FACTORS ASSOCIATED WITH TUBERCULOSIS TREATMENT OUTCOMES AMONG PATIENTS IN MOMBASA COUNTY, KENYA

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OF
AGRICULTURE AND TECHNOLOGY

2023

Factors Associated with Tuberculosis Treatment Outcomes among Patients in Mombasa County

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A Thesis Submitted in Partial Fulfilment of the Requirements for the Degree of Master of Science in Public Health of the Jomo Kenyatta University of Agriculture and Technology

2023

DECLARATION

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

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

Godana Mamo Barako

This thesis has been submitted for examination with our approval as university supervisors

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

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

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DEDICATION

This study is dedicated with all my love and respect to my wife, parents, and my beloved children; Yasmin and Mustafa who made a lot of sacrifice during the entire duration of the course. May the almighty Allah give them strength and understanding to give me much support in future.

ACKNOWLEDGEMENT

I am grateful to almighty Allah for his guidance and blessing for my efforts during the course of the study. This project would not have been possible without the support and encouragement of a number of individuals who have made invaluable contribution to this project. I would like to express my very great appreciation to supervisors Professor Simon Karanja for valuable and constructive suggestions during the planning and development of this research work. His willingness to give his time so generously has been very much appreciated regularly giving guidance and reviewing the thesis.

I would like to offer my special thanks to Dr. Rahma Udu for her patient guidance, advice, enthusiastic encouragement and assistance in keeping my progress schedule. My grateful thanks also go to my lecturer Madam Kerich for encouragement and support in providing vital information related to the milestones on project submission.

I would also like to extend my thanks to County Health Department of Mombasa for approval of the research to be carried out in their facilities without forgetting all TB and Leprosy coordinators who worked tirelessly to support identification of sampled patients in various facilities.

Finally, I wish to thank all the people who supported me in data collection and the health care workers and community volunteers who gave their perspective during focused group discussions.

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ABBREVIATION AND ACRONYMS

AAFB	Acid alcohol fast bacilli
AIDS	Acquired Immunodeficiency Virus
ARV	Anti-retroviral drugs
CDC	Centre for disease control and prevention
DLTLD	Division of Leprosy Tuberculosis & Lung Disease
NLTLD	National Leprosy TB and Lung Disease Unit
DOTS	Direct observation of treatment short course strategy
EPTB	Extra-Pulmonary TB
FDC	Fixed dose combination
HIV	Human immunodeficiency virus
IUTLD	International Union against Tuberculosis & Lung Disease
KNBS	Kenya national bureau of statistics
MDR-TB	Multidrug resistant tuberculosis
MOPHS	Ministry of public health and sanitation
NLTP	National Leprosy & Tuberculosis Programme
PTB	Pulmonary Tuberculosis
TB	Tuberculosis
W.H.O	World Health Organization

OPERATIONAL DEFINITION OF TERMS

Cured A pulmonary TB patient with bacteriologically confirmed TB at the beginning of treatment who were smear- or culture-negative in the last month of treatment and on at least one previous occasion (smear conversion at month 6 or 8)

Direct Observation of Therapy (DOT) Means a trained health care worker or other designated individuals including family members and friends observes the patient diagnosed with TB take the correct drugs and correct dose at the correct time.

Extensively drug resistant TB Is a form of multidrug resistant TB with additional resistance to injectable and fluoroquinolone.

Extra-pulmonary TB: Refers to a case of TB involving organs other than the lungs, e.g. pleura, lymph nodes, abdomen, genitourinary tract, skin, joints and bones, meninges. Diagnosis should be based on at least one specimen with confirmed *M. tuberculosis* or histological or strong clinical evidence consistent with active EPTB, followed by a decision by a clinician to treat with a full course of tuberculosis chemotherapy. The case definition of an EPTB case with several sites affected depends on the site representing the most severe form of disease.

Multidrug resistant tuberculosis This is a patient with bacteriological confirmed resistance to Rifampicine and Isoniazide.

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.

Pulmonary TB Refers to any bacteriologically confirmed or clinically diagnosed case of tuberculosis involving lung parenchyma or tracheobronchial tree.

Successful treatment outcome If TB patients were cured (i.e., negative smear microscopy at the end of treatment and on at least one previous follow up test) or completed treatment with resolution of symptoms.

Unsuccessful treatment outcome If treatment of TB patients resulted in treatment (i.e., remaining smear positive after five months of treatment), lost to follow up, death or not evaluated (patients who transferred to another treatment centres outside the county and there treatment outcome unavailable)

ABSTRACT

Tuberculosis is caused by the bacterium *Mycobacterium tuberculosis,* which is an air born disease transmitted from person to person by aerosolized droplet nuclei. It typically affects the lungs (pulmonary tuberculosis) but can affect other sites as well. The failure to eliminate or completely reduce TB as a public health problem has been largely associated with little attention the disease attracts from the government, poor management of TB control programmes, high rates of poverty and population growth especially in urban areas due to migration and HIV/AIDS pandemic. Considerable progress has been made since introduction of DOTS strategy. The primary objective of this study was to determine the factors associated with TB outcomes among TB patients in Mombasa County. The study was conducted in Mombasa County which is one of the 47 counties in Kenya with an urban population of 1,063,854. The study was conducted in all health care units in the county. The study used a cross-sectional research design. The study population was the total number of notified patients with tuberculosis in one quarter in the study area (Mombasa's health care units) and this was found to be 1207 in the year 2017. It was from this population that a systematic random sample size of 265 patients were interviewed. Data was collected within a period of three months with the help of three research assistants using semi-structured questionnaire and focused group discussion guide Quantitative data were analyzed using SPSS version 20 Descriptive statistics frequency (%), mean, and standard deviation were used to express quantitative data. In bivariate analyses, odds ratios (OR) and 95% confidence intervals (CI) for the association between TB treatment outcome and health related factors, institutional factors and patient related factors was done using logistic regression. The results revealed that patients who are educated about health are more likely to cure of TB than patients who are not (OR 1.716, 95% CI, 0.35 to 2.48). More so, patients who receive psychosocial support are more likely to get cured than those who don't receive psychosocial support (OR 4.08, 95% CI, 2.00 to 8.32). The results also revealed that patients who visits hospitals where health-workers are trained in less than 6 months are more likely to get cured compared to those who visits hospitals where health workers last training was more than a year (OR - 3.116, 95% CI, 0.703 to 3.93). The results further reveal that monthly supervision is more likely to result to cure as compared to no supervision at all (OR 2.433, 95% CI, 0.72 to 4.142). Similarly, once in a while supervision is more likely result to cure as compared to no supervision at all (OR 1.432, 95% CI, 0.31 to 3.12). The results of the study give evidence to, therefore, conclude patient related factors, health care workers related factors, and institutional factors are critical to TB treatment outcome in that order. The study gives an impetus to propose categorical efforts in addressing patient related factors such as enhancing further awareness on treatment adherence and imposition of penalties to habitual treatment defaulters. Institutional frameworks also need to be put in place to address distance to health centre issues, convenience of clinic time and drug stock out as a sure way of minimizing the sources of variation on TB treatment outcome.

CHAPTER ONE

INTRODUCTION

1.1 Background

Tuberculosis (TB) is caused by the bacterium *Mycobacterium tuberculosis*, which is an air born disease transmitted from person to person by aerosolized droplet nuclei. It typically affects the lungs (pulmonary tuberculosis) but can affect other sites as well (Varaine & Rich, 2014). The disease is spread in the air when people who are sick with pulmonary TB expel bacteria through coughing, sneezing, laughing or talking (Ministry of public health and sanitation (MOPHS), 2009. Relatively small number of people infected with TB will eventually develop the active disease and the probability is much higher among the people living with Human immunodeficiency virus/ Acquired immunodeficiency virus (World Health Organization (WHO), 2010).

Worldwide, Tuberculosis is among the top ten causes of death, third among the infectious diseases overtaking even HIV (WHO, 2016). In 2012 8.6 million people developed the disease, 1.3 million died (WHO, 2013). WHO introduced DOTS strategy in 1990 as a cost effective way to control TB and improve health. Adoption and implementation of this strategy has substantially improved TB control globally. Kenya is one of the few countries in Africa to have achieved the WHO targets of detecting 70% of new TB cases and cure 85% of smear positive TB (WHO, 2014).

In Africa, Continued challenges with providing and accessing essential TB services have meant that many people with TB are not diagnosed and treated. The reported number of people newly diagnosed with TB fell from 7.1 million in 2019 to 5.8 million in 2020. There was a partial recovery to 6.4 million in 2021, but this was still well below pre-pandemic levels. Reductions in the reported number of people diagnosed with TB suggest that the number of people with undiagnosed and untreated TB has grown, resulting first in an increased number of TB deaths and more community transmission of infection and then, with some lag-time, increased numbers of people developing TB.

Kenya is one of the 22 high burdened countries in the world ranked 13th globally and 5th in Africa. Between 2006 and 2010, more than 110,000 cases of TB were notified every year and about 44 per cent of these cases were HIV co-infected. The WHO estimate shows that there are at least 2000 cases of MDR-TB in 2009, of which only 7.5% (150) cases have been identified and notified (WHO, 2011).

Tuberculosis (TB) remains a major cause of morbidity and mortality in Kenya. It affects all age groups but has its greatest toll in the most productive age group of 15 to 45 years Sitienei, Nyambati and Bours (2013). Kenya had TB prevalence of 558 cases per 100,000 population's way above the previous estimates based on annual notification reports. (Martinus Willem Borgdorff (Republic of Kenya), 2018. The major factor responsible for the large TB disease burden is the current HIV epidemic. Other factors that have contributed to this large TB disease burden include poverty and social deprivation that has led to mushrooming of peri-urban slums and congestion. Although TB cases notified in the country has stagnated recently, a new challenge of resistant strains of TB is gradually but surely increasing and in particular MDR TB (ministry of public health and sanitation (2010). This new challenge threatens to reverse gains made in the fight against TB in Kenya. Drug Resistant TB (DRTB) is occasioned by development of resistance by the TB bacilli to first line drugs, a result of improper treatment of patients, poor management of supply and quality of drugs, and airborne transmission of bacteria in public places, Companion handbook WHO (2014)

Mombasa county, which is the focus of this study, is one of the counties with high tuberculosis burden of 425 case notification rate against a national prevalence of 215 (National Leprosy and Lung Disease Program, 2014). More than eighty cases of multidrug resistant TB were diagnosed in the County by end of 2014 (Ministry of health, 2012). A total of twenty-six patients are currently on treatment in County.

1.2 Statement of the problem

Tuberculosis control has three overlapping dimensions; humanitarian, public health and economic. The public health concern emanates from proper diagnosis and treatment of TB patient to decrease disease transmission within community

(Arnadottoir, 2009). TB is also responsible for direct or indirect cost to individual and society. The productive adults bear the greatest burden of TB, once infected they are weakened and often unable to work (Laxminarayan, 2007).

Tuberculosis remains a major public health problem causing losses in quality of adjusted life years (QALYS) or disability adjusted life-years (DALYs) and it ranks 7th globally in the global life years lost ranking (Banerjee and Nasaru, 2014). The failure to eliminate or completely reduce TB as a public health problem has been largely associated with little attention the disease attracts from the government, poor management of TB control programs, high rates of poverty and population growth especially in urban areas due to migration and HIV/AIDS pandemic. Considerable progress has been made since introduction of DOTS strategy.

The world health assembly passed a resolution to end global TB epidemic with targets to reduce TB death by 95% and cut new cases by 90% between 2015 and 2035 to ensure that no family is burdened with catastrophic expenses due to TB (WHO, 2014).

The WHO has recommended adoption of directly observed therapy (DOTS) as strategy to achieve high treatment completion rates in 1990. This is expected to reduce patient's loss to follow up, treatment failures, death and emergence of drug resistance associated with treatment interruptions. Studies have shown that 86-90% of patient receiving complete treatment successfully as compared to self-administered to therapy. Treatment completion and cure rates for Mombasa County have over a long period of time remained low. This is attributable to a number of factors associated with patients, health facility and health care workers (Ministry of Health, 2020).

This study addresses the overall problem associated with patients that hinder treatment completion and also attempt to identify factors that promote TB treatment completions in Mombasa County. The county had the highest TB burden in country with 469 TB cases per 100,000 populations which is higher than the national prevalence of 217/100,000 (National Leprosy TB and Lung Disease (NLTLD), 2013). Eleven percent of patients started on treatment in Mombasa County failed to

complete full course of treatment due high rates of loss to follow up, deaths and transfers to other counties reducing treatment completion. One hundred and seventy-six TB patients died in Mombasa County in the year 2012, 6% being children below 15 years of age, in addition 49% of the patients who died were co-infected with TB/HIV mainly patients aged between 20-39 years old. Further, two hundred and twenty patients were lost to follow in the year 2012 with 23% of them in Mlaeo TB control zone. Likoni and Ganjoni contributed 16% and 14% respectively and this was attributed to substance abuse and lack of social support from close family members. One hundred and eighty-seven TB patients were also transferred to other counties across the country and could not be evaluated. Changamwe and Mlaleo TB control zones contributed more than 50% of these cases.

1.3 Significance of the Study

The study findings will be of benefit to various parties. First the findings will be of help to the community health community workers as it shows the factors associated with tuberculosis treatment outcomes among patients. This will form a basis for awareness creation to the general public regarding the same. The study findings will be beneficial to the ministry of health as it will give insights on the appropriate policies that can be developed in order to curb the spread of TB among citizens. Finally, the study findings will be of help of scholars as it contributes more literature on factors associated with tuberculosis treatment outcomes.

1.4 Justification

Mombasa County is one of the eleven high burdened counties that had the highest case notification rate 225-294 cases per 100,000 population (Division of TB Leprosy and Lung Disease Program, 2021). The county plays a major role in the economy of the coast region attracting large number of people. Forty nine percent of TB cases notified in the year 2020, came from Mombasa County,(NTLDP, 2021). Loss to follow up among TB patients can cause a serious public health problem because patients are at high risk of developing drug resistance

The treatment completion rates vary according to the various categories of patients with smear positive pulmonary relapse cases having the lowest at 86% and smear not done pulmonary patients having 91%. This is attributable to high loss to follow ups among smear positive retreatment cases (7%), high death rates among smear negative pulmonary cases (5%) and transfer outs among new smear positive patients (4%). Efforts to improve TB treatment completion rates require understanding of factors that influence patient's adherence to TB treatment. Quantitative and qualitative research can contribute to this understanding and promote treatment success rates. Treatment outcome monitoring is a vital part of the surveillance needed to successfully eliminate TB Treatment outcome. Monitoring is an important part of the surveillance required to successfully reduce burden of TB. The factors related with TB treatment outcome has not been studied in Mombasa County.

1.5 Study objectives

1.5.1 Broad objective

To determine factors associated with TB outcomes among TB patients in Mombasa County

1.5.2 Specific objective

1. **To establish patient-related factors associated with TB outcomes**
2. **To establish health care worker related factors associated with TB outcomes**
3. **To establish the health facility related factors associated with TB outcomes**

1.6 Research questions

1. What are the patient-related factors associated with TB outcomes?
2. What are the health care worker related factors associated with TB outcomes?
3. What are the health facility related factors associated with TB outcomes?

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews relevant literature from previous studies done on factors influencing outcome of TB patients. This is in keeping with the objective of the study and makes recommendation to the policy makers and TB managers. Comparison in various approaches employed in designing previous research was done and all relevant sources including books, scientific articles and other credible sources mainly on factors associated with TB patient's outcomes considered.

The literature review address three major factors that affect TB patient's outcomes. The first section study research related to patient level factors that promote or discourage patient from completing TB treatment. The second section focus on health care worker related factors and finally the third section on research related to health facilities that affect TB patient's outcomes.

2.2 Background of Tuberculosis

Since the days of immemorial, tuberculosis has been in existence. The first origin of TB occurred in the first domestication of cattle's, and the skeletal of pre-historic humans were found to have TB (Buzic & Giuffra, 2020). Rene Laennec and Gaspard Laurent established the stages and forms of tuberculosis identity. Doctor Edward Livingstone established the Trudeau laboratory in 1874 which became a modern sanatorium (Castro *et al.,* 2020). Robert Koch in 1882 described the bacillus-causing tuberculosis, *Mycobacterium tuberculosis* and developed the tuberculin test of diagnosis of the diseases in 1890. The first genuine success in immunization against tuberculosis was developed from attenuated bovine strain tuberculosis by a French bacteriologist Albert Calmette and Camille-Guerine in 1908 and it was called BCG '(Bacillus of Calmette and Guerine).

The first use of BCG by humans was in 1921 (Singh, Netea, & Bishai, 2021). However, the first specific tuberculosis drug became available in 1944 when Selman

Abraham discovered streptomycin. Later, Para-amino Salicyclic acid (PAS) was developed and followed by the development of Isoniazid and other antibiotics that revolutionized TB treatment in 1955 (Koeken *et al.,* 2020). In 1950s Sir John Crofton developed multidrug chemotherapy. In 1986, unexpected resurgence of tuberculosis occurred in most parts of the world due to HIV/AIDS (Letang et al., 2020). HIV was later regarded to be the high-risk factor for reactivation of tuberculosis in population who are infected with *Mycobacterium tuberculosis* and HIV (Wu *et al.,* 2021).

2.3 The Burden of Tuberculosis

Tuberculosis has re-emerged as a major public health problem in the world. Roughly, it is estimated that at least a third of the word population is infected with tubercle bacillus, and around 8 million progress to have active tuberculosis disease each year, while 2 million of those die of the disease. According to WHO reports, incidences of the TB grew by 1% in the year 2003 in the world. This might seem as a low growth rate or long time ago, but recent studies have found the increase of the disease in the 19^{th} century having an effect in 20^{th} century.

Currently, about one-third of the world's population is infected with M. tuberculosis and new infections occur at a rate of one per second. However, most of these infections are asymptomatic and most of them do not cause tuberculosis disease. Tuberculosis is the second most common cause of death after HIV. In 2014, there were an estimated 13.7 million chronic active cases and in 2015 there were 8.8 million new cases and 1.34 million deaths in both developed and developing countries (WHO, 2016). China has achieved great progress, with an 80 percent decline in its TB mortality rate. Although, the distribution of tuberculosis is not uniform across the world, every nation has reported various cases of tuberculosis. In U.S, 10% of the population test positive, while Swaziland was reported to be the country with the highest estimated incidence rate of TB with 1200 cases in every 100,000 people in 2007. In 2010, India had the highest incidence with an estimated 2.0 million new cases. The reported cases in developed countries have always been attributed to the urban environment with almost infinitesimal cases in rural areas.

In Africa, 9 countries have been designated as having high prevalence of TB according to the reports by World Health Organization accounting for 46% of the world's TB cases; Democratic Republic of Congo, South Africa, Kenya, Mozambique, Tanzania, Ethiopia, Nigeria, Zimbabwe and Uganda. The most affected part in Africa is South Africa cutting across East and Central Africa although some of the West African countries also bear the burden of TB while North African Countries are less affected. In Africa, TB burden coincides with HIV/AIDS prevalence and usually serving as a manifestation of the latter. The Millenium Development Goal (MDG) main objective with regard to TB in Africa is to halt and reverse the incidences by 2020. This has seen various developments and campaigns emerging in the last couple of years.

Kenya being among the highly burdened country in the world contribute to the collective 80% of the global TB disease burden. The most devastating attribute is that it has a generalized TB prevalence affecting productive age groups (15-44 years old). Males are 1.4 times more likely to have TB than females. The number of TB cases had increased tenfold from 11,625 in 1990 to 116,723 cases in 2007 to 106,083 in 2010. The average annual increase over the past 10 years was 4% for all forms of TB. In 2012, the total TB cases notified in Kenya were 99,159 cases (MOH and Division of Leprosy Tuberculosis & Lung Disease (DLTLD), 2012).

The major reason for the increasing burden of TB in Kenya is the concurrent HIV epidemic. People Living with HIV/AIDS (PLWHA) are the major subgroup with increased incidence of tuberculosis. The national average co -infection with HIV was 39% in 2011 (MOH and DLTLD, 2012). So TB infection control remains a major programmatic intervention in TB control especially in this era of HIV epidemic and the increasing prevalence of drug resistant TB.

2.4 Theoretical review

The most successful public health programs and initiatives are based on recognizing the health behaviours in the context they occur. As such interventions to improve health behaviour can be designed with an understanding of behaviour change models and the ability to use them skilfully. This study will be anchored by transtheoretical

model which is a theory of social behaviour change. The key element in this model is stage of change and proposes that people are at different stages of readiness to adopt healthful behaviours. For successful behaviour change, the model describes the sequence of steps which an individual goes through: Precontemplation, contemplation, preparation, action and maintenance. However, people do not always follow these stages in a linear manner but often repeat certain stages depending on their level of self-efficacy and motivation.

The behaviour of patients and providers have an impact on drug adherence and patient outcomes. Patient's knowledge, attitude, perception and acceptance of TB drug adherence influence their outcome (Centre for disease control and prevention (CDC), 2003). Outcome of TB patients are influenced by types of drug regimen that they are given leading to high pill burden and long duration of treatment, patient factors, relationship between patient and providers and the system of care (Arnadottoir, 2009). Patients may drop out as symptoms subside due to clinical improvement. Geographical proximity to treatment centers, alcoholism and drug addiction may also contribute patient's loss to follow up.

In a systematic review on timing of loss to TB follow up, majority occurred after the intensive phase of treatment (Kruk, May, 2008). A study conducted in Georgia in October 2013 showed that lower household income was found to be significantly associated with poor TB treatment outcome. According to Liew *et al*., (2015), the commonest predictors of unfavorable outcomes were: old age, male sex, foreign citizenship, lower education, and treatment in tertiary setting, smocking, previous anti-TB treatment, HIV infection and patients with extra-pulmonary TB.

2.5 Empirical Literature Review

2.5.1 Patient-related factors

According to self-efficacy concept developed by Albert Bandura in 1977, motivation, thinking, feelings, quality of decision making are influenced by the level of self-efficacy. Peoples self-efficacy believes, determine their level of motivation and how much efforts they will exert in achieving their endeavours (TB treatment

completion). Belief in curability, severity of the disease, support from family members and health care professional positively influence TB patient's drug adherence (Nezenega, Perimal-Lewis & Maeder, 2020). Age and gender have been linked to treatment adherence in diferent settings (Deshmukh et al., 2018). In a longtitudinal study by Fatigegun *et al.,* (2009), the level of knowledge on the TB disease influenced whether or not patient chooses to complete treatment.

Drug resistant tuberculosis, low BMI, adverse drug events were identified as independent prognostic factors for poor outcomes among TB patients in China (Tang, 2013). Knowledge about curability and importance of adherence are strongly associated with high treatment completion as compared with those lost to follow up according to Tachfouti *et al.,* (2012). More than two fifth of TB clients are lost to follow up within the first two months of treament. This is attributable to ignorance about duration of TB treatment, travelling from treatment sites, improvement in health status and drug adverse effects. Herbal remedies and alcohol was also identified as a factor that hinder TB treatment completion according to Zhang (2021).

In a systematic review by Freire (2021), comobidity with diabetes is associated with increased risk of treatment failure and death during treatment and increased chances of relapses later on in life. A prospective cohort study involving pulmonary TB patients with comordity with diabetes (Jepsen *et al.,* 2012) assessed anthropometry and clinical parameters found that diabetes comordity delayed recovery of body mass and haemoglobin which are important functional recovery indicators. In another retrospective study carried in Maryland among tuberculosis patients with co-morbidity (Dooley *et al.*, 2015) established that diabetes is a major risk factor for death among TB patients and there is a trend toward increased time to culture conversion by two months.

In a retrospective case control study in Singapore there was no significant association of defaulting with age, sex, marital or employment status, disease characteristics, or treatment-related factors and lack of family support were found to be factors strongly predictive of default, Chee *et al*., (2016). A recent study to assess the risk of loss to follow among previously treated tuberculosis patients in South Africa, established

that previously treatment history, male gender and age group of 19-39 years were independently associated with loss to follow up, Marx et al, (2012)

A cohort study done in Spain among co-infected patients revealed that 11% of patients were lost to follow up and this was found to be higher among previously treated patients and 6.6% died, Monge *et al*., 2014. Unsuccessful treatment was associated with social economic status according to any criteria used, except for the definition of poverty line. Poverty seems to be hampering the achievement of the World Health Organization targeted 90% cure rate in developing settings.

2.5.2 Health care worker related factors

Service-related factors are strongly associated with loss to follow up among TB patients. Long waiting times, poor physician patient communication, fear of information leakage are associated with high rate of defaulters among co-infected patients (Nour & Mohsen, 2013). Communication between the client and the service providers are critical component of health care as it helps to develop trust and create good doctor and patient relationships (Miller, 2017). Lack of knowledge among health care workers can negatively affect TB clients outcomes. Poor interpersonal relations and communication has also been negatively associated with TB clients outcome (Datiko, Jerene & Suarez, 2020).

The main obstacle to TB treatment compliance among male patients are insufficient knowledge and individual cost during treatment. Communication between health professionals epecially TB drug dispensers is essential for improving treatment completion rates (Mishra *et al.*, 2016). Health care workers should analyse TB patients weekly attendance and investigate any barriers the clients are facing to ensure continued care and support. TB clients require special attention especially on assessing drug adhrerence, pysical, social and psychological needs, HIV/AIDS care and support for the those who are coinfected.

Health education was found to significantly improve total health status of TB patients by improving treatment adhrence (Pradipta, 2020). The service providers should always reiterate the importance of treatment adhrence and consequences of

non-adhrence. The need to continue treatment without interuption and encouraging patients to inform health workers if they are likely to travel. Education on drug adverse effects and how to recognise and report to health workers. During the entire duration of care, the service providers are required to assess clinical progress, drug adherence, accuracy of medication given, availability of drugs, patients ability to attend appointments and anything that would disrupt treatement (Mishra *et al.*, 2016).

Proper skills in managing clients with tuberculosis may influence the treatment completion rates. The health care workers should always reinforce importance of treatment completion to individual and the community at large (Ministry of Health, 2013). A dequate information given at the beginging of treatment including steps to take when missing clinic dates are crucial in ensuring that patients complete full course of treamtent. Patients encouraged to contact clinic staff if they fail to attend clinic so that alternative arrangements could be made (Mishra *et al.*, 2016). Efforts should be made to establish reasons for non-adhrence and address the situation in amicable and non judgemental manner. An alternative plan of care should be instituted for those patients who cannot return to facility for treament.

A system to properly identify TB patients who have failed to keep appointments be put in place by service providers in every basic TB treatment units in the county. Immediate tracing of patients who miss clinic be made by contacting them or making home visits through community volunteers attached to the facility. Accroding to a study carried out by Jirongo (2013) the hospital management is critical in management of tuberculosis. Hospital management facilitates care, recognition and coping with treatment problems and therefore, the management approaches are vital in ensuring successful construction of tuberculosis cure and prevention procesess. The study proposed a care management model as an intervention strategy which took the form of a care flow which ads the nursing consultation to discharge and direct communication of the case by the hospital nursing to PHC.

2.5.3 Health facility related factors

The basic TB management unit defined as functional area services offered (average 50 – 150,000 population), should offer at least smear microscopy laboratory (Ministry of Health, 2013). Treatment initiated in diagnostic centers and referred to peripheral sites for continuum of care. Each unit is assigned a sub county TB Leprosy coordinator usually a paramedic professional responsible for ensuring that TB control activities are implemented in line with national guidelines (Mishra *et al.*, 2016). Proper organization designed to facilitate patient's enrolment, adherence to treatment, monitoring of care established through identifying a TB clinic in each treatment centers preferably with clinic days. Direct observation of TB treatment for all diagnosed cases by health care workers, community volunteers or family members should be established in treatment centers to improve client's outcome (Ministry of Health, 2013). Treatment supervisor ensures that every dose of TB medicine is taken by patient at the right dose and interval.

The infrastructure, human resource and organizational issues are important in TB care and control. Clinical guidelines and case management programmes are crucial to have as makeup of structural elements. The system designs which involves information and materials, management, training of health care workers, continuous medical education, assessment and monitoring of the system is important in ensuring high treatment success rates for TB control. Uninterrupted availability of TB supplies and monitoring tools in management of tuberculosis is necessary to achieve higher treatment success rates.

2.5.4 Health Management

TB management has been critical in the fight against TB, however, some of the governments and clinics especially in the developing worlds have remained relatively behind. This has left the management of TB on the hands of community-based organizations. The CBOs provide a range of services in TB management such as tracing of contacts and defaulters, case finding, sputum collection, TB screening, health education, DOT support by community caregivers, and HIV and TB awareness campaigns in churches schools and community. The clinics in

collaboration with CBOs use case finding, TB screening and sputum collection approach by conducting door to door campaigns, visits to schools and farms and through church-related community outreach. The organizations also provide treatment adherence counselling. To minimize loss to follow up the health managers develops list of defaulters and then liaise with CBOs to conduct follow-up visits.

Health in prisons is not just about prisoners and it is another cause of concern for tuberculosis management. Prisons are small communities in themselves, with custodial personnel, health staff and many others, such as lawyers, delivery personnel, sanitary technicians, repairmen, etc., coming in and out every day. Visitors enter and leave prisons after coming into close contact with the prisoners on a regular basis, several times a week or even more often. Prisons are closed communities, but certainly not hermetically so. If an infectious disease such as TB is present amongst the prisoner population, it will spread via these visitors that span the gap between the prisons and the outside community. In Latin America, they are called ‘‘poblaciones puente’’, or ‘‘bridge populations’’, an expression that well illustrates this continuity and possible flow of contagion between prisons and the outside world. Prisoners, or at least the majority of them, are eventually released from prison. If those with TB have not been detected, or have not received proper treatment, they will spread TB outside into their families and the community

2.6 Distribution of Tuberculosis

The importance of research regarding spatial and temporal distribution of TB in TB control programs has increased tremendously globally in the recent past. The dynamics of infectious diseases depends on the spatial distribution of hosts and pathogens and the probability of an encounter between them. The probability of infection declines as the distance between the susceptible and the infected hosts increases. Like many other infectious diseases, TB infection is prone to clustering or spatial aggregation.

Different studies have outlined the importance of studying the geographic variation of TB clustering. In Gambia, a spatial analysis of tuberculosis revealed a significant highland and low-rate space-time and spatial clusters in two districts. In addition,

spatial ecology and spatial epidemiology studies on drug resistance of tuberculosis showed presence of marked spatial variability across the world. Further, spatio temporal patterns of drug-sensitive and multidrug-resistant tuberculosis in South America indicated spatial aggregation of patients diagnosed with MDR in which cases were found to be more tightly grouped. Subgroup analysis by the study suggested that the indication of resistance is potentially driven by increased transmission.

The spatial ecology and spatial epidemiology study of global tuberculosis drug resistance have shown the presence of significant clustering of TB epidemic. A study in Portugal revealed that spatiotemporal clustering of tuberculosis incidence hyperendemic and the hotspots attributed to crowding, HIV infection and other social determinants. The finding was supported by the study in Mexico which pointed out that high-incidence hotspots play crucial role in propagating TB epidemics.

A spatial analysis tuberculosis infection patterns in high prevalence areas in Brazil found that unemployment and poverty were associated with spatial clustering. In support of that finding, a study in Antananarivo city showed that the risk dynamics of TB cluster were linked to socio-economic status and patient care factors. The study also indicated that regions with low vulnerability and high income or education with high estimated TB rates. People movement has also been found to be a risk factor indicating difference in TB transmission among nations. Taking an example, travelling to the country with high TB occurrence among South Africans was a risk factor but not among the Turkish people residing in Netherlands. The travel-associated odds ratio between these two travellers is related to the differences in TB incidence between the countries.

Systematic characterization of the spatio-temporal distribution of TB cases can benefit real time surveillance and help public health investigations of TB outbreaks as to what level of spatial resolution results in improved detection sensitivity and timeliness. Improved diagnostic and curative efforts need to be combined with additional preventive efforts. Limited studies have been published in Kenya. (Cavanaugh, 2012) Conducted bivariate and multivariate analyses to assess

characteristics associated with TB death. The findings were that HIV infection in children with TB is common, and the data suggested that HIV is particularly deadly in TB patients below 15 years, the group with the lowest rate of testing. Poor data recording and reporting limited the understanding of TB in this age group. Expansion of HIV testing may improve survival, and more complete data recording and reporting would enhance the understanding of pediatric TB.

A number of studies have dominated the importance of studying geographic variation of TB clustering. For instance, the spatial analysis of TB in Gambia, Greater Banjul, showed a significant high-low rate spatial and space-time clusters in two districts. Additionally, another spatial ecology and spatial epidemiology study of worldwide drug resistance tuberculosis revealed the presence of marked spatial variability across study regions. Additionally, spatio temporal patterns of multidrug-resistant and drug sensitive tuberculosis in South American setting showed spatial aggregation of patients with confirmed MDR in which cases the confirmed MDR disease was found to be tightly grouped. The analysis of subgroup indicated that the appearance of resistance may be driven by increase of transmission.

Globally, spatial ecology and spatial epidemiology of drug resistance tuberculosis have shown the presence of significant clustering of TB. A study in Portugal revealed that spatiotemporal clustering of tuberculosis incidence hyperendemic hotspots which are characterized by crowding. Social determinants along with HIV infection found that population with clustering of respiratory contacts experience aggregation of TB cases and high numbers of re-infection events.

Although, there are so many studies done to seek understanding spatial epidemiology of TB globally (Shaikh & Malik, 2019; Aturinde & Mansourian, A. (2019). Couceiro *et al* 2014; and Harling *et al* 2014), there are few such studies conducted in Africa. An analysis of point of pattern and spatial statistics were used to identify clustering of TB cases in the areas of high incidence in South Africa. The study found significant association between number of notified TB cases and factors such as overcrowding, unemployment, number of drug users (Beyers et al., n.d). In a muti-country study Poisson regression model was used to explore temporal and spatial

patterns of TB distribution in Africa. The researchers found significant clustering of cases and indicated 25 Africa countries were at increased risk of tuberculosis while 10 countries were termed as “hot spots” (Utman et al 2017.

In Kenya, there is scanty literature on the application of spatial analysis and application of GIS on TB epidemiology. Sitienei (2010) evaluated the effect of risk factors on the spatial temporal distribution of TB using data obtained from randomly sampled patients in 3 Kenyan provinces which are Rift valley, Nyanza, and Nairobi. The study found significant clustering in Nairobi and Nyanza province which indicated a higher median relative risk. In another study, Kipruto et al (2015) assessed spatial and temporal distribution of TB using 47 Kenyan counties as spatial reference units. The study found a significant clustering of TB cases in a number of counties over a period of 3 years (2012- 2014) whereby 11 counties had a higher estimated risk of case notification rates per 100,000 (Nairobi, Mombasa, Homa bay, Kisumu, Siaya, Machakos, Mombasa, Marsabit, Isiolo, Lamu, and Makueni)

2.7 Outcomes of Treatment of Tuberculosis

Active TB diseases can be cured by antibiotics. The drug and treatment options usually depend on the country. Achieving TB cure takes about eight months of daily treatment and effective treatments make a person with TB non-contagious hence preventing further spread of TB (Vilmink *et al.*, 2013). To ensure effective treatment, the patient is recommended to take his or her pills under supervision. This approach usually is called DOTs (Direct Observed Treatment Short Course) and cures 95 per cent of TB cases.

Several reasons for undesired TB outcomes such as death or drug resistance have been reported to be high age, low income, male sex or limited access to transport, distance from home to the treatment centres, limited interest in information and limited social support, cormodibity and incomplete treatment compliance have all been found to be related to unsuccessful treatment outcomes. Although the implementation of DOTS improves the success of TB treatment and decreases the transmission of resistant tuberculosis, global TB incidence is still growing at 1% a

year. Findings showing the magnitude of TB unsuccessful outcomes indicated that the burden of TB is attributed to defaulted treatment, transfer out, failure and death.

Loss to follow-up with all MDR treatment regimens and different models of care is a concern. According to reports by WHO (2012), a 9-month regimen in Ethiopia presented excellent results among MDR-TB patients. The shorter and more patient acceptable regimen, pave way for more effective better tolerated treatment for TB patients. A large number of adverse drug reactions reported by the patients in a study in Bangladesh on both hospitalized and ambulance treatment is in line with the findings of previous studies. These reactions are cause of global public health concern since they contribute considerably to morbidity, loss to follow-up, mortality and increased health-care costs. According to a study in Nigeria, most patients in MDR-TB treatment experienced adverse drug reactions mainly psychiatric, ototoxic and neurological in the first 2 months of treatment although many of these reactions resolved in later months.

2.8 Drug Resistance TB

Chemotherapy is the most potent weapon available in the fight against tuberculosis. When used properly, available anti-TB drugs are able to reach cure rates above the 85% target recommended by the World Health Organization (WHO, 2006). Early in the chemotherapy era, resistance associated with treatment failures emerged and has become a common occurrence worldwide. Of particular concern are the increasing prevalence of organism's resistant to isoniazid and rifampicin, the two drugs that form the backbone of modern short-course therapy. Rifampicin (RIF) resistance occurs mostly in conjunction with INH resistance (90% of cases) and can be used as a surrogate marker for multidrug resistance (Quy et al., 2016). Drug resistance in *M. tuberculosis* occurs as a result of random spontaneous chromosomal mutations during natural cell replication. These mutations are neither drug induced nor drug linked.

The probability of a drug-resistant mutant occurring is directly proportional to the size of the bacterial population (Mermin J. 2007). "The frequency of primary resistant organisms varies for each drug; however, it is usually between 10-6, to 10-

8. Spontaneous resistance to isoniazid is estimated to occur once in every 106 organisms, and to rifampicin once in every 108 organisms. The probability of spontaneous mutants being simultaneously resistant to two or more drugs is the product of the individual mutants. The development of drug resistance is a man-made amplification of a naturally occurring phenomenon. Previous treatment for tuberculosis predisposes to the selection of multi-drug resistant organisms. Noncompliance is a major factor in allowing the resistant organisms to survive (Sarita et al., 2007). Multi-drug therapy is used to prevent the emergence of drug resistant mutants during the long duration of treatment. Resistance can be defined as single-drug, multi-drug, or poly-drug resistance depending on the number of drugs and/or which drugs are involved (Van et al., 2005; Raviglione et al., 2007).

Although an unequal global distribution of drug resistance exists between poor and rich countries, the problem is global (WHO, 2007). The regions where drug-resistant TB is more prevalent lack the resources to implement adequate measures to control even the susceptible types of the disease. Recent reviews have reported a high prevalence of primary multidrug resistant tuberculosis in Latvia (1998: 9.0%), Estonia (1998, 14.1%) and Dominican Republic (1994-1995: 6.6%). The case fatality rate is high among patients with HIV/AIDS who are infected with strains of drug resistant M. tuberculosis (WHO, 2009). MDR-TB in AIDS patients is on the rise and the future it may be alarming (Quy et al., 2016; Cohen et al., 2006). WHO estimates there were around 2,000 cases of multidrug-resistant (MDR)-TB in Kenya in 2007, although only 4.1 percent of these cases were diagnosed and notified. This was based on only 4,000 (14% of all retreatment cases) sample analyzed at the central reference laboratory (NLTB, 2019).

As of 2010 one case of Extra drug resistant tuberculosis (XDR-TB) had been reported in the western part of Kenya in Busia (NLTB, 2010). The high rates of drug resistance TB currently being reported in Kenya are alarming. In 2006, WHO estimated a total of 400,000 multi-drug resistant TB (MDR-TB) to have occurred in the world of which 10, 000 of them were reported from African countries (WHO, 2008a). There is a policy supporting MDR-TB diagnosis and treatment and a laboratoy testing facility and in 2008, USAID continued to support routine MDR-TB

surveillance (Zwarenstein et al., 1998; WHO, 2009). In most areas of the world where TB is common, reliable pre-treatment drug susceptibility results are not available. However epidemiological studies have shown that most previously treated patients with drug resistance initially had primary drug resistance. Mycobacterium tuberculosis strains resistant to anti-TB drugs can be transmitted the same way MTB strains susceptible to anti-TB drugs are transmitted." Human immunodeficiency virus (HIV) infection curtails the effects of TB control programme by lowering the life expectancy of those receiving TB treatment (Githui et al., 1998; Taylor et al., 1999; Zhiyuan et al., 2008).

2.9 Critique of existing literature

Most of the researches done previously are desktop research which reviewed studies previously done. In a research done in federal medical centre in South west Nigeria in 2013, a small sample of 78 patients was used in this tertiary facility and the researchers heavily relied on secondary data. The methodology used mostly focused on individual factors especially patient related factors without correlating with institutional factors which may have influenced the patients to abandon or complete treatment.

2.10 Research gaps

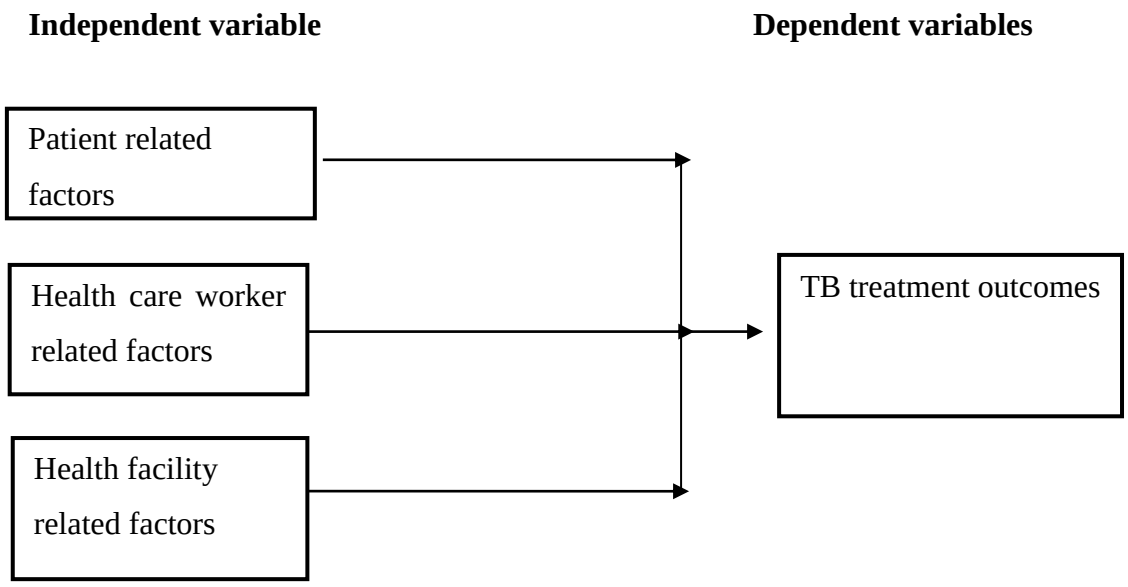
The goal of any TB programme globally is to achieve high treatment success and reduce the proportion of patients with undesirable outcomes. This historical disease, affect more than two billion people world- wide and claims several lives every year with significant proportion of patients diagnosed failing to complete their treatment due recalcitrant behaviour, negative attitudes among health care workers and poor infrastructure. No research has ever been done in Mombasa County to investigate why twelve percent of patients registered failed to complete treatment despite availability of drugs and fairly accessible treatment centres (Appendix 5).

2.11 Summary of literatures

Tuberculosis can be put under control since it's a curable disease by ensuring that all patients adhere to treatment for the entire six to eight months. Due to long period of treatment, some patients experience fatigue and feel that they have they have improved and no need for continuing treatment. Direct observation of treatment is an important strategy recommended by WHO to improve treatment success. The full implementation of this strategy is expected to reduce TB morbidity, mortality, treatment failures, patient loss to follow up, death and emergence of drug resistant TB. Desktop, cross sectional and case control studies were conducted to establish the correlation between a number of factors the influence treatment adherence and successful treatment completion.

2.12 Conceptual framework

The conceptual framework is adopted from the socio-behavioural model advanced by (Andersen, 1995) and collated from literature review. The model framework looks at the predisposing characteristics, and enabling resources as the major factors for uptake of preconception care. Figure 1.1 below presents the conceptual framework for the study.



Adopted from the socio-behavioural model advanced by (Andersen, 1995)

Figure 2.1: Conceptual framework

From the conceptual framework, it is hypothesized that patient related factors leads to improved TB outcomes. It is expected that health care worker related factors lead to improved TB treatment outcomes. It is also hypothesized that health facility related factors leads to improved TB outcomes.

Adopted from the socio-behavioural model advanced by (Andersen, 1995)

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study site

The study was conducted in Mombasa County which is one of the 47 counties in Kenya with an urban population of 1,063,854, Population Density of 4860 people per square km. Proportion of Males 51.8% and HIV Prevalence 7.4%. The Doctor to Population ratio 1:7,000. Mombasa lies between latitudes 3°56' and 4°10' south of the equator and longitudes 39°34' and 39°46' east. It is the smallest county in Kenya, covering an area of 229.7 km^2 excluding 65 km^2 of water mass. The county is situated in the South Eastern part of the former Coast Province. It borders Kilifi County to the North, Kwale County to the South West and the Indian Ocean to the East. Administratively, the county is divided into seven divisions, eighteen locations and thirty sub-locations.

Highly populated areas are in Island Division, Likoni, Kingorani, Bamburi, Bangladesh Mikindani, Jomvu, Miritini, Migadini, Port Reitz, Mishomoroni and Bombolulu among others. 65.24% of the population contribute to the county labour force with a literacy level of 86.2%. The unemployment rates stand at 13.5% with a poverty index of 37.6% according to Kenya integrated household budget survey, 2013. The county has one referral hospital, two county hospitals, eight health centres, 41 dispensaries and 259 private health facilities. The County had a HIV prevalence of 7.4% according to Kenya AIDS Indicator Survey of 2012 and its one of the factors that fuels high tuberculosis burden.

The County had a tuberculosis case notification rate of 425 per 100,000 populations against national notification of 210, TB/HIV Co infection rate of 30%. It has 8 tuberculosis control zones, 109 treatment centres, 48 TB diagnostic centres and 52 HIV care and treatment centres.

3.2 Study design

The study adopted retrospective cross-sectional research design and used qualitative and quantitative approaches. Cross-sectional research design was adopted due to its ability to gather real time data across all respondents that qualify the selection criteria and the consistence of the same data arising from environmental similarities over the respondents' community. Additionally, Cross-sectional studies allows for data collection from a large pool of subjects and comparing differences between groups. However, a cross sectional study is prone to non-response bias if participants who consent to take part in the study differ from those who do not, resulting in a sample that is not representative of the population. To mitigate this, the researcher used a larger sample size so that it remains a good representative of the entire study population.

3.3 Study population

The study population was the number of notified patients with tuberculosis in one quarter in the study area (Mombasa's health care units) and this was found to be 1207 in the year 2017. It was from this population that a systematic random sample size of 292 patients were interviewed. In the systematic sampling, the first subject was selected randomly. A random number was obtained between 1 and 3 of the first patients to determine the first subject to be recruited. In this case, the target population was 1207 TB patients diagnosed and registered between 1st April 2017 and 30th of June 2017 (3 months). Therefore, 1207/292 =4.1. Therefore, every 4th patient was recruited to the study until the sample size of 292 was achieved. The target population also included 8 FGD participants and 8 key informants. Therefore, the total number of study participants was 308.

3.4 Inclusion and exclusion criteria

3.4.1 Inclusion criteria

1. All patients diagnosed with TB and registered in TB clinics in the study area during the study period were included, regardless of primary site of involvement (e.g., pulmonary or extra-pulmonary).
2. New patients who started medication between April and June 2017 and re-treatment cases that started treatment between February and April were also included.
3. Patients with drug resistant form of tuberculosis who started treatment between Feb and April 2015 were also included

3.4.2 Exclusion criteria

Children below 15 years and patients registered outside the review period were excluded from the study as they have already completed and released from treatment.

3.5 Sample size determination

Cochrane 1977 formulae was used to determine the sample out of the population of 1207 TB patients diagnosed and registered between 1st April 2017 and 30th of June 2017. These group of patients were expected to have successfully completed treatment between September and December 2017. Successful treatment means that the patients fully recovered from TB while unsuccessful treatment means that the patients had not fully recovered from TB. It was assumed that the patients had been diagnosed with TB and had adhered to treatment.

$$n = \frac{Z\alpha/_2{}^2 P(1-P)}{d^2}$$

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

$$n = 385/1+ (385-1)/1207$$

$$n = 292$$

3.6 Sampling techniques

A multistage sampling technique that involved stratification of the study population into different strata of study interest and then followed by a proportionate systematic random sampling was used (Marshall, 1996 and Habib, *et al*, 2014). Probability proportional to size sampling was used to get a representative sample from the eight TB zone in Mombasa County based on the contribution of TB cases. A list retrieved from the County's vital health records and cohort interviews were used as an important tool in identifying respondents for the study during clinic days. On the other hand, one key informant from each of the 8 TB zones in Mombasa County was purposively selected to participate in the study. Additionally, 8 community health volunteers were randomly selected to participate in the FGD.

Data was collected within a period of three months with the help of three research assistants using semi-structured questionnaire (See Appendix II) and focused group discussion guide (see appendix III). Data obtained from the participants who met the inclusion criteria and gave informed consent to participate in the study. The respondents filled the questionnaire which consisted of both closed and open-ended questions with the help of research assistants. Interviews were organized where the study subjects gave their opinions on the questions on the focused group discussion guide. The focused discussion group had a leader who moderated the discussion and an assistant moderator who took notes. The time and venue were communicated to the participants and discussions lasted between 30-45 minutes. Audio and video recording was done to record information and later be transcribed.

Table 3.1: Sample distribution according to TB districts

S/No	TB districts	Population	Percentage	Sample	Cumulative total
1	Changamwe	223	19	56	56
2	Mvita	121	10	28	84
3	Ganjoni	141	11	33	117
4	Kisauni	104	7	21	138
5	Nyali	136	12	36	174
6	Jomvu	115	10	28	202
7	Likoni	208	13	38	240
8	Mlaleo	159	18	52	292
	Total	**1207**	**100**	**292**	

3.7 Data collection

Mix method was used to collect data (qualitative and quantitative) advantages, triangulations

3.7.1 Qualitative and quantitative approaches

3.7.1.1 Questionnaire

Semi structured questionnaire was used to collect primary data from respondents (the TB clients) following consent to participate in the study for generating a quantitative data.

3.7.1.2 Focused Group Discussion

Focused group discussions were used to explore and document community perspectives on factors influencing the TB client's outcomes. These discussions were facilitated by a simple interviewing checklist which basically comprised simple questions to stimulate a discussion on the subject of interest. The FGD participants were community health workers in the various TB districts

3.7.1.3 Key informant Interview

Other confirmatory information was collected through key informant interviews which were directed to hospital/health care institutions' management staff including TB focal persons at the facilities that participated.

3.7.2 Validity and Reliability

3.7.2.1 Validity

In order to ensure that the questionnaire measure what it's intended to measure, piloting was conducted with thirty patients in one facility. According to Zohrabi (2013), content validity is the extent to which the data constitute accurate measurements of what is supposed to be measured. Validity refers to Kaiser-Meyer-Olkin (KMO) test was performed to test for validity. The significance of the KMO coefficient was evaluated using a chi square test and a critical probability value (p value) of 0.05. According to Field (2005), KMO Value/Degree of Common Variance of between 0.90 to 1.00 is "Marvelous", 0.80 to 0.89 is "Meritorious", 0.70 to 0.79 is "Middling" 0.60 to 0.69 is "Mediocre", 0.50 to 0.59 is "Miserable", 0.00 to 0.49 is "Don't Factor".

Table 3.2: Validity Test (KMO and Bartlett Test)

	KMO	Bartlett's Test of Sphericity			Conclusion	Validity
Variables		Approx. Chi-Square	df	Sig.		
Patient related factors	0.774	66.483	30	0.00	Middling	Valid
Health care worker related factors	0.841	75.564	30	0.00	Meritorious	Valid
Health facility related factors	0.742	74.031	30	0.00	Middling	Valid

The values of the KMO Measure of Sampling Adequacy for all the variables were above 0.500. The significance of the KMO coefficient was evaluated using a Chi-Square test and a critical probability value (p-value) of 0.05. A Chi-Square coefficient ranging from 66.483 to 75.564 and a p-value of 0.000 imply that the coefficients were significant. Therefore, the null hypothesis of no intercorrelation between the items of each dimension in the structured questionnaire was rejected and

concluded that all the values are statistically significant at 0.05 percent level of significance.

3.7.2.2 Reliability

Reliability refers to the repeatability, stability or internal consistency of a research instrument (Mohajan, 2017). Reliability analysis was done to evaluate survey constructs. Reliability analysis was evaluated using Cronbach's alpha. Sekaran and Bougie (2013) argued that coefficient greater than or equal to 0.7 is acceptable for basic research. Bagozzi (1994) explains that reliability can be seen from two sides: reliability (the extent of accuracy) and unreliability (the extent of inaccuracy). The most common reliability coefficient is Cronbach's alpha which estimates internal consistency by determining how all items on a test relate to all other items and to the total test- internal coherence of data. The reliability is expressed as a coefficient between 0 and 1.00. The higher the coefficient, the more reliable is the variable under consideration.

Table 3.2: Reliability Results

Variables	Cronbach's Alpha	Conclusion
Patient related factors	0.977	Reliable
Health care worker related factors	0.882	Reliable
Health facility related factors	0.841	Reliable

The pilot results showed that the variable statements were highly reliable with a representative Cronbach's Alpha of 0.977, 0.882 and 0.841 for patient related factors, health care worker related factors and health facility related factors respectively.

3.8.3 Pre-test of data collection tools

Pretesting was conducted so as to ensure the reliability and suitability of the questionnaire. It was also used as a means of training and assessing research assistants who were involved in the main survey. Pretesting conducted on a selected group of Mombasa residents who were randomly picked from the Bamburi Health

Centre. A total of 30 respondents were sampled for the pre-test. This group was not included in the actual data collection exercise.

3.9 Data processing, analysis and presentation

All subjects were assigned a subject identification number (SID). All data entered into the study databases were de-identified and only associated with a SID in password protected files. A double entry system for the data was maintained. All paper research records were kept in a password protected; locked filing cabinet located in a restricted-access room at the research station. Data entry, cleaning and validation were performed in order to achieve a clean data. Quantitative data were analyzed using SPSS version 20 Descriptive statistics frequency (%), mean, and standard deviation were used to express quantitative data. Relationship between the independent variables and dependent variable were established using Chi-square test of association. In bivariate analyses, odds ratios (OR) and 95% confidence intervals (CI) for the association between TB treatment outcome and health related factors, institutional factors and patient related factors was done using logistic regression. The qualitative data (FGD and KII) were subjected to a thematic content analysis.

This approach entailed the categorization of recurrent data collected under thematic areas (Green & Thorogood, 2010). The analysis was done manually using general purpose software tools using Microsoft Word (La Pelle, 2004).

3.10 Ethical consideration

To exercise and ensure that ethical issues were upheld, efforts were made to ensure that the sample population were well informed of the primary objectives of the research as purely for academic purposes. Voluntary participation was therefore declared as well as confidentiality of all respondents' information including secrecy of identity, health status, life style and related outcomes from the treatment and life styles thereof. The researcher also obtained the authorization from the County director of Health (Mombasa County) to collect data. Authorization to collect data was also obtained from Pwani University ethical revew committee which is

accredicated by the national commission for science, technology and innovation (NACOSTI, KENYA)

CHAPTER FOUR

RESULTS

This chapter presents the research results as well as discussing the same in line with the underlying objectives and hypothesis of the study. It further compares the findings/results thereof with those of other related work and provides a conclusion in line with the professional knowledge and implications thereof.

4.1 Response Rate

The number of questionnaires that were issued to the respondents was 292. A total of 265 questionnaires were well filled and returned, providing a response rate of 90.75 %.

Table 4.1: Response Rate

Response	Frequency	Percent
Well filled and returned	265	90.75
Non –returned	41	9.25
Total	**292**	**100.0%**

Source: Survey Data (2017)

The number of questionnaires administered to the respondents was 168. One hundred and twenty-seven questionnaires were well filled and returned, giving a response rate of 75.5%. According to Santonja et al. (2018), a response rate of above 50% is adequate for a descriptive study. Return rates of above 50% are sufficient to analyze and publish, 60% is good, and 70% is great while above 80% is excellent.

4.2 Demographic characteristics of the respondents and TB-Outcome relationship

The gender of the participants was almost equally balanced. There were 147 male participants and 118 female participants who accounted for 55.5% and 44.5% respectively. The mean age of the participants was 35 (± SD 9.8) years with a range

of 25 to 55 years. Participants who were below 18-25 years accounted for 5.7%, while those who 25 to 34% accounted for a higher percentage of 28.3%. Those who indicated age between 35 to 44 years accounted for the highest percentage of 36.9% and those who indicated age between 45 to 55 years accounted for a relatively lower percentage (24.2%) of the participants. Additionally, those who are above 55 years accounted for 4.9%.

Majority of the respondents 192 (72.5%) were married while only 59 (22.3%) were single and only 14 (5.2%) of the respondents were widowed or divorced. The study sought to identify the association between religion and TB treatment outcome. 164 (61.9%) of the respondents were Christians while 101 (38.1%) of the respondents were Muslims. None of the study participants indicated Hinduism or any other religion.

Majority 174 (61.9%) of the respondents had primary education while those who had secondary education were 54(19.2%) of the total respondents. Those who attended college were relatively small compared to those who had secondary education with 32 (11.4%) and only 5 (1.9%) respondents had no education at all. The distribution of occupation was fair, however, majority 89 (33.6%) of the respondents indicated they were casual labourers, 68 (25.7%) of the respondents indicated that they were salaried employees, 37 (14%) indicated that they did subsistence farming, 35 (13.1%) indicated that they carried fishing, 15 (5.7%) indicated that they practised cash crop farming while 21 (7.9%) indicated that they are self-employed.

The socio-demographic attributes of the respondents are summarised in the table 4.1 below.

Table 4.2: Demographic characteristics summary results

Social demographic characteristics	Successful	Un-successful	Frequency	Percentage
Male	132 (90%)	15 (10%)	147	55.5
Female	99 (85%)	17 (15%)	118	44.5
Mean (SD)			35	(±9.8)
Median			36	(25-55)
<25 years	21 (75%)	7 (25%)	28	5.7
25 – 34 years	86 (89%)	11 (11%)	97	28.3
35 – 44 years	82 (87%)	12 (13%)	98	36.9
45 – 54 years	19 (100%)	0 (0%)	19	24.2
55 and above years	25 (93%)	2 (7%)	27	4.9
Single	53 (90%)	6 (10%)	59	22.3
Married	168 (88%)	24 (12%)	192	72.5
Divorced/Widowed	12 (86%	2 (14%)	14	5.2
Christian	139 (85%)	25 (15%)	164	61.9
Muslim	94 (93%)	7 (7%)	101	38.1
Primary and below	150 (83%)	29 (17%)	179	63.8
Secondary	53 (98%	1 (2%)	54	19.2
College	30(93.8%)	2(6.2%)	32	11.4
Cash crop farming	9(60%)	6(40%)	15	5.7
subsistence farming	32(86.5%)	5(13.5%)	37	14
Fishing	33(94.3%)	2(5.7%)	35	13.1
casual laborer	79 (89%)	10 (11%)	89	33.6
Salaried employee	59 (87%)	9 (13%)	68	25.7
Self-employed	21 (100%)	0 (0%)	21	7.9

No – Number, % - Percentage, Successful – cured plus treatment completed, Unsuccessful- died, lost to follow up, not evaluated

4.3 HIV Status of the respondents

Table 4.3: The HIV status of the respondents

HIV Related Questions	Successful	Un-successful	Frequency	Percentage	X^2	df	p-value
Serological status							
Positive	77(85.6%)	13(14.4%)	90	34			
Negative	114(89.1%)	14(10.9%)	128	48.2	126.743	3	**0.001**
Declined	10(100%)	0	10				
Not done	32(86.5%)	5(13.5%)	47	17.8			
HIV status Management							
ART							
Yes	91(90.1%)	10(9.9%)	101	34			
N/A	142(86.6%)	22(13.4%)	164	66	14.977	1	**0.001**
CPT							
Yes	91(90.1%)	10(9.9%)	101	34			
No	142(86.6%)	22(13.4%)	164				

No – Number, % - Percentage, X^2 – Chi square; df – degrees of freedom; p – level of significance; $p \leq 0.05$ indicates the relationship is significant.

4.3.1 HIV Status

The study sought from the respondents about their HIV serological status and the results showed that 90 (34%) respondents were positive, 128 (48.2%) were negative. However, 10 (3.8%) of the respondents declined to take the tests and 37 (14%) cases were reported as not done. There is a significant association between the serological status and the outcome of the TB treatment (X^2 =126.743; df = 3 and *p-value* = 0.001). The study revealed that 90(34%) respondents were under ART and CPT while 175 (66%) reported that the option of being under ART or CPT was not applicable. There was a significant association between HIV status management and outcome of the TB Treatment (X^2 =14.977; df = 1 and *p-value* = 0.001).

4.4 Lifestyle and outcome of the TB treatment

Below is a summary of the respondents' socio-economic and life-style status.

Table 4.4: Earning, Dwelling place, Households, Room size and Person living with

Lifestyle characteristics	Successful	Un-successful	Frequency	Percentage
<5000	14(82.4%)	3(17.6%)	17	6.4
5001-10,000	76(83.5%)	15(16.5%)	91	34.3
10,001-15,000	41(77.4%)	12(22.6%)	53	20
15,001-20,000	71(97.3%)	2(2.7%)	73	27.5
>20,000	13(100%)	0	13	4.9
None	18(100%)	0	18	6.8
Permanent	90 (93%)	7 (7%)	97	36.6
Semi-permanent	108 (86%)	18 (14%)	126	47.6
Temporary	35 (83%)	7 (17%)	42	15.8
Stone	13(81.2%)	3(18.8%)	16	6
Mud/wood	53(91.4%)	5(8.6%)	58	21.9
Mud/cement	45(75%)	15(25%)	60	22.6
Tin	11(100%)	0	11	4.2
Corrugated Iron sheets	87(90.6%)	9(9.4%)	96	36.2
Brick/block	24(100%)	0	24	9.1
1-2 household members	139(85.8%)	23(14.2%)	162	61.1
3-4 household members	89(94.7%)	5(5.3%)	94	35.5
> 4 Household members	5(55.6%)	4(44.4%)	9	3.4
1-2 rooms	132(85.7%)	22(14.3%)	154	58.1
3-4 rooms	97(92.4%)	8(7.6%)	105	39.6
> 4 rooms	4(66.7%)	2(33.3%)	6	2.3
Family	190 (86%)	32 (14%)	222	83.8
Friends	25 (100%)	0 (0%)	25	9.4
Alone	18 (100%)	0	7	2.6
Others	0	11(100)	11	4.2

No – Number, % - Percentage

4.5 Patient level/related factors

Patient related factors which simply are the patient descriptors which translate to be the independent or predictor variables to treatment outcomes. Table 4.4 below shows the summary descriptive as well as the association between the patient related factors and TB treatment outcomes.

Table 4.5: Patient level related factors

Patient related factors	Successful	Un-successful	Frequency	Percentage	X^2	df	p-value
Times treated for TB							
One	185 (88%)	26 (12%)	211	79.6			
Two	32 (86%)	5 (14%)	37	14			
More than twice	**14 (100%)**	**0**	14	5.3	31.955	3	**0.001**
Unknown	2(66.7%)	1(33.3%)	3	1.1			
Cigarette Smoke							
Yes	85 (76%)	27 (24%)	112	42.3	44.102	1	**0.001**
No	148 (97%)	5 (3%)	153	57.7			
Drink Alcohol							
Yes	94 (76%)	29 (24%)	123	46.4	53.46	1	**0.001**
No	139 (98%)	3 (2%)	142	53.6			
Health Education							
Yes	131 (85%)	24 (15%)	155	58.5			
No	102 (93%)	8 (7%)	110	41.5	10.854	1	**0.028**
Psychosocial support							
Yes	**176 (96%)**	**8 (4%)**	184	69.4	45.982	1	**0.001**
No	57 (70%)	24 (30%)	81	30.6			
Knowledge of illness							
Yes	222 (91%)	22 (9%)	244	92.1	26.516	1	**0.001**
No	11 (52%)	10 (48%)	21	7.9			
Side effects							
yes	131 (85%)	24 (15%)	155	58.5	42.577	1	**0**
No	102 (93%)	8 (7%)	110	41.5			
Stigma							
Yes	129 (88%)	17 (12%)	146	55.1	5.637	1	0.228
No	**104 (87%)**	**15 (13%)**	119	44.9			

No – Number, % - Percentage, X^2 – Chi square; df – degrees of freedom; p – level of significance; $p \leq 0.05$ indicates the relationship is significant.

Majority 211 (79.6%) of the respondents indicated that they were treated for TB once. A relatively lower number 37 (14%) of the respondents indicated that they were treated for TB twice while 14 (5.3%) of the respondents indicated that they were treated for TB more than twice and 3 (1.1%) indicated unknown times they were treated for TB. The number of times treated for TB had a significant association with TB treatment outcome (X^2 = 31.955; df = 3 and *p-value* = 0.001). This is in contrast to a study done by Wohlleben J. et al. (2017) in Tajikistan where previously

treated patients were found to be at high risk of loss to follow up. (OR 2.03, 95% CI 1.05 -3.95).

Majority 57.7% (153) of the respondents indicated that they don't smoke cigarette while a relatively lower number 112 (42.3%) of the respondents indicated that they smoke cigarette. The association between cigarette smoking and outcome of the TB treatment was significant ($X^2 = 44.102$; df = 1 and *p-value* = 0.001).

In relation to this, A FGD in Bamburi healthcare reported that:

"Drug abuse is rampant among patients and most of them come for treatment late when they can no longer perform their daily activities. Drug adherence among this population is very poor as most loss to follow up are from this category of patients. Sometimes this will lead to death. The TB/HIV co-infection rate is also high among drug addicts. They also have a habit of changing dens as they engage in theft and when police men are searching for them, they move and change their dens and end up being lost to follow at the point of TB care."

Similar views were almost echoed by focus group from Ganjoni dispensary. One of the participants said that:

"Some of our clients with unsuccessful *treatment outcomes are street families who lack the basic necessities including shelter and where to keep their medicines, they keep on changing sites of residence and this had led to loss to follow up. Substance abuse among this population is also common and this has led side effects like vomiting and abdominal pains and among few cases has led to death and loss to follow up due to poor drug adherence. They food which is crucial for TB treatment as the disease is debilitating when left untreated, they don't have a place to prepare food supplements provided at the nutritional clinic in case therapeutic foods are in short supply which happens most of the time. They come late most of the time and occasionally skip drugs."*

Majority 53.4% (142) of the respondents indicated that they don't drink alcohol while a relatively lower number 123 (46.4%) of the respondents indicated that they

drink alcohol. The association between drinking alcohol and outcome of the TB treatment was significant (X^2 = 53.46; df = 1 and *p-value* = 0.001). Majority 58.5% (155) of the respondents indicated that they were educated about health while a relatively lower number 110 (41.5%) of the respondents indicated that they never received health education. The association between health education and outcome of the TB treatment was significant (X^2 = 10.854; df = 1 and *p-value* = 0.028).

Majority 69.5% (184) of the respondents indicated that they had psychosocial support while a relatively lower number 81 (30.6 %) of the respondents indicated that they don't have psychosocial support. The association between psychosocial support and outcome of the TB treatment was significant (X^2 = 45.982; df = 1 and *p-value* = 0.001).

One participant in the FGD said that:

"In some instances, the family members no longer support the patients and because of prolonged duration of TB treatment some patients just give up and completely lost to follow up. Sometimes they change their residence without informing the facility, this mostly occurs to those casual workers who move from industry to another looking for job"

The respondents were asked to indicate if they knew the kind of what illness they were suffering from. Majority 92.1% (244) of the respondents indicated that they had knowledge of illness while a low number 21 (79 %) of the respondents indicated that they had no knowledge of illness. The association between knowledge of illness and outcome of the TB treatment was significant (X^2 = 44.102; df = 1 and *p-value* = 0.001). Majority 58.5% (155) of the respondents indicated that they experienced side effects while a relatively lower number 110 (41.5%) of the respondents indicated that they don't have side effects. The association between side effects and outcome of the TB treatment was significant (X^2 = 42.577; df = 1 and *p-value* = 0.001).

Majority 51.1% (146) of the respondents indicated that they experienced stigma while a relatively lower number 119 (44.9%) of the respondents indicated that they

don’t experience stigma. The association between stigma and outcome of the TB treatment was not significant ($X^2 = 5.637$; df = 1 and *p-value* = 0.228).

Table 4.7 shows that respondent who are treated more than twice are 3.993 times more likely to get cured of TB compared to those who are treated once (OR-1.993, 95% CI, 0.7 to 5.5). Additionally, respondents who are treated twice are 1.33 times more likely to get cured compared to those who are treated once (OR-1.33, 95% CI, 0.21 to 3.65).

Patients who smoke cigarette are 0.579 times less likely to get cured as compared to those who don’t smoke cigarette (OR-0.579, 95% CI, 0.26 to 2.28). Additionally, patients who drink alcohol are 0.307 times less likely to get cured of TB as compared to those who don’t drink alcohol (OR-0.307, 95% CI, 0.139 to 3.678). The results also revealed that patients who are educated about health are 1.716 times more likely to cure of TB than patients who are not (OR-1.716, 95% CI, 0.35 to 2.48). More so, patients who receive psychosocial support are 4.08 times more likely to get cured than those who don’t receive psychosocial support (OR 4.08, 95% CI, 2.00 to 8.32). Finally, it was revealed that patients who has knowledge of illness are more 1.98 times likely to get cured to those who are not knowledgeable (OR-1.98, 95% CI, 0.17 to 2.47).

Related studies by Dujaili, et al (2010), confirmed a linear relationship between cigarette smoking with poor treatment outcomes. This study further isolated treatment outcomes with smoking severity. Influence of drinking of alcohol on treatment outcomes was studied by Pelzter and Louwz (2014) in their work that aimed at isolating factors associated with treatment failure and death of patients from TB incidences.

The impact of health education was exhaustively explored and discussed by D’Souza (2003) and specifically in the treatment of Pulmonary Tuberculosis. D’Souza provides evidence of effect of intensive health education on adherence to treatment which was studied in 60 newly diagnosed pulmonary tuberculosis (TB) patients where their knowledge of TB before and after health education was recorded and their health status during the first three months of the treatment was assessed to

measure the effect. His study revealed a statistically significant difference in the total health status scores of patients, after receiving intensive health education between 1st and 30th day, 30th and 60th day, 60th and 90th day, and 1st and 90th day, higher mean post-test knowledge scores, and a highly significant association between sputum conversion and adherence to treatment. Unsuccessful outcome as death, lost-to-follow up, treatment-failure, or not-evaluated and successful outcome as a patient cured or completed-treatment.

Table 4.6: Odds Ratio results summary for patients related factors

TB Treatment outcome					
Patient related factors	**Treatment Outcome**		**Odds Ratio**	**CI (95%)**	**p. value**
	Successful	**Unsuccessful**			
Times Treated					
Twice	86%	14%	1.333	0.21-3.65	0.347
More than twice	100%	0%	1.993	0.7-5.5	0.684
Unknown	67%	33%	0.275	0.24-3.69	0.328
Once	88%	12%	Referent		
Smoke Cigarette					
Yes	76%	24%	0.579 (1.73)	0.26-2.28	**0.006**
No	97%	3%	referent	referent	referent
Drink Alcohol					
Yes	76%	24%	0.307 (3.26)	0.139-3.678	**0.003**
No	98%	2%	Referent	referent	referent
Health education					
Yes	85%	15%	1.716	0.35-2.48	0.365
No	93%	7%	Referent	referent	referent
Psychosocial support					
Yes	96%	4%	4.08	2.00-8.32	**0.000**
No	70%	30%	Referent	referent	referent
Knowledge of illness					
Yes	91%	9%	1.98	0.17-2.47	0.21
No	52%	48%	Referent	referent	referent

Source: Survey 2018

4.6 Health care worker related factors

Table 4.7: Health care worker related factors summary results

Healthcare worker related factors	Successful	Un-successful	Frequency	Percentage	X^2	df	p-value
Friendly service providers							
Yes	228 (90%)	26 (10%)	254	95.8	28.97	1	**0.001**
No	5 (45%)	6 (55%)	11	4.2			
Clinic time convenience							
Yes	212 (91%)	21 (9%)	233	87.9			
No	21 (66%)	11 (34%)	32	12.1	36.984	1	0.**001**
Waiting time							
Less than 5 minutes	91(87.5%)	13(12.5%)	104	39.2	39.167	3	0.549
Between 5- 10 minutes	75 (93%)	7 (7%)	81	30.6			
Between 10-30 minutes	75(92.6%	6(7.4%)	69	26			
More than half an hour	10 (91%)	1 (9%)	11	4.2			
Last time HWC training							
6 months	221 (91%)	21 (9%)	242	91.3	32.352	1	0.**001**
6-12 months	12 (52%)	11 (48%)	23	8.70			**0.001**

No – Number, % - Percentage, X^2 – Chi square; df – degrees of freedom; p – level of significance; $p \leq 0.05$ indicates the relationship is significant.

Majority 95.8% of the respondents indicated that there were friendly service providers while 4.2% (11) of the respondents indicated that there were no friendly service providers. There was significant association between outcome of the TB treatment and the service provision (X^2 =28.97; df = 1 and p-value = p-value = 0.001). Majority 87.9 % of the respondents indicated yes for the clinic time convenience while 12.1% (32) of the respondents indicated No for the clinic time convenience. There was significant association between outcome of the TB treatment and time convenience (X^2 =36.94; df = 1 and p-value = 0.001).

Several responses were also recorded regarding the clinic day. One of the FGD participants agreed that the clinic has some special arrangements to treat those who have TB. She said that:

"The clinic normally opens from 8.30 to 12.00 pm on Thursdays, those who come late are also served before 4.00 pm when dispensary close for the day. Special arrangements are made for those who require TB drugs early before 8.00 am on Tuesday when the clinic closure extended up to 8.00 pm because of patients collecting HIV drugs."

Other participants from Bamburi healthcare agreed that:

"Clinic days are on Thursdays between 8.30 am to 4.00 pm, the timings are convenient for most of our patients except Matatu touts and their drivers who are always in a hurry as they drop their appointment cards and disappear. Sometimes they fail to follow daily drug dosages and end up being lost to follow up. There are also cases of death among this population due to poor drug adherence. We need to have a discussion about how to support this category of patients, may be having rescheduling their clinic times to lunch hour when they are taking a break."

Similarly, a participant from Ganjoni dispensary noted there are arrangements for clinic days. He said that:

"*Yes, it's on Mondays, between 8.00 am to 2.00 pm. The timing is convenient for most of the patient except a few industrial workers who prefer very early in the morning 7.00 am and truck drivers late in the evening at 6-7.00 pm. Street families usually don't have time as they skip clinics very often."*

Majority 39.2% of the respondents indicated that the waiting time was less than 5 minutes' providers while 30.6% (11) of the respondents indicated between 5-10 minutes. There was no significant association between outcome of the TB treatment and waiting time (X^2 =39.167; df = 3 and p-value = 0.549). Majority 91.3% of the respondents indicated that their health workers were trained in the last 6 months while 5.7% (15) of the respondents indicated that there were trained in the last 6 to 12 months. A small number 8 (3%) of the respondents indicated that they are never trained There was significant association between outcome of the TB treatment and HWC training (X^2 =32.352; df = 2 and p-value = 0.001).

In the FGD, one of the FGD participants gave a genuine revelation about the staff involvement in managing TB patients. He said that:

"Only two, one of them supported by a partner. The rest of health care workers are not well orientated on management of TB patients. When both health care workers are engaged elsewhere as it occurs sometimes when there is a training, there is usually huge gap in documentation of TB registers."

Other participants from Chaani dispensary revealed a good number of involvements. He noted that:

"Three health care workers are directly involved in TB patient's management at the facility one being a community volunteer who closely monitors the patients."

Additionally, these views contrasted those of participant from Ganjoni dispensary who revealed a community volunteer as the manager. She said that:

"The dispensary has assigned a community volunteer to provide TB services, the other health care workers are less engaged in providing the continued care apart from the laboratory which helps in diagnosis and follow up lab tests. There is need to train more health workers to support management of TB."

Several responses were given regarding training. Most of them revealed that there is no regular training. One of the participants from FGD said that:

"There is no schedule for capacity building for any diseases, planning normally done at national level and the last one was done 2014, only one person from the facility attended. Currently most staff are new and have never been trained on TB management."

Another participant from Bamburi healthcare noted that:

"The last training was 2 years ago and we feel this is inadequate, after all its only one person who is usually selected for such training and most of the clinical staff at this facility have never been trained on current management of patients."

Additionally, it was noted that training in Chaani dispensary was held a year ago. The participant from FGD revealed that:

"One year ago, when two health care workers attended pediatric TB training. We feel there is a gap in diagnosis patients early enough by training all health care workers including those in outpatient's department who are the first line of contacts to all presumptive TB patients. Sometimes delay in diagnosis is caused by the health care worker because of not suspecting TB."

Table 4.8: Odds Ratio summary results for healthcare worker related factors

HWC factors	Treatment Outcomes		Odds Ratio	CI (95%)	p. value
	Successful	Unsuccessful			
Friendly service providers					
Yes	90%	10%	14.692	0.97-15.128	**0.040**
No	45%	55%	referent	referent	referent
Clinic time convenience					
Yes	91%	9%	2.879	0.703-11.793	**0.020**
No	66%	34%	referent	referent	referent
Waiting time					
Less than 5 mins	85%	15%	1	0.10-3.435	0.132
between 5 mins and 10 mins	93%	7%	1	0.10-2.22	**0.038**
between 10 mins and 20 mins	86%	14%	1	0-1.8	0.063
more than half an hour	91%	9%	Referent	referent	referent
HCW training					
Less than 6 months	91%	9%	3.116	0.7 -3.93	**0.004**
6 - 12 months	52%	48%	1.011	0.1 -2.22	0.003
More than a year	0	0	referent	referent	referent

Table 4.8 shows that respondents who are attended by friendly service providers are 14.692 times more likely to get successfully treatment outcome as compared to those who are attended by unfriendly service care providers (OR-14.692, 95% CI, 0.97 to 15.128). Additionally, it was revealed that patients who encountered convenience clinic time are 2.879 times more likely to get successfully treatment outcome as compared to those who did not (OR-2.879, 95%CI, 0.703 to 11.793).

The results also revealed that patients who waited for 5 mins or 5 to 10 mins or 10 to 20 mins have equal chance of being cured compared to those who waited for more than half an hour (OR-1, 95% CI, 0.10 to 3.435, 0.10 to 1.22, 0 to 1.8). Similarly, patients who encountered very friendly, friendly, indifferent and very unfriendly healthcare workers had equal chance to get cured of their TB (OR-1, 95% CI, 0). The results also revealed that patients who visits hospitals where health workers are trained in less than 6 months are 3.116 times more likely to get successfully treatment outcome as compared to those who visits hospitals where health workers last training was more than a year (OR-3.116, 95% CI, 0.703 to 3.93). Additionally, those who visits hospitals where training is between 6 to 12 months are 1.011 times more likely to get successfully treatment outcome as compared to those who visits hospitals where training was done more than a year (OR-1.011, 95% CI, 0.1 to 2.22).

Convenience of clinic time provides TB patients an opportunity to access services from health outlets. Takarinda, et al. (2012) described convenience of clinic time as a factor more related to patients' willingness and consciousness to adhere to treatment more than a factor related to health care management. In a cross-sectional study conducted in Zimbabwe, Tukarinda, et al confirmed that convenience of treatment time enhanced high positive TB treatment outcomes while Obwoge, et al (2016) documented cases of non-adherence to TB treatment in Baringo, Kenya to include cases of patients' characteristics that culminated to inconvenience in attending clinic. These cases were attributed to either socio-cultural or economic setup which rendered patients' attention diverted to other activities. In the case of Mombasa County, convenience of clinic time could be attributed to comparative time that patients had outside their critical economic activities or simply due to laxity as Obwoge, et al (2016) documented. The results of the regression procedure somehow demonstrate that health care workers' arrangements on clinic access time for TB patients was unfavorable and therefore had issues on their treatment outcomes.

4.7 Health facility related factors association with TB treatment outcome

Table 4.9: Summary statistics for health facility related factors

Institutional factors	Successful	Un-successful	No	Percentage	X^2	df	p-value
Stock out of anti-tb drugs							
Yes	18(100%)	0	197	74.3	48.911	2	0.**001**
No	215(87%)	32(13%)	32	12.1			
I don't know	0	0	0	0.00			
Supervision							
Monthly	172(87.3%)	25(12.7%)	160	60.4	7.425	2	0.492
Once in three months	32(100%)	0	82	30.9			
Never	29(80.6%)	7(19.4%)	23	8.7			

No – Number, % - Percentage, X^2 – Chi square; df – degrees of freedom; p – level of significance; $p \leq 0.05$ indicates the relationship is significant.

4.7.1 Stock out of anti-TB drugs

Majority 74.3% of the respondents indicated there is situations of stock out of anti-TB drugs while 12.1% of the respondents indicated that there is no situation of stock out of TB drugs. The was significant association between stock out of anti-TB drugs and treatment of TB outcome (X^2 =48.911; df = 2 and p-value = 0.001).

A participant from the FGD said that:

"Drugs are not issued based on the order sent, this has led shortage of some TB drugs sometimes back."

Other participants echoed that view by saying that: "No stock out at all."

However, another respondent said that they experienced stock out of drug for specific medicine. He revealed that:

"Yes, we experience stock out one of pediatric TB medicines (Ethambutol 100mg) which last one day, and Levofloxacin for treatment of DR TB. But mostly drugs are available when ordered."

Majority 60.44% of the respondents indicated there is monthly supervision while 30.9% of the respondents indicated that supervision is once in a while and 8.7% of the respondents indicated that there was no supervision at all. There was no significant association between supervision and treatment of TB outcome (X^2 =7.425; df = 2 and p-value = 0.492). Findings from the FGD showed that institutional continuous medical education was not necessary. One respondent said that:

"It's only done for purposes of giving feedbacks after an individual attends a training or sensitization meetings. There are no schedules, only done when necessary."

Another response from Chaani FGD confirmed the necessity. She revealed that:

"There are no scheduled CME'S but the last one done a month ago."

A respondent from Bamburi health centre gave a differing view. He said that:

"We normally organize for feedback meetings after a staff goes for training or sensitization meeting on Wednesdays and 3rd week of every month to get updates."

Table 4.9: Odds Ratio for health facility related factors

Institutional factors	Treatment Outcomes		Odds ratio	CI (95%)	Sig.
	Successful	Unsuccessful			
Stock out of drugs					
Yes	100%	0%	0.511	0.11-2.375	**0.003**
No	87%	13%			
Supervision					
Monthly	87%	13%	2.433	0.72-4.143	0.411
Once in while	100%	0%	1.432	0.31-3.12	0.231
Never	81%	19%	referent	referent	referent

Table 4.9 shows that stock out of drugs is 0.511 times less likely to result to get successfully treatment outcome as compared to stock with drugs (OR-0.511, 95% CI, 0.11 to 2.375). The results further reveal that monthly supervision is 2.433 times more likely to result to get successfully treatment outcome as compared to no

supervision at all (OR-2.433, 95% CI, 0.72 to 4.142). Similarly, once in a while supervision is 1.432 times more likely result to get successfully treatment outcome as compared to no supervision at all (OR-1.432, 95% CI, 0.31 to 3.12).

Health services in Mombasa County are part of an institutional framework which is governed through focused resource mobilization along with logistic arrangements that must respond to health standards worldwide. Lack of these standards would therefore be a loophole for sub-standard outcomes on the overall health sector, TB treatment being among them.

Stock out duration is an institutional factor highly correlated with adherence to treatment and by extension, TB treatment outcome (WHO, 2013). WHO (2013) outlines stock out duration is a situation that predisposes patients to poor treatment adherence which has a high positive impact on drug resistance and resultant poor treatment out comes. This was not the case with the Mombasa County patients where stock out duration demonstrated through patient follow up probably due to borrowing from near facilities to mitigate the undesirable treatment outcomes. Stock out duration studies in South Africa by Roux, (2015) also confirmed high positive implications with poor treatment outcomes but mainly for HIV and AIDS.

CHAPTER FIVE

DISCUSSUONS, CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the major findings of this study particularly on the factors that influence outcome of tuberculosis treatment in Mombasa County. In addition, it provides a direction for further studies as well as giving some recommendations for policy making by the relevant authorities.

5.1 Discussion of Findings

5.1.1 Patient level/related factors

The first objective of the study was to determine patient-related factors associated with TB outcomes. From the findings, the number of times treated for TB had a significant association with TB treatment outcome (X^2 = 31.955; df = 3 and *p-value* = 0.001). This is in contrast to a study done by Wohlleben et al. (2017) in Tajikistan where previously treated patients were found to be at high risk of loss to follow up. The findings also showed that the association between cigarette smoking and outcome of the TB treatment was significant (X^2 = 44.102; df = 1 and *p-value* = 0.001). It was also found that the association between drinking alcohol and outcome of the TB treatment was significant (X^2 = 53.46; df = 1 and *p-value* = 0.001). Moreover, the results showed that the association between health education and outcome of the TB treatment was significant (X^2 = 10.854; df = 1 and *p-value* = 0.028). This concurs with Tang (2013) who found that adverse drug events are prognostic factors for poor outcomes among TB patients in China. The association between psychosocial support and outcome of the TB treatment was also found to be significant (X^2 = 45.982; df = 1 and *p-value* = 0.001). The findings agree with Lalor et al. (2013) who found that recovery from TB is positively influenced by psycho social support. The research findings further showed that the association between knowledge of illness and outcome of the TB treatment was significant (X^2 = 44.102; df = 1 and *p-value* = 0.001). This is in line with findings by Fatigegun *et al.,* (2009) who established that the level of knowledge on the TB disease influences whether or not patient chooses to complete treatment. Additionally, the association between

side effects and outcome of the TB treatment was significant (X^2 = 42.577; df = 1 and *p-value* = 0.001). The association between stigma and outcome of the TB treatment was not significant (X^2 = 5.637; df = 1 and *p-value* = 0.228). The findings agree with another retrospective study carried in Maryland among tuberculosis patients with co-morbidity and established that diabetes is a major risk factor for death among TB patients and (Dooley *et al.*, 2015)

5.1.2 Health care worker related factors

The second objective of the study was to determine health care worker related factors associated with TB outcomes. The findings showed that there was significant association between outcome of the TB treatment and the service provision (X^2 =28.97; df = 1 and p-value = p-value = 0.001). This agrees with Miller (2017) that communication between the client and the service providers are critical component of health care as it helps to develop trust and create good doctor and patient relationships

The findings further showed that there was a significant association between outcome of the TB treatment and time convenience (X^2 =36.94; df = 1 and p-value = 0.001). This is in line with the findings by Nour and Mohsen (2013) that Service-related factors are strongly associated with loss to follow up among TB patients. Long waiting times, poor physician patient communication, fear of information leakage are associated with high rate of defaulters among co-infected patients Moreover, the findings showed that there was no significant association between outcome of the TB treatment and waiting time (X^2 =39.167; df = 3 and p-value = 0.549). The findings further showed that there was significant association between outcome of the TB treatment and HWC training (X^2 =32.352; df = 2 and p-value = 0.001).

5.1.3 Health facility related factors

The third objective of the study was to determine the health facility related factors associated with TB outcomes. The study findings showed that Majority 74.3% of the respondents indicated there is situations of stock out of anti-TB drugs while 12.1% of

the respondents indicated that there is no situation of stock out of TB drugs. There was a significant association between stock out of anti-TB drugs and treatment of TB outcome (X^2 =48.911; df = 2 and p-value = 0.001). The findings align with that of Audu et al. (2017) who established that late provision of Anti-Tuberculosis drugs leads to poor TB management. The findings further showed that there was no significant association between supervision and treatment of TB outcome (X^2 =7.425; df = 2 and p-value = 0.492). Atif (2018) also found that supervision has a positive and significant influence of TB treatment outcome. The findings concur with that of Jirongo (2013) who found that hospital management is critical in management of tuberculosis. Hospital management facilitates care, recognition and coping with treatment problems and therefore, the management approaches are vital in ensuring successful construction of tuberculosis cure and prevention procesess.

5.2 Summary of Major Findings

This study was based on three objectives and the following is a summary

5.2.1 Patient related factors

The results give evidence that among the patient related factors, cigarette smoking, drinking alcohol, access to health education, previous history of TB treatment, psychological support and distance to health facilities had significant association with the TB treatment outcome. These results provide empirical evidence on the critical issues that resources can be directed to in order to improve TB burden in the County of Mombasa. This was supported by odds ration results which revealed that patients who smoke cigarette are less likely to get cured as compared to those who don't smoke cigarette (OR 0.579, 95% CI, 0.26 to 2.28). Additionally, patients who drink alcohol are less likely to get cured of TB as compared to those who don't drink alcohol (OR 0.307, 95% CI, 0.139 to 3.678). The results also revealed that patients who are educated about health are more likely to cure of TB than patients who are not (OR 1.716, 95% CI, 0.35 to 2.48). More so, patients who receive psychosocial support are more likely to get cured than those who don't receive psychosocial support (OR 4.08, 95% CI, 2.00 to 8.32).

5.2.2 Health Care Workers related factors

For health care related factors, convenience of clinic time was the only critical issue that had a severe impact on TB treatment outcomes. This by extension implies that an operational framework needs to be put in place to address this problem as a way to enhance access to TB treatment or general health care. This was supported by the OR results which revealed that respondents who are attended by friendly service providers are more likely to get cured of their TB compared to those who are attended by unfriendly service care providers (OR 14.692, 95%CI, 0.97 to 15.128). Additionally, it was revealed that patients who encountered convenience clinic time are more likely to get cured of their TB compared to those who did not (OR 2.879, 95% CI, 0.703 to 11.793).

Additionally, patients who waited for 5 mins or 5 to 10 mins or 10 to 20 mins have equal chance of being cured compared to those who waited for more than half an hour (OR 1, 95%CI, 0.10 to 2.435, 0.10 to 2.22, 0 to 1.8). Similarly, patients who encountered very friendly, friendly, indifferent and very unfriendly healthcare workers had equal chance to get cured of their TB (OR 1, 95% CI, 0). The results also revealed that patients who visits hospitals where health-workers are trained in less than 6 months are more likely to get successful outcomes as compared to those who visits hospitals where health workers last training was more than a year (OR 3.116, 95% CI, 0.703 to 3.93). Qualitative analysis supported the findings of quantitative analysis in that many respondents argued that distance and lack of support from health practitioners as the main cause of lower chances of successful outcomes.

5.2.3 Institutional factors

Drug stock-out was significant institutional factor to successful TB treatment outcome. This could be explained on the basis that drugs could alternately be accessed if patients went to other alternate health outlets. However, viewed from a village perspective, drug stock out demonstrated a need for attention in order to uphold/enhance TB treatment outcome. Stock out duration is an institutional factor highly correlated with adherence to treatment and by extension, TB treatment

outcome (WHO, 2013). WHO (2013) outlines stock out duration is a situation that predisposes patients to poor treatment adherence which has a high positive impact on drug resistance and resultant poor treatment outcomes.

The results reveal that monthly supervision is more likely to result to successful treatment outcomes as compared to no supervision at all (OR 2.433, 95% CI, 0.72 to 4.142). Similarly, once in a while supervision is more likely result to successful treatment outcomes as compared to no supervision at all (OR 1.432, 95%CI, 0.31 to 3.12). This was supported by some of the qualitative findings which revealed that out of stock of drugs such as paediatric was a common reason for treatment failure.

5.3 Conclusions

Based on the findings of the study, the study therefore, conclude that Patient related factors, Health Care Workers related factors and Institutional factors are significant factors that influence the outcomes of TB among TB patients in Mombasa County. Specifically, among the patient related factors, times treated for TB, cigarette smoking, drink alcohol, health education, psychosocial support, knowledge of illness and side effects were concluded to be the factors that affect successful TB outcomes among TB patients. That is, the less the patient smokes cigarette, drinks alcohol the more the patient outcomes are likely to be improved. In addition, patients who are treated more often, and those who are enlightened about their health are more likely to recover from TB. Therefore, It is worth noting that the patient needs to be aware of the patient related factors in order to minimize the risk that are associated with them.

Likewise, it was concluded that for positive effects on the TB outcomes among TB patients, such factors as friendly service providers, clinic time convenience, short waiting time as well as health worker training contribute significantly. These factors help in the process of treatment of the TB patients both physically and psychologically. In conjunction with the above, the availability of drugs in stock, shorter duration of stock out of anti-TB drugs and frequent hospital and patient supervision contributes to the recovery of the TB patients. And thus, the institutional

factors have been acknowledged and concluded to play a pivotal role in the outcomes of TB patients.

5.4 Recommendations

The study gives an impetus to propose categorical efforts in addressing patient related factors such as enhancing further awareness on treatment adherence, differentiated care for high-risk patients and imposition of penalties to habitual treatment defaulters to minimize risk of drug resistant TB. Institutional frameworks also need to be put in place to address distance to health centre issues, convenience of clinic time and drug stock out as a sure way of minimizing the sources of variation on TB treatment outcome.

Strengthening TB adherence counselling for patients treated for the first time to improve treatment completion. Counselling service should also be enhanced for patients taking alcohol and those smoking cigarettes as both are associated with less likelihood of completing TB treatment. Implementation of TB work place program through sensitization of company managers on the importance of TB treatment support to reduce chances of loss to follow as sighted by focused group discussions. Patients centred TB services should be provided by all facilities by focusing on the needs of the patients by agreeing on the best time to pick drugs to reduce the risk of loss to follow ups. The County should also develop the capacity of health care workers on TB management on regular basis to improve treatment outcomes.

5.5 Suggestions for Further Research

Since the health sector environment is delicate and presents new challenges, it will be important to replicate this study after duration of five years and establish the position as at that time. Further, this will provide a platform for comparison with other Counties in order to establish any relevant similarities and/or differences for enhanced health care improvement from the TB treatment perspective.

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APPENDICES

Appendix I: Consent form (English)

Hallo, my name is_____. I am student at Jomo Kenyatta University of Agriculture and Technology. I am here to investigate illness in the community. I have come here to conduct a study on factors that influence TB outcomes among patient with TB. I have a few questions to ask about how TB affects people and type of care you receive from our service providers. The main objective of this study will be to determine the factors that influence TB outcomes. The result of this study will assist the ministry of health to identify the gaps and thereby inform the policy makers on appropriate policy formulation. This study has been approved by the ministry of public health and sanitation. Am here to tell you more about this study answer any question and see if you would like to take part. The interview may take 10 minutes.

Procedures to be followed:

If you agree to take part in this study, there are few steps that I will take you through as shown below:

1: I will ask you some few questions related to TB disease

2: I may recommend you go for your routine follow up investigations to Lancet Kenya to assess how you are faring with your treatment.

Risk:

There is a small risk which could happen to you as a result of taking part in this study. You may feel concerned when asked about your TB disease or HIV status. You are free to answer or not answer any of the questions. It's upon you.

Benefit:

There are benefits to you if you choose to take part in this study. The information from this study will help us to better understand whether you are receiving quality

care according to the national guideline in the country. This will go a long way in fighting TB in Kenya.

Assurance of confidentiality:

All the answers you have provided will be handled with securely and will not be disclosed to anybody apart from the study investigators. All data collected will be handled confidentially and your identity will not be disclosed in any public reports or publications. The data will be stored in computer with password and hard copies will be kept in lockable cabinets.

Right to refuse or withdraw:

Your participation in this study is voluntary as a research subject and you may wish not to take part in this study at any time. If you do not wish to take part or withdraw later on you will continue to receive the normal health care from the facility, this will not be affected in any way.

Subject: If during the course of this study you have any questions concerning the nature this research you should contact Mr. Samson Kioko, County TB and Leprosy Coordinator Mombasa P.O BOX 90233, 80100, Mombasa. Telephone number: 0721 756935.

If in case you have a question concerning rights of participation, you should contact; The chairman, Pwani University ethical review committee, P.O. BOX 195-80108 Kilifi, Kenya.

Consent for participation in the study

I ..... have read/been read to the information shown above and had the opportunity to ask questions and all were answered satisfactorily. I hereby give consent for my participation as explained to me.

Appendix II: Consent form (Kiswahili version)

Hujambo, jina langu ni..... Mimi ni mwanafunzi wa chuo kikuu cha ukulima na tekinologia cha Jomokenyatta. Niko hapa kufanya uchunguzi wa ugonjwa katika jamii.Nimefika hapa kufanya utafiti kuhusu matokeo ya matibabu ya ugonjwa wa kifua kikuu na jambo ambalo linalosababisha. Nina maswali kadhaa kuhusu vile kifua kikuu kinaadhiri watu na aina ya huduma unayopata kutoka kwa wahudumu. Lengo kuu la utafiti huu ni kutambua sababu zinaathiri matokea ya matibabu ya kifua kikuu. Matokea la utafiti huu litasaidia wizara ya afya kutambua mapengo na kujulisha utengenezaji wa sera. Utafiti huu umekubaliwa na wizara ya afya ya uma na mazingira. Nikohapa kuelezea mengi kuhusu utafiti huu, Jibu swali lote na uone kama unaweza kujihusisha katika utafiti huu. Mahojiano yatachukua dadika kumi.

Mpangilio ya kufuata

Ukikubali kujihusisha na utatifi huu kunamaelezo machache yafuatayo, yatakayo kuelekeza hapa chini: Nitakuuliza maswali kadhaa kuhusu ugonjwa wa kifua kikuu.

Athari

Kuna athari ndogo inaweza kuibuka kutokana na kujihusisha na utafiti huu. Unaweza hisi na kuwa na hofu ukiulizwa maswali kuhusu ungonjwa wa kifua kikuu na ukimwi. Ukohuru kujibu au kutojibu swali lolote, kulingana na wewe.

Faida

Kunaumuhimu ukichagua kushiriki kwa utafiti huu. Maelezo kutokana na utafiti huu utasaidia kuelewa vizuri kama unapata huduma ya hali ya juu kulingana na sera ya matibabu ya kitaifa. Hii itawezesha kupambana na ugonjwa wa kifua kikuu nchini Kenya.

Udhibitisho wa siri ya ubinafsi

Yale majibu yote ulipeana yatashughulikiwa vilivyo na hakuna siri itakayo tolewa isipokuwa mhusika wa utafiki. Ripoti yote itashughuliwa kwa umakini na majiwa yako haitolewa kwa ripoti ya umma. Ripoti itahifadhiwa katika tarakilishi ambayo imethibitiwa and waraka litawekwa katika dawati ambalo litafungwa.

Haki ya kukataa au kujiondoa

Kushiriki kwako katika utafiki huu ni hiari na unaweza amua kutoshiriki wakati wowote. Ukiamua kutoshiriki au kujiondoa baadaye utaendelea kupata matibabu ya kawaida katika zahanati zetu.

Muhusika: Ukiwa na maswali yoyote ukiendelea kushiriki katika utafiki huu utawasiliana na Bwana Samson Kioko, Mkuu wa kaunti wa ugonjwa wa kifua kikuu na ukoma Mombasa, sanduku la posta 90233 – 80100. Nambari ya simu- 0721 756935

Kama utakuwa na maswali yeyote kuhusiana na haki ya kushiriki, utawasiliana na; mwenyekiti, chuo kikuu cha pwani kamati ya maadili, sanduku la posta 195-80108, Kilifi, Kenya.

Idhini ya kushiriki katika utafiti

Mimi..... nimesoma au nimesomewa maelezo yalionyeshwa hapo juu na nimekuwa na fursa ya kuuliza maswali na kujibiwa yote nikatosheka. Ninapeana idhini ya kushiriki kama nilivyoelezwa.

Appendix III: Questionnaire

TO DETERMINE FACTORS ASSOCIATED WITH TB OUTCOMES AMONG TB PATIENTS IN MOMBASA COUNTY

Date of interview.....

Interviewer.....

Section A: PATIENT DEMOGRAPHICS

1. Patient study ID: ..... 2: TB zone: .....

3: TB treatment centre: ..... 4: Patient name: .....

5: Physical address:.....

6: Types of patient: ..... 7: Date of diagnosis: ..... 8: Date started treatment:.....

9. **Treatment outcome……**

9: What is your age?

15 – 19 Yrs	☐	20 – 24 Yrs	☐
25 – 29 Yrs	☐	30 – 34 Yrs …	☐
35 – 39 Yrs		40 – 44 Yrs	
45 - 49 Yrs	☐	50 – 54 Yrs	☐

55 – 59 Yrs ☐ 60 – 64 Yrs ☐

> 65 Yrs ☐

10: Gender

Male ☐

Female ☐

11: Marital status

Married ☐ Single/Never married ☐

Divorced/Separated ☐

Others

(Specify.....)

12: What is your level of education?

Primary school ☐

High school ☐

Tertiary/University education ☐

No formal education ☐

13. Religion

Christianity ☐

Islam ☐

Hindu ☐

Others, specify .....

14. What is your occupation?

Farming ☐

Fishing ☐

Business ☐

Casual labourer ☐

Salaried employment ☐

Others.....
.....
.....

15: Level of earning

Ksh 0 – 5,000 ☐ Ksh 5,0001 – 10,000 ☐

Ksh 10,001-15,000 ☐ Ksh 15,001- 20,000 ☐

Ksh > 20,000 ☐

16: Housing

Permanent ☐ Semi-permanent ☐

Temporary ☐

17: Main type of wall material and main dwelling

Stone ☐ Mud/Wood ☐

Mud/Cement ☐ Tin ☐

☐

Corrugated iron sheets	☐	Brick/Block	
Grass/Reeds	☐	Wood only	☐
Others	☐		

18: Household size

1-2 household members'	☐	3-4 House hold members	☐
>4 house hold members	☐		

19: What is the size of the room

1-2 rooms	☐	3-4 rooms	☐
>4 rooms	☐		

20: Who do you live with

Family	☐	Friends	☐
Alone	☐	Others	☐

Section C: Patient level factors

21. How many times were you treated for TB before (duration > 1 month?)

One	☐
Two	☐
More than twice	☐
Unknown	☐

22. If lost to follow up, why did you stop the treatment?

.....

.....

.....

.....

23. Have you ever smoked cigarette?

Yes ☐

No ☐

24. If yes how many packets of cigarettes do you smoke per day on average?

Do not smoke ☐

Less than one pack per day ☐

More than one pack per day ☐

(Packs refers to 20 sticks of cigarette) ☐

25. Have you ever drunk alcohol? ☐

Yes ☐

No ☐

26. If yes for how long were you a drinker or for how long were you drinking ☐

27. Were you offered health education when you started TB treatment? ☐

Yes ☐

No ☐

28. Are you suffering from any chronic illness? ☐

Yes

No

If yes specify .....

29. Do you get any psychosocial support from family and friend during the time of TB

Treatment?

Yes

No

30. Do you have someone who reminds and ensures that you take your TB medicines on

daily basis?

Yes

No

31. Do you know what illness you are suffering from?

Yes

Don't know

32. What is the duration of TB treatment?

Less than two months

Between two to five months

Six to Eight months

Don’t know

33. Did you ever experienced drugs related side effects after starting TB treatment?

Yes ☐

No ☐

34: Did you inform your family or friends that you are treated for TB?

Yes ☐ No ☐

35. Do you feel uncomfortable when you take your TB medicine in front of your family

members, friends or relatives?

Yes ☐

No ☐

36. Have you ever taken the following drugs

Heroine ☐

Cocaine ☐

Hashish ☐

Bang ☐

37. How far is the TB treatment centre from where you stay?

Less than 2.5 km ☐

Between 2.5 to 5 km ☐

More than 5 km ☐

Health care worker related factors

38. How would you rate the attitude of staff who attended you at health facility"

Very friendly ☐ Indifferent ☐

Friendly ☐ Unfriendly ☐

Very unfriendly ☐

39. Is the clinic day and time convenient for you?

Yes ☐

No ☐

40. How long do you wait before you are given TB medicine?

Less than 5 minutes ☐

Between 5- 10 minutes ☐

Between 10-20 minutes ☐

More than half an hour ☐

Institutional factors

41. When was the last time the health care workers were trained or sensitized on TB?

Less than six months ago ☐

Six to twelve months ago ☐

More than one year ago ☐

42. Has the facility experienced stock out of anti-TB drugs over the last one year?

Yes ☐

No ☐

43. If yes, for how long did the stock out last? ☐

44. How often do you receive supervision from Sub County or County level?

Every month ☐

Once in a quarter ☐

Once in a year ☐

More than one year ☐

Never supervised ☐

Appendix IV: Questionnaire for key informant

Facility in charge/Medical superintendent

Facility level factors

Q1: What challenges do you face in tuberculosis care and control in this facility?

Q2: Does the facility have established regular clinic days for tuberculosis patients?

Q3: How many staffs are directly involved in management of patients with Tuberculosis?

Q4: Are health care workers trained on tuberculosis management?

Q5: When was the last training or continuous medical education done at this hospital?

Q6: Have you ever experienced shortages anti-TB drugs in the last one year?

Appendix V: Questionnaire for focused group discussion (TB focal persons and community volunteers)

Q1: What are contributing factors to un-successful TB treatment outcomes?

Q2: Are the clinic days and opening hours convenient for TB patients?

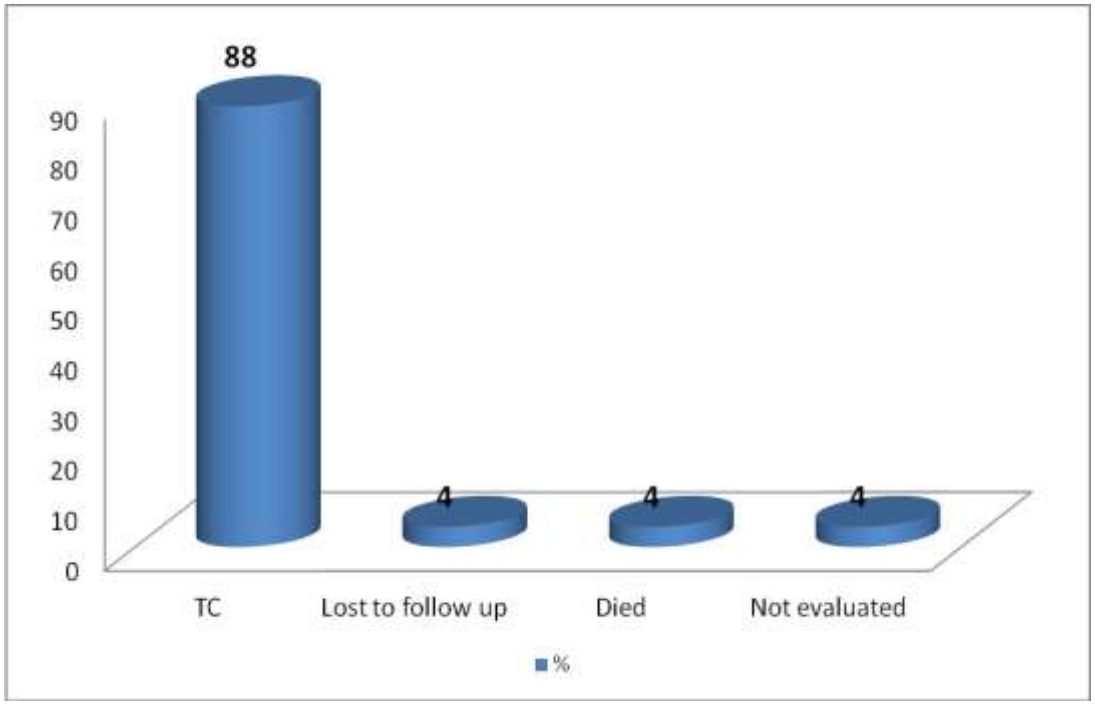
Q3: Are all facility staff involved in management of TB patients?

Q4: Do health care workers receive TB trainings?

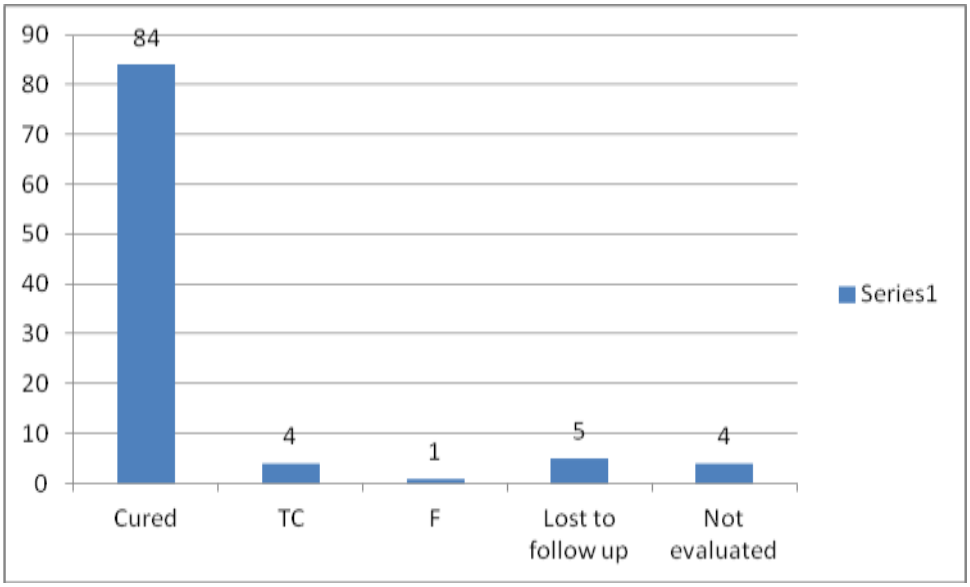
Q5: Are continuous medical educations done at facility level to update health care workers?

Q6: Have you experienced stock out of TB drugs in the last one year?

Appendix VI: TB outcomes for 5,227 patients registered in 2012 Mombasa county

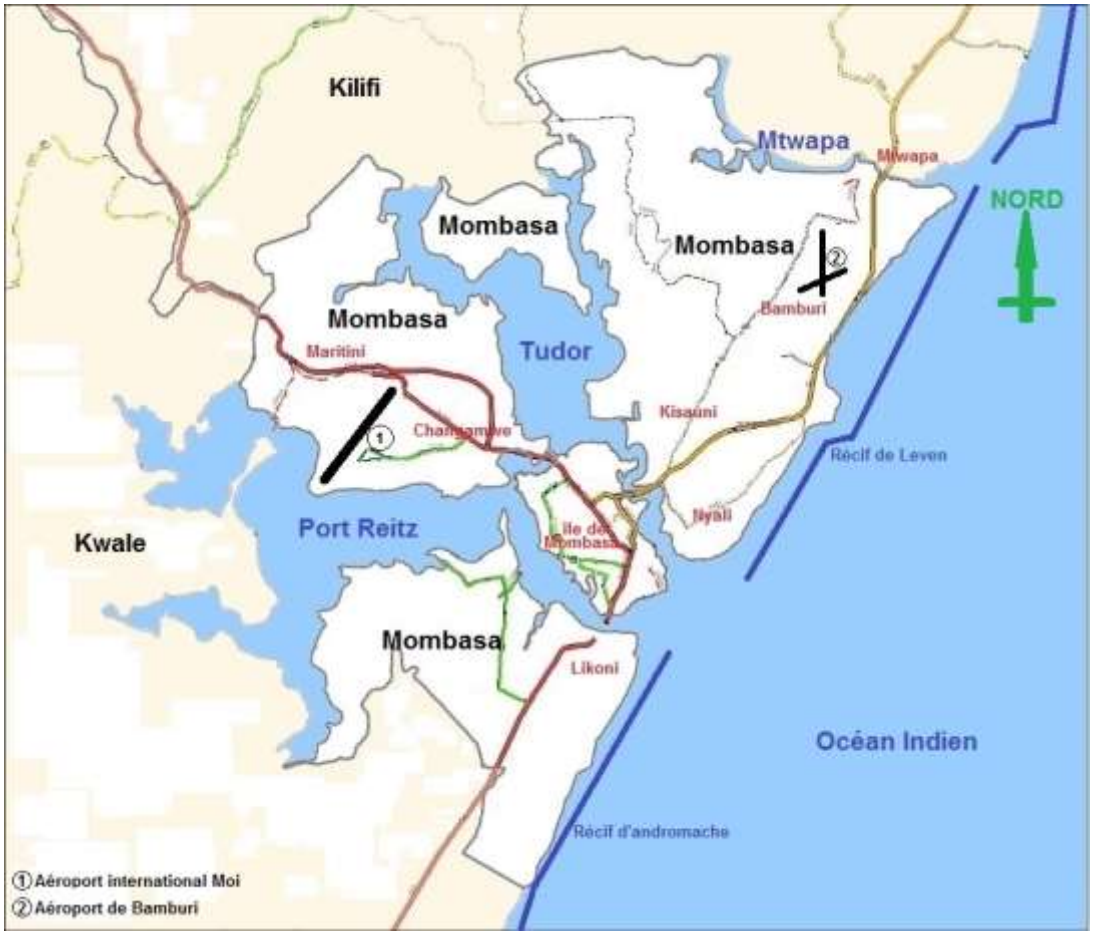


Appendix VII: Cure rates for 2,210 new smear positive TB patients registered in 2012 in Mombasa County.



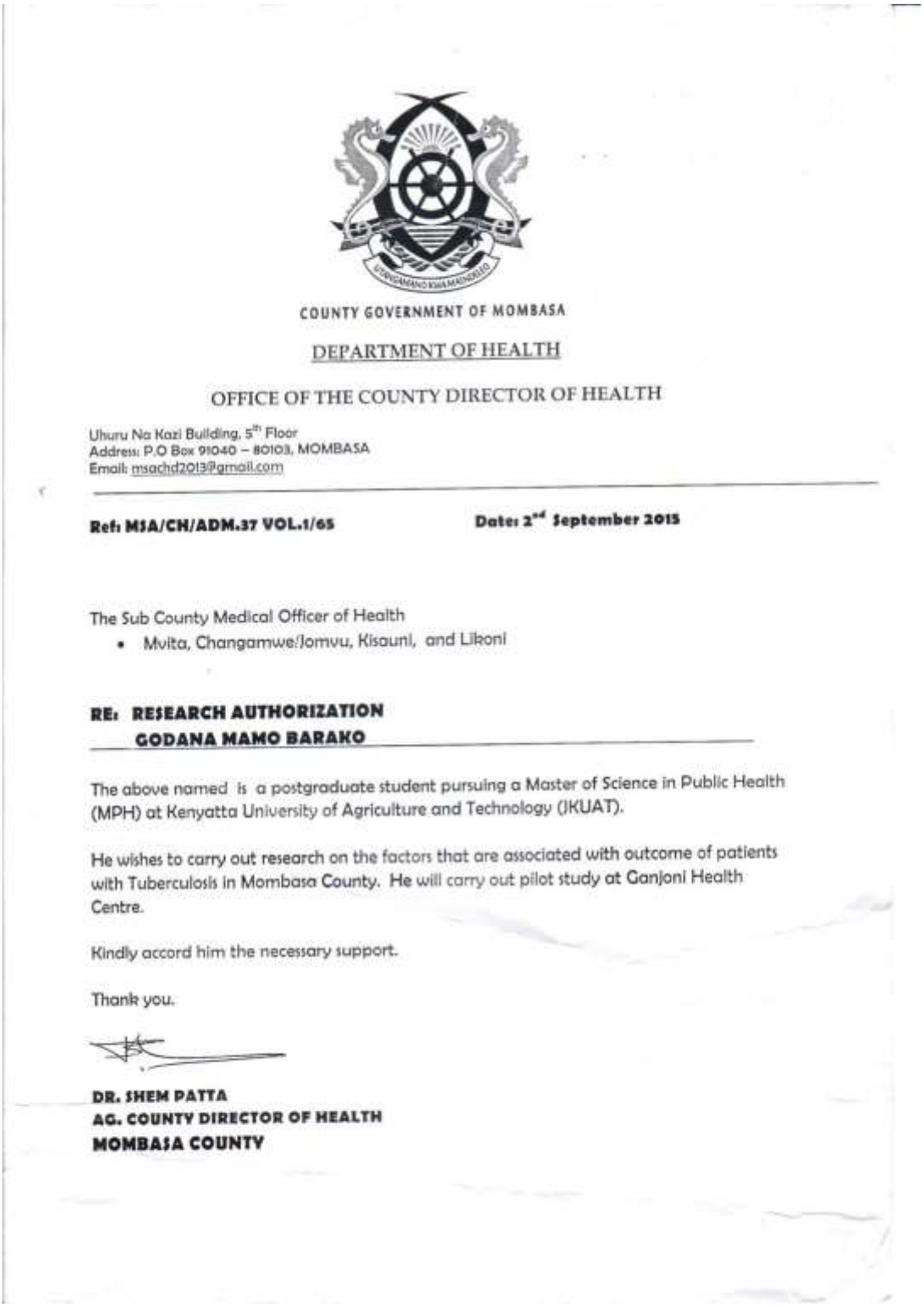
Source: TIBU system accessed 8th Novermber 2014.

Appendix VIII: Map of Mombasa County



Source Wiki media

Appendix IX: Letter of approval for piloting and data collection (County Government)



COUNTY GOVERNMENT OF MOMBASA

DEPARTMENT OF HEALTH

OFFICE OF THE COUNTY DIRECTOR OF HEALTH

Uhuru Na Kazi Building, 5th Floor
Address: P.O Box 91040 – 80103, MOMBASA
Email: msachd2013@gmail.com

Ref: MSA/CH/ADM.37 VOL.1/65 **Date: 2nd September 2015**

The Sub County Medical Officer of Health

- Mvita, Changamwe/Jomvu, Kisauni, and Likoni

RE: RESEARCH AUTHORIZATION
GODANA MAMO BARAKO

The above named is a postgraduate student pursuing a Master of Science in Public Health (MPH) at Kenyatta University of Agriculture and Technology (JKUAT).

He wishes to carry out research on the factors that are associated with outcome of patients with Tuberculosis in Mombasa County. He will carry out pilot study at Ganjoni Health Centre.

Kindly accord him the necessary support.

Thank you.

DR. SHEM PATTA
AG. COUNTY DIRECTOR OF HEALTH
MOMBASA COUNTY

Appendix X: Certificate of ethical review

NACOSTI ACCREDITED

ERC/MSc/012/2015

Pwani UNIVERSITY

ETHICS REVIEW COMMITTEE

ACCREDITTED BY THE NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION (NACOSTI, KENYA)

CERTIFICATE OF ETHICAL APPROVAL

THIS IS TO CERTIFY THAT THE PROPOSAL SUBMITTED BY:

GODANA M. BARAKO

REFERENCE NO:
ERC/MSc/012/2015

ENTITLED:
Determine the factors that are associated with outcome of patients with Tuberculosis in Mombasa County.

TO BE UNDERTAKEN AT:
MOMBASA COUNTY, KENYA

FOR THE PROPOSED PERIOD OF RESEARCH

HAS BEEN **APPROVED** BY THE ETHICS REVIEW COMMITTEE

AT ITS SITTING HELD AT PWANI UNIVERSITY, KENYA

ON THE 26th **DAY OF MAY 2015**

CHAIRMAN SECRETARY LAY MEMBER

PTO

Pwani UNIVERSITY
Ethics Review Committee,
Pwani University, www.pu.ac.ke, email: r.thomas@pwaniuniversity.ac.ke, tell: 0719 182218
The ERC: Giving Integrity to Research for Sustainable Development

NACOSTI ACCREDITED

Pwani UNIVERSITY

ERC/MSc/012/2015

NOTICE:

This decision is subject to the information available at the time of APPROVAL. The Committee may on its own motion and/or by application by a Party, review its decision on the grounds of discovery of new and important information which was not reasonably within its knowledge at the time of decision or on account of mistake or error apparent on the face of the record, or for any other sufficient reason, provided the researcher shall be given prior opportunity to be heard.

Pwani UNIVERSITY
Ethics Review Committee,
Pwani University, www.pu.ac.ke, email: r.thomas@pwauniversity.ac.ke, tell: 0719 182218.
The ERC, Giving Integrity to Research for Sustainable Development