FACTORS ASSOCIATED WITH ACCESS TO TUBERCULOSIS CARE AMONG TUBERCULOSIS PATIENTS IN MANDERA EAST SUB-COUNTY, KENYA

BY

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A THESIS SUBMITTED IN PARTIAL FULFILMENT FOR THE REQUIREMENTS OF THE DEGREE OF MASTER OF SCIENCE IN FIELD EPIDEMIOLOGY OF MOI UNIVERSITY

DECLARATION

This thesis is my original work and has not been presented for an academic award in any other university. No part of this thesis may be reproduced without the prior permission of the author and/or Moi University.

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DEDICATION

I dedicate this work to my parents, who despite being illiterate struggled to educate me up to the university level without any formal employment or income. I also want to dedicate this work to my family (my wife and children) for their support and belief.

ABSTRACT

Background: Tuberculosis is an infectious disease caused by *Mycobacterium tuberculosis*. In 2021, 10.6 million individuals got infected with tuberculosis globally and tuberculosis incidence in Kenya was 251 cases per 100,000 population. Between 2019–2021, Mandera county had 1223 cases of which 68 (6%) were lost to follow up and 55 died giving a case fatality rate of 4.5%. The lost to follow-up and mortality could be attributed to a lack of access to tuberculosis care that may also result in drug-resistant tuberculosis. Access to tuberculosis care is the timely use of all the healthcare services provided at the tuberculosis clinic for patients to achieve the desired outcome which is to complete treatment.

Objectives: to determine patient related and health-facility-related factors associated with access to tuberculosis care among tuberculosis patients in Mandera east sub-county.

Method: a cross-sectional study was used. The target population were individuals aged 18 years and above who were diagnosed with tuberculosis in Mandera county. Using a sampling frame of 1223 from TIBU system, a total of 394 tuberculosis patients were selected using simple random sampling. Structured questionnaires were used to collect data from the selected patients on health facility and patient related variables. Descriptive analysis was done by calculating frequencies and proportions for categorical variables. Inferential analysis was conducted using adjusted prevalence odds ratio (aPOR).

Results: most respondents were male at 64.5% (231/358), and urban residents were 83.2% (298/358). Those who had means of transport to the facility were 83.2% (298/358) while those with fare were 20.9% (75/358). Those who did not experience adverse drug reactions were 79.9% (286/358). A majority, 70.4% (252/358) had a tuberculosis clinic in their town of residence, while 77.7% (278/358) were able to access the tuberculosis clinic because they lived within 5 kilometers radius to a clinic. Access to tuberculosis care was 88.8%. Those with means of transport had higher odds of access to tuberculosis care in comparison to those who lacked (aPOR=19.53, $p<0.001$). Respondents with fare had higher odds of accessing tuberculosis care in comparison to the ones without fare (aPOR=20.33, $p<0.001$). Those who adhered to medications had 48.34 times odds of accessing tuberculosis care in comparison to the ones who did not adhere (aPOR=48.34, $p<0.001$). The odds of accessing tuberculosis care were higher in those who had tuberculosis clinic in their town of residence compared to the ones who did not have (aPOR=5.26, $p=0.008$). Those who had privacy at the health facility had higher odds of accessing tuberculosis care (aPOR=12.92, $p<0.001$) in comparison to the ones who did not.

Conclusion: several factors associated with access to tuberculosis care among patients in Mandera East sub-county. Access to transportation, affordability of fare, medication adherence, availability of a tuberculosis clinic in the patient's town of residence, and privacy at the health facility were significant predictors of access to care.

Recommendations: To improve access to tuberculosis care in Mandera East sub-county; stakeholders can work towards improving access to transport services, community engagement, financial and medication adherence support.

LIST OF ABBREVIATIONS

ADR – Adverse drug reaction

CDC – Center for Disease Control and Prevention

DRTB – Drug Resistant Tuberculosis

DOTs – Directly Observed Treatment Shortcourse

FELTP – Field Epidemiology and Laboratory Training Program

FET – Fisher exact test

HIV – Human Immunodeficiency Virus

LTFU – Lost to follow up

MDR – Multi drug resistant

MS – Microsoft

NTLD-P – National tuberculosis leprosy and lung disease program

POR – Prevalence Odds Ratio

RT-PCR – Reverse transcription polymerase chain reaction

SEL – socioeconomic level

TB – Tuberculosis

TIBU – Treatment information from basic unit

XDR – Extensively drug-resistant tuberculosis

Table of contents

List of Tables

List of Figures

ACKNOWLEDGEMENT

I would like to acknowledge my supervisors for their tireless efforts in guiding me throughout the development of this proposal from concept note to the end. I am grateful to the Ministry of Health (FELTP Kenya program) for the scholarship opportunity and Moi University Lectures at the School of Public Health and to the FELTP faculty members for their continuous support and mentorship. My fellow colleagues and FELTP residents for moral support. It is difficult to list all those who in one way or another contributed to my success but let me also acknowledge my mum for her sincere prayer and best wishes. Finally, my family particularly my wife and kids, and my younger brother for understanding, support and encouragement throughout the process.

CHAPTER ONE

1.0 INTRODUCTION

1.1. Background of the Study

Tuberculosis (TB) infectious disease is caused by *Mycobacterium tuberculosis* (Dong et al., 2022). The bacteria usually infects the lungs, but can also infect other organs like the kidney, spine and brain (CDC, 2016). According to the World Health Organization (WHO), 1.5 million people died of TB infection in 2020(WHO, 2021). Globally it is the second leading cause of mortality after Covid-19. Tuberculosis is curable and the treatment is six months anti-TB medication regimen. TB incidence was 127 cases per 100,000 population in 2020 affecting 9.9 million worldwide. In 2021, 10.6 million got infected which is an increase of 4.5% from 10.1 million in 2020, reversing many years of slow decline(WHO, 2022). Similarly, the TB incidence rate (new cases per 100 000 population per year) is estimated to have increased by 3.6% between 2020 and 2021, following declines of about 2% per year for most of the past two decades.

Kenya is one of the thirty nations with a high burden of TB, according to the World Health Organization (WHO) (Enos et al., 2018). In 2021 TB incidence in Kenya was 251 cases per 100,000 population (WHO, 2022). Considering significant state and partner investments in TB prevention and treatment over the last 20 years, the illness still ranks as the fourth greatest cause of mortality (Enos et al., 2018). Consequently, finding everyone who has TB and effectively treating them should be a top priority for the nation. An increase in the duration of the population's risk of exposure to tuberculosis depends on a patient's infectiousness (Khan et al., 2019). Kenya TB prevalence survey conducted in 2016 found that in Kenya the prevalence of TB was 558 cases per 100, 000 population in

comparison to the notification of reported cases which was 233 cases per 100,0000 for the same year (Enos et al., 2018). According to The national tuberculosis, leprosy and lung diseases program (NTLD-P) online database-treatment information from basic unit (TIBU) an electronic surveillance system that is used at NTLD-P for data collection and reporting, only 76436 cases were diagnosed and treated translating to 192 cases per 100,000 population for the same year(TIBU, 2016). This pool of unreported TB cases continues to fuel the spread of the disease, as one undiagnosed and untreated person can infect 10 to 15 others (Kouhpayeh, 2022). Tuberculosis is the sixth leading cause of death in Kenya (MOH, 2020). In 2019, there were 86,504 TB cases reported and treated, of whom 10% were minors (less than 15 years old)

According to an annual report by NTLD-P, there were 609 cases of TB were notified in 2021 (*Annual Reports – NLTP*, 2021). The Same year Mandera East sub-county reported 359 cases, suggesting that more than half of the total cases notified came from Mandera East sub-county.

Access to treatment of tuberculosis and services is the timely use of all the healthcare services provided at the TB clinic for patients to achieve the desired outcome which is to remain on treatment throughout the treatment period or complete treatment and get cured (Leclair et al., 2022). Access to treatment of tuberculosis and services is very important in managing TB as it assures sustainable option for patients to complete treatment, which in turn results in getting cured. Access to treatment of tuberculosis and services could not be measured by one indicator as it involves many sectors including, distance, availability of the TB clinic, availability of healthcare workers, availability of medicines, nutritional supplements and availability of all the services within the TB clinic. In view of these

reasons, access could be measured using its outcome (Leclair et al., 2022). One of the main outcomes of access to treatment of tuberculosis and services is being on care throughout the treatment period, completing treatment and getting cured. Those who continuously adhered to treatment and completed treatment could be termed as those group that had access to treatment of tuberculosis and services and those who lacked access to treatment of tuberculosis and services are those who did not complete treatment.

1.2. Problem Statement

In Kenya, tuberculosis is the fifth most prevalent infectious disease with a significant fatality rate. (Sinha et al., 2021). In 2015/2016 the incidence of TB in Kenya was 426 cases per 100,000 population (Enos et al., 2018). According to the TIBU surveillance system from 2019 to 2021 Mandera County had 1223 cases. Those lost to follow-up were 68 out of 1223. According to an annual report by NTLD-P, there were 609 cases of TB were notified in 2021 (*Annual Reports – NLTP*, 2021). The Same year Mandera East sub-county reported 359 cases, suggesting that more than half of the total cases notified came from Mandera East sub-county.

The County had ten drug-resistant TB (DRTB) patients out of which one was lost to follow-up. The case fatality rate was 55 out of the 1223 translating to 5% while TB is curable and preventable. Although healthcare services were available at the TB clinics for patients with TB in all counties in Kenya, not all TB patients adhered to and completed their TB treatment regimen. It is therefore important to investigate factors associated with access to TB care in Mandera East Sub County.

1.3. Justification

The infection of TB is a cause of concern for the health and wellbeing of large numbers of people. Lack of access to TB care and completion of treatment is a significant obstacle to TB prevention and control, particularly in non-developed countries which leads to high morbidity and mortality rates (Nyangoma et al., 2020). There is insufficient published data on access to treatment of tuberculosis and services among TB patients and this study would address the knowledge gap and eventually the data will be used to manage the factors affecting access hence increase access to treatment of tuberculosis and services in Mandera County-Kenya, hence prevention of morbidity and mortality due to TB.

1.4. Research Questions

i. What are the socio-economic factors related to access of TB care among TB patients in Mandera County?
ii. What are patient related factors affecting access to treatment of tuberculosis and services among TB patients in Mandera County?
iii. What are the health facility-related factors associated to access to treatment of tuberculosis and services among TB patients in Mandera County?

1.5. Objectives

1.5.1. Broad Objective

To determine factors associated with access to treatment of tuberculosis and services among TB patients in Mandera County-Kenya.

1.5.2. Specific Objectives

i. To determine patient related factors associated to access to treatment of tuberculosis and services among TB patients in Mandera East sub-County.
ii. To identify health-facility-related factors associated to access to treatment of tuberculosis and services among TB patients in Mandera East sub-County.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1. Definition, aetiology and historical distribution of Tuberculosis

Tuberculosis is a communicable disease that has affected a huge number of individuals worldwide and is curable if detected and treated promptly. Prior to the twentieth century, tuberculosis was the leading cause of death in the industrialized world, and it remains a threat to public health in many developing nations. One-third of the world's population is currently at risk for contracting tuberculosis, and 5-10% of those at risk will be susceptible to the disease at some point in their lives. Globally, about 40% of TB infections were undetected in 2017 (WHO,2018). In Sub-Saharan Africa, 60% of TB patients commenced treatment, and 50% of patients achieved a successful outcome (Hansen et al., 2017). The majority of instances are passively discovered at the health facility level. In recent years, however, a more aggressive strategy has been established to actively seek for new TB cases in the community. Despite these efforts to enhance diagnosis, detection of tuberculosis cases in low-income countries has remained difficult due to a variety of factors, including geographical constraints (Murray et al., 2013). Delays in TB diagnosis raise the prevalence of tuberculosis and hamper global efforts to eliminate the disease by 2030 (Murray et al., 2013). In Kenya, an estimated forty percent of tuberculosis cases go untreated and can infect an average of ten to fifteen individuals annually (NTLD-P, 2016).

2.2. Global Tuberculosis Burden

In 2020, approximately 84% of TB mortality among HIV-negative individuals and 85% of the total number of TB mortality among HIV-negative and HIV-positive individuals occurred globally(WHO, 2021). WHO geographic areas of Africa and South-East Asia,

India contributed to 38 percent of worldwide TB mortality in HIV-negative individuals and for 34% of the total population in both HIV-negative and HIV-positive individuals. Of the 53% of HIV-negative individuals that died were male and 32% were female, while 16% were children (15 years old). 50% of TB-related deaths among HIV-positive individuals were attributable to TB (WHO, 2021). In 2007, there were almost 9.27 million new infections of tuberculosis worldwide, according to the World Health Organization's 13th annual tuberculosis report, which was released on World TB Day, March 24, 2009. The average number of cases per capita, which peaked in 2004 at 142 per 100,000 and declined to 139 per 100,000 in 2007, is a more relevant indicator of the issue since, despite the fact that this number shows an increase from 9,24 million in 2006, the global population has also increased. An estimated 1.32 million people without HIV infection and 456,000 people with HIV-positive status passed away from tuberculosis in 2007. (WHO, 2019).

Estimates of illness burden influence the direction of health research and financing, as well as how interventions are prioritized within disease control budgets. Current burden estimates may grossly underestimate the health costs associated with tuberculosis by leaving out post-tuberculosis, which could result in the misallocation of resources, political focus, and research effort. Initial evidence of the biases resulting from omitting post-tuberculosis burden has come from burden estimates for specific settings. For example, an analysis comparing the burden of tuberculosis in India with and without post-tuberculosis discovered that total disability-adjusted life years increased by 62% when post-tuberculosis was included (Menzies et al., 2021). A study of the burden of tuberculosis in Tarrant County, Texas, USA, discovered a sizable portion of the total burden was brought on by chronic tuberculosis sequelae.

With 1.6 million fatalities from a single infectious agent in 2017, tuberculosis (TB) is the biggest cause of mortality globally and a threat to public health (Enos et al., 2018). In 2017, an estimated 10 million people contracted TB disease, while only 6.4 million (61%) received notifications. By 2035, the worldwide TB objectives seek to reduce TB fatalities by 95%, incidence by 90%, prevent families impacted by TB from experiencing catastrophic costs as a result of TB by 0%. In order to locate all event instances, efforts must be increased up when the full burden of TB has been determined. when the health notification and vital registration systems are poor.

About 25% of the total new infections of tuberculosis globally were reported in India in 2017, totaling 2.8 million new cases(Secretary Of Jan Swasthya Sahyog et al., 2018). This includes 147,000 new cases of MDRTB (multi-drug resistant tuberculosis), or around 25% of all cases worldwide. Not HIV but tuberculosis (TB) caused 423,000 deaths in India. This amount generally corresponds to one-third of the total worldwide. In India, tuberculosis treatment is governed by the Revised National Tuberculosis Control Program (RNTCP). The vast majority of our patients come from Madhya Pradesh and Chhattisgarh, two regions where the RNTCP reports remarkably favorable results from treatment. In accordance with publicly disclosed RNTCP data, almost 85% of patients are predicted to have satisfactory results; nevertheless, there are reservations regarding data inaccuracies. According to non-RNTCP Indian figures, only 50–75 percent of diagnosed or admitted patients have been beneficial. Much fewer studies has been done on healthcare accessibility variables such as therapy setting, proximity to care, and loss-to-follow-up prior to and throughout therapy than on patient demographic data and microbiologic data, that have been shown to influence tuberculosis results in India.

According to case-fatality-based research, 239 000 children under the age of 15 are estimated to have perished from tuberculosis in 2015, with 191 000 of the deaths happening in children under the age of five (>80% of the mortality in children under the age of 15) (Dodd et al., 2017) . Over 96% of the fatalities (>96%) involved youngsters who were not getting tuberculosis treatment. The number of pediatric tuberculosis deaths could be roughly cut in half if the case-detection ratio for children were increased from its current value of approximately one in three to the two in three currently achieved in adults, or reduced by more than ten times if all children with tuberculosis were treated, according to current projections of low mortality rates (1% mortality) in pediatric patients (Jenkins et al., 2017). Both for under-5 and under-15 death rates, the majority of deaths occurred in the WHO regions of Africa and Southeast Asia; the countries with the greatest per-country mortality rates were India, Nigeria, China, Indonesia, and the Democratic Republic of the Congo. These are all populous nations with annual tuberculosis incidence rates < 400 that are included on the current WHO list of 30 countries with a high burden of the disease. Children with HIV accounted for about 17% of mortality. In sub-Saharan Africa, where 36% of tuberculosis deaths occurred in children infected with HIV, tuberculosis mortality per person was greatest. Around 24% of cases of tuberculosis in children worldwide resulted in death (Dodd et al., 2017).

Twenty-two high-burden countries account for eighty percent of the global tuberculosis load (WHO, 2009). In 2007, India (with 2 million cases), China (1.3 million), Indonesia (530 thousand), Nigeria (460 thousand), and South Africa had the highest prevalence (460,000). 79% of the projected 1.37 million HIV-positive cases occurred in Africa, whereas 11% occurred in Southeast Asia. An estimated 500,000 cases of multidrug-

resistant (MDR) TB were reported in 2007. (Including 289,000 new cases). 55 nations have reported instances of extensively drug-resistant TB (XDR) by the end of 2008. Of them, 131,000 were in India, 112,000 in China, 43,000 in Russia, 16,000 in South Africa, and 15,000 in Bangladesh. These most recent numbers are cause for grave concern and indicate a potential danger to the ability to treat tuberculosis in both individual patients and treatment programs (WHO, 2019).

The diagnosis phase of the care cascade showed the greatest variation in performance between high-burden countries and non-high-burden countries, demonstrating that a significant proportion of presumed tuberculosis patients remained undetected, especially in high-burden countries (Kim et al., 2019). The tuberculosis care cascade varied significantly among the 30 high-burden nations. Nigeria had the lowest rate of diagnoses (less than 20%), and 85% of newly discovered cases of tuberculosis went misdiagnosed and untreated. On the other hand, people with tuberculosis in Papua New Guinea and Angola did not obtain treatment for their illness despite excellent diagnosis rates.. There was discovered to be a general inverse correlation between population health indices, such that nations with subpar care cascades also had subpar health outcomes and coverage of essential medical treatments (such as immunization and prenatal care). The main obstacle to tuberculosis control, particularly for nations with high burdens, was diagnosis. The care cascade phase with the strongest association to population health indicators was determined to be performance in relation to diagnosis. The findings point to the possible use of tuberculosis care cascades as a tracer to evaluate the performance of the entire health system. This is a relevant tracer because tuberculosis treatment lasts for several months and shows how well a health system is delivering continuity of care.

Reducing the global impact of diseases such as TB, HIV/AIDS, and malaria by 2030 is an additional environmentally friendly development aim (Sobe Jermano Boyong et al., 2018). In contrast, the World Health Organization's Eliminate Tuberculosis Strategy, the term of that was adopted by the organization's member nations in 2014, set the audacious goal of eliminating tuberculosis by 2035. Conflicts that are violent may most certainly still provide a barrier that hinders national and international efforts to combat TB. This is because the likelihood of tuberculosis spreading is greatly increased by the absence of medical and social services as well as the negative health effects of population dislocation. The interactions of TB in areas of armed conflict have not received much attention in studies, which naturally limits the effective use of resources for containment. The objective of this investigation was to document the standard diagnostic proficiency for tuberculosis (TB), ascertain the medication vulnerability of retrieved Mycobacterium tuberculosis, and pinpoint potential contributors in this domain. A qualitative assessment of the challenges in obtaining entry to TB management institutions in this area was also conducted. One in five patients who visit the Wau teaching hospital are estimated to be infected by the tuberculosis virus. The study's estimations are greater than those from earlier research done in Somalia and Ukraine in similar conditions. Despite the fact that men made up the majority of the instances, our information biased distribution according to gender may be the reason for this. However, considering that those receiving treatment were selected at arbitrary this may also be a sign of the differences in the methods how men and women access healthcare. Research has demonstrated that men are actually more likely than women to look for medical assistance. Same trends in seeking medical care based on gender have also been noted in Asian countries, including Bangladesh. Warrap, located

about 111 kilometers west of Wau town, has the second-highest concentration of tuberculosis cases. In actuality, Wau and Warrap accounted for 84% of the study's TB cases. This raises the possibility that these two townships are hubs for TB. In such a scenario, high population density and poor health care systems would both contribute to the status quo. The Dinka, who comprise a sizable portion of the people under investigation, are the predominant ethnic group residing in Wau town. It follows that the majority of the TB patients discovered during this examination belonged to the Dinka ethnic group, which is not surprising. However, it's important to highlight that 61% (24/39) of the TB cases involved animal interaction of some kind. Similarly, this could be the outcome of the majority of our sample's ethnic group, the Dinka, having pastors.

2.3. Tuberculosis in Kenya

Kenya is bordered by Somalia to the north-east, Ethiopia and Sudan to the north, the Indian Ocean to the east, Uganda to the west, and Tanzania to the south. In 2005, the incidence of HIV was 6.7%, while 115,234 cases of tuberculosis were reported in 2006. In 2006, the TB/HIV co-infection rate was 52%. National tuberculosis, leprosy and lung disease program (NTLD-P) is committed to attaining the WHO's international targets of 70 percent case detection and 85 percent cure. Similarly, the Kenyan government adheres to the 2015 Millennium Development Goal of reducing the prevalence and mortality of tuberculosis.

The World Health Organization (WHO) has designated Kenya as one of the 30 states with the highest TB burden. Notwithstanding significant state and partner investments in TB treatment and prevention over the past 20 years, the illness still ranks as the fourth greatest cause of mortality. Therefore, discovering everyone who has TB and successfully treating them should be a top priority for the nation. In Kenya, there were 558 (455-662) cases of

pulmonary TB that were bacteriologically proven in people over the age of 15 per 100,000 people.

Geographical variations in the TB load exists by county profile (Sifuna et al., 2019). For instance, the Nyanza Region in Western Kenya, which includes the Siaya and Kisumu Counties, has the greatest prevalence of TB, with a projected incidence of 500 cases per 100,000 people.3 A 700 cases per 100,000 population incidence has been reported in some locations of the region, particularly the vicinity of Kisumu City. The estimated reported TB incidence in some wards was assessed to be 10 times higher than that in others, the rate of new smear-positives varied up to 14 times, and the rate of treatment failure rates differed up to 40 times. Even as more in-depth individual-level research are conducted in the selected locations to assess the most significant factors related to disease distribution, these data may be useful for effective TB control strategies. All years, with the exception of 2015, where the TB rates near Siaya and Bondo fell, it was noted that the elevated reported TB incidence rates were primarily in the vicinity of the major cities of Kisumu, Siaya, and Bondo. In Kisumu County's southernmost region, South-East Nyakach, which neighbors Homa Bay County, we also noted high TB rates. This region is adjacent to Sondu, a commercial center that has expanded as a result of the Sondu Miriu power plant. Additionally, Sondu town serves as a transportation center for the nearby towns of Kericho and Kisii. This may help to explain why there are more TB cases in this area due to the large number of employees and traders that live there.

About one in five smear-positive TB patients in a study of inaccurate reporting of the disease in Kenya were not known to the NTLD-P, showing that the true TB burden was greater than previously thought (Tollefson et al., 2016). Unreported cases might not get

treatment, continue to spread TB in society or, worse still, dying prematurely. This is a major threat to the public's health. To enable adequate treatment for patients, prompt public health responses, and reliable analysis of trends, accurate documentation of TB disease is crucial. Without trustworthy TB monitoring systems, NTLD-P is unable to provide resources, create national plans, monitor progress toward goals for TB control, and report it. To make sure that all confirmed TB cases—and not only those that have begun treatment—are reported to the NTLD-P, TB surveillance in Kenya needs to be enhanced. In Kenya, inadequate reporting was not widespread: With up to one in three smear-positive cases in some locations being unknown to the NTLD Program, it was worst in places with a high TB burden. Larger institutions and largely metropolitan settings (like Nairobi) showed significantly higher levels of under-reporting. Low reporting levels may result from poor recording quality and late delivery of health care at these establishments. A TB surveillance study in Kenya revealed that hospitals and health facilities struggled to keep accurate TB data for patients (Sharma et al., 2015).

Patients with sparse smears also had considerably greater levels of under-reporting, probably because clinics may prioritize contacting the most contagious patients while leaving those with scanty smears looking for medication by themselves (Tollefson et al., 2016). In TIBU, however, hundreds of highly contagious patients were identified but not reported, raising questions about the possibility of ongoing transmission of diseases. Of those 715 undocumented patients, 229 (32%) had a smear grading of at least 3+, and 416 (58%) had an infection grade of at least 2+. Similarly, even though patients under the age of 55 made up the majority of undetected cases, the proportion of older patients who failed to report their cases was significantly higher. This may be due to older individuals are

generally more likely to die, which has been identified as the main cause of prior to treatment loss to follow-up in other nations.

In addition, poverty, starvation, and overpopulation persist in urban slums and institutions such as prisons in Kenya. These factors also contribute considerably to tuberculosis transmission and interact with HIV to exacerbate the problem. Kenya's slum inhabitants account for a disproportionate number of tuberculosis cases, with notification rates of 733 per 100,000 in Nairobi and 800 per 100,000 in Mombasa (Laohasiriwong et al., 2016). Nairobi, where 70% of the city's 3 million residents live in slums, accounted for 20% of the nation's TB cases in 2004. Poverty was a key predictor of Directly Observed Treatment Short Course (DOTS) program utilization or case detection. Variation in poverty accounted for about 18% of case detection rate differences across counties and 63% of variation between provinces.

Significantly lower-case detection rates were observed in rural districts with higher levels of poverty. Unexpectedly, a neighborhood with much higher levels of urban poverty had significantly higher case detection rates. This may be due to the low opportunity costs (transportation, time away from work) faced by urban patients in comparison to their rural counterparts and the availability of free TB care from the public sector (Soriano-Arandes et al., 2019). Poverty played a comparable role in explaining the variation in treatment success rates, with higher levels of poverty in both urban and rural locations being associated with lower success rates. In a number of rural districts, the incidence of poverty is at least 70%, and case detection and treatment success rates are relatively low. Kilifi, Kuria, Kisii, Bondo, Homa Bay, and Rachuonyo are among the districts with high rates of rural poverty and poor rates of case detection.

2.4. Diagnosis of tuberculosis

Certain symptoms, such as chest pain, contributed to the prolonged delay in diagnosis. Some symptoms have been linked to a lack of understanding of tuberculosis and its symptoms. People typically believe that cough and fever are the only symptoms, and as a result, they disregard chest pain, which contributes to a delay in diagnosis (Laohasiriwong et al., 2016). According to NTLD-P (2016) data, 38 percent of TB patients in Kenya have at least one symptom. Coughing was the most prevalent symptom (15%), with 7% of patients experiencing coughing for more than two weeks. Other prevalent symptoms included chest pain (19%), drenching night sweats (12%), exhaustion (11%), fever (8%) and cough with sputum (5%) in proportional frequency.

However, there are no statistics on the percentage of delayed diagnosis for each symptom and both suspected and probable cases in Kenya (NTLD-P, 2016). The most prevalent symptoms were cough, weight loss, and appetite loss, and they were linked to patient delay (Bojovic et al., 2018). In a study conducted in Tanzania by Said et al. (2017), individuals who did not have chest discomfort and who came with hemoptysis were more likely to have a delayed diagnosis of tuberculosis. This is because patients neglect their symptoms, leading to delays in seeking care. Patients with a cough lasting more than two weeks or expectoration are regarded to be possible tuberculosis patients and should undergo smear microscopy, culture, and Gene Xpert testing (Soriano-Arandes et al., 2019). Tuberculosis may also present with non-specific signs and symptoms, such as irritability, vomiting, poor nutrition, neurological symptoms, respiratory distress, gastrointestinal symptoms, fever, and splenomegaly, which may also result in a delayed diagnosis.

The Wau Teaching Hospital's (WTH) diagnostic instruments for finding Mycobacterium in sputum are sufficient (Sobe Jermano Boyong et al., 2018). This evaluation is based on the discovery that, through downstream diagnostics carried out in Uganda, all thirty-nine cases that were identified at WTH using fluorescence microscopy also turned out to carry Mycobacterium. Similarly, the downstream diagnostics revealed that every one of the 26-fluorescence microscopy negative samples that were randomly selected in WTH was similarly negative. The workload and the diagnostician's expertise and skill level have a major impact on the diagnostic tool's quality. Based on this, other NTP centers could gain from these abilities and knowledge by being trained by Wau's diagnostic technical staff.

The patient took an average of 36 days to seek consultation after symptoms began, and an average of 42 days to receive a diagnosis, for a total of 78 days before that point (Sebastian *et al*., 2021). Within 6 weeks of commencement, 72.8% of patients see their doctor, and within 6 weeks of consultation, 74.7% receive a diagnosis. The wait time for an outcome was longer in private facilities. When government agencies were engaged and cough was a noticeable symptom, diagnosis required less time. Socio-demographic characteristics do not appear to alter time. More efforts are needed to eliminate tuberculosis diagnosis delays, particularly with private healthcare practitioners.

To distinguish between COVID-19 bronchopneumonia and tuberculosis, careful chest radiographic assessment is helpful (Vishnu Sharma et al., 2022). Long-covid manifestations could be misinterpreted for tuberculosis signs. In such circumstances, a normal chest x-ray in a lack of sputum production may assist in ruling out tuberculosis. Every patient with nCovid-19 bronchopneumonia needs to have their chest x-ray carefully examined for any abnormalities that might be tuberculosis-related. As atypical radiological

symptoms may be more frequent in patients with nCovid-19, all patients with chest radiological abnormalities should have sputum analysis to rule out tuberculosis. There may be certain cases when the manifestations, indications, clinical characteristics, and chest radiographic characteristics of nCovid-19 bronchopneumonia and pulmonary tuberculosis correlate. In cases where nCovid-19 is suspected, correlation of chest radiographic abnormalities with epidemiologic history, clinical presentation, and RT-PCR test results, or in later stages antibody titers, will assist confirm or rule out the diagnosis. A definite diagnosis of pulmonary tuberculosis should be made through bacteriological verification. As a consequence of the quick, precise, and trustworthy results, molecular diagnostic methods should be employed to confirm or rule out tuberculosis in suspect cases.

One of the main contributing factors to isoniazid-resistant TB among HIV-positive patients in Swaziland may be the extended period of time between diagnosis and start of TB treatment in patients with HR-TB, PDR-TB, and MDR-TB (Dlamini et al., 2019). The study's "time lag" refers to the amount of time, independent of the number of effective medications, that it takes to start a TB patient on treatment following diagnosis by either LPA, C&DST, or gene Xpert testing. The underutilization of LPA and the delayed delivery of results from the national reference laboratory to facilities could be the cause of this delay. The patient would keep spreading the virus because of the delay in receiving a proper diagnosis and starting treatment. Evidence has long been available to support the theory that patients with tuberculosis who receive effective treatment quickly lose their infectiousness and that the majority of tuberculosis cases go undiagnosed or untreated. Given that over 90% of study participants were on antiretroviral therapy (ART) and that the majority of them had CD4 counts of 200 cells/microliter or below at the time of TB

diagnosis—which may have been the cause of infection—this may also apply to Swaziland. It's possible that isoniazid-resistant TB was spread within the facility because the majority of these patients began antiretroviral therapy (ART) prior to the present TB outbreak. According to the study, resistance to all forms of isoniazid-resistant tuberculosis was found to be predicted by recurrence and failure of prior treatment (Dlamini et al., 2019). Given that those patients were given priority for DST within the study's parameters, this outcome is evident. However, the study did incorporate a history of prior TB treatment to highlight the significance of universal C&DST in enabling individuals to receive effective treatment at an early age, hence halting the spread of TB and reducing resistance amplification. According to the World Health Organization, the primary reason for the high percentage of DR-TB cases requiring retreatment is the inability to detect the disease at the time of initial presentation. Gegia *et al*. (2017) conducted a systematic review study that examined 19 cohort studies and 33 trials. The findings indicated that treating isoniazid-resistant tuberculosis with the WHO standard regimen for new patients led to treatment failure, relapse, and acquired multidrug resistance in 11% (6–17), 10% (5–15), and 8% (3–13) of patients, respectively. In line with the findings of earlier research, there was a strong current association between high alcohol consumption and either HR-TB or PDR-TB. Rehm et al. did a systematic review and found that numerous research demonstrated the detrimental effects of alcohol on the immune system, making heavy drinkers more susceptible to tuberculosis. Excessive alcohol consumption affects the disease's incidence as well as its course. It has also been connected to changes in the pharmacokinetics of medications used to treat tuberculosis (TB), a higher risk of re-infection, a higher rate of treatment defaults, and the emergence of drug-resistant strains of the illness. This could possibly be related to

Swaziland's inadequately ventilated alcohol stores, which encourage the spread of tuberculosis (TB) among the country's immunocompromised (HIV-positive) alcohol consumers. Additionally, living in a rural area was linked to both HR-TB and PDR-TB. This may be explained by the possibility that living in a rural area raises a patient's exposure to substandard housing or malnourishment, as well as the possibility that they will have limited access to diagnosis and treatment due to a lack of available healthcare services and financial constraints. All of these factors could contribute to the spread of isoniazid-resistant tuberculosis. When patients without a prior medical history were excluded from the analysis, the model deemed rural residency to be less significant. However, the association's intensity and relevance were heightened by non-adherence to TB therapy. The findings imply a favorable correlation between living in a rural area and non-adherence to TB treatment.

The amount of the infectious pool of tuberculosis (TB) increases with delay in diagnosis and treatment, which contributes to increased community transmission of the disease (Alema *et al.*, 2019). Delays in obtaining care exacerbate the illness by raising the possibility of medication resistance, treatment failure, death, and the spread of drug-resistant TB strains across the community. Consequently, early diagnosis and treatment of pulmonary tuberculosis can lead to a more effective detection and cure rate, which will lessen the burden of tuberculosis. However, pulmonary tuberculosis patients in low- and middle-income countries (LMICs) have lengthy delays in diagnosis and treatment as a result of poor health seeking behavior; the average delay is 31.7 days, while the average patient and health system delays are 28.4 days, 67.8 days, and 31.7 days, respectively. Recent research conducted in Ethiopia suggests that the median wait time for health care

seeking may vary from 20 to 63 days. The Tigrai region, where the current study was done, was the site of another investigation that revealed a median reported delay in seeking medical attention of sixty days. This suggests that the extent of health care seeking delay behaviors in the Tigrai region was not adequately captured by reliable data. Studying the factors influencing PTB patients' delays in seeking medical attention is essential to preventing the disease from getting worse and developing complications, especially in developing nations like Ethiopia where the population has low literacy rates, poor economic standing, and limited access to basic health services. There hasn't been any research on PTB patients' delays in seeking medical attention, which would have assisted program coordinators in creating policies and procedures that would encourage better care-seeking practices. Thus, the purpose of this study was to ascertain the prevalence of health care seeking delay and the factors that influence it in patients with pulmonary tuberculosis in the North-West zone of the Tigrai region in North Ethiopia.

2.5. Empirical Review

Previous studies done on factors affecting access to treatment of tuberculosis and services were reviewed under the following sub-headings; socio-economic factors, health facilities related factors and patient related factors affecting access to TB care.

In a research conducted in the South African province of Free State, the practitioners all discussed educating their patients (Moodley et al., 2020). Regarding the caliber of the information provided by professionals to patients, there seems to be evidence to the contrary. Christian et al. investigated the Western Cape's TB healthcare system's quality and compliance with national norms (Christian et al., 2018). Only 43% of cases fulfilled the required threshold for competent case management, according to their analysis, and

protocol deviations might be linked to insufficient training and understanding, oversight issues, and a lack of clinical governance. They complained that the personnel repeatedly failed to share information, and that only one-third of exchanges included a discussion of the significance of returning for TB findings. The health advancement talks at the facilities in this study covered general information on TB symptoms and measures to prevent infections, including how completing treatment guaranteed better health and stopped resistant disease, cough habits, early TB symptom identification, adverse effects diagnosis, and management (Moodley et al., 2020). This information was derived from unstandardized guidelines, and different clinicians and facilities had different messages. Because of this, it was impossible to determine if patients had received enough information about their condition or how to manage it. The Western Cape study's overall findings indicated a lack of effort in disseminating crucial information about untreated TB and the necessity for treatment, and they noted that lax protocol adherence may have contributed to the dismal TB results (Christian *et al*., 2018).

MDR-TB has been linked to treatment non-adherence for tuberculosis. Non-adherence to TB therapy was positively linked with HR-TB, PDR-TB, and MDR-TB, if the analysis was limited to patients without a prior history of treatment (Dlamini et al., 2019). The outcomes align with the findings of a research study by Naidoo et al. and a corresponding manual on programmatic management of multidrug-resistant tuberculosis (MDR-TB) from the World Health Organization. These studies indicated low treatment adherence as a risk factor for drug-resistant tuberculosis (DR-TB). This could be explained by the correlation between poverty and tuberculosis (TB), as the majority of patients do not follow their treatment regimens due to food insecurity or insufficient funds for transportation to healthcare

facilities for refills. On the other hand, TB is among the most stigmatized illnesses, and it can also make adherence difficult or cause patients to miss appointments because of side effects. In this investigation, IPT was not linked to TB that was resistant to isoniazid. Results from earlier research on the impact of IPT on isoniazid-resistant tuberculosis were inconsistent. According to a study by Cattamanchi et al., IPT and HR-TB have a favorable correlation. Conversely, a meta-analysis revealed that IPT was not statistically linked to HR-TB; nonetheless, the results could not rule out a higher incidence of isoniazid-resistant TB following IPT. Less than 10% of the HIV-positive patients in the current study had undergone IPT, making the results unclear. Therefore, additional prospective studies with a bigger sample size are necessary to achieve reliable results.

The prevalence of MDR/RR-TB has been linked to a number of factors, including patient non-adherence to prescribed medication, physician error related to inadequate or inappropriate chemotherapy prescribed, a poorly operating National Tuberculosis Programme linked to poor drug quality, a lack of Directly Observed Treatment Short-course (DOTS) and irregular drug supply (Tembo & Malangu, 2019). On the other hand, nothing is known about how these factors contribute to the high rate of MDR/RR-TB in Botswana. Determining the causes linked to the high incidence of MDR/RR-TB in Botswana is essential for resource allocation, burden reduction, and setting health priorities. In order to create an efficient control program, the goal of this study was to ascertain the present burden of MDR/RR-TB and the parameters linked to its prevalence among suspected DR-TB patients in Botswana. Previous research conducted in Ethiopia has indicated that the incidence of TB medication resistance is often caused by variables such as poor patient adherence, inappropriate treatment regimens provided by medical

professionals, and prior exposure to anti-TB drugs. According to other studies, the most frequent characteristics linked to the frequency of medication resistance are female sex, younger age, urban domicile, non-permanent inhabitants, known TB contact, rural population, and HIV infection. This study indicated that the prevalence of MDR/RR-TB was positively correlated ($p<0.05$) with both a history of prior TB therapy and smear positivity. However, no statistically significant correlation ($p>0.05$) was found in our investigation between the prevalence of MDR/RR-TB and specific patient characteristics as age, gender, HIV status, or population type. According to the evidence gathered, stopping further transmission requires early case discovery and the fast beginning of suitable therapy. The disease burden will be considerably decreased by targeted policies for smear-positive cases and patients who have already received treatment for tuberculosis. These policies will include the establishment of a top-notch DOTS program that includes patient monitoring and medication-taking follow-up. To further lessen the burden of MDR/RR-TB, it is necessary to enhance drug resistance surveillance monitoring systems and execute efficient infection control methods. Significant information about the present prevalence of MDR/RR-TB in Botswana as well as factors related to its prevalence have been made public by this study. This study has shown minimal levels of MDR/RR-TB in Botswana, according to the data. Only a positive smear and a history of prior anti-TB medication were found to be statistically significant factors linked to the prevalence of MDR/RR-TB. As a result, effective DOTS plan implementation, ongoing drug resistance surveillance, stopping the spread of new MDR/RR-TB cases, and treating current patients should be the main goals of MDR/RR-TB management strategies. Enhancing TB infection control initiatives should be the main goal of future interventions.

2.5.1. Socio-Economic Factors

Although medication for podoconiosis was free, two publications explained that the cost of transportation discouraged individuals from obtaining therapy (Tora et al., 2012). Podoconiosis is a kind of non-filarial elephantiasis that afflict barefoot people in highland tropical locations. In a research done by vergunst, 11% (n = 322) of the participants with disabilities could not afford transportation to reach health care facilities, according to one report (Vergunst *et al*., 2017). Intriguingly, several sources claimed that participants were required to pay more for their wheelchairs and accompanying attendants (Hailemariam et al., 2016). In the articles retrieved, additional expenses associated with receiving care in a nearby institution included lodging and meals

There is a large body of research demonstrating the connection between TB burden and socioeconomic level (SEL). However, a large portion of the research depends on environmental data and does not account for well-known risk variables at the user level (Siroka *et al*., 2016). In four of the eight nations examined, there was a relationship between a household's lower SEL in comparison to other households, but this association did not follow the predicted dose-response pattern. Additionally, no association was discovered when evaluating absolute wealth in multi-country pooled analysis. To optimize the efficacy of TB control initiatives, policymakers around the world require better population-based evidence to inform budget allocation outside of the health care sector. By determining the TB risk differential for the most destitute households, this investigation tried to offer that proof.

Both high- and low-income nations struggle with case detection and patient retention in TB care, particularly in rural areas (Diaw et al., 2018). In LIC, where up to 70% of patients

are lost to follow-up, there have been little research on patient retention in care. This practice is probably causing the spread of medication resistance, stressing the need for novel tactics to keep TB patients in care and treatment.

Increased participation from churches and community networks is anticipated to have a significant positive impact on TB services in this area (Diefenbach-Elstob *et al*., 2017). Former patients who have been successfully treated can offer assistance and services to new patients, especially in a society where ties to the local community are already strong and highly valued. Numerous factors were found to be significantly influenced by education, or a lack thereof. Inadequate patient education regarding their condition and course of therapy may be a result of the tremendous workload that healthcare professionals must bear. However, adequately qualified former patients might easily give instructional services, such as those that new patients receive.

In Europe, and more specifically in European union countries, there are several policies in place for the healthcare management of people with a latent TB infection or TB disease (Sotgiu et al., 2017). There is a lack of scientific data on how to effectively and early identify TB patients, and the diagnostic methods used to identify people with latent TB infection are insufficiently accurate. Political issues with managing refugees plague nations like Greece and Italy, and the inadequate living conditions in immigration camps can raise the risk of Mycobacterium tuberculosis transmission. There is an urgent need for political commitment and strong advocacy. The existing migratory patterns pose a risk to both human and healthcare systems. For the migrant and indigenous populations' health to improve, new uniform and goal-oriented policies and methods are required.

2.5.2. Health Facility Related Factors

According to a study done in Nepal, staffing shortages at peripheral health facilities are a significant issue (Marahatta et al., 2020). Significant barriers for patients were the staff's irregular presence, official hours, and frequent absence on multiple days. Patients were unable to receive care because, according to the majority of participants, staff was frequently missing even during business hours, the medical center didn't follow established business hours, and staff members were difficult to find for several days. Another major problem was the lack of staff who could diagnose, treat, and administer medicine. This led to missed opportunities for diagnosis, delayed medication introduction, insufficient counseling, and subpar drug adherence. The fact that some patients had to pay to visit a more expensive medical facility for a diagnostic added to their displeasure.

Closer proximity to hospital centers that give treatments upon referral increases the likelihood of obtaining specialized medical care when region urbanization was taken into account, while closeness to outreach programs reduced the number of clinic visits and enhanced continuity of care. This could be a result of increased ties to community-based groups that provide non-medical health services or engagement with multidisciplinary teams like Assertive Community Treatment, where service consumers might encounter non-medical team members (Leclair et al., 2022)

Frequently, respondents were dissatisfied with the unavailability of drugs at health centers. When asked, health professionals and service providers frequently cited a shortage of supply from higher centers as the cause. Even the absence of syringes and purified water was occasionally cited as a justification for referring patients to other facilities. The

indoctrination and advocacy of the establishment of a health center for the communities was recognized by both patients and health professionals.

Health centers were created in a location near the residences of political figures, and access difficulties for the bulk of the people are frequently emphasized (Leclair *et al*., 2022). Additionally, reaching health facilities might be challenging for villages in mountainous areas where settlements are scarce and distributed over a vast mountainous area.

According to a study carried out in the Kersa District of Ethiopia between June and July 2012, a significant proportion, 135 (35.2%) tuberculosis individuals suspected, have not requested for microscopic examination of sputum smear. The patient files and laboratory data did not contain twenty one (8.4%) of the sought-after patients (Dabaro, 2017). Of those who were evaluated and recorded, only 10 (4.4%) got a positive smear. Participants identified a number of factors as important contributors to the low case identification rate, including the scarcity and erratic availability of acid fast bacilli reagents and supplies, insufficient facilities, frequent power outages, a lack of trained healthcare professionals, negligence on the part of healthcare professionals, weaknesses in the laboratory quality assurance framework, and a poor culture surrounding the use of health information.

Connecting TB patients to care was faced with a number of health system difficulties *(Vanqa et al.*, 2021). According to a study conducted in Cape Town, South Africa, by Furin *et al*., nurses did not provide individuals with sufficient data during the prior to treatment phase to adequately prepare and arm them with the necessary information before beginning the treatment journey (Furin et al., 2020). Moodley et al. conducted an exploratory study in 2018 with patients and doctors in the Free State Province of South Africa. This study demonstrated how TB treatment is hampered by patient education gaps and patient-

centered practices (Moodley et al., 2020). The findings indicated that patients thought the TB messaging they had been given was insufficient. Clinicians acknowledged that their medical care of tuberculosis (TB) lacked the psycho-social component in treating a social disease of this magnitude and concentrated on therapeutic information. Another study by Kigozi et al. in the Free State Province of South Africa revealed that patients with prior TB and those whose initial sputum test results were negative but later confirmed as positive for TB were the majority of patients who delayed linking to care (Kigozi et al., 2017). These investigations highlight the disconnects in communication that exist between TB patients and healthcare providers and that cause patients to receive care more slowly. The results are consistent with this earlier research, demonstrating that patients were not adequately informed about the various diagnostic procedures and any potential variations in the outcomes.

The relationship between the patient and the therapist is questioned for its deficiencies. Patient counseling continues to be a crucial component in lowering follow-up failure rates, with combined behavioral counseling and TB care boosting adherence to recommended treatment regimens (Nyasulu et al., 2018). To guarantee high-quality patient education and communication, clinicians must have understanding of TB disease and its care as well as outstanding communication skills (Moodley et al., 2020). A possible strategy is to provide resources that are user-friendly and culturally suitable in local languages. It has been demonstrated that the use of straightforward written material augmented by visual signals like pictograms improves comprehension and memory of the knowledge. In the Eastern Cape of South Africa, the adoption of a picture-based TB brochure in primary care clinics was regarded as a crucial patient teaching tool (Okeyo & Dowse, 2018). By providing

factual information that encourages adherence to recommendations and reduces guesswork, illustrated material has been demonstrated to increase patient communication. Clinicians require adequate instruction in interpersonal skills, especially when the engagement is related to compliance with treatment, whether it is with the use of new resources or in routine care. Developing mHealth innovations, for instance, could help close the communication gap between patients and clinicians and minimize missed opportunities for follow-up via text messaging (Hirsch-Moverman et al., 2017). This technique, nevertheless, depends on having the ability to use mobile technology and having up-to-date contact information, both of which have been questioned in this study. Similar research was done in India by Arulchelva et al., who also promoted the use of social media for interpersonal communication, such as watching health-related movies on mobile devices (Arulchelvan & Elangovan, 2017).

It is recognized that using a patient-centered strategy directly helps patients since it enables the doctor to comprehend the patient's expectations, feelings, and social setting of the condition (Moodley et al., 2020). Better treatment outcomes are probably going to be obtained by the doctor who assumes the expert role while still treating the patient as an equal. The patient's preferences can be taken into account, addressed, and incorporated when developing management plans, allowing care to be tailored to the unique needs of the patient. More generally, the patient-centered approach emphasizes social support programs, improved communication and collaboration between the community and health sectors, as well as the empowerment of TB patients and their communities.

The majority of studies, such as Grut et al., 2015, Scheffler et al., 2017, and Loyola-Sánchez et al., 2016, have uncovered both positive and negative views that influence

PWDs' access to health care (Grut et al., 2015). Positively, the papers suggested that providers were friendly, helpful, and willing to treat the health conditions of their clients (Scheffler et al., 2017). Moreover, some providers established a bond with their consumers that aided the delivery of quality health care (Loyola-Sanchez et al., 2016). These positive attitudes were in part the result of intensive efforts aimed at increasing providers' sensitivity to the health requirements of clients with disabilities. Nonetheless, a number of studies found that negative provider attitudes, including discrimination and stigmatization, were significant barriers to health care access (Hanlon et al., 2017).

Since 2013, the nascent republic of Southern Sudan has been beset by armed conflict, resulting in the mass displacement of millions of people (Sobe Jermano Boyong et al., 2018). While people of the Wau Greater region accounted for 66% of the probable tuberculosis cases in this study, almost one-third of the illnesses originated from places located between 100 and 545 kilometers away from Wau town. These would be seen as considerable distances for a patient to travel, even by automobile, in order to receive TB medical care. As our qualitative data showed, some of these people had indeed traveled these considerable distances on foot to get to Wau. Gunfights caused the patients' travels to be interrupted in certain circumstances. Thus, it is quite probable that only those who could withstand the arduous travel and unsafe surroundings arrived at this medical center. This implies that the true number of cases of tuberculosis may exceed the figures we have published. The most startling finding from these results is that a few TB individuals said they had previously started treatment, but they were unable to finish it because they could not get to WTH for replenishment. It is said that the main factor contributing to drug resistance to TB medications in other places is treatment regimen noncompliance. The bulk

of the cases, however, were still curable with the first line of TB medications, i.e., 94.6% and 100% susceptibility to rifampicin and isoniazid, according to our drug susceptibility profiles. The results indicate a surprisingly low prevalence of resistance, in contrast to other nations that have had protracted armed conflicts, such as Syria, Georgia, and Ukraine. The information in our study does not allow us to determine whether this is a direct outcome of the functional TB service provision that has been reported in Afghanistan. In order to comprehend this tendency, more research in this field needs to be planned.

Approximately 80% of rural Indian TB patients saw success with self-administered therapy (SATs) following ten years of clinical quality improvement and community involvement in a high-risk demographic (Secretary Of Jan Swasthya Sahyog et al., 2018). Many of the clinical and demographic factors found in earlier research were still present in the analyses, but their effect sizes were smaller than those of variables pertaining to care access. Even at long distances, there was an adverse relationship between distance from care and favorable treatment results and a clear correlation with loss to follow-up. Adverse effects usually started quite early in the course of treatment. These positive results are not as high as those reported by the RNTCP. However, it is unclear whether the patient classification enrolled in treatment in this environment is comparable given prior criticism of reported RNTCP data. The TB treatment success rates that have been steadily improving in basic and secondary care settings can probably be explained by a variety of system-based modifications. A special TB Ward with its own staff has been established in the inpatient environment. This ward is situated in a part of the hospital with plenty of natural light and ventilation. In line with recent recommendations for the nutritional care of the malnourished tuberculosis patient, patients on this ward receive two meals and one snack

per day that are high in protein and calories. Patient-wide counseling, which includes an explanation of typical adverse responses, the follow-up schedule, and what to expect during treatment, has been used in the outpatient setting at the time of diagnosis. Patients and their families can call the assistance line at any time with questions or concerns. To assist with managing the pill burden, patients and a family member are given a drug organization box. When necessary, family direct observed therapy (DOTs) is also used. Patients receive dietary support as much as feasible. Financial assistance is provided when required to pay for travel expenses to and from the hospital. Reminder phone calls are made a few days before scheduled appointments, and patients who do not follow up are contacted by TB program staff. The staff uses phone or in-person contact to trace patients who have been lost to follow-up. Patients who are severely malnourished and especially vulnerable to an early adverse drug reaction are frequently admitted to the TB Ward for a three-day stay in order to monitor the start of their treatment. Aggressive treatment of co-morbid conditions that may impact treatment outcomes and quality of life is also part of the TB care provided to all patients. For TB medication administration, narrow weight-based bands are used in an effort to reduce adverse drug reactions in the undernourished. The usage of daily medication regimens predates recent modifications to national treatment recommendations in India by a long margin. We believe that a combination of the previously mentioned modifications is responsible for the progressive improvement in TB treatment success rates.

2.5.3 Patient Related Factors

People with prior experiences at health facilities have a significant impact on the decision to seek treatment for those with mental problems (Hailemariam et al., 2016). In the majority

of cases, individuals expressed dissatisfaction with the treatment they received at facilities. Particularly, some patients seeking care at health facilities since their health issues have not improved (Tora et al., 2012). Some clients sought alternative care, such as traditional and faith-based healers, as a result of the perceived inadequate quality of services (Tilahun et al., 2017). Intriguingly, when patients exhausted their traditional treatment options, Western medical facilities became their last recourse (Banks et al., 2016). Additionally, others rely on medical shops or fly to major cities to obtain medical care (Van Hees et al., 2015). Some of the publications emphasized that clients' and caregivers' lack of service-related knowledge restricted access. For instance, one study reported that community members were unable to distinguish individuals with mental illness (Braathen et al., 2013). In addition, (Hamilton et al., 2017) indicated that the knowledge of health care practitioners and policymakers regarding services is crucial for making services accessible. In several instances, however, the papers reported that providers and policymakers demonstrated inadequate knowledge of services (Hanlon et al., 2017). The lack of understanding of providers about the diagnosis and management of disability-related health problems was another concern mentioned in the literature. In contrast, according to one publication, 66% (n = 142) of study participants with spinal cord injuries reported that their health care professionals were educated about their problems (Hamilton et al., 2017).

One of the causes of the development of acquired DR-TB is lost to follow-up (LTFU) (Andargie et al., 2021). Following LTFU, patients who return to retreatment were more likely to contract DR-TB, had a worse prognosis, and possibly even pass away. An estimated 52 MDR-TB patients who were lost to follow-up are likely to have resulted in 5 patients developing XDR-TB, 3 new individuals developing MDR-TB and 1 new

individual developing XDR-TB, and 3 fatalities, according to reports on the economic burden of non-adherence to TB treatments. Furthermore, it is probable that LTFU resulted in additional costs close to USD 380,000 (USD 325,000 for health services and USD 55,000 for household and societal expenses). This translates to a price per patient of more than USD 7,000. Ethiopia had a high rate of lost to follow-up among MDR-TB patients, with regional variations noted. The loss to follow-up was substantially correlated with the anatomical site of MDR-TB. Reducing LTFU requires strengthening the patient-centred monitoring system to address treatment compliance barriers on the patient and healthcare system sides. Healthcare providers employed by MDR-TB treatment facilities ought to encourage patients on continuing their treatment, with a focus on extrapulmonary MDR-TB patients. A difficulty we faced while conducting this evaluation was the dearth of research focused solely on lost to follow-up.

Despite the fact that DR-TB is a top concern in Swaziland, no research on the risk factors for isoniazid-resistant TB in HIV-positive patients has been published (Dlamini et al., 2019). In order to inform the TB and HIV programs on the causes of isoniazid-resistant TB and to facilitate the development of treatments to address the issue, empirical data is therefore required. In addition, the Swaziland government has carried out a number of initiatives to lessen the prevalence of tuberculosis among those who are living with HIV. Increased TB case findings, quick diagnostic tests (Xpert MTB/RIF), the ability to perform drug susceptibility tests for first- and second-line TB drugs locally, integrated patient testing (IPT) for HIV-positive patients who have tested negative for TB, increased antiretroviral therapy (ART), TB medications obtained from quality-assured suppliers, decentralized TB and HIV services, and integrated TB/HIV services are some of these.

The results of treatment and related variables for DR-TB have been the subject of numerous primary investigations (Andargie et al., 2021). The estimates of the prevalence and related variables of LTFU among DR-TB patients varied according to these primary investigations. On poor treatment outcomes, a few systematic reviews and meta-analyses have been reported. Nevertheless, the computation of LTFU in the review by Eshetie S. et al. included patients who were not assessed in the outcome assessment. Patients whose treatment outcome was "not evaluated" (transfer outs and patients still receiving therapy) were not included in our review. A patient should follow the suggested regimen for the whole prescribed length in order to ascertain the patient's final treatment outcome. Because of the huge magnitude of the denominator, the prevalence of LTFU in the aforementioned review paper may have been underestimated. The second review by Tola H. et al. focused on treatment non-adherence in all TB patients, not just those with DR-TB. This included intermittent treatment with LTFU in combination. In general, other systematic studies took into account variables linked to favourable or unfavourable treatment outcomes. In this case, the unfavourable result included LTFU combined with treatment failure, treatment default, and/or death. The factors that are especially linked to treatment-related leg pain failure (LTFU), a significant consequence of acquired drug resistance and, thus, a major factor in the community's spread of drug-resistant tuberculosis (DR-TB), are not well-evidenced. Thus, the purpose of this review was to estimate the prevalence of LTFU and related variables among MDR-TB patients in Ethiopia.

Given customers' limited knowledge, the authors acknowledged that providing information about services could facilitate access to health care(Louch et al., 2022) . Similarly, some publications assert that the ability of clinicians to effectively explain the types of health

care services that are easily available can result in efficient health care delivery (Hussain & Tait, 2015). In certain instances, however, health care practitioners had trouble interacting with clients with intellectual and hearing disabilities (Burton & Walters, 2013). A paper identified the incapacity of clinicians to comprehend the degree of comprehension of clients with intellectual disabilities as a barrier to the delivery of health care (Scheffler et al., 2017). Another study found that physicians were unable to deliver information or converse in sign language with hearing-impaired patients. Consequently, two publications reported that clinicians relied on care givers to report the health problems of clients.

According to a study conducted in the Ntcheu district of Malawi, the majority of participants knew that the condition could be healed if TB-like symptoms were observed and a diagnosis was made early (Nyasulu et al., 2018). Many others raised the possibility that access to care may not be a problem. A chance and entry point for a campaign to encourage early diagnostic seeking, which can result in early treatment and a decreased burden of TB, is the belief among the majority of participants that TB is treatable and that medications are accessible.

Living with a spouse or family decreased the likelihood of being able to access and receive healthcare, according to research by LeClair (Leclair et al., 2022). The behavioral access to care model proposed by Andersen contends that social support promotes the use of health services. Living with relatives reduced the likelihood of requiring medical attention, the likelihood of receiving it, and the frequency of clinic visits in this study. Living with family members may make the "marked difference that is negatively appraised" more obvious, increasing the self-perceived stigma from both the standpoint of the service user and from the relatives (Reupert et al., 2021)

The stigma associated with severe disease or chronic illness may limit service users' and their loved ones' ability and willingness to fully participate in treatment, which may raise the choice for self-reliance (Goulet et al., 2020). Living with relatives may also boost the perception of one's capacity for self-management because some may assume the position of caretaker and handle some elements of care, minimizing the need for clinic visits or postponing the family doctor's recommendation of a consultant or specialist. This might be especially true in health systems where daily care and help-seeking are primarily reliant on relatives and close friends (MacDonald et al., 2021). Another argument is that families might shield their loved ones who are suffering from serious illnesses from services they do not deem appropriate or that must be obtained through community health volunteers whom families are unwilling to use. Access to and usage of healthcare are significantly hampered in Québec and abroad by issues relating to the acceptability of mental health services, particularly in a setting where having a severe disease is still highly stigmatized (Leclair et al., 2022).

People who inject drugs are another highly stigmatized group, and a narrative synthesis of access to services for this group has highlighted the important roles that nonjudgmental health professionals, high levels of confidentiality, and flexibility of services play in increasing access and making services more acceptable to service users (MacDonald et al., 2021). To access care that might endanger their relationship with a loved one, expose them to discrimination or judgment from healthcare professionals, or cause them to feel unsafe or ineffective, families may be unwilling to use community health volunteers Inadequate support from some practitioners and significant discrimination from others may have contributed to the frustration of many families and service users, particularly those who

also have co-occurring substance use disorders (Gronholm et al., 2017). For some service users, the correlation can be the opposite: those who can't get timely access to the right medical treatment would be more likely to move in with parents, siblings, or adult children. Relatives are the main sources of financial, psychological, and social support, thus resources should be put toward educating them about their health and offering them support (Maybery et al., 2021). This calls for enough funding to give healthcare professionals the time to talk to and listen to families, as well as the training they need to understand the ethical and legal ramifications of such intimate family engagement. Relatives are too frequently placed in difficult situations where they must balance getting medical attention, navigating the administrative maze and civil court requirements, and maintaining their own health and safety (Kaslow et al., 2020).

A patient-centric strategy should be taken into account at the programmatic level to increase TB treatment adherence (Deshmukh et al., 2018). For treatment adherence, a plan that involves social support mobilization, nutritional supplementation, and motivational counseling is required. For greater adherence and treatment success rates in TB treatment, participants recommended a Patient Support Group-led treatment care paradigm.

In a Montenegrin study, it was found that a number of factors contributed to patients' delays in receiving TB diagnoses. According to demographic data, marital status was linked to a significant patient delay (Bojovic et al., 2018). Married people experienced longer wait times for their patients, but a more thorough explanation for this link was missing. In reality, cultural variables that affect access to healthcare could be a possible cause of such an outcome. Contrarily, Montenegro does not fall under this because all citizens have equal access to healthcare. The development of numerous health ailments is likely one of many

problems that people in such economies experience given that the economy of Montenegro is currently undergoing change. The decision to schedule a doctor's appointment might have been put off due to difficulties in providing for families. None of the socioeconomic variables were related to a significant or protracted patient delay. Regardless of whether a person has health insurance or not, Montenegro offers free diagnostic services and treatment for tuberculosis. This is how the national strategy seeks to lessen potential obstacles to obtaining health care, particularly for poor population groups.

According to Nyasulu et al. (Nyasulu et al., 2018). TB is widely seen as a serious illness with serious implications that put everyone—including participants—at risk. Due to long diagnostic delays, TB was also seen as a challenging illness. Awareness of a threat must exist before attitude can alter, according to a majority of behavior change models. Given that the majority of individuals think they have TB, there may be a chance for a campaign that emphasizes how early diagnosis and treatment can help people lower their risk of infection. This can considerably slow down the spread of TB. According to estimates, every incurable infection may lead to twenty additional outbreaks annually (Nyasulu et al., 2018). The importance of swift identification and therapy, which may be able to arrest the spread of tuberculosis, was well acknowledged. Nevertheless, people's limited familiarity with the majority of TB symptoms and their aversion to what is thought to be repercussions of testing positive for TB appeared to have had an impact on their capacity to seek an early diagnosis.

In the past, the population's biggest health issue was tuberculosis. Individuals with greater tuberculosis understanding were less inclined to have patient delay in seeking treatment. However, having more information hasn't always been linked to a lower chance of patient

delays. (Mahato et al., 2015). Structured initiatives in the field of public health to increase understanding of the tuberculosis problem, especially among those who are at risk, seem to have been beneficial.

Rural Victoria, Australia, therapeutic outcomes and health-seeking habits were comparable in both urban and rural settings. (Moyo et al., 2023). Despite the apparent tendency toward health-related delays necessitates continuous tracking and evaluating chances for programmatic developing, the findings obtained implied that current initiatives were operating successfully. Additionally, those above 64 had an even greater chance of mortality from TB, and because of this danger, more intense care may be needed. Mutembo et al., contradicted with the findings (Mutembo et al., 2019), that the likelihood for mortality in the remote regions of Zambia was 70% greater; nevertheless, these variations happened in the setting of our better equipped and less frequently occurring scenario. In rural Victoria, it was found that advancing age and male gender were determinants of reduced successful completion of treatment, which may open the door for treatments. Specifically, understanding of a lower likelihood for therapy finishing in these communities could be considered in evaluating the degree of additional assistance and treatment monitoring needed for individuals with TB and promote specialized instruction as well as support for compliance solutions for categories with noted lower rates of finishing treatment.

According to a Zimbabwean research, remote regions had a mortality rate that was greater than metropolitan areas (Mutembo et al., 2019). Patients living in remote locations typically experience poor TB treatment results, particularly lost to follow-up, in comparison to those living in metropolitan areas (Musaazi et al., 2017). This study includes

information on persistent tuberculosis and offers a reliable evaluation of therapeutic results for persistent TB reported independently for mortality, failure of treatment, and lost to follow-up. Considering persistent TB victims not retained in care have a chance to advance to MDR-TB and are a possible danger for continued infection of the multi-drug resistance tuberculosis, it is crucial for recurrent TB patients to underestimate the size of retention level. Rural locations had a lower retention rate while having a lower frequency of recurrent TB than metropolitan areas. This suggests that rural areas have a higher likelihood of producing the next wave of MDR-TB infections (Musaazi et al., 2017).

Adverse drug reactions, extended regimens, and before TB treatment were programmatic variables that contributed to loss to follow-up (Shringarpure et al., 2016). Patient factors included social support, monetary security, disease disclosure, anxiety about stigma, and co-morbidities. Health and Safety system variables included interaction between patients and providers and connections, treatment psychotherapy and comprehension, and diversity in medicine (Shringarpure et al., 2016). It is known that stigma makes MDR-TB patients less likely to be followed up. Compliance with treatment and uptake were observed to be inhibited by stigma. It managed to motivate some patients to finish their care in order to prevent home visits from medical staff for extraction procedures. Proximity from DOT sites had been determined to possibly contribute to patient retention in specific settings, despite the fact that geographical proximity is not frequently reported in the literature as a cause of loss to follow up. Additionally, it was discovered that migratory labor may increase loss to follow-up because it exacerbated patients' numerous problems with regard to their movable housing and socioeconomic requirements. Loss to follow-up has been linked in large part to financial difficulties.

Early case discovery and immediate anti-TB chemotherapy start are key to controlling the spread of TB (Nyasulu et al., 2018). People must be able to recognize TB infections by being aware of the symptoms and signs for the reason to avoid future infections. Being able to do that could greatly aid in early detection. As a result, populations will experience early treatment and a decreased risk of illness.

The people who took part in a study conducted by Nyasulu made references to the requirement for long-term treatment compliance in order to be cured of TB (Nyasulu et al., 2018). Most of the participants thought this was a significant obstacle to overcoming the illness. Some of the patients did, however, admit to forgoing treatment too soon once their health had improved. As the condition returned and the patient was compelled to resume a complete treatment regimen, this just led to additional pain. The author makes the case that patients with little awareness of tuberculosis unlikely inclined getting medical attention, they resort to unconventional healers and self-medication, which causes undesirable outcomes.

A large proportion of those interviewed believed that TB was a disease that transmitted readily from one person to another and was infectious. Others stated that tuberculosis is a respiratory infection, emphasizing on significance of following coughing protocol in order to prevent the illness from spreading. However, most of the participants had several false beliefs about how TB spread. The misunderstandings theme below provides an illustration of this (Nyasulu et al., 2018). The majority of cases believed that tuberculosis was serious illness with an insidious onset that mostly affected the chest and was challenging to detect. The majority of respondents were worried about the frustration one must through before

receiving the proper diagnosis and therapy. Patients were frequently treated with various drugs with no progress caused emergence of signs that mimicked the same lung diseases.

The research found that although those who participated had a correct understanding of tuberculosis as an infectious disease with a cure, they were unaware of its etiology or method of spread (Nyasulu et al., 2018). In contrast to the common belief that random interaction and the exchange of cutlery are the primary means of TB transmission, participants held the opinions that genes, drinking and using tobacco, cold weather, trauma, gritty environments, and poor omens were the main causes of tuberculosis. This is accurate, despite the fact that the patients had been getting therapy previously and that the medical center ought to have provided TB information. It is quite troubling that there is a dearth of knowledge about tuberculosis (TB) as this leads to false assumptions about the prevention and control of TB, making it difficult to decrease the impact of TB.

According to the study's findings, pastoralists in comparison to the nearby sedentary population had significantly less knowledge of the causes, symptoms, method of transmission, prevention, and treatment of tuberculosis (TB) (Mbuthia et al., 2018). In comparison to the sedentary group, a smaller percentage of pastoralists blame bacilli for their TB cases. It is greater than research done in Ethiopia's non-pastoral population and Afar and Somali shepherds. Instead, the majority of nomads in this survey were misinformed about the causes of TB; for example, witchcraft, excessive labour, and sexual overindulgence were cited as contributing factors. Furthermore, in comparison to sedentary groups, more nomads reported misconceptions about the etiology of TB and factors for exposure to the disease, such as sharing utensils and unventilated homes. These findings

are consistent with research done in Ethiopia's non-pastoral society as well as among Afar and Somali pastoralists.

In comparison to this, less shepherds than the inactive group claimed to use contemporary medications to cure TB (Mbuthia et al., 2018) . This shows that the general population of nomads receives little understanding of the etiology and management of tuberculosis. This can be a result of their itinerant habit and geographical location, which make it challenging to engage them in a regular health education approach. Lack of understanding regarding the causes of tuberculosis and conventional assumptions concerning its origins may have a negative effect on patient attitudes toward seeking medical care and taking preventative actions because most people who hold these beliefs may choose to use conventional approaches or refrain from going to healthcare facilities. As a result, the nomadic population may experience longer diagnosis and treatment delays, which could speed up the transmission of disease. Only 33% of those who responded to research in the Shinille area of Ethiopia's Somali Region identified health service providers as a source of TB knowledge. This suggests that there is a weaker connection between the healthcare worker and shepherds than there is in the sedentary community. In comparison to being inactive, being a pastoralist was less likely to be a predictor of having a high level of general TB knowledge, according to the multivariable logistic regression analysis. This is consistent with research conducted in Ethiopia's other pastoral regions.

In terms of occupation, farmers were more likely to postpone than other professionals (Alema et al., 2019). This outcome is in line with studies carried out in Uganda., where farmers reported excessive patient delays in comparison to other respondents. In a related study conducted in Mozambique, farming has additionally been found to be an indicator of

vulnerability for delaying obtaining medical attention. This may be the result of farmers' ignorance of tuberculosis, which eventually influences their decision to seek medical attention. The study's conclusions showed that waiting to seek medical attention was significantly correlated with having little knowledge of PTB. Similar results have been found in Ethiopia, China, Malawi, and Mozambique, where a delay in seeking medical attention has been linked to low PTB understanding. This may be the result of insufficient understanding about tuberculosis, which influences health-seeking behavior and causes an intolerable wait in seeking medical attention. Patients' wait times for service were correlated with the medical facility they contacted first; patients who consulted public health centers were more unlikely to encounter this occurrence compared to individuals who attended general hospitals. This finding contradicts with earlier studies that discovered people who visited healthcare clinics had a higher propensity to put off seeking health services. Nonetheless, a study by Sabawoon et al. discovered a similar finding: patients were less likely to put off seeking medical attention longer after receiving an evaluation at a hospital. This implies that enhancing medical facilities' ability to identify and treat tuberculosis could lead to a major decrease in latencies. Getting therapy from these unofficial practitioners prior to going to the medical centers was discovered as well to be related to an extended wait in obtaining medical attention. pursuing care from unconventional practitioners (the unconventional therapists, spiritual practitioners of healing, or sacred water) has been shown to be a major contributing measure for extended treatment obtaining putting off. This result is consistent with multiple other investigations that were carried out. One explanation given in the current study for not seeking medical attention from medical institutions was financial difficulties. This is consistent with

research conducted in Ethiopia, Ghana, India, and other Asian countries. The study's findings demonstrated a strong relationship across the length of time spent waiting for health services and the extent of the condition as a justification for a visit to a hospital. This could be because critically ill individuals arrive at the hospital very away, thinking their illness has reached its end. A study that found that PTB patients' inability to visit the hospital due to their severity of disease was another factor for the wait. Furthermore, hemoptysis, a proxy indicator of the severity of tuberculosis, was linked to a greater likelihood of not getting medical assistance, according to a meta-analysis and systematic review study carried out in Asia. This result showed that patients with tuberculosis delayed seeking medical attention. The study's conclusion demonstrated that patients with pulmonary tuberculosis exhibited a significantly delayed conduct when it came to seeking medical attention. Independent predictors of the delay in seeking medical attention included occupation, being a farmer, having limited knowledge, consulting traditional or religious healers before going to a public health center, not seeking treatment from a health facility right away due to a financial issue, and being seriously ill with a disease. More resources must be mobilized to health facilities so they may be outfitted with diagnostic medical modalities in order for the approach to be implemented effectively. Health professionals should put in a lot of effort in the interim to raise community knowledge of the advantages of getting medical attention for illnesses as soon as possible.

The findings show a statistically significant connection among TB and age. (Sobe Jermano Boyong et al., 2018). When in comparison to people under the age of 10–19, those between the ages of 20–45 and those above 46 had respective odds of being TB cases of 13 and 2.9 times higher. This result is consistent with other data, supporting the hypothesis that

tuberculosis primarily affects individuals during their prime years of productivity and may be associated with HIV. It should be emphasized that our model did not identify a relation between the genders of TB patients and the skewed distribution observed in the summary statistics. On the other hand, the model indicated a strong correlation between drinking milk and having tuberculosis. The likelihood of having tuberculosis (TB) was twice as high in someone who drank cooked milk as in someone who did not. This result may indicate that Mycobacterium tuberculosis, rather than M. bovis, is the cause of infection in the majority of cases. It may also be interpreted as an indirect reflection of the milk-drinking habits of the most of suspected patients, reside in towns. But since raw milk consumption also showed a marginally significant association, We can't entirely exclude out the possibility of TB caused by zoonotic animals. However, since we lacked the means to type the strains using molecular techniques beyond what is currently available, this cannot be proven by this research. Decision trees are a depiction of the covariate patterns that underlie the generated logistic regression model, and they have been utilized in the past to guide diagnostic algorithms. At the clinical level, a combination of indicators' predictive value can be used to help Wau Teaching Hospital prioritize cases. For instance, there was a 100% chance that a financially dependent female between the ages of 20 and 45 who came from a household with 4-5 people and drank raw milk would get tuberculosis. Among the 207 suspected TB cases, this covariate pattern only happened once. However, the identical pattern—consumption of cooked milk as opposed to raw milk—occurred three times, and two of those instances were associated with a TB case. According to the analysis's results, there is a strong correlation between a high residential occupancy rate and a high risk of tuberculosis. Retrospectively identifying appropriate variable combinations that can

support clinical triaging at Wau Teaching Hospital is one useful application of this approach.

The tuberculosis (TB) five-year rate of incidence by race (2011–2015) did not match the demographic distribution of Suriname's ethnic population in a meaningful way (Gopie et al., 2021). Native Americans and Creoles had the greatest incidence rates; these populations were disproportionately represented among TB patients. While making up 3.9% and 17% of Suriname's assessed population, respectively, indigenous and creole people accounted for 8.6% and 36.4% of the country's evaluated tuberculosis cases. Indigenous and Creole individuals continued to have the highest incidence rates of tuberculosis even after HIV-negative patients were excluded. The extremely high TB prevalence among the natives in comparison to non-natives showing better evident when HIV coinfection is taken into account, indicating that additional risk factors are most likely involved. In Suriname, indigenous people have the greatest rate of material poverty. As a result, low socioeconomic status—which is linked to higher TB rates—may put this group at risk for developing TB. The fact that many Indigenous people reside in isolated areas with limited access to healthcare is another aspect to take into account. Most of the natives reside in the countryside and the interior of Suriname, with only 20.1% of them living in Paramaribo.

Multivariable modeling revealed the earlier demonstrated beneficial impacts of the female gender and the adverse impacts of low BMI on the results of treatment. (Secretary Of Jan Swasthya Sahyog et al., 2018). These consequences were either less significant than problems with healthcare access or affected by them. Regarding safeguarding against unfavorable consequences, the treatment location was crucial. Why TB patients who

received treatment in primary care settings fared better remains unclear. When it comes to travel expenses, primary care is typically less expensive than secondary hospital treatment. This could act as a motivator. A CHW may have better oversight of their care because the majority of their main medical users live in the neighborhoods that they serve.. Because of the less hectic pace and somewhat more private environment, counseling might also be more effective in the primary care practice. Although other countryside, low-income populations have already noted how distance from care affects outcomes, there is a dearth of data on tuberculosis in India, and what little is known about it only relates to delayed beginning of care and loss to follow-up. Furthermore, these data only go as far as 40 km and only measure absolute distance—not journey time. This is probably due where the data originates from the Punjab, a province with a stronger public health system than Chhattisgarh. Up to a 200 km actual distance or eight hours of journey time, this impact has been reported. Additionally, in multivariable models, the season of treatment commencement and distance from care had a strong interaction. The factors that were most closely connected with unfavorable results were monsoon, or particularly the summer, when treatment was started, as well as greater distances from the care provider. In Chhattisgarh, migrant laborers work in farms during the monsoon season, which occurs in the summer. Because there is a higher chance of adverse results during these months, patients who travel long distances should be closely monitored. Some of these people might benefit from primary care nearby during the monsoon.

2.6. Conceptual Framework

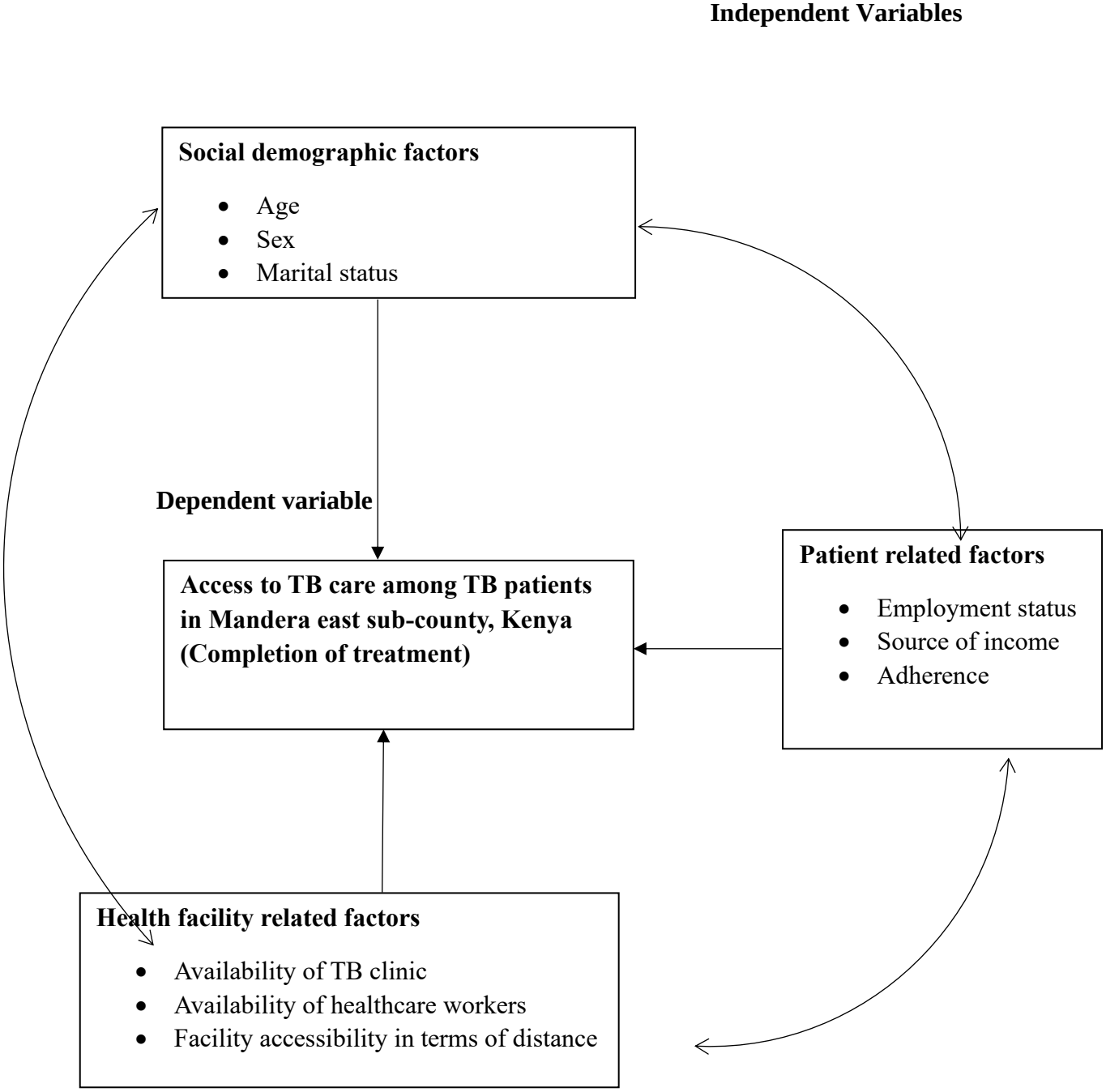


Figure 1: Conceptual framework

Source: Author (2022)

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1. Research Design

A cross-sectional analytical study was conducted to determine the factors affecting access to treatment of tuberculosis and services in Mandera East sub-County. The participants were identified from patient files in health facilities from January 2019 to December 2021 and traced to the community level where interviews were conducted.

3.2. Variables

The dependent variable was access to treatment of tuberculosis and services determined by the indicator completion of treatment and the exposure variables were Socio-demographic factors (gender, residence, age and level of education), social economic factors (source of income, employment status transport affordability, accommodation availability), health facility related factors (accessibility in terms of distance, availability of staffs, availability of the facility), and patient related factors (Adherence to medication, stigma, beliefs, use of alternative medicine).

3.3. Target Population

TB patients who were above 18 years old, residents of Mandera East sub-County and enrolled to care from January 2019 to December 2021 was the target population.

3.4. Research Area

Mandera County was the study area. The County covers an area of 25,939.8 km2, and is primarily populated by pastoralists. Wajir County to the southwest, Ethiopia to the north and Somalia to the east, which was located between latitudes 3° 25' 0.01" N and longitudes 40° 40' 0.12" E (appendix:7). The County had seven administrative sub-Counties; Kutulo,

Mandera North, Lafey, Mandera East, Mandera west, Banisa and Mandera Central, Mandera County had a population of 775085 (Census, 2019). Mandera East (144168), Mandera North (129500), Mandera west (86713), Mandera Central (140725), Kutulo (63722), Lafey (74593) and Banisa (135664). There are 32 facilities with TB patients across the county. The literacy level is 139195 out of 775085 attained primary and above level of education according to Census 2019 (Census, 2019). This research was studied in the major sub-county of Mandera East Sub-County health facilities. The population density, high number of TB Clinics, and high number of TB patients enrolled in care and lost to follow-up prompted the selection of the study area. In comparison to other Sub-Counties with only one TB clinic and fewer TB patients Mandera East Sub-County had 13 TB clinics out of 32 facilities. Mandera County had 1845 cases of between January 2019 to December 2021 (TIBU, 2021). Mandera East sub-county had 1223 cases the same period showing that out of the seven administrative sub-counties, 60.43% of the total cases came from Mandera East sub-County. Mandera County was vast and considering the whole county was not logistically feasible hence, Mandera East sub-county was chosen for the study.

Table 1: Research area characteristics

Sub-county	Population density (Census, 2019)	TB patients enrolled (TIBU, 2021)	Lost to follow-up (TIBU, 2021)
Mandera East	144168	1223	68
Mandera North	129500	128	7
Mandera Central	140725	139	9
Mandera West	86713	85	4
Banisa	135664	134	5
Lafey	74593	74	2
Kutulo	63722	62	2

3.5. Sampling and Sample Size

3.5.1. Sample Size

To calculate sample size, the Fisher formula was used (Sin & Biom J., 2014):

$$n = \frac{z^2 P (1-P)}{d^2}$$

$$n = \frac{(1,96)^2 \times 0.5(1-0.5)}{(0.05)^2} \approx 384 \text{ participants or cases}$$

Where

n = the desired sample size assuming the population more than 10,000.

p = success probability. =50% or (0.5)

q = failure probability (1-p) or (1-0.5) =0.5

d = alpha of 5% or margin of error of 5% or (0.05).

Z = confidence interval 95% = 1.96 read from the z score tables

The sample size was calculated using Cochran's sample size formula for population less than 10,000 as follows:

nf=n/(1+n/N)

Where N= population size, n=384, and nf=required sample size

nf=384/(1+384/1845) = 357.46≈358

with 10% non-response the sample size was 393.8 ≈ 394

3.5.2. Sampling Technique

Simple Random Sampling (SRS) was used with computer generated random numbers to select the unique identifiers of TB patients from the County's TB clinics using a sample frame of 1223 from TIBU system, which yielded a sample size of 394 respondents. The researcher used case proportion to determine the number of participants who were sampled from each facility in order to create a simple random sample. SRS ensured that all subjects (TB patients) from the County have an equal opportunity to be enrolled in the study.

3.6. Research Instrument

Structured questionnaire in KOBO collect tool was used. The questionnaire was piloted on 20 participants that met the inclusion criteria but were not part of the final study participants (Appendix:3)

3.7. Inclusion Criteria

Participants that were considered were TB patients who resided in Mandera East sub-County from 2019 to 2021 and 18 years old and above of age and had been on TB treatment during that period and stopped or completed the TB treatment.

3.8. Exclusion Criteria

Those on transit, mentally ill patients who could not give consent, those who were too sick to be interviewed and those who refused to be interviewed were not considered.

3.9. Data Collection

There was an initial screening of respondents to identify those who met the inclusion criteria. Patients' files were picked randomly and identification of participants followed. Abstraction of data was done, then the patients were traced and followed at the community level. Consent was administered then interviews conducted for those who consented. Interviewers in the community were to complete the questionnaires.

3.10. Data Analysis

The questionnaire data analyzed using EPI info. (version 7.2) and Microsoft Excel software. The dependent variable (access to TB care) was computed based on the number of participants who responded that they completed TB treatment (Appendix 3, section B, question 2). Descriptive analysis was done on all the independent variables. Analytical analysis was conducted on both the independent variables and dependent variables to establish if there is an association. Two by two tables were created to determine the relation between the exposure variables and outcome variable. The dependent variable was put into bivariate analysis by using those who have access as those who are on care and those who have no access to be the ones who are not on care. On care meant those patients who tested positive for TB between January 2019 to December 2021 and completed their treatment. Those who did not complete treatment were represented as not on care.

The prevalence odds ratio was computed for the association, at alpha 0.05 (5%) significance level utilizing the Chi-square method of analysis. To control for confounders

variables like age, level of education and sex were put as control variables and were included in the analysis by doing stratification. Frequency tables, graphs and 2x2 tables were used to present the results.

3.11. Ethical Consideration

Approval to conduct the study was sought from Moi University (FAN:0004321) appendix 1, the national council of science, technology, and innovation (NACOSTI- 808289) appendix 2 and the Mandera County Department of Health. Participants were given a written consent to participate in the study. The confidentiality of participants was maintained throughout the study. The participant's identity was not revealed. Each participant was assigned a study number, which was only used for data collection to prevent duplication and not appear on the final form used for data analysis. Only authorized persons accessed the data, and information gathered during the study. Following a strict ethical protocol, the data was collected in a manner that ensured confidentiality and accuracy. The study activities did not inflict any harm to the participants.

CHAPTER FOUR

4.0 RESULTS

4.1. Introduction

This chapter presents findings on the barriers related to access TB care among TB patients in Mandera East sub-County, Kenya. First, the response rate was looked at and provide a quick demographic breakdown of the respondents. In addition, the chapter presents the findings.

4.2 Response Rate

There were 394 participants who participated in the research. The ones who completed the questionnaire satisfactorily were 358. This study had an overall response rate of 90.86%. According to Jack Fincham, a response rate of 90.86% is deemed adequate (Fincham, 2021). This represents more than half of the total sample size; thus, the accuracy of the results is unaffected.

4.3 Access to Tuberculosis Care

Access to tuberculosis care was measured as treatment completion. Of those who completed treatment 88.8 % (318/358) had access to treatment of tuberculosis and services while 11.2% (40/358) had no access to treatment of tuberculosis and services in Mandera Eat sub-County.

4.4 Socio-demographic characteristics

To understand the structure of the data more so fair sample representation, descriptive analysis was conducted. Results obtained were presented in Table 2. showing that the majority of the respondents, 35.2% (126/358), were aged between 26-45 years. Male were 64.5% (231/358). Most respondents were married 64.5% (231/358), followed by single 24.6% (88/358). In terms of residence Mandera East had the majority of the respondents

83.2% (298/358). The proportion of the sample who had no education were 49.7% (178/358), with formal education (those who attended schools) were 41.1% (147/358) and those with informal education (those who attended madrassa) were 9.2% (33/358) (figure 3). Of the 41.1% (147/358) with formal education, majority had secondary education certificate 81.6% (120/147), with tertiary level of education were 12.3% (18/147) and with primary level of education were 6.1% (9/147). Majority of the respondents had informal occupation 92.2% (330/358) while the rest were in formal occupation 7.8% (28/358).

Table 2: Socio-demographic characteristics

Variable	Frequency N=358	Percent (%)
Age in years		
≤25	90	25.1
26–45	126	35.2
46–65	85	23.7
>65	57	15.9
Gender		
Female	127	35.5
Male	231	64.5
Marital Status		
Divorced	13	2.6
Married	231	64.5
Single	88	24.6
Widowed	26	7.3
Residence		
Mandera East Sub-County	298	83.2
Others*	60	16.8
Level of formal education	N=147	
Primary	10	6.1
Secondary	118	81.6
Tertiary	19	12.3
Occupation		
Formal	28	7.8
Informal	330	92.2

*Banisa, Lafey, Mandera North, Mandera South, Mandera West and Kutulo sub-counties

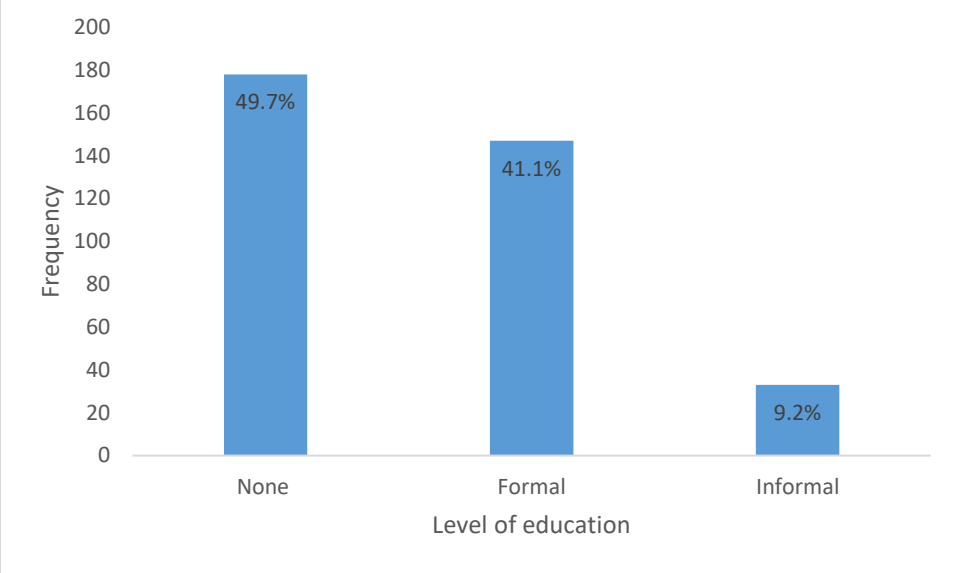


Figure 2: Level of education

4.4.1 Association of sociodemographic factors and access to TB care

Results from Table 3 highlighted those with access to treatment of tuberculosis and services was highest among those aged between 26 and 45 years. Using this age group (26-45) as baseline, the odds of accessing TB care was lower in those who were aged 18-25 (POR= 0.385), 46-65 years (POR= 0.650), 66 and above (POR=0.550) in comparison to age group 26-45. The relation between age group and accessing TB care was not significant, χ^2 (3, N = 358) = 4.899, P=0.179.

Females had higher odds of accessing TB care (POR=3.481) in comparison to males. The relationship between gender and accessing TB care in Mandera County was significant, χ^2 (1, N = 358) = 8.247, P=0.004. Females were more likely to access TB care in Mandera County in comparison to Males.

The odds of accessing TB care in Mandera County by divorced were 1.714 times, married 1.429 times singles 0.695 times those who were widowed. The relationship between access and marital status was not significant, FET (3, N = 358) = 4.229, P=0.238.

Those who acquired formal education had higher odds of 11.748 times those with no education to access TB care in Mandera County. Those with informal education like madrasa education had odds of 3.794 higher in comparison to the ones with no education. The association between level of education and accessing TB care in Mandera County was significant, FET (2, N = 358) = 26.149, P<0.001.

Among the respondents with formal education, the odds of accessing TB care was; with primary education (POR=0.512) with secondary level of education (POR=6.531) in comparison to the ones with tertiary level. The relationship between literacy and accessing TB care in Mandera County was not significant, FET (2, N = 358) = 4.996, P=0.082.

The odds of accessing TB care in Mandera County was 0.546 times in those with formal occupation in comparison to the ones with informal occupation. The association between occupation and accessing TB care in Mandera County was significant, χ^2 (1, N = 358) = 1.367, P=0.242.

Those respondent from Mandera East sub-county had 82.040 times higher odds of accessing TB care in comparison to the ones from other sub-Counties in Mandera County. The relationship between residence and access to treatment of tuberculosis and services in Mandera County was significant. Those who reside in Mandera East sub-county had more likelihood of accessing TB care in comparison to the ones who reside in other sub-counties, χ^2 (1, N = 358) = 161.528, P<0.001.

Table 3: Association of sociodemographic factors and access to TB care

		Access to TB care			
Risk Factors		Yes (%)	No (%)	cPOR*	Significance
Ages	<=25	75(83.3)	15(16.7)	0.385(0.160,0.923)	χ^2=4.899;
	26-45	117(92.9)	9 (7.1)	-	df=3;
	46-65	76(89.4)	9(10.6)	0.650(0.247,1.710)	P=0.179
	>65	50(87.7)	7(12.3)	0.550(0.194,1.557)	
Gender	Female	121(95.3)	6(4.7)	3.481(1.419,8.534)	χ^2=8.247;
	Male	197(85.3)	34(14.7)		df=1;
					P=0.004
Marital status	Divorced	12(92.3)	1(7.7)	1.714(0.160,18.370)	FET†=4.229;
	Married	210(90.9)	21(9.1)	1.429(0.393,5.190)	df=3;
	Single	73(83)	15(17)	0.695(0.184,2.632)	P=0.238
	Windowed	23(88.5)	3(11.5)	-	
Level of education	Formal	144(98)	3 (2)	11.748(3.533,39.069)	FET=26.149;
	Informal	31(93.9)	2(6.1)	3.794(0.866,16.614)	df=2;
	None	143(80.3)	35(19.7)		P<0.000
Level of formal education	Primary	9 (90)	1 (10)	0.512(0.02793,8.95)	FET=4.996;
	Secondary	117(94.7)	1 (5.3)	6.531(0.3891,108.6)	df=2;
					P=0.082
	Tertiary	18(99.1)	1 (0.9)		
Occupation	Formal	23(82.1)	5(17.9)	0.546(0.195,1.527)	χ^2=1.367;
	Informal	295(89.4)	35(10.6)		df=1;
					P=0.242
Residence	Mandera East Sub-County	293(98.3)	5(1.7)	82.040(29.52,228)	χ^2=161.528;
					df=1;
	Others‡	25(41.7)	35(58.3)		P<0.001

***cPOR-crude prevalence odds ratio, †FET-Fisher exact test ‡others-Banisa, Lafey, Mandera North, Mandera South, Mandera West and Kutulo sub-counties**

4.4.2 Multivariate results for socio-demographic factors

Multivariable logistic regression calculated to describe the sociodemographic factors affecting access to treatment of tuberculosis and services in Mandera County as shown in table 4.

Table 4: Multivariate results for socio-demographic factors

	Access to TB care			
Risk Factors	Yes(%)	No(%)	aPOR*	Significance
Gender				
Female	121(95.3)	6(4.7)	3.234(1.419,8.534)	P=0.041
Male	197(85.3)	34(14.7)		
Level of education				
Formal	144(98)	3 (2)	10.621(3.533,39.069)	P<0.001
Informal	31(93.9)	2(6.1)	2.654(0.866,16.614)	
None	143(80.3)	35(19.7)		
Residence				
Mandera East Sub-County	293(98.3)	5(1.7)	79.918(28.277,225.871)	P<0.001
Others‡	25(41.7)	35(58.3)		

***aPOR-adjusted prevalence odds ratio, ‡others-Banisa, Lafey, Mandera North, Mandera South, Mandera West and Kutulo sub-counties**

4.5 Patient related factors

Included exposure to media, employment status, sources of income, availability of means transport, availability of meals, availability of accommodation during treatment and insecurity.

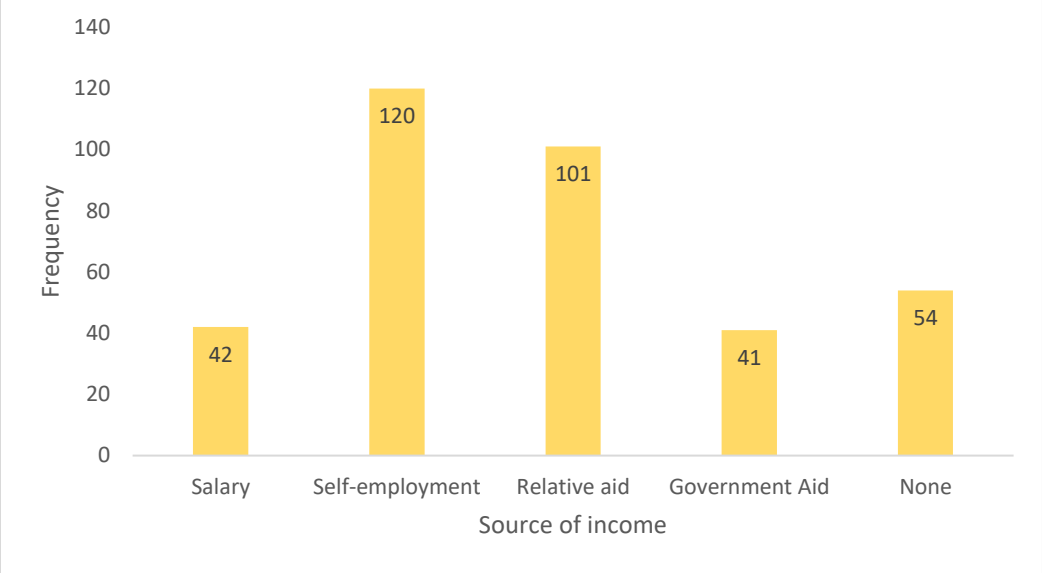


Figure 3: Source of income

Table 5 detailed that majority were exposed to all media types that is TV, Radio and internet 44.1% (158/358), 43.3% (155/358) were exposed to only radio. Those who were unemployed were 86.6% (310/358). The self-employed as a source of income were 33.5% (120/358), got income from relatives were 28.2% (101/358), salary as a source of income were 11.7% (42/358), from government were 11.5% (41/358) and the rest had no source of income (figure 4). Those who had means of transport to the facility were 83.2% (298/358) while those with fare were 20.9% (75/358).

Table 5: Descriptive analysis of patient related factors

Variable	Frequency N=358	Percent (%)
Media exposure		
TV, Radio, Internet	158	44.1
Radio, TV	17	4.8
Radio	155	43.3
None	28	7.8
Employment status		
Yes	48	13.4
No	310	86.6
Lack of means of transport		
Yes	60	16.8
No	298	83.2
Lack of fare		
Yes	75	20.9
No	283	79.1
Lack of Meals		
Yes	92	25.7
No	266	74.3
Incurring accommodation cost		
Yes	110	30.7
No	248	69.3
Affected by insecurity		
Yes	36	10.1
No	322	89.9
Adherence to medication		
Yes	290	81.0
No	68	19.0
Experienced adverse drug reaction		
Yes	72	20.1
No	286	79.9
Stigma from the community		
Yes	66	18.4
No	292	81.6
Stigma from healthcare workers		
Yes	100	27.9
No	258	72.1
Felt discriminated against		
Yes	60	16.8
No	298	83.2
Use of herbal medicines		
Yes	60	16.8
No	298	83.2
With comorbidities		
Yes	34	9.5
No	324	90.5

4.5.1 Association between patient related factors and access to treatment of tuberculosis and services

The respondents who did not lack meals during the period of treatment were 74.3% (266/358). The respondents who do not incur accommodation cost during clinic visits were the majority at 69.3% (248/358). The ones who adhered to their medications up to completion by following the healthcare workers' instructions were 81% (290/358). Those who did not experience adverse drug reactions were 79.9% (286/358). Those who experienced community stigma were 18.4% (66/358) and from healthcare workers were 27.9% (100/358). The ones who felt discriminated upon people realizing their status as TB positive patients were 16.8% (60/358). Those who use herbal medications in concurrence with TB medications were 16.8% (60/358) while those with comorbidities were 9.5% (34/358).

A chi square test was carried out to check whether patient related factors had a relationship with access of TB care. Results were shown in table 5.

The odds of those who were exposed to all the media types (TV, Radio and internet) were 24.890 times higher in accessing TB care in Mandera County in comparison to the ones who were not exposed. Radio and TV exposure were 2.769 times higher to access TB care while those with radio only exposure were 12.6 times higher to access TB care in comparison to the ones without media exposure. The association between media exposure and accessing TB care in Mandera County was significant. Those who were exposed to media had higher likelihood to access TB care in comparison to the ones who were without media exposure, χ^2 (3, N = 358) = 64.863, P<0.001.

The employed respondents had higher odds of access to treatment of tuberculosis and services (POR=1.445) in comparison to unemployed ones. The relationship between employment status and accessing TB care in Mandera County was significant, FET (1, N = 358) = 0.450, P=0.502

The odds of accessing TB care in Mandera County was higher in those who had Salary as a source of income (POR=8.938), self-employed (POR=15.810), while those who got relative aid (POR= 16.672) and government aid as a source of income (POR= 4.010) in comparison to the ones without income. The relationship between source of income and access to treatment of tuberculosis and services in Mandera County was significant, FET (4, N = 358) = 59.979, P<0.001.

There was significant association between lack of transport means by respondents and access. Odds of access in Mandera County was 82.041 times higher in those who had means of transport in comparison those who lacked means of transport, χ^2 (1, N = 358) = 161.528, P<0.001.

The respondents who had fare to access the health facilities had odds of 38.283 times higher in accessing TB care in Mandera County in comparison to the ones without fare. The relationship between lack of fare and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 111.552, P<0.001. Those with fare were had higher likelihood of accessing TB care in Mandera County.

Those who had meals during the period of treatment were 14.312 times higher in accessing TB care in Mandera County in comparison those who lacked meals. The relationship between lack of meals and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 63.285, P<0.001.

Those who had accommodation and did not incur any accommodation cost during the period of treatment were 18.043 times more likely to access TB care in Mandera County in comparison those who lacked accommodation and incurred accommodation cost. The relationship between incurring accommodation cost and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 62.319, P<0.001.

Those who were not affected by insecurity were 117.142 times higher in accessing TB care in Mandera County in comparison those who were affected by insecurity during their clinical visits. The association between affected by insecurity and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 194.136, P<0.001.

The odds of accessing TB care in Mandera County in those who adhered to medications by following healthcare workers' instructions was 82.441 times higher in comparison those who did not adhere to medications during the period of treatment. The association between affected by insecurity and access to treatment of tuberculosis and services in Mandera County was significant, FET (1, N = 358) = 147.557, P<0.001.

The relationship between experiencing adverse drug reaction and access to TB treatment and services was significant. Odds of access in Mandera County in those who did not experience adverse drug reactions was 53.164 times higher in comparison those who experienced adverse drug reaction, χ^2 (1, N = 358) = 127.278, P<0.001. Those who Experienced adverse drug reaction were less likely to access TB care in Mandera County.

Those who did not perceive community stigma had 122.912 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison those who perceived stigma at the community level. The association between community and access

to treatment of tuberculosis and services in Mandera County was significant, FET (1, N = 358) = 164.275, P<0.001.

Those who did not perceive stigma by healthcare workers at the facility during clinical visits had 17.614 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison to the ones who perceived healthcare workers' stigma. The relationship between healthcare workers' stigma and access to treatment of tuberculosis and services in Mandera County, χ^2 (1, N = 358) = 66.608, P<0.001.

Those who did not feel discriminated after people knowing their TB status had 82.041 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison to the ones who felt discriminated. The relationship between felt discriminated and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 161.528, P<0.001.

Those who did not use herbal medication in concurrence with TB medication had 82.041 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison to the ones who used herbal medicines. The association between use of herbal medicines and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 161.528, P<0.001.

Those who did not have comorbidities with TB had 2.808 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison to the ones with comorbidities. The association between with comorbidities and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 5.779, P<0.001.

Table 6: Association between patient related factors and access to treatment of tuberculosis and services

	Access to TB care			
Risk factors	Yes (%)	No (%)	cPOR*	Significance
Media exposure				
TV, Radio, Internet	151(95.6)	7(0.4)	24.890(8.615,71.91)	P<0.001
Radio, TV	12(70.6)	5 (29.4)	2.769(0.7695,9.965)	P=0.502
Radio	142(91.6)	13(8.4)	12.600(4.948,32.1)	P<0.001
None	13(46.4)	15(53.6)	-	
Employment status				
Yes	44(91.1)	4(8.9)	1.445(0.4904,4.259)	P<0.001
No	274(87.5)	36(12.5)		
Source of income				
Salary	39(92.9)	3(7.1)	8.938(2.451,32.59)	P<0.001
Self-employment	115(95.8)	5(4.2)	15.810(5.55,45.05)	P<0.001
Relative aid	97(96.0)	4(4.0)	16.672(5.344,52.01)	P<0.001
Government aid	35(85.4)	6(14.6)	4.010(1.443,11.14)	P<0.001
None	32(59.3)	22(40.7)	-	
Lack of means of transport				
No	293(98.3)	5 (1.7)	82.041 (29.52,228)	P<0.001
Yes	25(41.7)	35(58.3)		
Lack of fare				
No	277(97.9)	6 (2.1)	38.283(15.14,96.81)	P<0.001
Yes	41(54.7)	34(45.3)		
Lack of Meals				
No	257(96.6)	9(3.4)	14.512(6.567,32.07)	P<0.001
Yes	61(66.3)	31(33.7)		
Incurring accommodation cost				
No	242(97.6)	6(2.4)	18.043(7.297,44.62)	P<0.001
Yes	76(69.1)	34(30.9)		
Affected by insecurity				
No	311(96.6)	11(3.4)	117.142(42.19,325.2)	P<0.001
Yes	7(19.4)	29(80.6)		

Adherence to medication				
Yes	286(98.6)	4(1.4)	82.441(26.89,240.6)	P<0.001
No	32(47.1)	36(52.9)		
Experienced ADR‡				
No	281(98.3)	5(1.7)	53.164(19.6,144.2)	P<0.001
Yes	37(51.4)	35(48.6)		
Stigma from the community				
No	289(99.0)	3(1.0)	122.912(35.68,423.4)	P<0.001
Yes	29(43.9)	37(56.1)		
Stigma from healthcare workers				
No	251(97.3)	7(2.7)	17.614(7.482,41.69)	P<0.001
Yes	67(67.0)	33(33.0)		
Felt discriminated against				
	293(98.3)	5(1.7)	82.041(29.52,228)	P<0.001
	25(41.7)	35(58.3)		
Use of herbal medicines				
No	293(98.3)	5(1.7)	82.041(29.52,228)	P<0.001
Yes	25(41.7)	35(58.3)		
With comorbidities				
No	292(90.1)	32(9.9)	2.808(1.173,6.718)	P=0.016
Yes	26(76.5)	8(23.5)		

***cPOR-crude prevalence odds ratio, ‡ADR-adverse drug reaction**

4.5.2 Multivariate results of patients related factors

Multivariable logistic regression calculations to describes patient related factors affecting access to treatment of tuberculosis and services in Mandera County as shown in table 7.

Table 7: Multivariate results of patients related factors

	Access to TB care			
Risk factors	Yes (%)	No (%)	aPOR*	Significance
Lack of means of transport				
No	293(98.3)	5 (1.7)	19.53 (5.44,70.16)	P<0.001
Yes	25(41.7)	35(58.3)		
Lack of fare				
No	277(97.9)	6 (2.1)	20.33(6.99,59.05)	P<0.001
Yes	41(54.7)	34(45.3)		
Affected by insecurity				
No	311(96.6)	11(3.4)	12.42(3.60,42.90)	P<0.001
Yes	7(19.4)	29(80.6)		
Adherence to medication				
Yes	286(98.6)	4(1.4)	48.34(22.32,92.86)	P<0.001
No	32(47.1)	36(52.9)		
Experienced ADR†				
No	281(98.3)	5(1.7)	10.77(1.43,81.22)	P=0.021
Yes	37(51.4)	35(48.6)		
Stigma from the community				
No	289(99.0)	3(1.0)	40.64(10.73,153.89)	P<0.001
Yes	29(43.9)	37(56.1)		
Use of herbal medicines				
No	293(98.3)	5(1.7)	23.74(7.39,76.21)	P<0.001
Yes	25(41.7)	35(58.3)		

***aPOR-adjusted prevalence odds ratio †ADR-Adverse drug reaction**

4.6 Health facilities related factors affecting access to treatment of tuberculosis and services among TB patients in Mandera County.

The factors that were considered in the study included availability of TB clinics, accessibility of the TB clinic in terms of distance less than or equal to 5 kilometers, lack of privacy at the facility during clinic visit, provision with nutritional supplements, among others. The results are presented in table 8. Majority of the respondents had a TB clinic in their town of residence 70.4% (252/358), 77.7% (278/358) were able to access the TB clinic because they lived within 5 kilometers radius. Those who experienced lack of privacy at the health facility were 16.5% (59/358). Those who reported the availability of healthcare workers at the facility were 85.5% (306/358), got nutritional supplements during clinical visits were 69.3% (248/358), satisfied with services provided at the health facilities were 76.8% (275/358) and those who ever missed any service at the healthcare facility they visit were 16.8% (60/358.

Table 8: Descriptive analysis of factors associated with health-facilities

Variable	Frequency N=358	Percent (%)
Availability of TB clinic in town		
Yes	252	70.4
No	106	29.6
TB clinic accessibility distance (<=5km)		
Yes	278	77.7
No	80	22.3
Lack of privacy		
Yes	59	16.5
No	299	83.5
Availability of Healthcare workers		
Yes	306	85.5
No	52	14.5
Provision of nutritional supplement		
Yes	248	69.3
No	110	30.7
Satisfaction with services provided		
Yes	275	76.8
No	83	23.2
Ever missed any service		
Yes	60	16.8
No	298	83.2

4.6.1 Association between health facility related factors and access to TB care

A chi square test was carried out to check whether health facility related factors had a relationship with access of TB care in Mandera County. Results were shown in table 9.

The relationship between availability of TB clinic in respondents' residential area and access to TB care was significant. Those who had TB clinic in their residential area had 24.351 times higher odds of accessing TB care in Mandera County in comparison those who had no TB clinic within their residential area, χ^2 (1, N = 358) = 72.410, P<0.001.

Those who with TB clinic in their area of residence were more likely to access TB care in Mandera Count in comparison to the ones who live in areas without TB clinic.

The respondents who had facility access within 5 kilometers radius had 56.053 times higher odds of accessing TB care in Mandera County in comparison to the ones who live distance more than 5 kilometers. There was significant

Table 9: Association between health facility related factors and access to TB care

	Access to TB care			
Risk factors	Yes (%)	No (%)	cPOR*	Significance
Availability of TB clinic in town				
Yes	247(98.0)	5(2.0)	24.351(9.2,64.46)	P<0.001
No	71(67.0)	35(33.0)		
TB clinic accessibility distance (<=5km)				
Yes	274(98.6)	4 (1.4)	56.053(19.02,165.2)	P<0.001
No	44(55.0)	36(45.0)		
Lack of privacy				
No	293(98.0)	6 (2.0)	66.412(25.45,173.3)	P<0.001
Yes	25(42.4)	34(57.6)		
Availability of Healthcare workers				
Yes	301(98.4)	5(1.6)	123.931(43.08,356.6)	P<0.001
No	17(32.7)	35(67.3)		
Provision of nutritional supplement				

Yes	242(97.6)	6(2.4)	18.043(7.297,44.62)	P<0.001
No	76(69.1)	34(30.9)		
Satisfaction with services provided				
Yes	268(97.5)	7(2.5)	25.271(10.59,60.29)	P<0.001
No	50(60.2)	33(39.8)		
Ever missed any service				
No	290(97.3)	8(2.7)	41.432(17.42,98.53)	P<0.001
Yes	28(46.7)	32(53.3)		

***cPOR-crude prevalence odds ratio, †FET-Fisher exact test**

association between TB clinic accessibility and access to treatment of tuberculosis and services in Mandera County, FET (1, N = 358) = 118.813, P<0.001.

Those who had privacy at the health facility had 66.412 times higher odds of accessing TB care in Mandera County in comparison to the ones who lacked privacy. The association between lack of privacy and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 153.599, P<0.001.

Those who reported availability of healthcare workers at the health facility had 123.931 times higher odds of accessing TB care in Mandera County in comparison to the ones who reported lack of healthcare workers. The relationship between availability of healthcare workers and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 193.154, P<0.001.

Those who were provided with nutritional supplements had 18.043 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison to the ones who were not provided with nutritional supplement. The relationship between provision of nutritional supplement and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 62.319, P<0.001.

The ones who were happy with the services given at the health facility had 25.271 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison to the ones who were not happy with the services provided. There relationship between satisfaction with services provided and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 88.963, P<0.001.

Those who reported that they never missed any service at the health facility they visited had 41.432 times higher odds of access to treatment of tuberculosis and services in Mandera County in comparison to the ones who missed clinic services. The relationship between missing services and access to treatment of tuberculosis and services in Mandera County was significant, χ^2 (1, N = 358) = 129.093, P<0.001.

4.6.2 Multivariate analysis of health facility related factors

Multivariable logistic regression was done to describes the health facility related factors affecting access to treatment of tuberculosis and services in Mandera County as shown in table 10.

Table 10: Multivariate analysis of health facility related factors

	Access to TB care			
Risk factors	Yes (%)	No (%)	aPOR*	Significance
Availability of TB clinic in town				
Yes	247(98.0)	5(2.0)	5.26(1.43,42.46)	P<0.008
No	71(67.0)	35(33.0)		
TB clinic accessibility distance (<=5km)				
Yes	274(98.6)	4 (1.4)	32.053(10.02,122.23)	P=0.028
No	44(55.0)	36(45.0)		
Lack of privacy				
No	293(98.0)	6 (2.0)	12.92(2.75,60.62)	P<0.001
Yes	25(42.4)	34(57.6)		
Satisfaction with services provided				
Yes	268(97.5)	7(2.5)	3.92(1.63,35.72)	P=0.001
No	50(60.2)	33(39.8)		
Ever missed any service				
No	290(97.3)	8(2.7)	15.24(5.07,45.81)	P<0.001
Yes	28(46.7)	32(53.3)		

***aPOR-adjusted prevalence odds ratio**

CHAPTER FIVE

5.0 DISCUSSION

The study objective was to assess the factors associated with access to TB care among TB patients in Mandera East sub-county. Access to TB care was 88.8% less than the recommended United Nations global targets of 90% by 2027(UN, 2023).

5.1 Sociodemographic factors

The study found that females were more likely to access TB care and complete treatment among TB patients in Mandera county in comparison to males. Females were mostly housewives with more time to attend clinics in comparison to males who fend for the family in terms of search for livelihood. Generally, women tend to follow instructions and keep appointments in comparison to men who are busy with many tasks and responsibilities. The same was found by a qualitative evaluation done in Kansas that male tend to forget the appointment schedule due to employer and relatives responsibilities (Ofei-Dodoo et al., 2019).

Females have more health seeking behaviors in comparison to males as they would like to survive and take care of their families as natural instincts (Ofei-Dodoo et al., 2019). Females are the ones who take care of children and always strive to protect and be there for their families. The role of females in the family set gives them more time to go and attend to their health issues.

Those with high literacy levels were likely to access TB treatment and services among TB patients in Mandera County in comparison to the ones with informal or no education at all (Noppert et al., 2019). Education plays major role in one understanding their health issues and importance to address those issues. Those who are educated have the opportunity to

interact with different sources of information on how to manage TB, which enables them to thrive on how to improve their health status. Those who are educated have increased health seeking behavior as the same was found by study done in Michigan that higher percentage of people with only a secondary school education, a higher rate of unemployment, poor livelihoods, increased percentage of people who live in slums, especially under the age of 18 and across racial/ethnic groups, have an impact on a number of medical diseases including tuberculosis (TB) (Noppert et al., 2019).

Those who reside in Urban setup were more likely to access TB care and complete treatment among TB patients in Mandera County in comparison to the ones patients who come from rural areas to access TB clinics in Mandera east sub-county. The respondents who reside in urban setup were living in their homes not incurring accommodation cost nor transport cost to access the facilities while their counterparts in rural areas usually incur accommodation cost or transport cost or both when visiting the TB clinic for their scheduled appointments to collect medication thus making it hard for them to complete their treatment. The geographical barrier is one factor that hinders TB patients residing in Mandera county. The same was discovered in a study conducted in Yemen, which confirmed the necessity of setting up testing and therapeutic facilities close to communities, particularly in nations with difficult landscapes and numerous barriers to emigration (Marahatta et al., 2020). The study found that marital status, age-group, literacy level and occupation were not significantly related to access to treatment of tuberculosis and services among TB patients in Mandera county.

5.2 Patient-related factors

This study discovered that most of those who took part of the study had means of transport that they could access the facility during clinic appointments and they had more access to TB treatment services in comparison to the ones who did not have means of transport to the facilities. Reliable transportation is very important to facilitate movement of patients from their home to the clinic and back to home. Some villages have no means of transport resulting in patients walking a long distance to access health facility or get means to visit the clinic. A research conducted in kwazulu-Natal Province, discovered that those with XDR TB travel long distance to health facilities to access care (Kapwata et al., 2017).

The respondents who had fare to access the facilities had a high likelihood to access TB care in Mandera County. Those who have money to pay for their transport would be very easy for them to access the facility during appointments. Visiting very far health facilities requires money for transport to reach the facility. This finding is supported by Sidney et al (Sidney et al., 2016).

Those who developed side effects and adverse drug reaction were also less likely to access TB care as it affects the perception towards the treatment. The effect causes them to fear the treatment as adverse effect could be very painfully (Mukumbang et al., 2017). The research also discovered that those who were not affected by insecurity were more likely to access TB care in comparison to the ones who experienced insecurity.

Insecurity cartels the freedom of movement and hinders one from moving from one place to another. Transportation and movement would halt during insecurity episodes as everyone is afraid to get harmed. Perceived community stigma by patients affected them not to access TB care and it was more unlikely for those who experienced community

stigma to access TB care among TB patients in Mandera county. Similar findings were reported by (Wexler et al., 2019). The research found that most of the individuals complied with the instructions given by the healthcare workers and they were more likely to access TB care in comparison to the ones who did not follow. Those who followed instruction has easy time going through the treatment process as the instruction would act as a guide throughout. Majority of the respondents did not use herbal medicines and they were more likely to access TB care in comparison to the ones who consumed herbal medicines during treatment period. Asmelashe (2017) found that acceptance and use of herbal medicines hinders one from access conventional medicines (Asmelashe Gelayee et al., 2017).

5.3 Health facility related factors

The study found that most of the respondents were residents who live in an area with TB clinic and they were more likely to access TB care in comparison to the ones who live in areas without TB clinic. Availability of TB clinic increases the chances of the residents accessing TB care because the clinic is within their vicinity and also the community health volunteers and community health assistants could easily access the residents living within 5 kilometres radius. The same was found by (Ugalde et al., 2019).

Those respondents who had no privacy at the health facility were more unlikely to access TB care in comparison to the ones who had no privacy issues. Lack of privacy at the facility discourages patients from visiting the facility and if they visit, they will not be comfortable. Privacy at the health facility is very important especially for those who are infected with highly stigmatized conditions like TB. Those who were satisfied with the services provided health facility were more likely to access TB care in Mandera county in comparison to the ones who were not satisfied. Satisfaction with all the services provided creates conducive

environment for the patients and makes them comfortable to complete treatment. Respondent who never missed any service at the health facility were more likely to access tuberculosis treatment and services in contrast to those who usually miss crucial services like laboratory services. All round service provision keeps patients in care and allow them to come to the facility. Missing some services discourages patients from visiting or keeping appointments.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study concludes that TB patients residing in Mandera county had the following socio-demographic factors that affected access to TB care; Gender, level of education, and residence. TB patients who were female, with formal education and resident of Mandera east sub-county had more access to treatment of tuberculosis and services in comparison to male, with informal or no education and resident of other sub-counties.

Tuberculosis patients residing in Mandera county had the following patient related factors that affected access to TB care; lack of means of transport, lack of fare, insecurity, adherence, adverse drug reaction, perceived stigma from the community and use of herbal medicines.

The following health facility related factors were associated with access to treatment for tuberculosis in Mandera County; availability of TB clinic in your residence, TB clinic accessibility distance (<=5km), lack of privacy, satisfied with services provided and ever missed services.

6.1 Recommendations

According to the study's findings and recommendations, it is important to comprehend the underlying processes that lead to community stigma, affecting male, those with informal or no education and residing in other sub-counties, when it is feasible, incorporate participatory reflection and action in and by the affected communities into your activities. In other words, involving the communities in identifying the concerns, problems, and potential solutions is a very valuable procedure before commencing an intervention.

Instead of using a preconceived notion of community needs, researchers or development workers use a variety of techniques to listen more intently to community voices and address the need identified by the target population. This approach is known as the participatory reflection and action (PRA) approach.

The study also recommends the involvement of TB patients in program interventions at all levels, including local, state, and federal ones. They should be involved in policy creation, research, and assessment as well. Where possible, current programs and facilities should also incorporate mainstream TB prevention, care, treatment, and support activities. At all stages of interventions, the stakeholders should be cognizant of gender concerns.

The NTLD-P should address stigma in the community at the points where it manifests or where it can be addressed. This is possible through ongoing sensitization and education through seminars and workshops. Additionally, it is important to ensure that people are not exposed to contradicting situations; this is seen as a social issue rather than a personal one.

Further studies on how gender, level of education and herbal use affect access to TB services in Mandera county should be conducted.

REFERENCES

Alchetron. (2017, August 18). *Mandera County—Alchetron, The Free Social Encyclopedia*. Alchetron.Com. https://alchetron.com/Mandera-County

Alema, H. B., Hailemariam, S. A., Misgina, K. H., Weldu, M. G., Gebregergis, Y. S., Mekonen, G. K., & Gebremedhin, K. A. (2019). Health care seeking delay among pulmonary tuberculosis patients in North West zone of Tigrai region, North Ethiopia. *BMC Infectious Diseases*, *19*(1), 309. https://doi.org/10.1186/s12879-019-3893-7

Andargie, A., Molla, A., Tadese, F., & Zewdie, S. (2021). Lost to follow-up and associated factors among patients with drug resistant tuberculosis in Ethiopia: A systematic review and meta-analysis. *PloS One*, *16*(3), e0248687. https://doi.org/10.1371/journal.pone.0248687

Annual Reports – NLTP. (2021). https://nltp.co.ke/reports/annual-reports/

Arulchelvan, S., & Elangovan, R. (2017). Effective communication approaches in tuberculosis control: Health workers' perceptions and experiences. *The Indian Journal of Tuberculosis*, *64*(4), 318–322. https://doi.org/10.1016/j.ijtb.2016.11.017

Asmelashe Gelayee, D., Binega Mekonnen, G., Asrade Atnafe, S., Birarra, M. K., & Asrie, A. B. (2017). Herbal Medicines: Personal Use, Knowledge, Attitude, Dispensing Practice, and the Barriers among Community Pharmacists in Gondar, Northwest Ethiopia. *Evidence-Based Complementary and Alternative Medicine: eCAM*, *2017*, 6480142. https://doi.org/10.1155/2017/6480142

Banks, H. S., Tsegay, G., Wubie, M., Tamiru, A., Davey, G., & Cooper, M. (2016). Using Qualitative Methods to Explore Lay Explanatory Models, Health-Seeking Behaviours and Self-Care Practices of Podoconiosis Patients in North-West Ethiopia. *PLOS Neglected Tropical Diseases*, *10*(8), e0004878. https://doi.org/10.1371/journal.pntd.0004878

Bojovic, O., Medenica, M., Zivkovic, D., Rakocevic, B., Trajkovic, G., Kisic-Tepavcevic, D., & Grgurevic, A. (2018). Factors associated with patient and health system delays in diagnosis and treatment of tuberculosis in Montenegro, 2015-2016. *PloS One*, *13*(3), e0193997. https://doi.org/10.1371/journal.pone.0193997

Braathen, S. H., Vergunst, R., Mji, G., Mannan, H., & Swartz, L. (2013). Understanding the local context for the application of global mental health: A rural South African experience. *International Health*, *5*(1), 38–42. https://doi.org/10.1093/inthealth/ihs016

Burton, H., & Walters, L. (2013, August 17). *Access to Medicare-funded annual comprehensive health assessments for rural people with intellectual disability*. https://doi.org/10.22605/RRH2278

CDC. (2016). *Basic TB Facts*. https://www.cdc.gov/tb/topic/basics/default.htm

Census. (2019).

Christian, C. S., Gerdtham, U.-G., Hompashe, D., Smith, A., & Burger, R. (2018). Measuring Quality Gaps in TB Screening in South Africa Using Standardised Patient Analysis. *International Journal of Environmental Research and Public Health*, *15*(4), 729. https://doi.org/10.3390/ijerph15040729

Dabaro, D. (2017). Factors affecting tuberculosis case detection in Kersa District, South West Ethiopia. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, *9*, 1–4. https://doi.org/10.1016/j.jctube.2017.08.003

Deshmukh, R. D., Dhande, D. J., Sachdeva, K. S., Sreenivas, A. N., Kumar, A. M. V., & Parmar, M. (2018). Social support a key factor for adherence to multidrug-resistant tuberculosis treatment. *The Indian Journal of Tuberculosis*, *65*(1), 41–47. https://doi.org/10.1016/j.ijtb.2017.05.003

Diaw, M. M., Ndiaye, M., Riccardi, N., Ungaro, R., Alagna, R., Cirillo, D. M., Codecasa, L., Viscoli, C., Nicolini, L. A., Besozzi, G., & StopTB Italia Onlus. (2018). Implementing TB control in a rural, resource-limited setting: The stop-TB Italia project in Senegal. *Multidisciplinary Respiratory Medicine*, *13*, 41. https://doi.org/10.1186/s40248-018-0154-3

Diefenbach-Elstob, T., Plummer, D., Dowi, R., Wamagi, S., Gula, B., Siwaeya, K., Pelowa, D., Siba, P., & Warner, J. (2017). The social determinants of tuberculosis treatment adherence in a remote region of Papua New Guinea. *BMC Public Health*, *17*(1), 70. https://doi.org/10.1186/s12889-016-3935-7

Dlamini, N. C., Ji, D.-D., & Chien, L.-Y. (2019). Factors associated with isoniazid resistant tuberculosis among human immunodeficiency virus positive patients in Swaziland: A case-control study. *BMC Infectious Diseases*, *19*(1), 731. https://doi.org/10.1186/s12879-019-4384-6

Dodd, P. J., Yuen, C. M., Sismanidis, C., Seddon, J. A., & Jenkins, H. E. (2017). The global burden of tuberculosis mortality in children: A mathematical modelling study. *The Lancet. Global Health*, *5*(9), e898–e906. https://doi.org/10.1016/S2214-109X(17)30289-9

Dong, B., He, Z., Li, Y., Xu, X., Wang, C., & Zeng, J. (2022). Improved Conventional and New Approaches in the Diagnosis of Tuberculosis. *Frontiers in Microbiology*, *13*, 924410. https://doi.org/10.3389/fmicb.2022.924410

Enos, M., Sitienei, J., Ong'ang'o, J., Mungai, B., Kamene, M., Wambugu, J., Kipruto, H., Manduku, V., Mburu, J., Nyaboke, D., Ngari, F., Omesa, E., Omale, N., Mwirigi, N., Okallo, G., Njoroge, J., Githiomi, M., Mwangi, M., Kirathe, D., … Weyenga, H. (2018). Kenya tuberculosis prevalence survey 2016: Challenges and

opportunities of ending TB in Kenya. *PLOS ONE*, *13*(12), e0209098. https://doi.org/10.1371/journal.pone.0209098

Fincham, J. E. (2021). Response Rates and Responsiveness for Surveys, Standards, and the Journal. *American Journal of Pharmaceutical Education*, *72*(2), 43.

Furin, J., Loveday, M., Hlangu, S., Dickson-Hall, L., le Roux, S., Nicol, M., & Cox, H. (2020). "A very humiliating illness": A qualitative study of patient-centered Care for Rifampicin-Resistant Tuberculosis in South Africa. *BMC Public Health*, *20*(1), 76. https://doi.org/10.1186/s12889-019-8035-z

Gopie, F. A., Hassankhan, A., Ottevanger, S., Krishnadath, I., de Lange, W., Zijlmans, C. W. R., & Vreden, S. (2021). Ethnic disparities in tuberculosis incidence and related factors among indigenous and other communities in ethnically diverse Suriname. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, *23*, 100227. https://doi.org/10.1016/j.jctube.2021.100227

Goulet, M.-H., Pariseau-Legault, P., Côté, C., Klein, A., & Crocker, A. G. (2020). Multiple Stakeholders' Perspectives of Involuntary Treatment Orders: A Meta-synthesis of the Qualitative Evidence toward an Exploratory Model. *International Journal of Forensic Mental Health*, *19*(1), 18–32. https://doi.org/10.1080/14999013.2019.1619000

Gronholm, P. C., Thornicroft, G., Laurens, K. R., & Evans-Lacko, S. (2017). Mental health-related stigma and pathways to care for people at risk of psychotic disorders or experiencing first-episode psychosis: A systematic review. *Psychological Medicine*, *47*(11), 1867–1879. https://doi.org/10.1017/S0033291717000344

Grut, L., Sanudi, L., Braathen, S. H., Jürgens, T., & Eide, A. H. (2015). Access to Tuberculosis Services for Individuals with Disability in Rural Malawi, a Qualitative Study. *PLOS ONE*, *10*(4), e0122748. https://doi.org/10.1371/journal.pone.0122748

Hailemariam, M., Fekadu, A., Selamu, M., Medhin, G., Prince, M., & Hanlon, C. (2016). Equitable access to integrated primary mental healthcare for people with severe mental disorders in Ethiopia: A formative study. *International Journal for Equity in Health*, *15*(1), 121. https://doi.org/10.1186/s12939-016-0410-0

Hamilton, R., Driver, S., Noorani, S., Callender, L., Bennett, M., & Monden, K. (2017). Utilization and access to healthcare services among community-dwelling people living with spinal cord injury. *The Journal of Spinal Cord Medicine*, *40*(3), 321–328. https://doi.org/10.1080/10790268.2016.1184828

Hanlon, C., Eshetu, T., Alemayehu, D., Fekadu, A., Semrau, M., Thornicroft, G., Kigozi, F., Marais, D. L., Petersen, I., & Alem, A. (2017). Health system governance to support scale up of mental health care in Ethiopia: A qualitative study. *International Journal of Mental Health Systems*, *11*(1), 38. https://doi.org/10.1186/s13033-017-0144-4

Hirsch-Moverman, Y., Daftary, A., Yuengling, K. A., Saito, S., Ntoane, M., Frederix, K., Maama, L. B., & Howard, A. A. (2017). Using mHealth for HIV/TB Treatment Support in Lesotho: Enhancing Patient-Provider Communication in the START Study. *Journal of Acquired Immune Deficiency Syndromes (1999), 74 Suppl 1*(Suppl 1), S37–S43. https://doi.org/10.1097/QAI.0000000000001202

Hussain, R., & Tait, K. (2015). Parental perceptions of information needs and service provision for children with developmental disabilities in rural Australia. *Disability and Rehabilitation*, *37*(18), 1609–1616. https://doi.org/10.3109/09638288.2014.972586

Jenkins, H. E., Yuen, C. M., Rodriguez, C. A., Nathavitharana, R. R., McLaughlin, M. M., Donald, P., Marais, B. J., & Becerra, M. C. (2017). Mortality in children diagnosed with tuberculosis: A systematic review and meta-analysis. *The Lancet. Infectious Diseases*, *17*(3), 285–295. https://doi.org/10.1016/S1473-3099(16)30474-1

Kapwata, T., Morris, N., Campbell, A., Mthiyane, T., Mpangase, P., Nelson, K. N., Allana, S., Brust, J. C. M., Moodley, P., Mlisana, K., Gandhi, N. R., & Shah, N. S. (2017). Spatial distribution of extensively drug-resistant tuberculosis (XDR TB) patients in KwaZulu-Natal, South Africa. *PloS One*, *12*(10), e0181797. https://doi.org/10.1371/journal.pone.0181797

Kaslow, N. J., Dunn, S. E., Henry, T., Partin, C., Newsome, J., O'Donnell, C., Wierson, M., & Schwartz, A. C. (2020). Collaborative patient- and family-centered care for hospitalized individuals: Best practices for hospitalist care teams. *Families, Systems & Health: The Journal of Collaborative Family Healthcare*, *38*(2), 200–208. https://doi.org/10.1037/fsh0000479

Khan, P. Y., Yates, T. A., Osman, M., Warren, R. M., van der Heijden, Y., Padayatchi, N., Nardell, E. A., Moore, D., Mathema, B., Gandhi, N., Eldholm, V., Dheda, K., Hesseling, A. C., Mizrahi, V., Rustomjee, R., & Pym, A. (2019). Transmission of drug-resistant tuberculosis in HIV-endemic settings. *The Lancet. Infectious Diseases*, *19*(3), e77–e88. https://doi.org/10.1016/S1473-3099(18)30537-1

Kigozi, G., Heunis, C., Chikobvu, P., Botha, S., & van Rensburg, D. (2017). Factors influencing treatment default among tuberculosis patients in a high burden province of South Africa. *International Journal of Infectious Diseases: IJID: Official Publication of the International Society for Infectious Diseases*, *54*, 95–102. https://doi.org/10.1016/j.ijid.2016.11.407

Kim, J., Keshavjee, S., & Atun, R. (2019). Health systems performance in managing tuberculosis: Analysis of tuberculosis care cascades among high-burden and non-high-burden countries. *Journal of Global Health*, *9*(1), 010423. https://doi.org/10.7189/jogh.09.010423

Kouhpayeh, H. (2022). Different diets and their effect on tuberculosis prevention in HIV patients. *Journal of Family Medicine and Primary Care*, *11*(4), 1369–1376. https://doi.org/10.4103/jfmpc.jfmpc_1289_21

Leclair, M. C., Charette, Y., Seto, M., Nicholls, T. L., Roy, L., Dufour, M., & Crocker, A. G. (2022). Barriers and facilitators of access and utilization of mental health services among forensic service users along the care pathway. *BMC Health Services Research*, *22*(1), 1495. https://doi.org/10.1186/s12913-022-08848-9

Louch, G., Albutt, A., Smyth, K., & O'Hara, J. K. (2022). What do primary care staff think about patients accessing electronic health records? A focus group study. *BMC Health Services Research*, *22*(1), 581. https://doi.org/10.1186/s12913-022-07954-y

Loyola-Sanchez, A., Richardson, J., Wilkins, S., Lavis, J. N., Wilson, M. G., Alvarez-Nemegyei, J., & Pelaez-Ballestas, I. (2016). Barriers to accessing the culturally sensitive healthcare that could decrease the disabling effects of arthritis in a rural Mayan community: A qualitative inquiry. *Clinical Rheumatology*, *35*(5), 1287–1298. https://doi.org/10.1007/s10067-015-3061-4

MacDonald, K., Ferrari, M., Fainman-Adelman, N., & Iyer, S. N. (2021). Experiences of pathways to mental health services for young people and their carers: A qualitative meta-synthesis review. *Social Psychiatry and Psychiatric Epidemiology*, *56*(3), 339–361. https://doi.org/10.1007/s00127-020-01976-9

Mahato, R. K., Laohasiriwong, W., Vaeteewootacharn, K., Koju, R., & Bhattarai, R. (2015). Major Delays in the Diagnosis and Management of Tuberculosis Patients in Nepal. *Journal of Clinical and Diagnostic Research: JCDR*, *9*(10), LC05-09. https://doi.org/10.7860/JCDR/2015/16307.6633

Marahatta, S. B., Yadav, R. K., Giri, D., Lama, S., Rijal, K. R., Mishra, S. R., Shrestha, A., Bhattrai, P. R., Mahato, R. K., & Adhikari, B. (2020). Barriers in the access, diagnosis and treatment completion for tuberculosis patients in central and western Nepal: A qualitative study among patients, community members and health care workers. *PLOS ONE*, *15*(1), e0227293. https://doi.org/10.1371/journal.pone.0227293

Maybery, D., Jaffe, I. C., Cuff, R., Duncan, Z., Grant, A., Kennelly, M., Ruud, T., Skogoy, B. E., Weimand, B., & Reupert, A. (2021). Mental health service engagement with family and carers: What practices are fundamental? *BMC Health Services Research*, *21*(1), 1073. https://doi.org/10.1186/s12913-021-07104-w

Mbuthia, G. W., Olungah, C. O., & Ondicho, T. G. (2018). Knowledge and perceptions of tuberculosis among patients in a pastoralist community in Kenya: A qualitative study. *The Pan African Medical Journal*, *30*, 287. https://doi.org/10.11604/pamj.2018.30.287.14836

Menzies, N. A., Quaife, M., Allwood, B. W., Byrne, A. L., Coussens, A. K., Harries, A. D., Marx, F. M., Meghji, J., Pedrazzoli, D., Salomon, J. A., Sweeney, S., van Kampen, S. C., Wallis, R. S., Houben, R. M. G. J., & Cohen, T. (2021). Lifetime burden of disease due to incident tuberculosis: A global reappraisal including post-

tuberculosis sequelae. *The Lancet. Global Health*, *9*(12), e1679–e1687. https://doi.org/10.1016/S2214-109X(21)00367-3

MOH. (2020). *Kenya launches new policies to stop TB Nairobi*. https://www.health.go.ke/kenya-launches-new-policies-to-stop-tb-nairobi-tuesday-june-30-2020/

Moodley, N., Saimen, A., Zakhura, N., Motau, D., Setswe, G., Charalambous, S., & Chetty-Makkan, C. M. (2020). "They are inconveniencing us" - exploring how gaps in patient education and patient centred approaches interfere with TB treatment adherence: Perspectives from patients and clinicians in the Free State Province, South Africa. *BMC Public Health*, *20*(1), 454. https://doi.org/10.1186/s12889-020-08562-3

Moyo, N., Tay, E. L., Trauer, J. M., Burke, L., Jackson, J., Commons, R. J., Boyd, S. C., Singh, K. P., & Denholm, J. T. (2023). Tuberculosis notifications in regional Victoria, Australia: Implications for public health care in a low incidence setting. *PloS One*, *18*(3), e0282884. https://doi.org/10.1371/journal.pone.0282884

Mukumbang, F. C., Mwale, J. C., & van Wyk, B. (2017). Conceptualising the Factors Affecting Retention in Care of Patients on Antiretroviral Treatment in Kabwe District, Zambia, Using the Ecological Framework. *AIDS Research and Treatment*, *2017*, 7356362. https://doi.org/10.1155/2017/7356362

Musaazi, J., Kiragga, A. N., Castelnuovo, B., Kambugu, A., Bradley, J., & Rehman, A. M. (2017). Tuberculosis treatment success among rural and urban Ugandans living with HIV: A retrospective study. *Public Health Action*, *7*(2), 100–109. https://doi.org/10.5588/pha.16.0115

Mutembo, S., Mutanga, J. N., Musokotwane, K., Kanene, C., Dobbin, K., Yao, X., Li, C., Marconi, V. C., & Whalen, C. C. (2019). Urban-rural disparities in treatment outcomes among recurrent TB cases in Southern Province, Zambia. *BMC Infectious Diseases*, *19*(1), 1087. https://doi.org/10.1186/s12879-019-4709-5

Noppert, G. A., Clarke, P., Hicken, M. T., & Wilson, M. L. (2019). Understanding the intersection of race and place: The case of tuberculosis in Michigan. *BMC Public Health*, *19*, 1669. https://doi.org/10.1186/s12889-019-8036-y

Nyangoma, M., Bajunirwe, F., & Atwine, D. (2020). Non-disclosure of tuberculosis diagnosis by patients to their household members in south western Uganda. *PloS One*, *15*(1), e0216689. https://doi.org/10.1371/journal.pone.0216689

Nyasulu, P., Sikwese, S., Chirwa, T., Makanjee, C., Mmanga, M., Babalola, J. O., Mpunga, J., Banda, H. T., Muula, A. S., & Munthali, A. C. (2018). Knowledge, beliefs, and perceptions of tuberculosis among community members in Ntcheu district, Malawi. *Journal of Multidisciplinary Healthcare*, *11*, 375–389. https://doi.org/10.2147/JMDH.S156949

Ofei-Dodoo, S., Kellerman, R., Hartpence, C., Mills, K., & Manlove, E. (2019). Why Patients Miss Scheduled Outpatient Appointments at Urban Academic Residency Clinics: A Qualitative Evaluation. *Kansas Journal of Medicine*, *12*(3), 57–61.

Okeyo, I. L. A., & Dowse, R. (2018). An illustrated booklet for reinforcing community health worker knowledge of tuberculosis and facilitating patient counselling. *African Journal of Primary Health Care & Family Medicine*, *10*(1), e1–e7. https://doi.org/10.4102/phcfm.v10i1.1687

Reupert, A., Gladstone, B., Helena Hine, R., Yates, S., McGaw, V., Charles, G., Drost, L., & Foster, K. (2021). Stigma in relation to families living with parental mental illness: An integrative review. *International Journal of Mental Health Nursing*, *30*(1), 6–26. https://doi.org/10.1111/inm.12820

Scheffler, E., Swartz, L., Vergunst, R., Braathen, S. H., Kritzinger, J., Mannan, H., Schneider, M., Visagie, S., & Mji, G. (2017). Exploring the interaction of activity limitations with context, systems, community and personal factors in accessing public health care services: A presentation of South African case studies. *African Journal of Primary Health Care and Family Medicine*, *9*(1), 1–9. https://doi.org/10.4102/phcfm.v9i1.1166

Sebastian, N. M., Haveri, S. P., & Nath, A. S. (2021). Delay in diagnosis of tuberculosis and related factors from a district in Kerala, India. *The Indian Journal of Tuberculosis*, *68*(1), 59–64. https://doi.org/10.1016/j.ijtb.2020.09.008

Secretary Of Jan Swasthya Sahyog, null, Laux, T. S., & Patil, S. (2018). Predictors of tuberculosis treatment outcomes among a retrospective cohort in rural, Central India. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, *12*, 41–47. https://doi.org/10.1016/j.jctube.2018.06.005

Sharma, A., Ndisha, M., Ngari, F., Kipruto, H., Cain, K., Sitienei, J., & Bloss, E. (2015). A Review of Data Quality of an Electronic Tuberculosis Surveillance System for Case-based Reporting in Kenya. *European Journal of Public Health*, *25*(6), 1095–1097. https://doi.org/10.1093/eurpub/ckv092

Shringarpure, K. S., Isaakidis, P., Sagili, K. D., Baxi, R. K., Das, M., & Daftary, A. (2016). "When Treatment Is More Challenging than the Disease": A Qualitative Study of MDR-TB Patient Retention. *PloS One*, *11*(3), e0150849. https://doi.org/10.1371/journal.pone.0150849

Sidney, K., Tolhurst, R., Jehan, K., Diwan, V., & De Costa, A. (2016). 'The money is important but all women anyway go to hospital for childbirth nowadays'—A qualitative exploration of why women participate in a conditional cash transfer program to promote institutional deliveries in Madhya Pradesh, India. *BMC Pregnancy and Childbirth*, *16*, 47. https://doi.org/10.1186/s12884-016-0834-y

Sifuna, P. M., Ouma, C., Atieli, H., Owuoth, J., Onyango, D., Andagalu, B., & Cowden, J. (2019). Spatial epidemiology of tuberculosis in the high-burden counties of Kisumu

and Siaya, Western Kenya, 2012-2015. *The International Journal of Tuberculosis and Lung Disease: The Official Journal of the International Union Against Tuberculosis and Lung Disease*, *23*(3), 363–370. https://doi.org/10.5588/ijtld.18.0245

Sin, H. J., & Biom J. (2014). *Stratified Fisher's Exact Test and its Sample Size Calculation. 10.1002/bimj.201300048.*

Sinha, P., Lönnroth, K., Bhargava, A., Heysell, S. K., Sarkar, S., Salgame, P., Rudgard, W., Boccia, D., Van Aartsen, D., & Hochberg, N. S. (2021). Food for thought: Addressing undernutrition to end tuberculosis. *The Lancet. Infectious Diseases*, *21*(10), e318–e325. https://doi.org/10.1016/S1473-3099(20)30792-1

Siroka, A., Law, I., Macinko, J., Floyd, K., Banda, R. P., Hoa, N. B., Tsolmon, B., Chanda-Kapata, P., Gasana, M., Lwinn, T., Senkoro, M., Tupasi, T., & Ponce, N. A. (2016). The effect of household poverty on tuberculosis. *The International Journal of Tuberculosis and Lung Disease: The Official Journal of the International Union Against Tuberculosis and Lung Disease*, *20*(12), 1603–1608. https://doi.org/10.5588/ijtld.16.0386

Sobe Jermano Boyong, C., Kankya, C., James, M., Munyeme, M., Jubara, A. S., Ndoboli, D., Ekuka, G., & Muwonge, A. (2018). Dynamics of tuberculosis in Wau, South Sudan during a period of armed conflict. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*, *12*, 54–65. https://doi.org/10.1016/j.jctube.2018.06.001

Sotgiu, G., Dara, M., Centis, R., Matteelli, A., Solovic, I., Gratziou, C., Rendon, A., & Battista Migliori, G. (2017). Breaking the barriers: Migrants and tuberculosis. *Presse Medicale (Paris, France: 1983)*, *46*(2 Pt 2), e5–e11. https://doi.org/10.1016/j.lpm.2017.01.013

Tembo, B. P., & Malangu, N. G. (2019). Prevalence and factors associated with multidrug/rifampicin resistant tuberculosis among suspected drug resistant tuberculosis patients in Botswana. *BMC Infectious Diseases*, *19*(1), 779. https://doi.org/10.1186/s12879-019-4375-7

TIBU. (2016). *TIBU - Patient Management System > Reports > Facility Reports > TB > New WHO Guidelines > District TB Register*. http://pms.dltld.or.ke/Reports/FacilityReports/TB/NewWHOGuidelines/DistrictTBRegister.aspx

TIBU. (2021). *TIBU - Patient Management System > Reports > Facility Reports > TB > New WHO Guidelines > District TB Register*. http://pms.dltld.or.ke/Reports/FacilityReports/TB/NewWHOGuidelines/DistrictTBRegister.aspx

Tilahun, D., Hanlon, C., Araya, M., Davey, B., Hoekstra, R. A., & Fekadu, A. (2017). Training needs and perspectives of community health workers in relation to

integrating child mental health care into primary health care in a rural setting in sub-Saharan Africa: A mixed methods study. *International Journal of Mental Health Systems*, *11*(1), 15. https://doi.org/10.1186/s13033-017-0121-y

Tollefson, D., Ngari, F., Mwakala, M., Gethi, D., Kipruto, H., Cain, K., & Bloss, E. (2016). Under-reporting of sputum smear-positive tuberculosis cases in Kenya. *The International Journal of Tuberculosis and Lung Disease: The Official Journal of the International Union Against Tuberculosis and Lung Disease*, *20*(10), 1334–1341. https://doi.org/10.5588/ijtld.16.0156

Tora, A., Davey, G., & Tadele, G. (2012). Factors related to discontinued clinic attendance by patients with podoconiosis in southern Ethiopia: A qualitative study. *BMC Public Health*, *12*(1), 902. https://doi.org/10.1186/1471-2458-12-902

Ugalde, A., Blaschke, S., Boltong, A., Schofield, P., Aranda, S., Phipps-Nelson, J., Chambers, S. K., Krishnasamy, M., & Livingston, P. M. (2019). Understanding rural caregivers' experiences of cancer care when accessing metropolitan cancer services: A qualitative study. *BMJ Open*, *9*(7), e028315. https://doi.org/10.1136/bmjopen-2018-028315

UN, declaration. (2023). *UN declaration on TB*. https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2023/featured-topics/un-declaration-on-tb

Van Hees, S., Cornielje, H., Wagle, P., & Veldman, E. (2015). Disability Inclusion in Primary Health Care in Nepal: An Explorative Study of Perceived Barriers to Access Governmental Health Services. *Disability, CBR & Inclusive Development*, *25*(4), 99. https://doi.org/10.5463/dcid.v25i4.373

Vanqa, N., Hoddinott, G., Mbenyana, B., Osman, M., & Meehan, S.-A. (2021). Linkage to TB care: A qualitative study to understand linkage from the patients' perspective in the Western Cape Province, South Africa. *PloS One*, *16*(11), e0260200. https://doi.org/10.1371/journal.pone.0260200

Vergunst, R., Swartz, L., Hem, K.-G., Eide, A. H., Mannan, H., MacLachlan, M., Mji, G., Braathen, S. H., & Schneider, M. (2017). Access to health care for persons with disabilities in rural South Africa. *BMC Health Services Research*, *17*(1), 741. https://doi.org/10.1186/s12913-017-2674-5

Vishnu Sharma, M., Vk, A., & N, A. (2022). Role of chest radiography in the diagnosis of pulmonary tuberculosis during nCovid19 pandemic. *The Indian Journal of Tuberculosis*, *69*(4). https://doi.org/10.1016/j.ijtb.2022.03.008

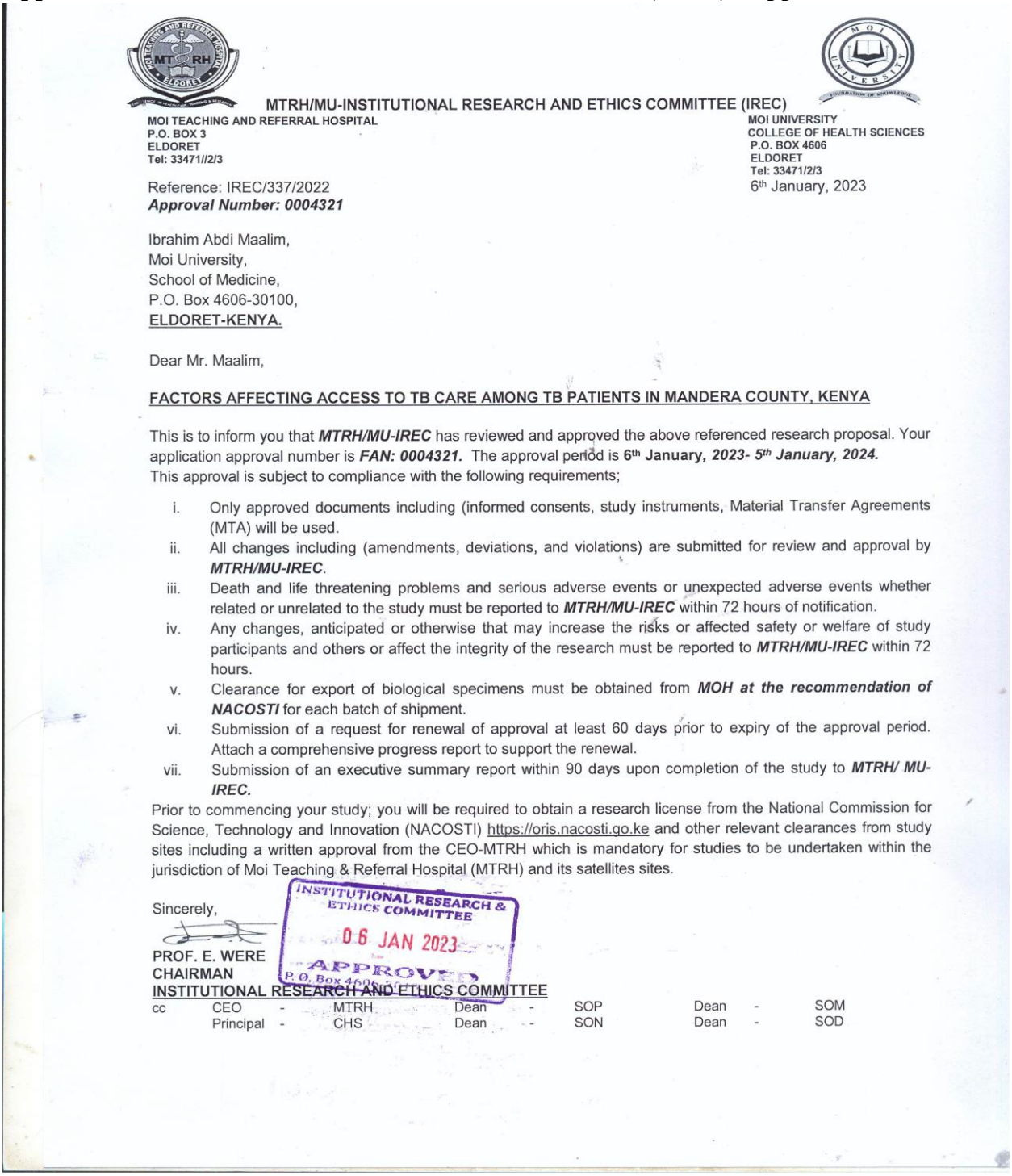
Wexler, C., Maloba, M., Brown, M., Mabachi, N., Goggin, K., Gautney, B., Odeny, B., & Finocchario-Kessler, S. (2019). Factors affecting acceptance of at-birth point of care HIV testing among providers and parents in Kenya: A qualitative study. *PloS One*, *14*(11), e0225642. https://doi.org/10.1371/journal.pone.0225642

WHO. (2021). *Global tuberculosis report 2021*. https://www.who.int/publications-detail-redirect/9789240037021

WHO. (2022). *2.1 TB incidence*. https://www.who.int/teams/global-tuberculosis-programme/tb-reports/global-tuberculosis-report-2022/tb-disease-burden/2-1-tb-incidence

APPENDICES

Appendix 1: Institutional Research and Ethics Committee (IREC)'s approval



MTRH/MU-INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
COLLEGE OF HEALTH SCIENCES
P.O. BOX 4606
ELDORET
Tel: 33471/2/3

Reference: IREC/337/2022
Approval Number: 0004321

6th January, 2023

Ibrahim Abdi Maalim,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

Dear Mr. Maalim,

FACTORS AFFECTING ACCESS TO TB CARE AMONG TB PATIENTS IN MANDERA COUNTY, KENYA

This is to inform you that ***MTRH/MU-IREC*** has reviewed and approved the above referenced research proposal. Your application approval number is ***FAN: 0004321.*** The approval period is **6th January, *2023- 5th January, 2024.***
This approval is subject to compliance with the following requirements;

i. Only approved documents including (informed consents, study instruments, Material Transfer Agreements (MTA) will be used.
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by ***MTRH/MU-IREC***.
iii. Death and life threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to ***MTRH/MU-IREC*** within 72 hours of notification.
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to ***MTRH/MU-IREC*** within 72 hours.
v. Clearance for export of biological specimens must be obtained from ***MOH at the recommendation of NACOSTI*** for each batch of shipment.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to ***MTRH/ MU-IREC.***

Prior to commencing your study; you will be required to obtain a research license from the National Commission for Science, Technology and Innovation (NACOSTI) https://oris.nacosti.go.ke and other relevant clearances from study sites including a written approval from the CEO-MTRH which is mandatory for studies to be undertaken within the jurisdiction of Moi Teaching & Referral Hospital (MTRH) and its satellites sites.

Sincerely,

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
06 JAN 2023
APPROVED
P. O. Box 4606-30100

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc CEO - MTRH Dean - SOP Dean - SOM
Principal - CHS Dean - SON Dean - SOD

Appendix 2: NACOSTI approval

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Ref No: **808289**

Date of Issue: **27/January/2023**

RESEARCH LICENSE

This is to Certify that Dr.. ibrahim Abdi maalim of Moi University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Mandera on the topic: FACTORS AFFECTING ACCESS TO TB CARE AMONG TB PATIENTS IN MANDERA COUNTY, KENYA for the period ending : 27/January/2024.

License No: **NACOSTI/P/23/23141**

808289

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix 3: Questionnaire

QUESTIONNAIRE/INTERVIEW SCHEDULE TO ASSESS FACTORS AFFECTING ACCESS TO TB CARE AMONG TB PATIENTS IN MANDERA EAST SUB-COUNTY, KENYA.

Date…… questionnaire number……..

a. The study findings are purely for academic purpose and all information given will be treated with confidentiality.
b. Select an option or options by ticking the correct response or responses.
c. Fill in the blanks for the structured questions.

A. Socio-demographic profile of the respondent

1. Age……..(in years)
2. Gender
   a. male ( ) b. female ( ) c. intersex ( )
3. Marital status
   a. single ( ) b. married ( ) c. divorced ( ) d. widowed ( )
4. Level of education
   a. none ( ) b. Formal ( ) c. informal ( )
5. If formal
   a. primary ( ) b. secondary ( ) c. Tertiary ( )
6. Occupation
   a. formal ( ) b. informal ( )
7. Mass media exposure
   a. radio ( ) b. TV ( ) c. internet ( ) d. none ( )

B. Access To TB care

1. Are you currently taking medicines?
   a. Yes ( ) b. No ( ) (if yes go to part C if No go to question 2)
2. Did you complete your treatment?
   a. Yes ( ) b. No ( )

C. Patient related factors

1. Are you employed?

   a. Yes ( ) b. No ( )

2. If yes

   a. formal ( ) b. informal ( )

3. If No, are you

   a. self-employed? ( ) b. Unemployed ( )

4. What is your source of income

   a. salary ( ) b. self-employment income ( ) c. Government aid( )

5. Have you ever missed appointment due to lack of transport?

   a. Yes ( ) b. No ( )

6. Did you ever miss taking your medications due to lack of meals?

   a. Yes ( ) b. No. ( )

7. If yes, how many times?

   ……

8. Do you incur accommodation cost when visiting the clinic?

   a. Yes ( ) b. No. ( )

9. Did you ever miss appointment due to accommodation problem?

   a. Yes ( ) b. No. ( )

10. If yes, how many times?.....

11. Do you come from across the border to access TB care?

    a. Yes ( ) b. No. ( )

12. If yes, have you ever been affected by border closure?

    a. Yes ( ) b. No. ( )

13. If yes, how many times?.....

14. Have you ever affected by insecurity to access TB care?

    a. Yes ( ) b. No. ( )

15. If yes, how many times?.....

16. Do you adhere to your medications?

    a. Yes ( ) b. No ( )

17. Are you allergic to any medicine?

a. Yes ( ) b. No. ( )

18. Have you ever experienced any adverse drug reaction (ADR)?

a. Yes ( ) b. No. ( ) (if yes answer question 19 and 20, and if no jump to question 21)

19. If yes did you report?

a. Yes ( ) b. No. ( )

20. Was it managed and educated on how to deal with ADR?

a. Yes ( ) b. No. ( )

21. Do you experience stigma from the community?

a. Yes ( ) b. No. ( )

22. Do you experience Stigma from healthcare workers?

a. Yes ( ) b. No. ( )

23. Have you ever felt discriminated against after people knowing your status?

a. Yes ( ) b. No. ( )

24. Are you satisfied with the services provided at the TB clinic?

a. Yes ( ) b. No. ( )

25. Did you use any herbal medication?

a. Yes ( ) b. No. ( )

26. Do you have any other illness apart from TB?

a. Yes ( ) b. No. ( )

27. If yes please specify……

28. Which phase of treatment are you at?

a. Intensive phase ( ) b. Continuous phase ( )

D. Health facility related factors

1. Is there a TB clinic in your town?

a. Yes ( ) b. No ( )

2. Is the facility accessible in terms of distance from your residence?

a. Yes ( ) b. No ( )

3. Did you ever missed to attend the clinic due to lack of fare?

a. Yes ( ) b. No. ( )

4. Is there lack of privacy at the clinic?

a. Yes ( ) b. No. ( )

5. Does the facility have healthcare workers who attend to you satisfactorily?

a. Yes ( ) b. No. ( )

6. Is the healthcare provider's attitude a problem?

a. Yes ( ) b. No. ( )

7. Are Medicines available?

a. Yes ( ) b. No. ( )

8. Are you provided with nutritional supplements?

a. Yes ( ) b. No. ( )

9. Is there support group that support you?

a. Yes ( ) b. No. ( )

10. Have you ever missed a service like laboratory services, clinical, medication?

a. Yes ( ) b. No. ( )

11. If Yes what service did you miss?

……

……

……

12. Did you manage to source from other facilities?

a. Yes ( ) b. No. ( )

13. If No what are the reasons?

……

……

……

……

……..

Appendix 4: Work Plan

Activity	**March-May 2022**	**June-December 2022**	**January-March 2023**	**April-June 2023**
Chapter one				
Literature review and Methodology				
Questionnaire formulation				
Field Data Collection				
Data Analysis				
Report Writing				
Submission				

Appendix 5: Budget

Item description	**Quantity**	**No. of days**	**Unit price**	**Total KES**
Transport and Fuel	1	20	10,000	20,000
Accommodation	2	50	5000	500,000
Research Assistant	1	180	1000	180,000
Airtime	2	12	5000	120,000
Data Bundles	2	12	5000	120,000
Printing and binding	10	2	1000	20,000
Total				**960,000**

Appendix 6: Certificate of Plagiarism

SR331

ISO 9001:2019 Certified Institution

EDU 999 THESIS WRITING COURSE

PLAGIARISM AWARENESS CERTIFICATE

This certificate is awarded to

IBRAHIM ABDI MAALIM

FELTP/5412/21

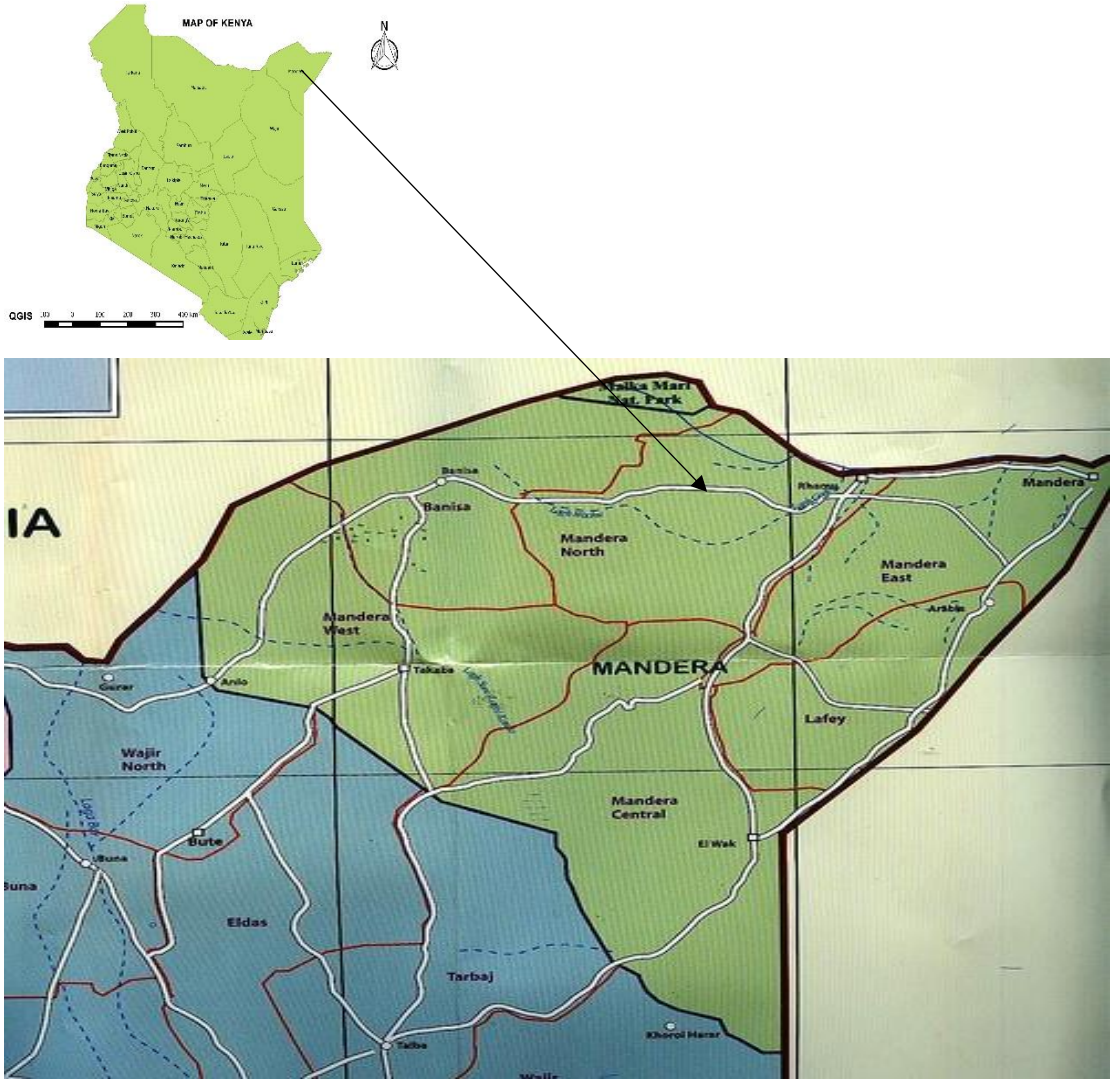
In recognition for passing the University's plagiarism

Awareness test for Thesis: **FACTORS ASSOCIATED WITH ACCESS TO TUBERCULOSIS CARE AMONG TUBERCULOSIS PATIENTS IN MANDERA EAST SUB-COUNTY, KENYA** With a similarity index of 8% and striving to maintain academic integrity.

Awarded by:

Prof. Anne Syomwene Kisilu
CERM-ESA Project Leader Date: 16/10/2023

Appendix 7: Map



Source: (Alchetron, 2017)