

**FACTORS ASSOCIATED WITH TUBERCULOSIS
TREATMENT OUTCOMES AMONG PATIENTS
ATTENDING TREATMENT CENTERS IN MOGADISHU,
SOMALIA**

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**Factors Associated with Tuberculosis Treatment Outcomes among
Patients Attending Treatment Centers in Mogadishu, Somalia**

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Science in Epidemiology in the Jomo Kenyatta University of
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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university

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DEDICATION

This Thesis is dedicated to my parents for their commitment in educating me despite limitation of resources. Secondly I dedicate this piece of work to my husband and our children for their continuous support.

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First I would like to thank the almighty God for enabling me to accomplish my studies well. Secondly I would like to thank my supervisors; Prof Simon Karanja and Prof Mohammed Karama for giving me inspiration and advice throughout my study period and especially during the research period. I wish you both God's blessings.

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ACRONYMS AND ABBREVIATIONS

AFB	Acid Fast Bacilli
CDC	Centers for Disease Control and Prevention
DALYs	Disability Adjusted Life Years
DOTS	Directly Observed Treatment Short courses
HIV	Human Immune Deficiency Virus
IDIs	In-depth interviews
IDP	Internally displaced people
KEMRI	Kenya Medical Research Institute
MDR	Multi-drug resistance
MOH	Ministry of Health
NTP	National Tuberculosis Programme
PLWHIV	People Living With HIV AIDS
SPSS	Statistical Package for Social Science
TB	Tuberculosis
WHO	World Health Organization
WV	World Vision

ABSTRACT

Tuberculosis (TB) remains one of the major health problems and the second leading infectious cause of mortality around the world. According to World Health Organization (WHO) 2016 report, TB remained one of the top 10 causes of death worldwide. There were an estimated 1.4 million TB deaths in 2015, and an additional 0.4 million deaths resulting from TB disease among people living with HIV. According to World Bank, the average TB incidence for Somalia from 1990 to 2014 was 284.96 cases per 100,000 people with a minimum of 274 cases per 100,000 people in 2014 and a maximum of 286 cases per 100,000 people in 1990. TB prevalence is 513 per 100,000 population and the mortality rate from TB excluding HIV/TB co-infection has been assessed at 64/100,000. Despite the availability of free TB treatment in TB centers in Somalia, the prevalence rates of TB and MDR-TB still remain high (513 per 100,000 population and 5.2% among new cases and 40.7% among retreatment cases respectively). The objective of this study was to determine factors associated with TB treatment outcomes among patients attending TB treatment centers in Mogadishu. The study adopted a cross-sectional design, using quantitative and qualitative methods of data collection. Data was collected by means of interviewer administered semi-structured questionnaire to ascertain individual and institutional level factors associated with TB treatment outcomes and key in-depth interviews with health workers to obtain more information on TB treatment and outcomes. Qualitative information was analyzed thematically using NVIVO 8. Quantitative data was analyzed using SPSS version 20. Descriptive analysis was done using frequencies, proportions, percentages and means. Chi-square test was used to establish the association between the dependent and the independent variables. The level of significance was set at 95%. The study findings were presented in form of tables and charts. Results indicated that the proportion of individuals with successful treatment outcomes was 81.8%. Successful treatment outcome was higher in married ($p=0.001$), educated ($p=0.044$), HIV-negative ($p=0.003$), new treatment case ($p=0.001$), and patients with knowledge on TB ($p=0.048$). None of the TB-health facility factors influenced TB treatment outcomes ($p\text{-value}>0.05$). The study recommended in depth patient education on TB management and treatment. Moreover, there was need to improve on patient – health provider relationship for increased successful treatment outcomes.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Tuberculosis (TB) is an infectious disease which commonly affects the lungs. It is caused by a bacteria called *Mycobacterium tuberculosis*. The disease is transmitted through droplets from an infected person with active pulmonary disease released in the air and then inhaled by another person (Qian, Li, Nielsen, Hyldgård, Wong, & Chwang, 2006). These people with pulmonary TB can infect others through droplet infection when they cough, sneeze or through talking. A person needs to inhale only a few of these germs to become infected. Other ways in which TB can be spread include ingesting infected milk or meat (bovine TB) (Tschopp, Schelling, Hattendorf, Aseffa, & Zinsstag, 2009).

Tuberculosis remains one of the major health problems and the second leading infectious cause of mortality around the world. WHO reported 9 million TB cases and 1.5 million deaths from TB in 2013 (World Health Organization, 2014). In 2015, there were an estimated 10.4 million new (incident) TB cases worldwide; and an estimated 1.4 million TB deaths, and an additional 0.4 million deaths resulting from TB disease among people living with HIV. Worldwide, the rate of decline in TB incidence remained at only 1.5% from 2014 to 2015. (World Health Organization, 2016). Of the estimated 9 million people who developed TB in 2013, one quarter were in the African Region, which also had the highest TB prevalence, mortality (World Health Organization, 2014) and burden (World Health Organization, 2016).

Globally, 3.5% of new and 20.5% of previously treated TB cases was estimated to have had multidrug-resistant TB (MDR-TB) in 2013 (World Health Organization, 2014). An estimated 1.1 million (13%) of the 9 million people who developed TB in 2013 (World Health Organization, 2014) and 1.2 million (11%) in 2015 of all new TB cases were

people living with HIV were HIV-positive (World Health Organization, 2016). The number of people dying from HIV-associated TB has been falling for almost decade. The African region accounts for about four out of every five HIV-positive TB cases and TB deaths among people who were HIV positive (World Health Organization, 2014).

Somalia is the one of the most violent and poorest countries in the world and TB is among the major cause of morbidity and mortality in the country. Tuberculosis is still a serious health issue in Somalia, where the estimated TB incidence and prevalence is 274 per 100,000 and 513 per 100,000 populations respectively (World Bank, 2014). The mortality rate from TB excluding HIV/TB co-infection has been assessed at 64/100,000. In 2009 the WHO estimated the prevalence of all forms of TB to be 290 per 100 000 population. The incidence of sputum smear positive cases was 160 per 100 000 population (World Health Organization, 2014).

1.2 Statement of the problem

One of the targets of the Sustainable Development Goals (SDGs) for 2030 adopted by the United Nations in 2015 was to end the global TB epidemic. The WHO End TB Strategy, approved by the World Health Assembly in 2014, calls for a 90% reduction in TB deaths and an 80% reduction in the TB incidence rate by 2030, compared with 2015 (World Health Organization, 2016).

Although the number of TB deaths fell by 22% between 2000 and 2015 (World Health Organization, 2016), TB remained one of the leading causes of deaths worldwide (World Health Organization, 2014). There were an estimated 480 000 new cases of MDR-TB and an additional 100 000 people with rifampicin-resistant TB (RR-TB) who were also newly eligible for MDR-TB treatment in 2015 (World Health Organization, 2016).

TB is still a serious health issue in Somalia, the estimated TB incidence and prevalence is 274 per 100,000 and 513 per 100,000 populations respectively (World Bank, 2014). The mortality rate from TB excluding HIV/TB co-infection has been assessed at 64/100,000, although data collection has been challenging due to the chronic conflict that has prevailed in Somalia for more than two decades. The estimated prevalence of MDR-TB is 5.2% among new cases and 40.8% among retreatment cases (Sindani, 2013). Despite the availability of free TB treatment in TB centers in Somalia, the prevalence rates of TB and MDR-TB still remain high (513 per 100,000 population and 5.2% among new cases and 40.7% among retreatment cases respectively). Furthermore the rate of unsuccessful TB treatment i.e. failed treatment, death, defaulting and transferring out is rated at 18.4% - 30.8% which significantly varies from the target (15%) set by WHO (Liddle et al., 2013). Additionally in Somalia the factors associated with the high prevalence of TB are not yet very clear (Ejeta et al., 2018).

1.3 Justification

The factors associated with increased rates of TB in Somalia are still not very clear and thus this study will provide information fill in the knowledge gap on factors associated with TB treatment outcomes in Mogadishu. Furthermore assessing factors associated with TB treatment outcomes would provide valuable information about the overall picture of the control activities in the region and there by assist in the development of a strategy for improving quality of service.

Additionally this study would act as future reference for researchers who would wish to conduct research on TB in Somalia. This study would help in improving the treatment outcomes of TB by preventing the development of MDR-TB.

1.4 Research Questions

1. What are the TB treatment outcomes among patients attending TB centres in Mogadishu?
2. What are the individual level factors associated with TB treatment outcomes among patients attending TB centres in Mogadishu?
3. What are the health facility level factors influencing TB treatment outcomes among patients attending TB centres in Mogadishu?

1.5 Research objectives

1.5.1 General objectives

To determine factors associated with TB treatment outcomes among patients attending TB treatment centers in Mogadishu, Somalia.

1.5.2 Specific objectives

1. To determine TB treatment outcomes among patients attending TB centres in Mogadishu, Somalia
2. To determine individual level factors associated with TB treatment outcomes among TB patients attending TB centres in Mogadishu.
3. To determine health facility level factors influencing TB treatment outcomes among TB patients attending TB centres in Mogadishu

CHAPTER TWO

LITERATURE REVIEW

2.1 Aetiology of Tuberculosis

The infectious disease TB is caused by the bacterium *Mycobacterium tuberculosis* (MTB) (World Health Organization, 2014). The infection generally affects the lungs, but can also affect other parts of the body. Most infections do not have symptoms, known as latent TB, where in about 10% of these latent infections progress to active disease which can kill about half of those infected (Esmail, Barry, Young, & Wilkinson, 2014). The classic symptoms of active TB are a chronic cough with blood-containing sputum, fever, night sweats, and weight loss (Cudahy & Shenoï, 2016).

2.2 History of Tuberculosis

TB is an ancient disease where it has been referred by numerous names including phthisis, consumption, and the white plague. The term *phthisis* first appeared in Greek literature, describing it as the "ulceration of the lungs, thorax or throat, accompanied by a cough, fever, and consumption of the body by pus. Hippocrates believed that it was a common contagious cause of illness in his time (Frith, 2014). The historical TB infection term "*consumption*" came about due to increased weight loss of the victim and also infection of other organs leading to a wide range of symptoms (Milburn, 2007). The term '*white plague*' emerged around the 18th century in Western Europe and the term White plague emerged around this time (Daniel, 2006).

2.3 *Mycobacterium tuberculosis*

Mycobacterium tuberculosis (MTb) is an obligate pathogenic bacterial species in the family Mycobacteriaceae and the causative agent of TB (Smith, 2003). It was first discovered in 1882 by Robert Koch (Cambau & Drancourt, 2014). Humans are the only known reservoirs of MTb. *Mycobacterium tuberculosis* has a waxy mycolic acid coating

on its cell surface, which makes the cells impervious to routine staining methods such as Gram staining (Talip, Sleator, Lowery, Dooley, & Snelling, 2013). It can only be detected using the Ziehl-Neelsen or acid-fast staining technique (Dezemon, Muvunyi, & Jacob, 2014).

2.4 Epidemiology of Tuberculosis

Approximately about one third of the world's population has been infected with *M. tuberculosis*, with new infections occurring in about 1% of the world population each year. However most infections with *M. tuberculosis* do not cause TB disease and 90-95% of infections remain asymptomatic. It is important to note that, over two thirds of the global TB burden is reported in Africa and Asia, where India, Indonesia and China account for the highest number of TB cases amounting to 43% of the global burden (Raviglione & Sulis, 2016).

Tuberculosis (TB) is a leading cause of morbidity and mortality worldwide (Raviglione & Sulis, 2016). In 2014 there was an estimated 9.6 million new TB cases worldwide of those infected, 5.4 million was among men, 3.2 million was among women and 1.0 million was among children. There was also 1.5 million T.B deaths (1.1 million among HIV- negative people and 0.4 million among HIV – Positive people) of which approximately 890,000 were men, 480,000 were women and 140,000 were children. Of these TB infections, 58% of them were in the South-East Asia and Western Pacific regions. A 45% drop in TB mortality rate has been observed globally since 1990 (Lozano, et al., 2013). The TB global mortality fell by 8.6% per annum between 1990 and 2010 (Murray et al., 2013).

The poorest and socially excluded groups often carry the largest burden of disease, which makes it essential to properly address the social determinants of health through poverty reduction measures and targeted interventions on high-risk populations (Raviglione & Sulis, 2016). TB accounted for 2.0% of all disability adjusted life years (DALYs) worldwide in 2010. Comparing data from 1990 with those from 2010, a decrease of 19.4% in the total number of DALYs due to tuberculosis was reported

(Murray et al., 2013). Between 1992 and 2002, higher TB burden was observed among men than among women. The rate found was 1.38 DALYs/100,000 population in the 55-64 year age group. (Gledovic, Vlajinac, Pekmezovic, Grujicic-Sipetic, Grgurevic, & Pesut, 2006).

The African region had approximately 28% of the world's cases in 2014 unfortunately Africa region had the most severe burden of TB relative to population: 281 cases for every 100 000 people more than double the global average of 133. In several African countries, including those with well-organized control programs, annual TB case-notification rates rose more than fivefold since the mid-1980s, reaching more than 400 cases per 100,000 people by 2006 (Bos, Baingana, Hofman, & Rogo, 2006) . HIV infection is the most important single predictor of TB incidence across the African continent (Dalbo & Tamiso, 2016). TB, and malaria are collectively referred to as infectious diseases of poverty (IDoPs), and these diseases are primarily concentrated in rural areas of Sub-Saharan Africa, Asia, and Latin America. It is estimated that more than 90% of the total impact as a result of death and disability caused by neglected diseases occurs in Sub-Saharan Africa (Bhutta, Sommerfeld, Lassi, Salam, & Das, 2014).

TB imposes a huge burden on the already overstretched health services in sub-Saharan Africa (SSA). Although SSA has 12% of the world's population it generated 29% of the 9 million TB cases and had 254,000 TB related deaths. SSA bears the highest global TB/HIV burden and over 50% of TB cases in SSA are co-infected with HIV. An estimated 1.5 million died from TB globally in 2013, of which a large majority of the 360,000 HIV-positive TB cases who died were from sub-Saharan Africa (Zumla, Petersen, Nyirenda, & Chakaya, 2015). The burden of disease Tuberculosis in Africa was 34.2 million, that is, 2.2% of total of the world DALYS (Galan & Cucu, 2013).

Individuals suffering from TB are often in their economically most productive age, and seeking TB care poses a significant economic burden to patients and households. The costs for patients of TB treatment have largely been neglected, although such costs often

exceed the costs to the health system. Household costs for TB care in Africa accounted for almost one fifth of their annual income. This cost is a reflection of the burden for patients who received a TB diagnosis; however, it is also likely to be a barrier for people with TB, particularly the poor, who do not access care at all (Ukwaja, Modebe, Igwenyi, & Alobu, 2012). In Uganda, 70% of the cost of TB treatment is borne by patients and their families (Ukwaja, Modebe, Igwenyi, & Alobu, 2012).

TB is one of the major health burdens in Somalia, contributing to a high morbidity and mortality among the population. The epidemiology of TB in Somalia is similar to other developing countries where the disease is related with widespread poverty, poor living conditions and reduced immune state especially those living with HIV and AIDS (Inambao, Adan & Mohamed, 2013). The incidence of TB in Somalia was estimated to be 290/100,000 persons annually in 2013 (Yarnell et al., 2013). In Somalia, TB is a serious health issue where an estimated TB incidence and prevalence is 274 per 100,000 and 513 per 100,000 populations respectively has been reported (World Bank, 2014). The 15-49 years age group is largely affected. It is reported that the incidence rate of TB in Somalia is among the highest in the world (Yarnell et al., 2013)

According to WHO, TB deaths in Somalia reached 6,458 or 5.03% of total deaths (World Health Organization., 2016). The age adjusted death rate is 123.01 per 100,000 of population in Somalia; which ranks number four in the world making TB one of the leading cause of morbidity and mortality among the adult population, contributing to significant loss in work productivity and increased household expenses in support of affected member of the household during its long treatment (Inambao, Adan, & Mohamed, 2013). The mortality rate from TB excluding HIV/TB co-infection was being estimated at 64/100,000. TB according to WHO estimates in 2009 report that all forms of TB in Somalia are about 290 per 100 000 population. The incidence of sputum smear positive cases was 160 per 100 000 population (World Health Organization, 2014). This was slightly higher than the total African number of cases per 100 000 population.

2.5 Symptoms and Diagnosis of Tuberculosis

The diagnosis of TB requires some clinical and biochemical tests. Some of these biochemical tests are very expensive and not available in every hospital in Somalia. This therefore impairs the efficiency of early detection of TB and consequently the management and treatment of the disease (CDC, 2009).

The major symptoms of TB include coughing, with sputum or blood, chest pains, fever, weight loss and night sweats (World Health Organization, 2013). Furthermore TB infection occurs among immunocompromised individuals (Narasimhan et al., 2013). Additionally TB infection causes no symptoms in health individuals (Granich et al., 2010).

2.5.1 Medical history

Patient's history of TB exposure, infection or disease is asked to determine whether they are new cases or they have been treated before with anti-TB drugs. Patients are also evaluated for other medical conditions that may increase the risk for TB disease such as HIV infection.

2.5.2 Physical examination

Physical examinations are not useful in confirming TB disease; however it can help in assessing the patient's general health and find other factors which may affect the TB treatment plan.

2.5.3 Chest x-ray

A chest radiograph is used to detect chest abnormalities. Lesions may appear anywhere in the lungs and may differ in size and shape. These abnormalities on chest radiographs may be suggestive of TB, but cannot be used to definitively diagnose TB.

2.5.4 Microbiological tests

In Somalia, due to unavailability of culture materials and equipment, the main microbiological diagnostic method used is acid fast bacilli (AFB) microscopy which is used to confirm presence of mycobacterium TB in sputum samples from pulmonary TB patients. Three samples of sputum are required from each patient to confirm the results (Centers for Disease Control and Prevention, 2009).

2.6 Tuberculosis treatment

The aim of TB treatment is to cure TB patients, prevent deaths from TB and to stop transmission of mycobacterium TB from the infected to the host community (Sulis, et al., 2016). TB Treatment can be challenging for patients as it requires taking multiple drugs for at least 6 months (Sia & Wieland, 2011).

The standard treatment regimen for TB patients is consists of an intensive phase that lasts 2 months and a continuation phase that last up to 4 months. In the intensive phase the TB patient is given 4 drugs (isoniazid, rifampicin, pyrazinamide, and ethambutol) to rapidly kill the *Mycobacterium tuberculosis* (Rao, 2014). Infectious patients become less infectious within approximately 2 weeks of starting treatment. In the continuation phase, 2 drugs (isoniazid, rifampicin) are used, over a period of 4 months. These drugs eliminate the remaining bacilli and prevent relapse (Sia & Wieland, 2011).

2.7 TB treatment outcomes

Globally in 2006 there is an estimated 4.1% new cases and 19% of previous treated cases with MDR –TB. In the same year a survey conducted by WHO documented that 240 000 people died of MDR-TB. Furthermore about 8000 patients were reported to have extensive drug resistance TB (XDR-TB). Additionally by 2019 about 123 countries globally reported at least one case of XDR-TB (WHO, 2019).

In Africa the rate of TB treatment outcomes are not yet within the set targets of the WHO. For instance based on a study done in South Africa the rate of unsuccessful TB treatment was about 24.5% for the co infected cases, 15.3% among the HIV negative and about 25.6% did not have HIV/AIDS. Furthermore among the co infected cases and the HIV positive cases the major outcome was death (Engelbrecht et al., 2017). Similarly in 2003 about 8.8 million new cases of tuberculosis resulted to about 1.7 million deaths. Furthermore HIV was associated with the high prevalence of TB and negative TB outcomes such as death (Corbett et al., 2006).

In Somalia the rate of successful TB treatment outcomes is about 69.2% to 81.6% the rate of failed TB treatment is 0.9 to 2.5%; rate of death is 3.9 to 7.2%; rate of defaulting is 3.2 to 9.6% and the rate of transferring out is 0.3 to 13.1% (Liddle et al., 2013).

Early diagnosis of TB patients and treating them immediately are two important elements in reducing transmission and achieving elimination of TB infection (Lönnroth et al., 2015). World Health Organization (WHO) has set the global target rate for a successful treatment outcome at 85% (Jordan & Davies, 2010). Monitoring Treatment outcome is a key element in TB elimination (Broekmans et al., 2002). A recommendation for assessing the outcome of TB treatment has been published by the WHO and classified treatment outcomes as indicated in Table 1 (World Health Organization, 2013).

Table 2.1: Treatment outcomes for TB patients (excluding patients treated for RR-TB or MDR-TB)

Outcome	Definition
Cured	A pulmonary TB patient with bacteriological confirmed TB at the beginning of treatment who was smear- or culture-negative in the last month of treatment and on at least one previous occasion
Treatment completed	A TB patient who completed treatment without evidence of failure <i>but</i> with no record to show that sputum smear or culture results in the last month of treatment and on at least one previous occasion were negative, either because tests were not done or because results are unavailable
Treatment failed	A TB patient whose sputum smear or culture is positive at month 5 or later during treatment
Died	A TB patient who dies for any reason before starting or during the course of treatment
Lost to follow-up	A TB patient who did not start treatment or whose treatment was interrupted for 2 consecutive months or more
Not evaluated	A TB patient for whom no treatment outcome is assigned. This includes cases “transferred out” to another treatment unit as well as cases for which the treatment outcome is unknown to the reporting unit.
Treatment success	The sum of cured and treatment completed

2.8 Factors associated with TB treatment outcomes

2.8.1 Socio-demographic and socio economic factors

Age is one of the factors that affect TB treatment outcomes .Studies had shown that old age is a risk factor for TB disease, and the prevalence of co morbidities that can alter the immune system is much greater in the elderly (Vesosky & Turner, 2005). Socio economic status of TB patients is strongly associated with TB (Hargreaves, Boccia, Evans, Adato, Petticrew & Porter, 2011). Poverty increases the risk of under nutrition as well poor adherence to treatment among TB patients which in turn influences the outcomes of patients on TB treatment.

2.8.2 Effect of Nutrition on TB Treatment outcomes

Drug therapy and nutritional balance are interrelated aspects of TB infection therapy that contribute to patient's treatment outcome (Mehta, Emery, Girish, Ryland Jr, & Roy, 2003). Looking at TB treatment, studies have shown a strong association between low BMI and severity of TB disease (Maro et al., 2010). Malnutrition also results in delayed recovery as well as delay in sputum smear conversion of pulmonary TB patients (Karyadi et al., 2002).

2.8.3 Effect of HIV/TB co infection on TB treatment outcomes

There is a general agreement that TB is one of the most common opportunistic infections among PLHIV, particularly in high TB prevalence areas (World Health Organization, 2011). HIV increases the risk of getting active TB disease after infection with *Mycobacterium tuberculosis*, among both people with recently acquired infection and those with latent infection (Corbett et al., 2003). As HIV infection progresses, CD4 cells count decline by about 50–80 cells/mm³ per year, and the overall immune system of the person becomes less able to prevent the dissemination of *M. tuberculosis* in the body (Havlir, Getahun, Sanne, & Nunn, 2008).

There is an increase in morbidity and mortality resulting from TB and HIV co infection which emphasize the need for early diagnosis and treatment of TB among all PLHIV and HIV among all people with TB (Badri, Wilson, & Wood, 2002). Previous studies has shown lower cure rates and higher mortality and re infection rate in HIV/TB co infected patients (Korenromp, Williams, Gouws, Dye, & Snow, 2003). Unfortunately, knowledge of the real extent of TB and HIV co infection in Somalia is limited because of incomplete surveillance data.

2.9 Multi Drug Resistant Tuberculosis in Somalia

Emergence of multi drug resistant tubercle bacilli is considered a major concern in TB management in Somalia. “The levels of MDR-TB in Somalia are among the highest in

the Eastern Mediterranean and African region.” (World Health Organization, 2013). In a nationwide survey conducted in Somalia (2010-2011), MDR-TB was found in 5.2% of patients with newly diagnosed TB and 40.8 % of patients with previously treated TB (Sindani, 2013).

According to WHO, MDR-TB are mostly found in areas with poor TB control programs. Drug resistance develops due to improper use of antibiotics by TB patients which is a result of administration of wrong treatment regimens and poor adherence to anti-TB drugs in which the patient fails to complete the course of regimen. Treatment of MRD-TB usually requires prolonged chemotherapy with highly toxic second-line drugs (Zager & McNerney, 2008). Although MDR-TB treatment was started in some regions of Somalia, Banadir and other regions are still suffering from lack of anti MDR TB drugs (World Health Organization, 2013).

2.10 Strategies for TB management in Somalia

There are different strategies developed since the WHO declared that TB disease is a major public health problem. Directly observed treatment short course (DOTS) strategy was developed in 1994 for better management of TB. It has 5 components (WHO, 2006); 1) sustained political commitment; 2) increased case detection through quality-assured bacteriology; 3) standardized treatment with supervision and patient support; 4) an effective drug supply; 5) monitoring and evaluation system.

The DOTS strategy has been implemented in most countries of the world including high TB burden countries. It has helped the improvement of the National TB programs by increasing case detection and treatment success rates, and reducing incidence and morbidity rates among the population (World Health Organization, 2006).

In 2006, the World Health Organization launched the Stop TB Strategy as evidence based approach for reducing the burden of TB in line with Millennium Development Goals (MDG). The targets of Stop TB strategy were to halt and reverse the incidence of TB by 2015 (MDG6, target6c), reduction of the prevalence and deaths due to TB by 50% by 2015, and elimination of TB as a public health problem by 2050 (World Health Organization, 2006).

2.11 Conceptual framework

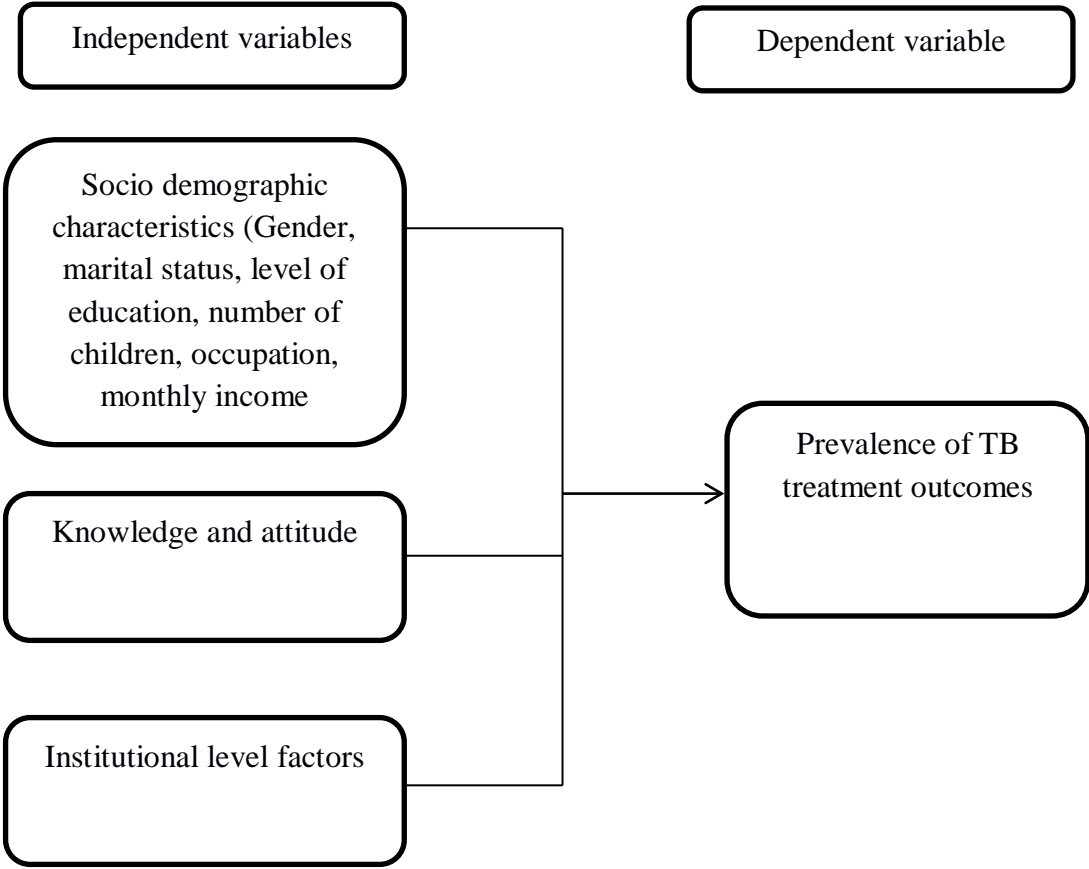


Figure 2.1: Conceptual framework

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study sites

The study was carried out in all (seven) public TB management units (TB centres) in Mogadishu namely Manhal, Ayan, Mercy, Muslim Aid, Dharkenley, Sacid, and Finsom TB centers. These health care facilities were re-established by international non-government organizations, to give free health care to patients in the city especially IDPs; after collapse public health care system in Mogadishu due to fighting that lasted two decades. Mogadishu, locally as Xamar (English: Hamar), is the capital and largest city in Somalia. Located in the coastal Banadir region on the Indian Ocean of the Horn of Africa, the city has served as an important port for centuries. In 2011, the population was estimated at about 2.5 million and about 200,000 of them were IDPs (Ministry of Interior and Federal Affairs, 2016).

3.2 Study design

The study design adopted a cross-sectional study design, using quantitative and qualitative methods. The design was appropriate since the researcher wanted to test the degree of relationship between and among variables within a specific point in time. Moreover, the design does not attempt to control or manipulate variables but determine current status of phenomena (Clive, 2006) and is concerned with hypotheses formulation and testing between non-manipulated variables (Best & Khan, 2007). Qualitative methods are credited in providing a depth of understanding of issues not always possible through quantitative methods (Creswell, 2009).

3.3 Study population

The study population comprised 1497 TB patients attending TB centers in Mogadishu.

3.4 Sample size determination

The sample size n is calculated using the Cochran's formula (Barlett, Kotrlik, & Higgins, 2001) as shown below.

$$n = Z^2_{1-\alpha} P (1 - P)/d^2$$

n = Desired sample size when population was greater than 10,000

α = level of significance (0.05)

z = Standard normal deviate corresponding to 95% confidence level (1.96).

p = Assumed proportion of TB patients experiencing unfavorable TB treatment outcomes (death, failure, defaulter, cure and completed) (50%).

d = Degree of accuracy desired at 5%

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384.2$$

This study used a sample of 385.

3.5 Sample size determination for qualitative data

A sample of 7 key informants was identified for indepth interviews. The principle of data saturation was applied to determine qualitative data sample size. By the time the seventh interview was conducted data had reached saturation point i.e. there was no new information coming out from the key informants and therefore qualitative data was collected from a sample of 7.

3.6 Inclusion and exclusion criteria

3.6.1 Inclusion criteria

- All TB patients attending the seven public TB centres in Mogadishu;
- TB patients aged 18 years and above;

3.6.2 Exclusion criteria

- TB patients severely ill to a point of being unable to participate in the study;

3.7 Study variables

3.7.1 Dependent variables

TB treatment outcomes

3.7.2 Independent variables

Socio-demographic characteristics, individual factors such as TB knowledge and health facility factors

3.8 Sampling technique

The TB patients were stratified according to the hospitals. Simple random sampling procedure using computer generated random numbers was used to randomly and proportionately select the study subjects. Study subjects were randomly chosen from the TB patients register, that formed the sampling frame, by giving serial numbers to all the TB patients and generate random numbers using random number generator software. Those who consented to participate were given a questionnaire to fill in their socio-demographic characteristics and they were followed till the treatment outcome was established. From each TB center, at least one health worker was purposively selected and interviewed.

3.9 Sample distribution

Probability proportional to size sampling was used. The sample distribution was as indicated in Table 2.2 below.

Table 3.1: Distribution of TB patients sampled per TB facility

Name of TB Facility	Number of TB Cases	Proportion of Sample size	Male	Female
Finsom TB Center	350	90	66	24
Mercy TB Center	295	76	48	28
Saacid TB Center	280	71	36	35
Manhal TB Center	260	67	54	13
Muslim Aid TB Center	180	47	31	16
Dhakinley TB Center	72	19	11	8
Ayan TB Center	60	15	10	5
Total	1497	385	256	129

3.10 Data collection tools

The researcher used both primary and secondary data. Secondary data was collected by reviewing patients file. Primary data was collected using researcher administered semi-structured questionnaires and key in-depth interviews. Questionnaires can obtain information about the thoughts, feelings, attitudes, beliefs, values, perceptions,

personality, and behavioral intentions of the research participants in a large population. Moreover, they provide data in the same form from all respondents which make both content and descriptive analysis easier (Johnson & Christensen, 2008; Babbie, 2007). Questionnaires were used to collect data on socio-demographic characteristics; knowledge on TB and treatment outcome from the patients. Key in-depth interviews were used to collect information on institutional level factors from health workers.

3.11 Data collection procedure

The research tools were researcher administered. Identified patients consented at the beginning of data collection upon authorization by Somalia government and hospital authorities. The tools had an introductory part verifying the purpose of the study, how confidentiality will be maintained and precise instructions on how to respond to the items. The study respondents were guided through the study and requested to provide as much data as possible. Any unclear questions were clarified on the spot.

3.12 Data management

Quality control was a continuous process throughout the study to maximize validity and reliability of the findings of the study. Validity estimates how accurately data obtained in the study represents a given variable or construct in the study (Mugenda, 2008). Validity in this study was ensured by pre-testing the instrument before administering to the study patients. Pretesting was done in Bondhere district using 39 questionnaires. This ascertained that the target audience could give an effective response. The research tools were reviewed appropriately. The content of the tools was also examined for logical or content validity. Content validity is the extent to which a measuring instrument provides adequate coverage of the topic under study (Best & Kahn, 2006).

Reliability refers to the level of internal consistency and stability of score obtained over time, of a measuring instrument (Fraenkel & Wallen, 2001). This was ensured by minimizing the external sources of variation and only considering the relevant variables of the study being measured only. Reliability was measured using the split half

technique using spearman's prophecy formula were a Cronbach Alpha coefficient of 0.81 was considered highly reliable.

Upon data collection, study tools were cross checked to ensure completeness. All study tools were stored in locked cabinets all throughout the study and accessed only by authorized persons so as to ensure confidentiality and to avoid data loss. After data collection, a double entry of the same data was done for accuracy purposes. The data was stored under passwords. Qualitative data was transcribed, translated and entered into NVIVO 8 and quantitative data into SPSS.

3.13 Data analysis and presentation

Quantitative data analysis involved both descriptive and inferential statistics. Descriptive analysis was done using frequency, proportion and mean. Inferential statistics were done using Chi-square test used to establish the association between the dependent and the independent variables. Logistic regression was used to estimate Odds Ratio (OR) as a measure of association. Statistical significance was checked using 95% confidence interval and p-value of <0.05 was considered significant.

Qualitative data was analyzed thematically. The study findings were presented in form of text, tables, and graphically.

3.14 Ethical considerations

This research protocol sought ethical approval from the Ministry of Health Somalia, Federal Republic of Somalia. Permission to conduct data collection was also sought from the facility in-charges of the selected public TB treatment centers in order to access the study population.

Respondents were assured that their participation was voluntary and that they could withdraw from the study at any time. Informed consent was obtained before administration of questionnaire. Participants were identified using unique identifiers assigned to them. Participants were informed that participation in the study would not

have any risks, financial benefits and the interview would take approximately 30-45 minutes per participant. Furthermore the questionnaire used was translated to Somali. To ensure privacy and confidentiality, all in-depth interviews were carried out in designated private rooms. Completed study tools were stored under lockable cabinets. All data was saved under password restricted computers. Only study related personnel would have access to study materials.

3.15 Expected application of results

It was expected that the results from this study would be utilized to improve the treatment outcomes of TB patients. The study sought to determine the factors associated with TB treatment outcomes among TB patients in Mogadishu City. And therefore the City government, hospital administrators and management, public health department, non-governmental organizations within Mogadishu City and all other relevant stakeholders could utilize the results to formulate policies, strategies, campaigns and other relevant interventions to reduce rates of poor treatment outcomes such as failure, relapse, default, and death from TB disease.

3.16 Limitations of the study

Since the study was carried out in public TB centers it would not be able to capture those TB patients that were receiving TB treatment from private hospitals. The applicability of the findings was limited to the area of study but have potential to impact plans in other localities. Another important limitation was recall bias; it may have been difficult for some patients to accurately recall the events that occurred sometime ago.

CHAPTER FOUR

RESULTS 4.1 Individual characteristics of the TB patients attending TB treatment centers in Mogadishu

4.1.1 Socio demographic characteristics of the TB patients attending TB treatment centers in Mogadishu

Out of the 385 study TB patients, there were significantly more males 256(66.5%) than females 129(33.5%). Out of the 385 study TB patients, most 199(51.7%) patients were married. The other TB patients were either never married 135(35.1%), divorced 34(8.8%) or widowed 17(4.4%). TB patients that had attended Madrassa were 128(33.2%) and those that attended primary education 83(21.6%). A proportion of 110(28.6%) TB patients were illiterate while only 64(16.6%) of the TB patients had secondary education. Of the 385 TB patients, a proportion of 139(36.1%) had consistent sources of income, that is, they were formally employed. The other TB patients either lacked consistent sources of income, that is, casual laborers 95(24.7%), or completely lacked a source of income, that is, either unemployed 108(28.1%), housewives 70(18.2%) or students 51(13.2%). TB patients who had no children were 127(33.0%), 117(30.4%), 26.2% TB patients had 4 to 6 children and 10.4% had over 6 children. TB patients had between 1 and 3 children. Of the 385 TB patients, a proportion of 139(36.1%) had consistent sources of income, that is, they were formally employed. Of the 385 TB patients, majority 283(75.3%) were from households that had a monthly income of less than or equal to 200USD. Only 17(4.4%) of the TB patients' households had income \geq 401 USD. The average number of persons currently living with the patients' in the households was 6.2 ranging between 2 to 14. Household with less than six persons were 190(49.4%) and those with between 6 and 10 persons were 175(45.5%).

Table 4.1: Socio demographic characteristics of the TB patients attending TB treatment centers in Mogadishu

Variable	Unit	Number	Percentage
Gender	Male	256	66.5
	Female	129	33.5
Age groups	18-27	175	45.5
	28-37	105	27.3
	38-47	53	13.8
	48-57	26	6.8
	58-67	19	4.9
	68-77	5	1.3
	78-87	2	.5
Marital status	Married	199	51.7
	Unmarried	135	35.1
	Divorced	34	8.8
	Widowed	17	4.4
Level of education completed	None	110	28.6
	Madrassa	128	33.2
	Primary/ Elementary	83	21.6
	Secondary	64	16.6
	Government employee	30	7.8
Current occupation	Un- employed	108	28.1
	Housewife	70	18.2
	Business	27	7.0
	Casual employee	95	24.7
	Firm employee	4	1.0
	Student	51	13.2
	0	127	33.0
Number of children	1-3	117	30.4
	4-6	101	26.2
	>6	40	10.4
	<201	290	75.3
Household income per month in USD	201-400	78	20.3
	>400	17	4.4
	<6	190	49.4
Number of persons currently in patients' households	6-10	175	45.5
	>10	20	5.2

4.1.2 Month of TB treatment, treatment category and HIV status of the TB patients attending TB treatment centers in Mogadishu

The 385 TB patients had been on treatment for a mean of 4.01 (SD 1.3) months within the range of 1 to 9 months. Majority 335(87%) TB patients had been on medication for more than two months. Of the 385 TB patients, 10 (2.6%) were HIV positive.

Table 4.2: Individual level characteristics of TB patients attending TB treatment outcomes in Mogadishu

Variable	Unit	Number	Percentage
Current month of TB treatment	<=2	50	13.0
	>2	335	87.0
Treatment category	New case	315	81.8
	Re-treatment cases	70	18.2
HIV status	Positive	10	2.6
	Negative	375	97.4

4.1.3 Knowledge on TB among TB patients attending TB treatment centers in Mogadishu

Of the 385 TB patients, a proportion of 50(13%) TB patients had never heard of TB before they were diagnosed. The 335(87%) TB patients that reported to have been aware of TB were mainly informed by family, friends, neighbours and colleagues. Of the 385 TB patients, Only 88(22.9%) patients were aware of the cause of TB. The unaware patients associated TB causes to food, dust, climate, heavy job and smoking.

Table 4.3: Knowledge on TB among TB patients attending TB treatment centers in Mogadishu

Variable	Unit	Number	Percentage
Heard about TB before diagnosis	Yes	335	87.0
	No	50	13.0
Cause of TB	Don't know	297	77.1
	Know	88	22.9
Common signs and symptoms of TB	Don't know	175	45.5
	Know	210	54.5
Possibility of TB transmission	Don't know	130	33.8
	Know	255	66.2
Ways of TB transmission	Don't know	152	39.5
	Know	233	60.5
Possibility to prevent TB	Don't know	158	41.0
	Know	227	59.0
Ways of preventing TB	Don't know	268	69.6
	Know	117	30.4
Existence of TB treatment and cure	Don't know	23	6.0
	Know	362	94.0
Ways of TB treatment	Don't know	43	11.2
	Know	342	88.8

Of the 385 TB patients, most 210(54.5%) TB patients were aware of the common signs and symptoms of TB. Of the 385 TB patients, majority 255(66.2%) TB patients were aware that TB could be transmitted. Moreover, majority 233(60.5%) of TB patients were aware of ways in which TB could be transmitted. Of the 385 TB patients, majority 255(66.2%) TB patients were aware that TB could be prevented. Of the 255(66.2%) TB patients who were aware that TB could be prevented, 200(52%) patients were aware of ways in which TB could be prevented. Of the 385 TB patients, majority 362(94%) TB patients were aware that TB could be treated and cured. Of the 362(94%) TB patients who were aware that TB could be treated and cured, 354(91.9%) patients were aware of how TB could be treated and cured. Knowledge on TB was assessed if the TB patients were aware of cause; signs and symptoms; possibility of transmission; possibility of

prevention; and possibility of treatment/ cure of TB. Each of the five units was awarded a score of one. Of the 385 TB patients, only 52(13.5%) had the full knowledge.

4.1.4 Attitude towards TB among TB patients attending TB treatment centers in Mogadishu

Patients' attitude on TB was assessed using adherence to dose, perception on seriousness of TB and having talked to someone after diagnosis. Of the 385 TB patients, a proportion of 285(74%) patients were not positive about TB.

Table 4.4: Attitude towards TB among TB patients attending TB treatment centers in Mogadishu

Variable	Unit	Number	Percentage
Attitude	Not positive	285	74.0
	Somehow positive	100	26.0
Talked about TB after diagnosis	No	189	49.1
	Yes	196	50.9
Adherence to dose	Adhered	350	90.9
	Not adhered	35	9.1
Perception on seriousness of TB	Very serious	152	39.5
	Somewhat serious	64	16.6
	Not very serious	169	43.9

Of the 385 TB patients, a proportion of 189(49.1%) TB patients did not talk to anyone about TB after they were diagnosed. The rest mainly spoke to spouses 59(15.3%), parents 51(13.2%), medical workers 45(11.7%), and close friends 40(10.4%). Of the 385 TB patients, most 350(90.9%) TB patients adhered to their dose. The TB patients had missed doses for an average of 2.2 (SD 1.3) within the range of 1 to 7 times. Main reasons for missed doses were depleted drugs and TB treatment centres not accessible; and patient forgot. Of the 385 TB patients, a proportion of 169(43.9%) patients did not perceive TB is a serious disease unlike 152(39.5%) who perceived it was a serious disease.

4.2 Institutional related factors of TB patients attending TB treatment centers in Mogadishu

According to 225 (58.45) of TB patients reported that the TB treatment centres were moderately accessible 225(58.4%). All seven TB treatment centres were open from six in the morning to one past midday from Saturday to Thursday; and medicine was issued free of charge. However, 75(19.5%) and 77(20%) patients were not aware of days and time TB treatment centres were open. A proportion of 2.1% of TB patients reported not to have received the medicine free of charge.

Table 4.5: Health facility factors of TB patients attending TB treatment centers

Variable	Unit	Number	Percentage
Physical accessibility of TB treatment centres	Hardly accessible	68	17.7
	Moderately accessible	225	58.4
	Easily accessible	92	23.9
Frequency of receiving anti-TB medicines	Every morning	152	39.5
	Every 3 days	152	39.5
	Weekly	81	21.0
Observation when taking anti-TB drugs	Not observed	370	96.1
	Observed	15	3.9
Treatment supporter	Present	253	65.7
	Absent	132	34.3
Nutritional support	Given	241	62.6
	Not given	144	37.4
TB awareness/training	Not trained	242	62.9
	Trained	143	37.1
Health educational materials for reading	Given	24	6.2
	Not given	361	93.8

Majority i.e. 234(60.8%) of TB patients proposed the need to increase working hours to improve services at the TB treatment centres. Moreover, according to 35.85 of the TB patients proposed the need to increase facility space. Of the 385 TB patients, DOT was applied by 10(2.6%) patients. Only a proportion of 152(39.5%) patients received medicine every morning. Another 152(39.5%) received medicines every three days and the rest weekly. Only 15(3.9%) patients were observed as they took medicine by health worker 8(2.1%), spouse 6(1.6%), relative 2(0.5%), and friend 1(0.3%). Of the 385 TB patients, majority 253(65.7%) patients had treatment support from relatives 124(32.2%), spouses 116(30.1%), and friends 13(3.4%). Of the 385 TB patients, most 253(62.6%) patients received nutritional support in form of maize and cooking oil and shared with family members. Of the 385 TB patients, 143(37.1%) and 24(6.2%) patients were trained on TB and received health educational materials on TB from the TB treatment centres. Training was mainly 372(96.5%) conducted once every three months.

4.3 TB Treatment outcome of TB patients attending TB treatment centers

Of the 385 TB patients, most 315(81.8%) treatment outcomes were successful. Specific successful treatment outcomes included cured 237(61.6%) and treatment completed 78(20.3%). Specific unsuccessful treatment outcome included treatment failed 26(6.8%), defaulters 24(6.2%), transferred 11(2.9%) and died 9(2.3%).

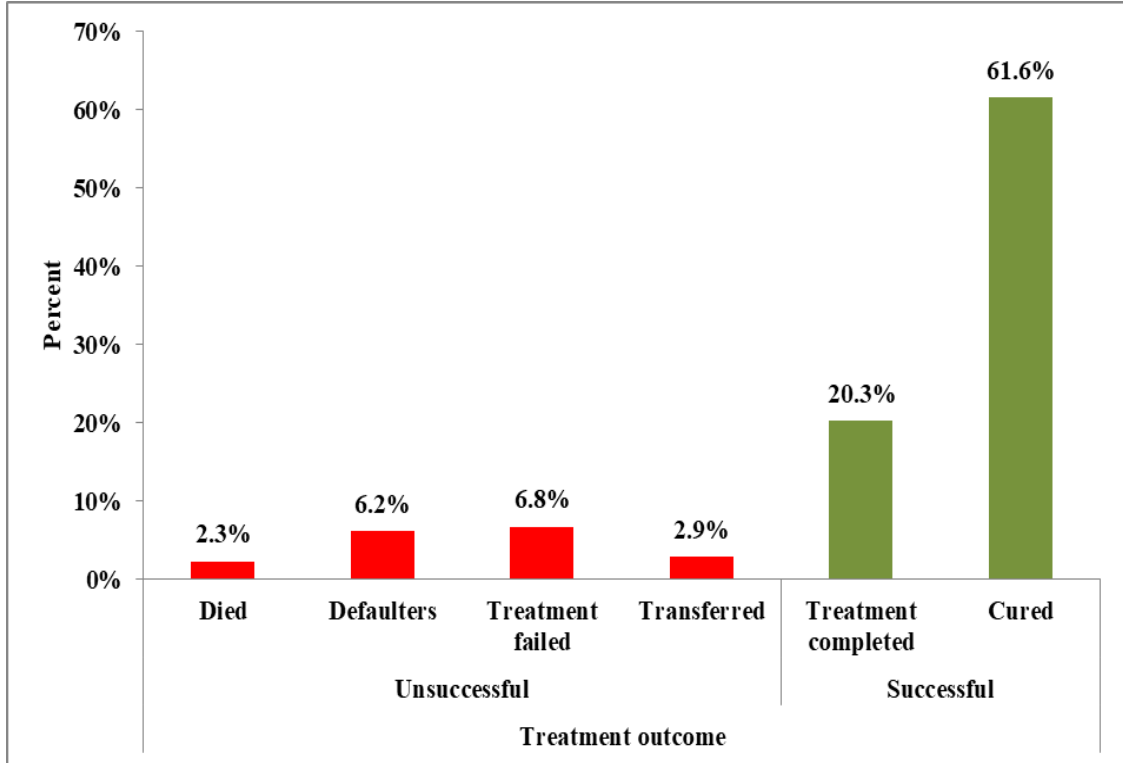


Figure 4.1: TB treatment outcome among TB patients attending TB treatment Centres in Mogadishu

4.4 Individual level factors influencing TB treatment outcomes

4.4.1 Demographic factors of TB patients influencing TB treatment outcomes

Multivariate analysis indicated that marital status, education level, HIV status and treatment category influenced treatment outcome. Married patients were more likely to have a successful treatment outcome (OR .3, 95% CI .1 to .6) as compared to the unmarried patients. Illiterate patients, patients who had attended madrassa and elementary education were less likely ((OR 4.1, 95% CI 1 to 15.9) (OR 4.5, 95% CI 1.2 to 17) (OR 5.9, 95% CI 1.6 to 21.8) respectively) to achieve successful treatment outcome compared to patients who had secondary education. Being HIV positive lowered the chances of successful treatment outcome (OR 4.4, 95% CI 1.1 to 17.7) compared to the HIV negative patients. New TB treatment cases were more likely to

have successful treatment outcome (OR 5.2, 95% CI 2.9 to 9.2) as compared to re-treatment cases

Table 4.6: Demographic characteristics associated with treatment outcome of TB patients attending TB treatment centers

Variable	Treatment outcome		P-value	Multivariate OR(95% CI)	P-value	Bivariate OR(95% CI)
	U	S				
Gender						
Male	47	209	.495	1.256(.7-2.4)	.899	.965(.6-1.7)
Female	23	106	Referent	Referent	Referent	Referent
Age groups						
18-27	24	151	.524	0.357(.02-8.5)	.199	6.292(.4-104)
28-37	25	80	.769	.625(.03-14.3)	.417	3.2(.2-54)
38-47	12	41	.694	.529(.02-12.3)	.397	3.417(.2-58.8)
48-57	2	24	.371	.206(.01-6.6)	.119	12(.5-273)
58-67	4	15	.702	.521(.02-14.8)	.385	3.75(.2-74.1)
68-77	2	3	.904	1.255(.03-50.97)	.810	1.5(.1-40.6)
78-87	1	1	Referent	Referent	Referent	Referent
Marital status						
Married	29	170	.001	.304(.1-.6)	.059	1.658(.98-2.8)
Unmarried	41	145	Referent	Referent	Referent	Referent
Number of children						
0	20	107	.543	.648(.2-2.6)	.616	.764(.3-2.2)
1-3	18	99	.859	.897(.3-2.96)	.657	.786(.3-2.3)
4-6	27	74	.220	2.017(.7-602)	.076	.392(.1-1.1)
>6	5	35	Referent	Referent	Referent	Referent
Educational level						
Illiterate	20	90	.044	4.073(1.0-15.9)	.019	.221(.06-.8)
Madrassa	27	101	.025	4.538(1.2-16.96)	.007	.184(.05-.6)
Elementary	20	63	.008	5.855(1.6-21.8)	.004	.155(.04-.55)
Secondary	3	61	Referent	Referent	Referent	Referent
Employment status						
Employed	46	200	.481	1.253(.7-2.4)	.726	.907(.5-1.6)
Un-employed	24	115	Referent	Referent	Referent	Referent
House hold income per month (USD)						
<201	56	234	.886	.885(.2-4.7)	.446	.557(.1-2.5)
201-400	12	66	.673	.684(.1-3.99)	.704	.733(.1-3.6)
>400	2	15	Referent	Referent	Referent	Referent

U- Unsuccessful; S- Successful; OR- Odds ratio; CI- Confidence interval

4.4.2 Treatment category and HIV status of the TB patients attending TB treatment centers in Mogadishu

Table 4.7: Treatment category and HIV status of the TB patients attending TB treatment centers in Mogadishu

Variable	Treatment outcome		P value	Multivariate OR(95% CI)	P-value	Bivariate OR(95% CI)
	U	S				
Treatment category						
New cases	40	275	0.001	.16(.08-.31)	.001	5.16(2.9-9.2)
Re-treatment	30	40	Referent	Referent	Referent	Referent
HIV status						
Positive	6	4	.035	4.426(1.1-17.7)	.003	.137(.038-.5)
Negative	64	311	Referent	Referent	Referent	Referent

U- Unsuccessful; S- Successful; OR- Odds ratio; CI- Confidence interval

4.4.3 Influence of knowledge on TB on TB treatment outcomes among TB patients attending TB treatment centers in Mogadishu

Bivariate analysis indicated that patients with moderate knowledge on TB were less likely to achieve successful treatment outcome (OR 2.4, 95% CI 1 to 5.6) compared to those with knowledge (Table 4.6).

Table 4.8: Effect of knowledge on treatment outcome of TB patients attending TB treatment centers

Variable	Treatment outcome		P-value	Multivariate OR(95% CI)	P-value	Bivariate OR(95% CI)
	U	S				
Knowledge on causes, symptoms, transmission, prevention and treatment of TB						
No knowledge	2	6	-	-	.821	1.227(.2-7.3)
Low knowledge	25	90	-	-	.396	1.472(.6-3.6)
Moderate knowledge	34	197	-	-	.048	2.37(1-5.6)
Knowledgeable	9	22	-	-	Referent	Referent
U- Unsuccessful; S- Successful; OR- Odds ratio; CI- Confidence interval						

4.4.4 Influence of attitude on TB treatment outcomes among TB patients attending TB treatment centers in Mogadishu

Bivariate analysis (p-value > 0.05) indicated that patients' attitude did not influenced treatment outcome (Table 4.8).

Table 4.9: Effect of attitude on treatment outcome of TB patients attending TB treatment centers

Variable	Treatment outcome		P-value	Multivariate OR(95% CI)	P-value	Bivariate OR(95% CI)
	U	S				
Attitude						
Not positive	52	233	-	-	.956	.984(.5-1.8)
Somehow positive	18	82	-	-	Referent	Referent
U- Unsuccessful; S- Successful; OR- Odds ratio; CI- Confidence interval						

4.4.5 Qualitative data supporting individual level factors

Three themes emerged in the qualitative data in regard to marital status, level of education and HIV status.

In regard to marital status all the respondents pointed out that:-

Nurse 1 “TB patients who were married have better support and potentially have high chances of having a successful TB treatment outcome and this are perhaps due to the support they receive from their spouses”.

Nurse 2 “TB patients who are married tend to have successful TB treatment outcomes this is because their spouses encourage them and remind them to adhere to the TB treatment”.

Nurse 3 “TB patients with stable families and married had better treatment outcomes and this could be due to continuous support by their partners”.

Nurse 4 “TB patients who have spouses recover quite fast and this could be attributed to assistance from the spouses”.

In regard to HIV status the following themes emerged:

Nurse 1 “TB patients who were HIV positive are less likely to have a positive treatment outcome and this could be due to their immune status and poor adherence to both TB and HIV treatment”.

Nurse 2 “HIV positive TB patients are highly affected by TB and most have unsuccessful TB treatment outcomes, this could be attributed to presence of other opportunistic infections”.

Nurse 3 “TB patients who have HIV in most cases result to unsuccessful TB treatment due to inconsistency in the uptake of TB and antiretroviral drugs”.

Nurse 4 “TB patients who are HIV positive tend to have poor recovery from TB and at times do not recover at all this could be due to poor immune status”.

In regard to level of education:-

Nurse 1 “TB patients with secondary level of education tend to have successful treatment outcomes this is perhaps due to their better understanding on the need to adhere to TB treatment”.

Nurse 2 “TB patients who have above secondary school education normally have higher chances of exhibiting successful TB treatment outcomes this could be attributed to their exposure and better understanding on the importance of completing TB treatment dosage”.

Nurse 3 “TB patients who have secondary level education in most cases will be more likely to have successful TB treatment outcomes this is potentially due to quick grasping of and following of TB treatment plan”.

4.5 Influence of institutional related factors on TB treatment outcomes among TB patients attending TB treatment centers in Mogadishu

Table 4.10: Effect of institutional factors on treatment outcome of TB patients attending TB treatment centers

Variable	Treatment outcome		P-value	Multivariate OR(95% CI)	P-value	Bivariate OR(95% CI)
	U	S				
Accessibility of TB treatment centres						
Hardly accessible	6	62	.084	0.41(.1-1.1)	.066	2.514(.9-6.7)
Moderately accessible	46	179	.893	0.956(.5-1.8)	.860	0.947(.5-1.7)
Easily accessible	18	74	Referent	Referent	Referent	Referent
Patient awareness on days health facility is open						
Not aware	15	60	.761	0.898(.5-1.8)	.649	0.863(.5-1.6)
Aware	55	255	Referent	Referent	Referent	Referent
Patient awareness on hours TB facility is open						
Not aware	17	60	.265	1.475(.7-2.9)	.323	0.734(.4-1.4)
Aware	53	255	Referent	Referent	Referent	Referent
Frequency of receiving anti-TB medicines						
Every morning	18	134	.167	0.561(.2-1.3)	.369	1.423(.7-3.1)
Every 3 days	39	113	.281	1.494(.7-3.1)	.096	0.554(.3-1.1)
Weekly	13	68	Referent	Referent	Referent	Referent
Observation when taking anti-TB drugs						
No	69	301	.167	0.961(.4-1.3)	.264	0.312(.04-2.4)
Yes	1	14	Referent	Referent	Referent	Referent
DOTS						
Not applied	69	306	.289	.494(.3-3.4)	.505	0.493(0.1-4)
Applied	1	9	Referent	Referent	Referent	Referent
Treatment supporter						
Yes	45	208	.632	0.87(.5-1.5)	.781	1.08(.6-1.9)
No	25	107	Referent	Referent	Referent	Referent
Nutritional support						
No	30	114	.330	3.1(.3-30.2)	.298	0.756(.4-1.3)
Yes	40	201	Referent	Referent	Referent	Referent
TB awareness/training in health facility						
No	41	201	.560	1.976(.2-19.5)	.413	1.247(.7-2.1)
Yes	29	114	Referent	Referent	Referent	Referent
Health staff service delivery						
Poor	30	103	.159	3.026(.6-14.1)	.146	0.327(.1-1.5)
Fair	38	191	.464	1.769(.4-8.1)	.333	0.479(.1-2.1)
Good	2	21	Referent	Referent	Referent	Referent

U- Unsuccessful; S- Successful; OR- Odds ratio; CI- Confidence interval

Multivariate and bivariate analysis (p-value > 0.05) indicated that none of the institutional factors influenced treatment outcome.

4.5.1 Qualitative data in support of institutional level factors

In regard to institutional level factors only one theme emerged regarding staffing and medication in health institutions:

Nurse 1 “ We normally do our best and supply patients with drugs however what will mostly determine successful or unsuccessful TB treatment outcomes is the behavior or other characteristic associated with the patient”

Nurse 2 “TB patients are well taken care of including being provided with food but at the end of the day the patients level of understanding among other characteristics influence their compliance with the treatment plan”.

Nurse 3 “We do as much as we can to give the TB patients the best care however their character significantly influences the TB treatment outcomes”.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATIONS 5.1 Discussion

5.1.1 TB treatment outcome

The study established that most 81.8% treatment outcomes were successful. This rate of successful treatment outcomes was slightly lower than that of studies conducted in southern Ethiopia (85.2%) (Gebrezgabiher et al., 2016) and Northern Ethiopia (89.2%) (Berhe et al., 2012). The rate of successful treatment outcome was also lower than the WHO set the global target rate for a successful treatment outcome which is at 85% (Jordan & Davies, 2010). However, the rate in this study was higher than that of studies conducted in Finland (70.1%), (Vasankari et al., 2007), South Africa (82%) (Seldon et al., 2012) and Southwestern Nigeria (46.1%) (Babatunde, et al., 2013). Specific successful treatment outcomes included cured (61.6%) and treatment completed (20.3%). The proportion of cured and treatment completed were different from those of a study conducted in southern Ethiopia where the cured were 11.8% and completed treatment were 73.5%) (Gebrezgabiher et al., 2016). Specific unsuccessful treatment outcome included treatment failed (6.8%), defaulters (6.2%), transferred (2.9%) and died (2.3%) and varied from those of a study in southern Ethiopia where 11.1% had defaulted, 3.4% died and 0.3% had treatment failure (Gebrezgabiher et al., 2016). Different studies had varied specific unsuccessful outcomes including 17.2% deaths in Finland (Vasankari et al., 2007); 12% deaths in South Africa (Seldon et al., 2012); 66.7%, 25.0%, and 8.3% defaulters, deaths and treatment failure respectively in Southwestern Nigeria (Babatunde, et al., 2013).

5.1.2 Individual level factors influencing TB treatment outcomes

Marital status, education level and HIV status formed the individual factors that influenced treatment outcome. Lower proportion of patients as compared to a study conducted in Nigeria was married (Ibrahim et al., 2011). Married patients were more

likely to have a successful treatment outcome as compared to the unmarried patients. This was similar to a study conducted in Turkey where married patients had higher successful treatment (Sengul et al., 2015). Illiterate patients, patients who had attended madrassa and elementary education were less likely to achieve successful treatment outcome compared to patients who had secondary education. This corresponds to findings in study conducted in Turkey where patients with low education rate had a lower successful treatment outcome than those with more education (Sengul et al., 2015).

Proportion HIV negative TB patients was higher as compared to that of a study done in Ethiopia (Ali et al., 2016). Being HIV positive lowered the chances of successful treatment outcome compared to the HIV negative patients. This was similar to findings in a study conducted in Ethiopia where HIV co-infected TB patients had a lower treatment success rate compared with the non-HIV infected patients (Ali et al., 2016). In addition, previous studies has shown lower cure rates and higher mortality and re infection rate in HIV/TB co infected patients in Africa (Korenromp et al., 2003; Finland (Vasankari et al., 2007); Northern Ethiopia (Berhe et al., 2012); and South Africa (Seddon et al., 2012). The lower successful treatment can be attributed to the fact that as HIV infection progresses, CD4 cells count decline by about 50–80 cells/mm³per year, and the overall immune system of the person becomes less able to prevent the dissemination of *M. tuberculosis* in the body (Havlir et al., 2008).

New TB treatment cases were more likely to have successful treatment outcome as compared to re-treatment cases. This finding was in agreement with that of a study conducted in Turkey (Sengul et al., 2015; Finland (Vasankari et al., 2007) and Southwestern Nigeria (Babatunde et al., 2013) where previous treatment history lowered chances of successful outcome. Similarly the levels of MDR-TB in Somalia are among the highest in the Eastern Mediterranean and African region” (World Health Organization, 2013) and the prevalence is highest among the previously treated TB (Sindani, 2013). The retreatment cases are mostly found in areas with poor TB control programs. The retreatment cases are mostly due to improper use of antibiotics by TB

patients which is a result of administration of wrong treatment regimens and poor adherence to anti-TB drugs (Zager & McNerney, 2008).

Knowledge level on cause; signs and symptoms; possibility of transmission; possibility of prevention; and possibility of treatment/ cure of TB were higher in this study as compared to a study done in Indonesia (Widjanarko et al., 2009). Patients with moderate knowledge on TB were less likely to achieve successful treatment outcome compared to those with full knowledge. This finding was similar to that of a study conducted in China poor knowledge was perceived by the interviewees as an influencing factor (Liang et al., 2012).

This study also assessed the influence of other individual factor including age, gender, size of household, number of children, attitude, employment and social economic status on treatment outcome. Most patients were male similar to study in southern Ethiopia (Gebrezgabiher et al., 2016). In this study, gender did not influence treatment outcome unlike in a study conducted in Finland where male patients were more associated with unsuccessful outcome (Vasankari et al., 2007). In Somalia, majority patients were aged 18-37 years unlike in southern Ethiopia where majority were aged 15-34 years (Gebrezgabiher et al., 2016). In this study, age did not influence treatment outcome unlike in a studies conducted in Finland (Vasankari et al., 2007) and Northern Ethiopia (Berhe et al., 2012) where old age was associated with unsuccessful outcome. Patients with no children were less than those of a study conducted in Turkey (Sengul et al., 2015). In this study, number of children did not influence treatment outcome unlike in a study conducted in Northern Ethiopia where unsuccessful treatment outcome was higher among households with higher number of children (Berhe et al., 2012). More patients were unemployed and lacked consistent source of income compared to patients in a study conducted in Bydgoszcz Poland (Przybylski et al., 2014). In this study, employment status did not influence treatment outcome unlike in a study conducted in Northern Ethiopia where unsuccessful treatment outcome was higher among the unemployed patients (Berhe et al., 2012). Majority patients' households had low monthly income similar to a study done in Kenya (Muture et al., 2011). In this study,

social economic status did not influence treatment outcome unlike in a study conducted in China where low social economic status was associated with unsuccessful outcome (Liang et al., 2012). More patients' households had more than six persons compared to a study done in Turkey (Sengul et al., 2015). A significant proportion of 74% patients were not positive about TB.

A data triangulation reviewed that marital status, level of education and HIV status were also supported as factors influencing TB treatment outcomes by the qualitative data as shown in the qualitative data section in chapter four.

5.1.3 Institutional level factors affecting TB treatment outcomes

This study also assessed the influence of institutional factors including health facility accessibility, service delivery, nutrition, mode of medication, training, and treatment supporter on treatment outcome. TB treatment centres were less accessible compared to a study in northern Ethiopia (Mesfin, et al., 2010). Unlike in this study, various social and economic including poor healthcare provision services were found to be associated with negative treatment results (Sengul et al., 2015). Patients complained of disrespect and incomplete explanations on TB. Similarly, a study in Indonesia established that patients had experienced problems in communication with the hospital staff. According to these patients the doctors or nurses were sometimes unfriendly and could have little patience (Widjanarko et al., 2009). In China, unsuccessful outcomes were associated with lack of coordination of services by health staff (Liang et al., 2012). Nutritional balance contributes to patient's treatment outcome (Mehta et al., 2003) which was not the case in this study. This is because malnutrition results in delayed recovery as well as delay in sputum smear conversion of pulmonary TB patients (Karyadi et al., 2002). Irrespective of DOTS strategy being implemented in most countries with high TB burden to increase case detection and treatment success rates, and reducing incidence and morbidity rates among the population (World Health Organization, 2006), its implementation has been very poor in Somalia. Unlike in this study, a study in China found out that unsatisfactory supervision of treatment was associated with unsuccessful

treatment outcomes (Liang, et al., 2012). Patients with treatment supporters were more in this study than those of a study conducted in Indonesia (Widjanarko et al., 2009). Most patients received nutritional support however a few were trained on TB. A study in South Africa established that malnutrition was associated with unsuccessful treatment outcomes (Seddon et al., 2012).

A data triangulation reviewed that the key informants were categorical in indicating that what influence TB treatment outcomes was entirely dependent on TB patient individual characteristics. This therefore supports the findings that no institutional level factors influenced TB treatment outcomes.

5.2 Conclusions

The TB treatment outcomes in Somali were as follows; 81.9% successful treatment, 2.3 % deaths, 6.2% defaulters, 6.8% failed treatment and 2.8% transferred. Individual lever factors that were found to significantly influence TB treatment outcomes were marital status, level of education, treatment category, HIV status and level of knowledge on TB. None of the institutional level factors significantly influenced the TB treatment outcomes among the TB patients attending TB treatment centers in Mogadishu.

5.3 Recommendations

I recommend that:-

1. The Somalia government and partners need to improve defaulter tracking and develop Prevention strategy on MDR TB
2. The Somalia government and partners need to support unmarried TB patients, generally improve literacy levels and develop prevention measures of HIV positive TB patients

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APPENDICES

Appendix I: Consent Form for Questionnaire

Contact information:

Researcher	Institution	Contact
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PART A

Introduction

You are invited to participate in this study. You have been selected as a possible participant in this study. We ask that we read and explain this form to you as you ask any questions you may have before agreeing to be in this study.

Purpose of the study

To determine factors associated with TB treatment outcomes among patients attending TB centers in Mogadishu, Somalia

Risks of Study Participation

This study has no known risks. Although your details will be written on paper, no other person will be allowed to read this information except the ones directly involved in this study. There are almost no chances of you getting an injury in the course of our study. Discomfort is not anticipated either as you will complete the questionnaire in absolute privacy.

Benefits

By participating in this study and answering to our questions, it's expected that the results from this study will be utilized to improve the treatment outcomes of TB patients. Taking part in this study will not involve any payment.

Study Procedures

If you agree to take part in this study: We shall ask you detailed questions for about 30-45 minutes, whose answers we shall note on paper. The information that you will provide during the study will be kept confidential. Only the interviewer and the researcher will have access to the questionnaires. The information will be destroyed after the study.

Confidentiality

The records of this study will be kept private. The questionnaire will not have your names but codes. The privacy will be enhanced by the use of lockable cabinet. Any publication or presentations arising from this study will not include any information that will make it possible to identify you as a subject. However this information will only be available to the people who are involved in the study.

Voluntary nature of the study

Participation in this study is voluntary. You have the right to refuse to participate or to answer to any question that you feel uncomfortable with. If you change your mind, you have the right to withdraw at any time. If anything is not clear or if you need further information, we shall provide it to you. Your decision whether or not to participate in this study will not affect your current or future relations with this hospital or the other institutions involved. If you decide to participate, you are free to withdraw at any time without affecting those relationships

Contacts and Questions

The researcher conducting this study is Marian Khalif Ali. You may ask any questions you have now, or if you have questions later, you are encouraged to contact him through telephone number: /+254-705635443, E-mail umusara2014@gmail.com

For any questions pertaining to rights as a research participant, the contact person is: The Secretary, KEMRI Ethics Review Committee, P. O. Box 54840-00200, Nairobi; Telephone numbers: 020-2722541, 0722205901, 0733400003; Email address: ERCAdmin@kemri.org

You will be given a copy of this form to keep for your records.

PART B: CONSENT FORM

Please read the information sheet (PART A) or have the information read and explained to you carefully before completing and signing this consent form. If there are any questions you have about the study, please feel free to ask them to the investigator prior to signing your consent form.

Declaration of the volunteer

I Miss, Mrs.....hereby give consent to participate in the proposed study. I have read the information sheet concerning this study, I understand the aim of the study and what will be required of me if I take part in the study. The risks and benefits if any have been explained to me. Any questions I have concerning the study have been adequately answered. I understand that at any time that I may wish to withdraw from this study I can do so without giving any reason and without affecting my access to normal health care services.

I realize that I will be interviewed once. I consent voluntarily to participate in this study.

Participant's name.....

Signature or left thumb printDate.....

Name of person taking consent.....,

Signature.....Date.....

Name of Investigator.....

Signature of Investigator/ Date/

Appendix II: Consent Form for Questionnaire in Somali

MULXAQA II: OGOLOSHO KA'QEYB GAL WAREYSIGA OO AF SOMALI

CINWANKA:SABABAHA LXARIRA DAWEYNRA QAAXDA EE MAGALADA
MUQDISHO, SOMALIA

Xarumaha iyo Kormeerayaasha:

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Qeebta A

Hordhac

Waad kumahdsantahay inaad ogalaatay inaan ku'wareesano. Waxaan ahay marian khalif ali waxaan ka'socda Institute of Tropical Medicine And Infectious Diseases-JKUAT. Waxaa icawin doona.....waxaan sameen doona baritaan oo aan firineyno sababha keento iney haweeneyda ku'adkaato foosha oo kunool Mgalada Muqdisho. Taasi wexey sababtaa iney hoyodu iyo dhalankaba iney xanuun iyo oof ba udtimaado. Waxaa lagaa soocodsaday inaad ka'sooqeeb gasho wareysiga sida aan u ogaano waxyalaha dhimashada iyo dhibata dhaliinka ukeenay haweenka jira 15 ila 49 sano oo kunool Xamar.

Ujeedada

Ujeedada wareysiga wa in la'ogaadaa sababaha keenta in haweenedu (15 ila 49) ey dhibato la'kulanto xiliga ey dhaleyso iyo dhaqamaha dhibatada kordhin karta oo la'kulmaan haweenka booqda xarumaha cafimaad ey kuyaala Xamara, Somalia.

Qaabka

Markaad ogalato inaad ka'qeeb gasho wareysigaan, waxaa lagaa raba inaad ka'jawabtid su'aalaha taasoo naga saacideeneeso inaaa kordhino fahanka iyo sababaha keena in dhalinka lagu dhibtooda markaasna aanu yareeno jirida iyo oofsiga hoyada iyo dhalaanka ey ku'nool Xamar. Maka aad ka'jawaabeesid su'aalaha waxan qoran doona qoralo kooban waana aan kaa duubi doonaa orahyadada.

Dhamaan orahyadada wa muhiim, jawab qalad iyo mid sax ah majirto, xurnimo dareen sheegna aragtidaada. Wareysigu wuxu soconaa 30-45 mirir.

Dhibaatoyinka, Dhawaca, Raxa la'aanta iyo Qatarta

Wareysigaan waa wareysi af ah marka ma'jiro wax halis ah oo aan filaneyno.

Faa'idoyinka

Faa'ido qaas ah malaha wareysigaan; sikastaba ha ahaatee fahanka haweenedu sababaha ukeeno dhibatada kolka ey umuleyso iyo sida loo yareeyo qatarta. Fahankaan wuxuu yareena bkashada iyo dhimashada hoyada iyo dhalaanka oo la'xariiro dhibatooyinka dhalida ee Xamar, Somalia.

Raaxo

Warkaani waa loo isticmala baritaankaan wana la'ilaalinaa . magacada lama arkaayo, mana lagu soo bandhigaayo bugageyga. Inta ey socoto baritaanka, waraqdaada ogolaasho, iyo wareysigagba walakala ilaalina. warakaada wararka kale baa lagu dhax daraa sida loo dhulundhuliyo. Dhamadkiina cid ogaan karto malaha qof sheegtay.

Xaqa diiditaanka/ ka'siibasho

Ka'qeeb gelistaadu waa iskaa wax uqabso; waad diidi karta inaad ka'jawaabto su'aalaha qarkii ama inaadba ka'qeebgasho. Waad dooran karta inaad ka'qeeb gasho iyo inkale.

Cod duubis

Baaritankan waa mid la'duubaayo, oraahdiinu waa wada muhiim. Orrahda duubani waxa loo isticamalaa sida loobuxiyo melaha banana oolaga tagay. Qofna lama siinaayo oo barintaankaan shaqo kuleheen. Kedibna wala tuuri.

Cinwaan

Wixii Su'aal ah oo aad ka'qabtobaritanka waxaad xur utahay inaad igala soo xariirto cinwankeyga marian kahalif ali, P.O. BOX 20095 Muqdisho. Tel: +252-616-460533 / +254-726-429464. Email address: **umusara2014@gmail.com**

Warbixinta kormeerayaasha:

Prof. Simon Karanja

Jomo Kenyatta University of Agriculture and Technology

Tel. +254-726-424669

Wixii su'aalo ah waxaad wareysan kartaa **Gacan yaraha, KEMRI Ethics Review Committee, P. O. Box 54840-00200, Nairobi; Telefon nambaro: 020-2722541, 0722205901, 0733400003; Email address: ERCAdmin@kemri.org**

PART B: CONSENT FORM

Adoo raali ah akhri warbixinta kuqoran (Qeebta A) ama kuwi lagu sharxay si taxadar leh ka'hor intaan dhameen oo aadan saxiixin ogolaashaha. Hadaa qabto su'aalo kusaabsan baritankaan, adoo raali ah waydii baaraha ka'hor intaadan saxiixin ogolaashaha.

Iska u ogolaashio

Aniga Marwo, Anisa.....halkaan ka'bixinaayo ogolaasho in aa kas cad uga qeeb galaayo baristaan. Aniga waan akhristay qoraalka ka'hadlaayo baristaan, waan fahmay ujeedkeeda iyo waxyalabaha liska rabo iyo qeebta aniga leyga'ga baahanyahay. Dhibta iyo dheeftana waa la'sharaxay. Su'aalihi aan qabayna waleyga jawabay aan ka'qabay baritaankaan. Waxan la'socda in kolkaan rabo aan ka'bixi karo baritaanka oo aan xur ahay, anigoo wax sababeen ah layga rabin ee eyna wax ka'dhibeenin xarumaha caafimaad oo aan adaayo.

Waxan la'socda in ley warey'sanaayo kolkaan ogolaado anoo xur ah. Aniga waan ogolaanaa wana ka'bixinaya ogolasho in aan ka'qeeb galo baristaan.

Ka'qeeb galaha magaciisa.....

Saxiixa ama sulkaTariikh.....

Magaca qofka qadayo ogolashaha.....

Saxiixa.....Tariikh.....

Magca baaraha.....

Appendix III: Questionnaire for Patient

QUESTIONNAIRE FOR ASSESMENT OF FACTORS ASSOCIATED WITH TB TREATMENT OUTCOMES IN MOGADISHU, SOMALIA, 2015

Date: ___ / ___ / ___

PART ONE: General and socio-demographic characteristics of the respondents

Code of the respondent _____

Month of treatment now-----

Treatment category-----

Code of the health facility-----

HIV Status. A. Positive. B.Negataive

Gender: A. Male B. Female

Age (year): _____

What is your current marital status?

Married B. Unmarried. C. Divorced D. Widowed

How many children do you have?

What is your current educational status?

Illiterate D. Elementary

primary F. secondary

Madrassa

What is your current occupation?

Government employee C. Housewife E. casual employee G.

Student

Un-employed D. Business F. Employee for organization H. Other _____

What is your average household income per month? -----

-

PART TWO: Questionnaire about patient level factors associated with TB treatment outcomes

Have you ever heard about the disease called TB? A. Yes B. No

If yes, from whom/where?

Newspapers and magazines E. Family, friends, neighbors and colleagues

Media (radio, TV, etc.) F. Religious leaders

Brochures, Posters and Printed material G. Teachers

Health workers H. Other (please explain): _____

What do you think is the cause of TB

Bacteria/Germs C. Shortage of food E. Hot climate G.

Smoking/chewing

Cold air D. Dust F. Sunlight H. Other (specify)_____

What are some of the common signs and symptoms of TB?

Cough for 3 or more weeks E. Fever and sweat at night

Sputum with blood F. Chest pain

Weight loss G. Don't know

Loss of appetite H. Other (specify): _____

Do you think that the disease can be transmitted from the patient to other person?

Yes B. No C. Don't know

If yes, how can a person get TB?

Through the air when a person with TB sneezes or coughs

Through touching items in public places (doorknobs, handles in transportation, etc.)

Through sharing cups E. Through handshakes F. Don't know

Through eating from the same plate G. Other (specify)_____

Do you think that the transmission of TB is preventable?

Yes B. No C. Don't know

If yes, how can a person prevent getting TB?

- Covering mouth and nose when coughing or sneezing
- Avoid shaking hands
- Early treatment
- Avoid sharing cups with a patient
- Closing windows at home
- F. Through good nutrition
- G. Use separate room for the patient
- H. Don't know
- I. Other specify _____

Can TB be cured?

- Yes
- B. No
- C. Don't know

How can someone with TB be cured?

- Modern drugs given by health institutions health personals
- Herbal remedies
- Home rest without medicine
- D. Praying
- E. Don't know
- F. Self treatment
- G. Other _____

How long it takes to go from your home to TB health facility?

- 10-15 min
- 15-25 min
- 25-40 min
- 40-1 hour
- More than 1 hour

How do you come to the health facility?

- Walking
- Public transportation
- Personal transportation
- Others

How long are you on TB treatment now?

.....

Have you ever miss a dose of your medications?

- A. Yes
- B. No

15. If yes, how many times?

.....

16. What was the reason of that?

.....

PART THREE: Assessment of TB attitudes and health facility factors

In your opinion, how serious a disease is TB?

- Very serious
- Somewhat serious
- D. Not very serious
- E. Don't know

How serious a problem do you think TB is in your area?

- Very serious
- Somewhat serious
- D. Not very serious
- E. Don't know

What was your reaction when you were found out that you have TB?

- Fear
- Surprise
- C. Shame
- D. Sadness or hopelessness
- E. Other _____

Who did you talk to about your illness when you had diagnosed with TB?

- Doctor or other medical worker
- Spouse
- C. Parent
- D. Close friend
- E. No one
- F. Other _____

What have you done when you had symptoms of TB?

- Pursued other self-treatment options (herbs, etc.)
- went to health facility
- Went to pharmacy
- D. went to traditional healers
- F. Other _____

When you had symptoms of TB, at what point have you sought medical help?

- When treatment on my own did not work
- When symptoms that look like TB signs lasted for 3-4 weeks
- As soon as I realize that my symptoms might be related to TB
- I don't remember

How many days of the week the health facility is open?

- Saturday- Monday
- Monday-Thursday
- Saturday-Thursday
- Don't know

How many hours the TB health facility is open?

6 am -10 pm

6 am -1 pm

6 am -5 pm

Don't know

Do you think that during your last visit to the clinic, the provider (doctor or nurse):

Was really attentive to you? 1.Yes 2.To some extent 3.No

Appeared to enjoy caring for you? 1.Yes 2.To some extent 3.No

Gave complete explanations? 1.Yes 2.To some extent 3.No

Seemed disorganized and flustered? 1.Yes 2.To some extent 3.No

Appeared to be skillful? 1.Yes 2.To some extent 3.No

Treated you with respect? 1.Yes 2.To some extent 3.No

Explained things in an understandable manner? 1.Yes 2.To some extent
3.No

Made you to feel free to ask questions? 1.Yes 2.To some extent 3.No

Helped you to understand your illness? 1.Yes 2.To some extent 3.No

Discussed with you the treatment options? 1.Yes 2.To some extent 3.No

Was the following true for your last visit to the clinic?

You had to wait too long before receiving care. 1. Yes 2. No

It was difficult for you to make an appointment with the provider. 1. Yes 2.
No

You received health educational materials for reading. 1. Yes 2. No

Did you receive free of charge medicine in the health facility?

Yes

No

How do you receive your anti-TB medicines?

I go every morning to the health facility to receive my treatment

I go every three days to the health facility to receive treatments for three days

I go once a week and receive treatments for the whole week

My treatment supporter collects my treatment for me

Other

Have you been observed when you were taking your anti-TB drugs during last visit?

Yes

No

C. don't remember

If yes, who was your observer?

Health worker at the facility

Spouse

Relative

Friend

Do you have treatment supporter?

Yes

No

If yes, who is your treatment supporter?

Spouse

Relative

Friend

Other

How would you assess the cleanness of the clinic at the time of your last visit?

Satisfactory

Unsatisfactory

Don't know

How would you assess the clinic conditions (renovation, equipment, supplies) at the time of your last visit?

Satisfactory

Unsatisfactory

Don't know

Would you again refer to the same provider if you had a similar problem?

Yes

No

Don't know

Would you recommend the same provider to your friends and relatives?

Yes

No

Don't know

Overall, how would you assess the care you received in the clinic during your last visit?

Excellent

Good

Fair

Poor

Out of the following, what measures would you consider the most important to make the services at the clinic better?

Increase facility space

Supervise providers

Improve hygiene/cleanliness

Increase working hours of the clinic

Increase free of charge drug supplies F. Others (specify) _____

Appendix IV: Questionnaire in Somali

QUESTIONNAIRE FOR ASSESSMENT OF FACTORS ASSOCIATED WITH TB TREATMENT OUTCOMES IN MOGADISHU, SOMALIA, 2015 (IN SOMALI)

taariikh: ___ / ___ / ___

QEEBTA KOWAAD : XOGTA GUUD

Wareysiga nambarkisa sirta _____

Bisha daawada usocoto-----

Nooca daawaynta-----

Number sirta e gobta cafimaad-----

Cudurka HIV ka. A. Positive. B.Negataive

Nooc: A. lab B. dhadig

sanad (meeqo sano): _____

hada maxa tahay?

xaas B. doob. C. qof la furay D. qof laga dhintay

meeqo caruur ayad leedahay?.....

wamaxay heerka waxbrashada aad gaartay?

ummi D. Elementary

primary E. secondary

Madrasa

Wamaxay shaqadadada?

Shaqale dowladeed C. xaas E. xirfad gacmeed G. arday

Saqa ma hesid D. Business F. shaqaale hay'adeed H. wax kale _____

Waa meeqa dakhilka bishii kuso galo ? -----

QEEBTA LABAAD:SU'AALO KUSABSAN ASBABAHA LAXARIIRO

DAWEYNTA TB

Waliga mamaqashay cudurka TB ? A. haa B. maya

1. hada,y ha tahay , yaad ?ka maqashay?

- A. Jurnalada
- B. warbahinta (radio, TV, etc.)
- C. Boogag
- D. Shaqaale cafimad
- E. qoyska, asxabta, qarabada
- F. sheikh
- G. macalin
- H. kuwo kale (sifaahfahi):_____

2. Maxay kulayahy maxa sababo TB?

- A. germis
 - B. dabeel qabow
 - C. cunno yari
 - D. bus
 - E. cimilo kulul
 - F. ileyska qoraxda
 - G. sigaar/qaad
 - H. wax kale
- (faahfahi)___

3. wamaxay calamdaha lagu kaerto cudurka qaaxada?

- A. Qufac ka badan 3 usbuuc
- B. Xaako dhiig lasocoto
- C. mizaanka o hoos u dhaco
- D. apiteet la'aan
- E. qandho ama dhidid habenki
- F. feera xanuun
- G. ma aqaano
- H. kuwea kele (cadee):_____

4. makulatahy ina cudurka qaaxada lakala qaadi karo?

- A. Haa
- B. maya
- C. ma aqaano

5. Haday haa tahay, maxa lakula qaada?

- A. Hawada marku qof qufaco ama hindhiso
- B. Taabsho
- C. Kalaska biyahah o lawadago
- D. In hal meel wax lagu cuno
- E. kacan salaanka
- F. ma aqaano
- G. kuwo kale ___

6. Makulatahy faafida cudurka qaaxada in laga hortagi karo?

- A. Haa
- B. maya
- C. ma aqaano

7. Haday haa tahay, side loga hortagi kara?

- A. In afka la daboosho marka laqufacayo ama la hindhisaayo
- B. In gacma kusalamida laga fokado
- C. In dhaqso la isdaweeyo
- D. In qofka xanuunsan glaas biyaha lalawadagin
- E. In daaqadaha la xiro
- F. in cunno nafaqo leh la cuno
- G. in qofka cudurka qabo qol gooni la seexyo
- H. ma aqaan
- I. kuwo kale _____

8. Qaaxda daawo maledahay?

A.Haa B. maya C. ma aqaano

9. Wamaxay daawada qaaxda?

A. Dawoyinka ay dhaqatiirta bixiyaan

B. Daawo dhaqmeed D. in ducada labadsado F. in la isdaweeyo

C. In guriga lagunssto E. ma aqaan G. kuwa kale _____

10. Meeqo saac aye ku jirta xarunta lagu daaweyo qaaxada?

- A. 10-20 minute
- B. 20 -40 minute
- C. 40 min-1 saac
- D. Ka badan 1 saac
- E. Ma aqaan

11. Side ku timaada xarunta daweynta qaaxada?

- A. Wad so lugeesa
- B. Bus ayad so racdaa
- C. Garigada qaaska ayad so racda
- D. Kuwa kale

12. Meqa ayad dawada qadanyesa hada?

.....

13. Waliga ma kataktay in qaadato dawadada?

- A. haa
- B. maya

15. haday ha tahay, meeqa jeer?

.....

16.maxay aheed sababta?

.....

QEEBTA saddexad : suaalo kusabsan xarunta cafimaad

1. Aragtidada makulatahy qaaxda in ay tahay cudur Qatar ah?

- A. Qatar aad waaye
- D. mahan qatar
- A. Xoga wa qatar
- E. ma aqaano

2. Meqa ayu kufafasan yahay cudurka dagaankada?

- A. Qatar aad waaye
- D. mahan qatar
- B. Xoga wa qatar
- E. ma aqaano

3. Maxad darentay marki cudurka lagugo sheegay?

- A. Cabsi
- C. ceeb
- E. kuwo kale _____
- B. Layaab
- D. murugo

4. Ya kala hadshay cudurkada marka lagugu sheegay?

- A. Dakhtar C. waalid E. qofne
B. Xaas D. saaxib F. kuwo kale_____

5. Maxad samesay markad isku aragty cudurka?

- A. Wax yabo kale isku daweeeye (geedo, etc.)
B. Xarun caafimad aya aaday D. dadka dhirta wax kudaweyo aaday
C. Farmashiye aaday F. kuwo kale _____

6. Marka cudurka kugudhacay ila meqa sugtay inta ka aado xarunta cafimadka?

- A. Marka daweynki an qadanye wax igu tari waayen
B. Marku qofaca ila 3 usbuuc igu gaaray
C. Marka iska shakiye ina qaaxo igu dhacay
D. Ma aqaan

7. Meeqo maalmood usbuuci u furanyhy xarunta?

- A. Sabti- isniin
B. isniin-khamiis
C. sabti ila khamiis
D. ma aqaan

8. meeqo saacdod aye furantahy xarunrta?

- A. 6 -10 subaxnimo
B. 6 -1 duhurnimo
C. 6 am -5 galbnimo
D. Ma aqaan

9. Tookti hore ad xarunta taktay waxyabhan sosocda midke ayu aha dhaqanka dhaqtarka:

- A. Mid faraxsan ? 1.maya 2.xooga 3maya
B. Sharaxad waafi kusiiyay? 1.haa 2.xoga 3. maya
C. Waxu u ekaa mid daaln? 1.haa 2.xoga 3. maya
D. Aqoon leh? 1.haa 2.xoga 3. maya

- E. Ixtaam badan? 1. haa 2.xoga 3.maya
- F. Si fiican wax kugu sharxay? 1.haa 2.xoga 3.maya
- G. Si fiican ku fansiiyay? 1.haa 2.xoga 3.,maya
- H. Cudurka ku sharxay? 1.haa 2.xoga 3.maya
- I. Dawada sida lo qaato ku sharxay? 1.haa 2.xogaa 3.maya

10. Waxan ma sax bey aheed /?

- A. Wax badn aya dawada sugeysay. 1. haa 2.maya
- B. Dhib aye aheed in lakulanto 1.haa 2. maya
- C. Waxad heshay aqoon iyo wacyigalin. 1. haa 2. maya

11. Daawo lacg laan ma heshay?

- A. haa
- B. maya

12. side daawada ku heshaa?

- A. Subax walbo dawada kaso qaada xarunta
- B. 3 maalin mar ayan soqaata
- C. Usbuuci mar aya soqaata
- D. Qof aya isoqaado
- E. Kuwo kale

13. Marka dawada qadayneso ma lagu kontroola?

- A. Haa
- B. Maya
- C. maxasuusto

14. Hady ha tahy, yak u kontrolo?

- A. Shaqaalaha caafimad
- B. xaas
- C. qaraabo
- D. saxib

15. maledahay daawo caawiye?

- A. haa
- B. maya

16. hady ha tahy, yawaaye cawiyahaga?

- A. xaas
- B. qaraabo
- C. saxiib
- D. kuwo kale

17. nadaafada side kulatahy o xarunta?

- A. fiican
- B. ma fiicno
- C. ma aqaan

18. side kulatahy qalbka xarunta yaal

- A. fiican
- B. ma fiicino
- C. ma aqaan

19. hadi ad marlabad xanuunsato makulabn laheed iosla dhaqtarka?

- A. haa
- B. maya
- C. ma aqaan

20. isla dhaqtarki qof kale macula talin laheed?

- A. haa
- B. maya
- C. ma aqaano

21. sidii ku siifeen laheed adeega aad ka heshay xarunta caafimaad?

- A. Aad u fiican
- B. Fiican
- C. caadi
- D. xun

22. maxa talo ah ka dhiaban laheed sida lo hormariyo xarunta?

A. In la weyneeyo jagada

C. In la kormeero si

jooqta ah

B. In nadaafada la kordhiyo

D. In

waqtiga shaqada la badiyo

Appendix V: Consent Form for in-Depth Interview in English

Contact Information:

Researcher	Institution	Contact
Marian Khalifa Ali	Kenya Medical Research Institute	+254705635443
Prof. Simon Karanja	Jomo Kenyatta University	+254-726424669
Prof. Mohamed Karama	Kenya Medical Research Institute	+254722885366

PART A

Background

Thank you for agreeing to do this interview. I am Marian Khalif from the Institute of Tropical Medicine And Infectious Diseases-JKUAT. I will be assisted by.....we are carrying out a study on factors associated with TB treatment outcomes among patients attending TB centers in Mogadishu, Somalia. You have been requested to participate in this interview on above study.

Purpose

The purpose of this interview is to establish factors associated with TB treatment outcomes among patients attending TB centers in Mogadishu

Procedure

By agreeing to participate in this study, you will be required to answer questions which will help to increase our understanding on TB treatment outcomes among patients attending TB centers in Mogadishu, Somalia. As you answer the questions we will be writing down the points and also record the statements.

All the views that you give are very important, there is no right or wrong answers. Please feel free to speak your opinion. The interview will last for about 30-45 minutes.

Potential Harm, Injuries, Discomforts or Inconvenience, Risks

The proposed research will involve an interview Discussion, therefore no physical harm or injury is expected.

Potential Benefits

This study has no direct benefit; however by participating you will help increase the understanding of factors associated with TB treatment outcomes among patients attending TB centers in Mogadishu.

Confidentiality

The information given here will be used for research purposes and will be kept confidential.

Anonymity is assured, meaning that your real name and the transcribed responses will be kept safe and will not be revealed in any part of the thesis. In the course of the study, your consent form, your filled questionnaire and the transcribed answers will be kept separately. The information that you provide will be integrated with those of other participants for the purpose of analysis. At the end of the study it will be impossible to determine who said what.

Right to refuse/Withdraw

Your participation in this study is voluntary; you may refuse to answer any particular questions or to participate altogether. You can choose to participate or not or stop at any timing.

Tape recording

The study will involve use of a recorder that you can see here to record the interview. All the views are very important to us so that is why we would like to record. The recorded information will only be used to fill in the blanks that the note taker will have left. It will not be shared with anyone who is not involved in this study. After wards, all the recorded information shall be erased.

Contact

If you have any questions or clarifications about this study, in the course of the study or even after the study itself, feel free to contact me using the following addresses **Marian Khalif Tel: +254705635443 Email address: umusara2014@gmail.com**

Details of other investigators:

Prof. Simon Karanja

Jomo Kenyatta University of Agriculture and Technology

Tel. +254-726-424669

Prof.MohamedKarama

Kenya Medical Research Institute

Tel. +254722885366

For any questions pertaining to rights as a research participant, the contact person is:

The Secretary, KEMRI Ethics Review Committee, P. O. Box 54840-00200, Nairobi;

Telephone numbers: 020-2722541, 0722205901, 0733400003; Email address:

ERCadmin@kemri.org

PART B

In order to show that you have given us the permission to interview and **record the interview**, we need your written consent. I have had the research explained to me. I have understood all that has been read and had my questions answered satisfactorily. I understand that I can change my mind at any stage and it will not affect the benefits due to me. I understand the information and agree to participate in the interview under the conditions stated.

1. Name of respondent.....signature/thumb print.....

Date

2. Interviewer/assistantsignature.....

Date.....

Appendix VI: in-depth interview in english

Study site: _____ Date: _____ Time of the interview: _____

Role of the respondent: _____

Experience: _____

Interviewer's name _____

INTERVIEW FOR HEALTH CARE PROVIDERS ON MANAGEMENT OF TB

1. How many health staff is working in this facility? What are their qualifications?

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

2. In your experience, are there some patients who receive anti TB drugs before coming to the facility for diagnosis? In your opinion why some patients seek private hospitals for Tb treatments?

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

3. What are the signs and symptoms used to reach diagnosis of TB? What is the most common method that is used daily to reach diagnosis of TB in this facility? How TB patients are managed in this facility? Are there free drugs

available to treat TB patients? Can I see drug combinations used to treat TB patients?

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

4. Is directly observed treatment strategies (DOTS) implemented in your facility? Do patients have treatment supporter at home?

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

5. Is susceptibility test done to all patients in this facility? Do you treat MDRTB patients in this facility? In general how does MDR-TB patients are managed in this facility?

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

6. Do you give TB patients food/nutrition support? What type of food is given to patients?

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

Thank you for your participation.

Appendix VII: in-depth interview in somali

Goobta : _____ taarikhda: _____ waqtiga waresiga: _____

Shaqda la warestaha: _____

khibrada: _____

magaca warestaha _____

waresiga shaqalaha caafimaad o la xariira daweynta cudurka qaaxada

1. Meeqa shaqala aya ka shaqeeso xarunta ? wa imisa tiradooda?

.....
.....
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2. Aragtidada ma jiraan bukaan dawada TB qaato int aysan xarunta imanin? Maxa ku kalifo bukanka inu aado hopitalka sida gaarka ah loo leyahy?

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3. Wa maxay calamha cudurka qaxada aad ku garatan bukaanka ? maxad ku xaqijisaan inu bukanka qaaxo qabo? Side u daweysaan?

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4. Ma istcmashaan (DOTS) ? bukaanka maleeyahy qof ku caawiyo dawada?

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5. Mala bara bukanka ku daweysmiwayo ama dawada adkeesi u yeesho? Maxalagu daweeya bukanada noocas noqda?

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6. Masiisan bukanka wax cunna ah? Meeqa nooc ayad siisaan?

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Appendix VIII: Ethical Approval

JAMHUURIYADDA FEDERALKA SOOMAALIYA
Wasaaradda Caafimaadka & Daryeelka
Bulshada



جمهورية الصومال الفيدرالية
وزارة الصحة
والخدمات الإجتماعية

Somali Federal Republic
Ministry of Health & Human Services

Ref: MOH&HS/0025/06/2017

05/06/2015/Mogadishu

TO WHOM IT MY CONCEARN

Subject: Research Authorization

Following your application for authority to carry out research on "Factors associated with tuberculosis treatment outcomes among tuberculosis patients attending tuberculosis treatment centers in Mogadishu, Somalia". I am pleased to inform you that you have been authorized to undertake research in public TB centers in Mogadishu for a period of six months ending on 31st December, 2015.

You are advised to report the **Ministry of Health** before embarking on the research project.

On completion of your research, you are expected to submit one hard copy and one soft copy of the research thesis to our office.

Best Regards,

Abdirashid Farah Osman

Director Admin & Finance, Ministry of Health

Federal Government of Somalia.



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Mogadishu-Somalia.