Tel (015) 962 1000 (Health) (015) 962 4958 (Social Dev) Fax (015) 962 2274/4623
Old Parliamentary Building Tel: (015) 962 1848, (015) 962 1852, (015) 962 1754, (015) 962 1001/2/3/4/5/6 Fax (015) 962 2373, (015) 962 227

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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH
CAPRICORN DISTRICT

REF : S.5/3/1/2
ENQ : Makgaloa M.O
TEL : 015 290 9252

FROM: DISTRICT EXECUTIVE MANAGER

TO : Mr. H. Matakanye - student no: 11550359
UNIVERSITY OF VENDA
PRIVATE BAG X 5050
THOHOYANDOU
0950

CELL : 073 8868 949
EMAIL: hmatakanye1@gmail.com

SUBJECT : PERMISSION TO CONDUCT RESEARCH IN THE DEPARTMENTAL FACILITIES (IN THE RURAL COMMUNITY OF BLOUBERG MUNICIPALITY)

The above matter refers:-

1. Permission to conduct the above research is hereby granted.
2. Kindly be informed that :
   - In the course of your research there should be no action that disrupts the services.
   - Kindly note that the Department can withdraw the approval at any time.
3. Your cooperation will be highly appreciated.

DISTRICT EXECUTIVE MANAGER **DATE** 2019.12.20

Private Bag x9530, Polokwane, 0700, 34 Hans Van Resnberg ST, Polokwane 0700
Tel: (015) 290 9000, Fax: (015) 291 3260/1568 Website: http/www.limpopo.gov.za

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LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH
WATERBERG DISTRICT

REF: 4/3/3.
ENQ: NKGODI D.R (PA TO THE DISTRICT EXECUTIVE MANAGER)
DATE: 14/01/2020.

TEL NO: 014. 718 0623 / 082 344 0227.
E-MAIL: David.Nkgodi@dhsd.limpopo.gov.za

TO: MATAKANYE H.

RE: PERMISSION TO CONDUCT RESEARCH: YOURSELF.

The above bear's reference:-

1. The office of the District Executive Manager, hereby confirms receipt of your request to conduct research on development of intervention strategies to improve Tuberculosis treatment adherence in 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.

DISTRICT EXECUTIVE MANAGER
WATERBERG DISTRICT

14/01/2020
DATE

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Editing and Proofreading Report

This letter serves to confirm that I, Dr I. Ndlovu of the English Department, University of Venda, have proofread and edited a report titled "Intervention Strategies to Improve Tuberculosis Treatment Adherence in Limpopo Province, South Africa" by Hulisani Matakanye (Student No: 11550359) to be submitted in the Department of Public Health, School of Health Sciences at the University of Venda.

I carefully read through the report, focusing on proofreading and editorial issues. The recommended suggestions are clearly highlighted and can either be accepted or rejected using the Microsoft Track Changes Function.

Yours Sincerely

Dr Isaac Ndlovu, PhD
Lecturer: English Department
University of Venda
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