

**FACTORS ASSOCIATED WITH INTERRUPTION OF
TUBERCULOSIS TREATMENT AMONG PATIENTS IN
NANDI COUNTY, KENYA**

ALFRED WANDEBA WANYONYI

**MASTER OF SCIENCE
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**JOMO KENYATTA UNIVERSITY OF
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**Factors Associated With Interruption of Tuberculosis Treatment
among Patients in Nandi County, Kenya**

Alfred Wandeba Wanyonyi

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DECLARATION

This thesis is my original work and has not been submitted to any other University.

Signature.....

Date.....

Alfred Wandeba Wanyonyi

This thesis has been submitted with our approval as the University supervisors,

Signature.....

Date.....

Prof. Hellen Lydia Kutima

JKUAT, Kenya

Signature.....

Date.....

Dr. Paul Mutebi Wanjala, Ph.D

University of Eldoret, Kenya

DEDICATION

I dedicate this thesis work to my family and friends. A special feeling of gratitude to my loving parents, the Late Jacob Wanyonyi Mulalu and Nancy Nawate Wanyonyi whose words of encouragement and push for tenacity ring in my ears. My last born brother the Late Corporal Jesse Francis Wanyonyi, whose death in Somalia while defending our country against Militia forever serves as a lesson on defending what we believe in. My other siblings the Late Elizabeth, Florence, Lorna, Joseph, Kennedy, David, Hellen, Jescah, Martin, Dennis, Maureen and Daniel for their support and encouragement during family meetings.

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TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
LIST OF APPENDICES	x
ABBREVIATIONS AND ACRONYMS	xi
DEFINITION OF TERMS	xiii
ABSTRACT	xiv
CHAPTER ONE	- 1 -
INTRODUCTION	- 1 -
1.1 Background information	- 1 -
1.2 Statement of the problem.....	- 4 -
1.3 Objectives	- 4 -
1.3.1 General objective	- 4 -
1.3.2 Specific objectives	- 5 -
1.4 Research questions.....	- 5 -
1.5 Justification	- 5 -
CHAPTER TWO	- 7 -
LITERATURE REVIEW	- 7 -
2.1 Introduction.....	- 7 -
2.2 Overview of TB epidemiology	- 7 -
2.2 Childhood TB	- 10 -
2.3 Determinants of TB infection	- 11 -
2.4 Determinants of interruption of TB treatment	- 14 -

CHAPTER THREE	- 18 -
MATERIALS AND METHODS	- 18 -
3.1 Study Area.....	- 18 -
3.2 Study design	- 20 -
3.2.1 Dependent variable.....	- 20 -
3.2.2 Independent variable	- 20 -
3.3 Study population	- 20 -
3.4 Inclusion criteria.....	- 21 -
3.5 Exclusion criteria.....	- 21 -
3.6 Sample size calculation	- 21 -
3.7 Ethical consideration	- 22 -
3.8 Sampling procedure.....	- 22 -
3.9 Pretesting of data collection tools	- 23 -
3.9.1 Validity.....	- 23 -
3.9.2 Reliability	- 23 -
3.10 Data collection.....	- 23 -
3.11 Data analysis	- 24 -
3.12 Expected application of results.....	- 25 -
3.13 Study limitations	- 26 -
CHAPTER FOUR	- 27 -
RESULTS	- 27 -
4.1 Univariate analysis	- 27 -
4.1.1 Socio-demographic characteristics.....	- 27 -
4.1.2 Patients’ diagnosis and follow up.....	- 32 -
4.2 Bivariate factor analysis	- 38 -
4.2.1 Patient factors	- 38 -
4.2.2 Disease related factors.....	- 40 -
4.2.3 Facility related factors	- 42 -
4.2.4 Knowledge, attitude and practices among TB patients	- 42 -

4.3 Stratified analysis	- 45 -
4.4 Multivariate analysis of factors associated with TB treatment interruption	- 45 -
CHAPTER FIVE	- 47 -
DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS	- 47 -
5.1 Discussion.....	- 47 -
5.2 Conclusions.....	- 56 -
5.3 Recommendations.....	- 57 -
REFERENCES	- 59 -
APPENDICES	- 73 -

LIST OF TABLES

Table 4.1: Socio-demographics of patients treated for TB in Nandi County by interruption status; 2014.....	- 28 -
Table 4.2: Other descriptive characteristics of patients treated for TB in Nandi County by interruption status, 2014	- 30 -
Table 4.3: Symptoms, side effects and reasons for interruption among patients treated for TB in Nandi County by interruption status, 2014.....	- 33 -
Table 4.4: Patient diagnosis and follow up among TB patients in Nandi County by interruption status, 2014	- 35 -
Table 4.5: Patients' sputum follow ups and outcomes among TB patients in Nandi County by interruption status, 2014	- 37 -
Table 4.6: Bivariate analysis of Patient factors among TB patients Nandi County, 2014.....	- 39 -
Table 4.7: Bivariate analysis of Disease related factors (Clinical status and Therapy) among TB patient in Nandi County, 2014	- 41 -
Table 4.8: Bivariate analysis of facility related factors among TB patients in Nandi County, 2014	- 42 -
Table 4.9: Bivariate analysis of Knowledge, attitude and practices among TB patients in Nandi County, 2014.....	- 44 -
Table 4.10: Stratified analysis of TB patients' smoking status in Nandi County by interruption status, 2014	- 45 -
Table 4.11: Unconditional Logistic Regression	- 45 -

LIST OF FIGURES

Figure 2.1: TB Global incidences, 2006.....	- 9 -
Figure 2.2: Risk factors for TB infection.....	- 13 -
Figure 3.1: Location and Map of Nandi County.....	- 19 -

LIST OF APPENDICES

Appendix 1: Stages of TB development.....	- 73 -
Appendix 2: Chest X-ray in pulmonary TB	- 74 -
Appendix 3: Classification of Drugs used in TB treatment.....	- 75 -
Appendix 4: Drugs used in MDR TB treatment.....	- 76 -
Appendix 5: Top 10 countries by TB incidence.....	- 77 -
Appendix 6: Paediatric TB score card.....	- 78 -
Appendix 7: New WHO recommended Pediatrics treatment regimen.....	- 79 -
Appendix 8: Risk factors for development of active TB following infection	- 80 -
Appendix 9: JOOTRH Ethics Review Board Approval	- 81 -
Appendix 10: Nandi County Health Department Clearance	- 82 -
Appendix 11: Informed consent Form	- 83 -
Appendix 12: Translation of Informed consent in Nandi Language	- 1 -
Appendix 13: Children's Assent form	- 5 -
Appendix 14: Translation of children's assent form to Nandi Language	- 7 -
Appendix 15: Parental permission form.....	- 9 -
Appendix 16: Translation of Parental permission in Nandi language.....	- 13 -
Appendix 17: Questionnaire.....	- 16 -
Appendix 18: Translated Patient questionnaire into Nandi Language	- 31 -
Appendix 19: Paper for Publication -PAMJ.....	- 43 -
Appendix 20: Published Manuscript-IJRSP	- 75 -

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired immune-deficiency syndrome
ALA	American Lung Association
ART	Antiretroviral therapy
AOR	Adjusted Odds Ratio
BCG	Bacille Calmette Guerin
BMI	Body Mass Index
CDC	Centre for Disease Control and prevention
CHEW	Community Health Extension Worker
CHW	Community Health Worker
CPT	Co-trimoxazole preventive therapy
CSF	Cerebrospinal fluid
CTX	Co-trimoxazole
CXR	Chest X-ray (radiograph)
DNA	Deoxyribonucleic acid
DOT	Directly observed treatment
DOTs	Directly observed treatment short course
DST	Drug sensitivity testing
E	Ethambutol
EAPHLN	East Africa Public Health Laboratories Network
EP	Extra-pulmonary
ERC	Ethical Review Committee
FDC	Fixed dose combination
FELTP	
HIV	Human Immune deficiency virus
IMR	Infant Mortality Ratio
INH (H)	Isoniazid
ITROMID	Institute of Tropical Medicine and Infectious Diseases
JOOTRH	Jaramogi Oginga Odinga Teaching and Referral Hospital

JKUAT	Jomo Kenyatta University of Agriculture and Technology
KEMRI	Kenya Medical Research Institute
KShs	Kenya Shillings
MDR TB	Multidrug resistant tuberculosis
NTM	Non-tuberculous mycobacteria
OR	Odds Ratio
PCP	<i>Pneumocystis carinii pneumonia</i>
PJP	<i>Pneumocystis jiroveci pneumonia</i>
POR	Prevalence Odds Ratio
PTB	Pulmonary Tuberculosis
R	Rifampicin
RAD	Returnees after default
RNA	Ribonucleic acid
RTI	Respiratory tract infection
TB	Tuberculosis
TB 4	Tuberculosis patients' register
UFMR	Under five mortality ratio
VCTs	Voluntary counseling and testing centers
W.H.O	World Health Organization
XDR TB	Extensive drug resistant Tuberculosis
Z	Pyrazinamide
ZN	Ziehl-Neelson

DEFINITION OF TERMS

- Cured:** Initially sputum smear-positive patient who has completed treatment and had negative sputum smears, on at least two occasions, one of which was at the end of treatment.
- Defaulted:** A patient who has not taken anti-TB drugs for 2 months or more consecutively, after starting treatment.
- Died:** A patient who died during the course of treatment regardless of the cause of death.
- Level 1-6:** Refers to the complexity of care available at different service points; Level 1 is health care at the community level; Level 2 is dispensary ; Level 3 Health centre; level 4 is Sub-county and County hospitals; Level 5 Regional referral hospitals and Level 6; National referral and Specialized Hospitals.
- Treatment completed:** A sputum smear-positive patient who has completed prescribed treatment and had negative smears, at the end of intensive phase, but none at the end of treatment.
- Treatment Interruption:** Failure to adhere to the drug prescription for two or more consecutive weeks, for any reason, without medical approval, with or without return to therapy or DOT non-adherence
- Transferred out:** A patient who has been transferred to another TB Unit or district and for whom the treatment result (outcome) is not known.

ABSTRACT

Tuberculosis is the second leading cause of mortality among that ascribed to infectious agents in the world. About two billion people are infected with *Mycobacterium tuberculosis*. Of the world burden, 80% is held by 22 countries, 9 of which are in Africa, Kenya being among them. A case, if untreated will infect 10-15 people annually. In 2015, about 80% of patients initiated on treatment completed their course. The objective of the study was to establish factors associated with TB treatment interruption. A cross sectional study using a semi structured pretested questionnaire on 252 randomly selected patients in the TB register of Nandi County for the year 2013/2014 was conducted. Data on socio-demographic factors, clinical information, family support, nutritional status and medication history was collected and analyzed by Epi- Info Version 7 (CDC, USA Atlanta). The overall interruption rate in Nandi County was 30.95%. Most of respondents were males and most of the patients were aged 30-39 years. There was low partner HIV testing (31.35%). The following factors were significantly associated with interruption on bivariate analysis; Alcohol use (OR 5.024), Smoking (OR 3.848), Perceiving disease as mild (OR 2.498) and Perceiving distance as a barrier (3.836), Being accompanied by family member (OR 0.494), Perceiving inadequate funds as a barrier (OR 4.137), Low Personal monthly income (OR 4.997), Being informed of diagnosis (OR 0.294), Experiencing side effects (OR 2.467), Seeking alternative treatment (OR 2.597), Having a negative HIV result (OR 0.519), Waiting time below 1 hour (OR 0.205), Living less than 10km from the treatment site (OR 0.227) and Use of herbal medicine during treatment (OR 2.614). Unconditional logistic regression indicated that Personal income (AOR 0.254), Alcohol use (AOR 2.843), Waiting time at the health facility (AOR 3.322), Perceiving distance as a barrier (AOR 2.046) and Perceiving inadequate funds as a barrier (AOR 2.800) independently influenced treatment interruption. This means that the aforementioned five factors are the most significant determinants of TB treatment interruption and should be addressed to reduce TB treatment interruption. This study has shown that one in every three patients interrupt treatment in the county. This could probably be attributed lack of confidence in the prescribed treatment leading to use of alternative therapy. It is recommended that intensive pretreatment counselling that focuses on the importance of adhering to treatment throughout the treatment period, expansion of DOT services and education of caregivers and alternative medicine providers be undertaken.

CHAPTER ONE

INTRODUCTION

1.1 Background information

Tuberculosis (TB) is a chronic infectious disease of humans and animals caused by various members of the *Mycobacteriaceae* family of bacteria. It is characterized by formation of tubercles in the lungs and other tissues of the body, often developing long after the initial infection. TB mostly affects the lung parenchyma tissue but can affect any body tissues other than the keratinous skin and hair follicle. It is curable and preventable (Rodriguez, 2009).

TB is caused by the rod-shaped non spore-forming, aerobic bacterium *Mycobacterium tuberculosis*. Mycobacteria typically measure 0.5µm by 3µm, are classified as acid-fast bacilli, and have a unique cell wall structure crucial to their survival. The well-developed cell wall contains a considerable amount of a fatty acid, mycolic acid, covalently attached to the underlying peptidoglycan-bound polysaccharide arabinogalactan, providing an extraordinary lipid barrier. This barrier is responsible for many of the medically challenging physiological characteristics of TB, including resistance to antibiotics and host defense mechanisms. The composition and quantity of the cell wall components affect the bacteria's virulence and growth rate. The peptidoglycan polymer confers cell wall rigidity and is just external to the bacterial cell membrane, another contributor to the permeability barrier of mycobacteria. Another important component of the cell wall is lipoarabinomannan, a carbohydrate structural antigen on the outside of the organism that is immunogenic and facilitates the survival of mycobacteria within macrophages (Smith., 2003).

Mycobacteria are a genus of Actinobacteria and belong to the family of *Mycobacteriaceae*. They are immobile, obligate aerobic, acid-fast gram-positive bacilli with high genomic glycoprotein content (59-66%). Due to the rich content of mycolic acids/mycolates, the cell wall is hydrophobic and waxy – attributes, which cause acid-fastness and makes substantial contribution to the hardness of this genus.

The *Mycobacterium* genus comprises more than 120 different species. Among them are pathogenic species which can cause serious diseases in humans and animals, for example tuberculosis and leprosy. Despite their close genetic similarity, these organisms differ considerably with regard to epidemiology, pathogenicity and their host spectrum. *Mycobacterium leprae* is the causative agent for Leprosy (Smith., 2003).

TB is transmitted from an infected person to a susceptible person in airborne particles, called droplet nuclei. These are 1–5 microns in diameter (MOH Kenya., 2013a). These infectious droplet nuclei are tiny water droplets with the bacteria that are released when persons who have pulmonary or laryngeal tuberculosis cough, sneeze, laugh, spit and shout. They remain suspended in the air for several hours to be transmitted through the aerosols and not by surface contact. This means touching cannot spread the infection unless it is inhaled (Ananya., 2013). A person needs to inhale only a few of these germs to become infected. About one-third of the world's population (2 billion people) has latent TB, which means people have been infected by TB bacteria but are not (yet) ill and cannot transmit the disease (Zumla, George, Sharma, Herbert, & Baroness Masham of Ilton, 2013).

Once inhaled, the infectious droplets settle throughout the airways. Majority of the bacilli are trapped in the upper parts of the airways where the mucus-secreting goblet cells exist. The mucus produced catches foreign substances, and the cilia on the surface of the cells constantly beat the mucus and its entrapped particles upward for removal. This system provides the body with an initial physical defense that prevents infection in most persons exposed to tuberculosis. Bacteria in droplets that bypass the mucociliary system and reach the alveoli are quickly surrounded and engulfed by alveolar macrophages, the most abundant immune effector cells present in alveolar spaces. This ultimately leads to control of the disease (latent TB) or progression to active disease, called primary progressive tuberculosis. The outcome depends on the immune system of the host. People infected with *M. tuberculosis* have a lifetime risk of falling ill with TB of 10% (Zumla et al., 2013). As the cellular processes occur, tuberculosis may develop differently in each patient, according to the status of the patient's immune system. The stages of TB development

include; latency, primary disease, primary progressive disease, and extra-pulmonary disease. Each stage has different clinical manifestations (Appendix 1). Persons with compromised immune systems, such as people living with HIV, malnutrition or diabetes, or people who use tobacco, have a much higher risk of falling ill. When a person develops active TB (disease), the symptoms (cough, fever, night sweats and weight loss) may be mild for many months. This can lead to delays in seeking care, and results in transmission of the bacteria to others. Patients with TB can infect up to 10-15 other people through close contact over the course of a year. Without proper treatment up to two thirds of cases with TB will die (Zumla et al., 2013).

TB is diagnosed by radiographic and laboratory examinations. Radiological examinations involve taking chest X-rays and demonstrating pulmonary infiltrates or cavities (Appendix 2). The laboratory diagnosis of tuberculosis is based on Microscopy and molecular methods. Three thin smears of sputum are obtained, the first being at the initial contact with patients and stained with Ziehl-Nielsen (ZN) stain and the resultant field examined under high power light microscopy. The identification of acid-fast bacilli confirms the diagnosis. Florescent microscopy uses the same principle but utilizes a fluorescent dye. Gene X-pert test and solid culture using Lowen-Jensen medium are usually performed on Multi drug resistant (MDR) suspected cases. Newer diagnostic techniques for faster detection of *Mycobacterium tuberculosis* include nucleic acid amplification tests. In these tests, molecular biology methods are used to amplify bacterial DNA and RNA, facilitating rapid detection of micro-organisms. If left untreated, 50-60% of patients with active pulmonary TB naturally progresses to death, 20-25% are spontaneously cured and 20-25% remain as chronic patients with cough (MOH Kenya, 2013c).

Tuberculosis treatment involves the use of multiple drugs taken in combination. This is done to prevent the emergence of drug resistance to any of the drugs (Appendix 3 and 4). Patients suffering from TB may have one or several of the following complications; haemoptysis, spontaneous pneumothorax, bronchiectasis, fibrosis of the lungs, lung

abscess, aspergilloma, pleural TB with pleural effusion, tuberculous peritonitis and ascites or Tuberculous meningitis.

1.2 Statement of the problem

An infected patient if untreated can infect 10-15 new patients with TB in a year. In Kenya, 80% of the patients infected are currently detected having been infected with TB (MOH Kenya, 2013a). The remaining 20% are responsible for the continued infection rates (MOH Kenya, 2013a). Apart from those not detected, there are those who, after initiation of treatment, default and thus increase the burden of new infections as well as chances of developing MDR TB. Other effects of treatment interruption include lowering treatment success rates, increasing cost of treatment due to repeated initiation of therapy and increase of period during which the patient remains infectious. All these contribute to increased treatment failure.

Reports indicate increased MDR cases in Kenya, currently at 3024 patients, a marked increase from 2012 (1344 patients) (MOH Kenya, 2013a; Zumla *et al.*, 2013). If this is not adequately addressed, then the cases of MDR TB will increase to a level where the resources of the unit of Tuberculosis and lung diseases in the country will be unable to handle. To address this it is important to understand the factors that determine treatment interruption, in order to mitigate against the hazardous ones and institute the protective measures.

1.3 Objectives

1.3.1 General objective

To establish the factors associated with interruption of treatment among patients on treatment for Tuberculosis in Nandi County, Kenya.

1.3.2 Specific objectives

The specific objectives were:-

1. To determine the social and demographic characteristics of patients treated for TB.
2. To determine the proportion of TB patients that interrupt treatment.
3. To determine the factors associated with TB treatment interruption.
4. To assess the quality of follow up for patients on TB treatment in the County.

1.4 Research questions

The study sought to address the following questions:-

1. What are the social and demographic characteristics of patients who interrupted treatment for TB in Nandi County having been initiated on treatment between January 1st 2013 and June 30th 2014?
2. What proportion of patients interrupted treatment among those initiated on treatment in Nandi County between January 1st 2013 and June 30th 2014?
3. What factors influenced the interruption of treatment among these patients?
4. Is patient follow up done as per the standard guidelines of the Ministry of Health?

1.5 Justification

Kenya is one of the 22 countries that together contribute 80% of the global TB burden (WHO, 2013a; MOH Kenya, 2013a). To reduce the burden of disease, there is need to address the issue of treatment interruption. Adherence is a very complex issue, determined by patient factors, service related factors as well as patients' attitude, knowledge and perceptions of TB among both patients and caregivers. The treatment success rates is currently at 87% nationally, Nandi County lags behind at 77% (MOH Kenya, 2013a).

There is minimal published data available on treatment interruption and associated factors in Kenya. A study conducted in Nigeria by Boateng *et al.*, (2010) established that gender, distance from treatment center, financial status and adverse effects of drugs were some of the factors that influenced treatment interruption. TB treatment default also appeared to be significantly associated with transportation time, the sex of the patient, patient

information and the quality of communication between patients and health workers (Comolet, Rakotomalala, & Rajaonarioa, 1998). False addresses given by patients were found to be both a methodological bias and a risk factor for future default.

Identification of these factors especially in Nandi County will lead to more research on methods to overcome the negative factors and hence enable early identification of those likely to interrupt treatment for focused counseling services. The results from this research will provide more information to policy makers so that the existing policies can be reviewed in favour of adherence. The results will also be used by the County in planning for health services. Since some of the patients who had defaulted were followed, the study will improve TB clinical indicators by tracing patients and ensuring they are re-initiated on treatment. The beneficiaries to this study will therefore be TB patients, TB defaulters, health workers, policy makers and the public in general.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on studies that have been conducted in relation to Tuberculosis epidemiology, diagnosis, and treatment, interaction with HIV/AIDS, determinants of infection and determinants of interruption of treatment. It has been drawn from studies done globally, in Africa and in Kenya. The literature review covers demographic, economic and cultural factors and policies related to TB. The sources of the literature include; books, journals, conference proceedings and internet resources.

2.2 Overview of TB epidemiology

Ask most people what the second ranked global killer pathogen after HIV/AIDS is and very few would know! The answer is TB. TB is caused by *M. tuberculosis*, a fastidious intracellular alcohol-acid fast bacillus. In the year 2013, two billion people in the world were living with TB (van't Hoog et al., 2011). This was one third of the total population of the world. Globally, nine million people contract the airborne bug while a further 1.4 million die from it every year (Sharecare., 2013). This translates to a person being infected with TB every second (World Health Sciences., 2013).

It is the most common cause of mortality among HIV + patients, of which 25% of HIV/AIDS fatalities are actually due to TB (Nathan., 2013; WHO., 2013b). In 2012, 8.6 million people fell ill with TB and 1.3 million died of it globally (WHO., 2013b). Over 95% of TB deaths occur in low- and middle-income countries, and it is among the top three causes of death for women aged 15 to 44 years (WHO., 2013b). In 2012, global estimates show that 530 000 children became ill with TB and 74 000 HIV-negative children died of it (WHO., 2013a).

Annually, of the more than nine million new cases of active TB that occurred worldwide in 2008, approximately 30% (2,529,000) of them were in Africa (Chaisson and Martinson., 2008; World Health Sciences., 2013). This translated to 363 per 100,000 persons in Africa being newly infected with TB each year. In Africa, the TB mortality was

74/100,000 of the population. The worst hit region in Africa was Southern Africa, with the disease also spreading to East, Central and West Africa. North Africa was the least affected (Figure 2.1).

In most cases, a heavy TB burden goes hand in hand with HIV prevalence and the two fuel each other. Twenty-two countries designated as having a high-burden of TB by the World Health Organization (2010) account for 80% of the world's TB cases; nine are in Africa (Democratic Republic of Congo, Ethiopia, Kenya, Mozambique, Nigeria, South Africa, Tanzania, Uganda, and Zimbabwe) (Chaisson and Martinson., 2008; Van't Hoog *et al.*, 2013). Kenya is ranked 15th of the 22 countries with highest TB burden (Appendix 5) and 5th in Africa (WHO., 2010).

There has been a steady increase in TB cases since the early 1990s. Case notification increased from 54/100,000 in 1991 to 326/100,000 in 2009 (MOH Kenya., 2014). The peak age for both sexes was 25-34 years with a male to female ratio of 1.4. In 2009, a total of 110,065 patients were notified, with a HIV sero-prevalence of 44% (Macro International & Kenya National Bureau of Statistics (Knbs) and Icf., 2010; MOH Kenya., 2014). WHO (2012) estimated that only 80% of TB cases were being detected, the remaining 20% being responsible for the continued transmission. The disease burden was attributed to high HIV prevalence with a conservative estimate of 7.1% (van't Hoog *et al.*, 2011).

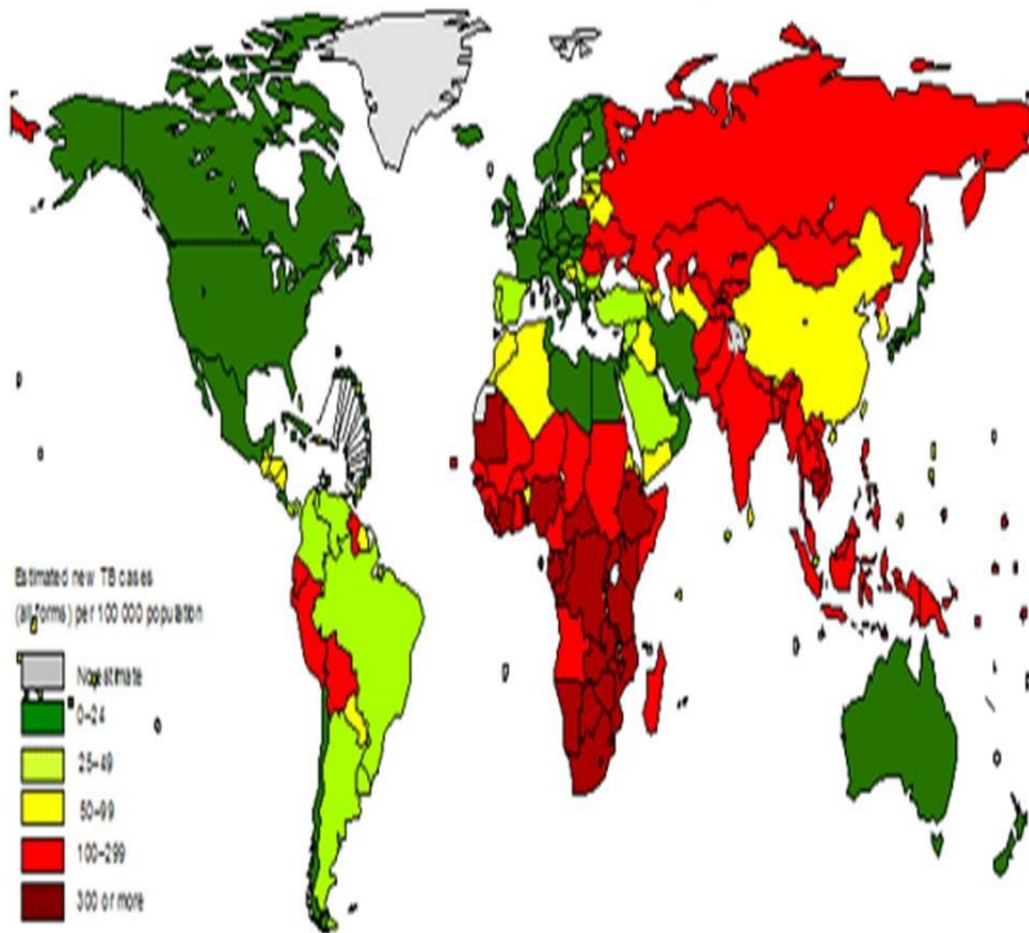


Figure 2.1: TB Global incidences, 2006

Source: WHO, (2006)

Treatment success rate for TB for the 2009 cohort was 85.5% for new smear positive pulmonary TB cases (n = 37,402) (TB CARE I., 2011). The case detection rate (all forms of TB) was 85% as reported in the WHO (2010) Global report. There are 1,538 AFB microscopy centers in Kenya, translating to one microscopy center per 26,000 persons and 2,818 treatment centers (TB CARE I., 2011). WHO (2010) estimate showed that the country had 3024 MDR TB patients. This justified the need for a national surveillance

system to monitor MDR TB. The burden of TB/HIV was highest in the Nyanza region with a HIV prevalence of 16.8% for those aged 15-64 years (Female 19.9% and 12.5% in males) and TB notification rate of 440/100,000 in 2006; approximately 1.5 times the Kenyan average (van't Hoog et al., 2011). In 2009, Nyanza, Rift Valley Province and Nairobi all contributed 56% of the total TB burden in Kenya (Sitieni, Nyambati, & Borus, 2013).

2.2 Childhood TB

Children are defined in this context as those below the age of 15 years. Diagnosis of TB in children is difficult and poses problems that are not present in adults. Children are less likely to have obvious symptoms of TB. In addition, sputum samples are difficult to collect from children. Culture and drug susceptibility results from tests of the adult source case often have to be relied upon for diagnosing and properly treating TB in a child (ALA., 2013; MOH Kenya., 2013b).

Cases of active or latent TB infection in children are of great concern since it indicates that transmission has occurred recently. Most adults who develop active tuberculosis were infected many years ago, when their immune systems were stronger and able to protect them. When a child is diagnosed with active TB, it means that someone close to them, almost always an adult, must have had active TB and was possibly transmitting the disease to others as well (ALA., 2013).

Of the 9 million new cases of TB that occur in the world every year, it is estimated that 15% occur in children less than 15 years of age. The World Health Organization global estimates show about 500,000 children fell ill with TB and 64,000 died in 2011 (WHO., 2011). Seventy-five percent of these childhood cases occurred in the 22 high TB-burdened countries, of which Kenya was one. In Kenya, TB in children below the age of 15 years accounted for about 11% of all cases (MOH, 2013a).

TB in infants and children younger than four years of age is much more likely to spread throughout the body via the bloodstream. Because of this, children are at much greater

risk of developing TB meningitis, a very dangerous form of the disease that affects the central nervous system. Therefore, prompt diagnosis and immediate treatment of TB are critical in pediatric cases. To aid in diagnosis, a score card and algorithm has been developed (Appendix 6).

Some groups of children are at greater risk for TB than others. These include; children living in a household with an adult who has active TB, children living in a household with an adult who is at high risk for contracting TB such as HIV infection, medically underserved, low-income, and foreign-born persons recently arrived (within 5 years) from countries that have a high TB incidence or prevalence, children infected with HIV or other immune-compromising conditions and children born in countries that have a high prevalence of tuberculosis as well as those from communities that are medically underserved. In general, the same methods used in treating TB in adults are used in children (Appendix 7). The primary difference between treatment for adults and children is the use of Ethambutol. One of the side effects of Ethambutol is impaired vision. Since this effect is difficult to monitor in young children, Ethambutol is not routinely recommended for use in children less than five years old (MOH, 2013c).

2.3 Determinants of TB infection

In addition to providing effective treatment and reducing mortality, another objective of TB control programs in countries with high TB incidence is to reduce the transmission from infectious TB cases. The development of TB in an exposed individual is a two-stage process following infection. In most infected persons, infection is contained by the immune system and bacteria become walled off in caseous granulomas or tubercles. In about 5% of infected cases, rapid progression to TB will occur within the first two years after infection (Narasimhan, Wood, Macintyre, & Mathai, 2013).

About 10% of people with latent infection will reactivate, half within the first year, the remainder over their lifetime (Vynnycky and Fine., 1997) mostly by reactivation of the dormant tubercle bacilli acquired from primary infection or less frequently by re-infection. Overall, about 10–15% of those infected go on to develop active disease at some stage

later in life (Vynnycky & Fine., 2000), but the risk of progression is much higher at about 10% per year (Corbett et al., 2003) in HIV-positive and other immune-compromised individuals.

The risk of infection following TB exposure is primarily governed by exogenous factors and is determined by an intrinsic combination of the infectiousness of the source case, proximity to contact and social and behavioral risk factors including smoking, alcohol, and indoor air pollution (Figure 2.2). In settings with increased chances of contacts with cases, transmission will be high (Narasimhan et al., 2013). Similarly, conditions which prolong the length of exposure to an infectious patient include health system-related factors such as delay in diagnosis. The factors that increase progression of infection to disease are primarily endogenous (host related). Conditions which alter the immune response increase the risk of progression to disease, with HIV co-infection being the most important of these (Corbett et al., 2003). However, at the population level impact of this risk factor could vary depending on the local prevalence of HIV.

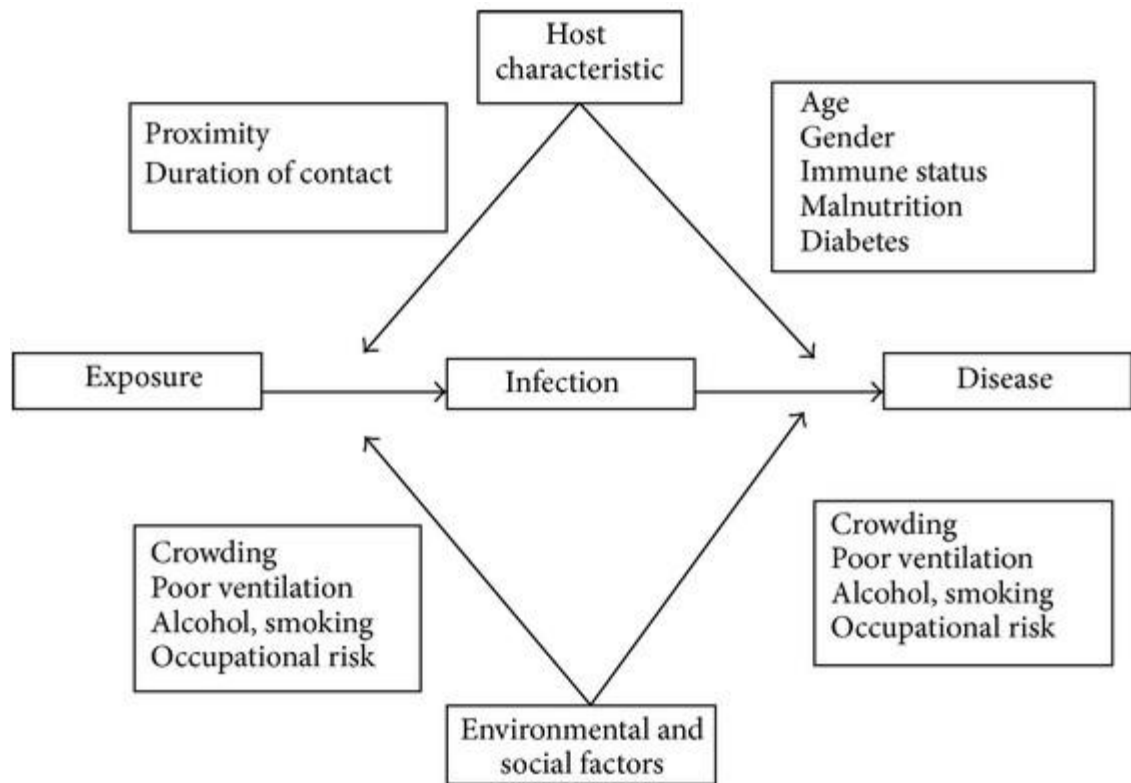


Figure 2.2: Risk factors for TB infection

Source: Narasimhan, (2013)

Diabetes, alcohol, malnutrition, tobacco smoke, and indoor air pollution are factors which impact a larger section of the population and accelerate progression to TB disease.

TB mostly affects young adults, in their most productive years. However, all age groups are at risk. Over 95% of cases and deaths occur in developing countries. People who are co-infected with HIV and TB are 21 to 34 times more likely to become sick (Collins *et al.*, 2002; Getahun *et al.*, 2010). The risk of active TB is also greater in persons suffering from other conditions that impair the immune system.

Tobacco use greatly increases the risk of TB disease and death. More than 20% of TB cases worldwide were attributable to smoking. In a study by Hussain *et al.*, (2003) in

Pakistani prison, smoking status, education level, age above 42 years, period of incarceration and average accommodation area were identified as significant contributors to TB infection. It was shown that lack of formal education may be a proxy for low socio-economic status (Hussain, Akhtar, & Nanan, 2003). Apart from the above factors associated with infection, the factors that have been shown to influence development of active disease following infection are as shown in Appendix 8.

2.4 Determinants of interruption of TB treatment

Studies done the world over have shown varying TB defaulter rates ranging from as low as 1% in good health systems to as high as 20% in worse performing areas (Castelnuovo., 2010; Toczek *et al.*, 2013). However, in selected populations, rates as high as 70%, have been demonstrated. Study findings have shown that the average time to default was 6 weeks (± 3 weeks) after initiation of treatment (Jaiswal *et al.*, 2003; Muture *et al.*, 2011).

Default appears to be significantly linked to transportation time, sex of the patient, patient information and quality of communication between patients and health workers (Ibrahim *et al.*, 2014). Study findings from a study conducted in Nigeria, Ibrahim *et al.*, (2014), revealed that interruption of treatment was associated with living more than 5km from the patients' treatment centre. This study established distance, cigarette smoking and lack of knowledge of the duration of treatment of TB as independent determinants of interruption. This argument was also supported by a study in Malaysia (OBoyle *et al.*, 2002) and South Africa (T. R. Kandel, Mfenyana, Chandia, & Yogeswaran, 2008). They reported long distance, costs of travel and travel time as the major risk factors for interruption of treatment among TB patients.

Association of TB and smoking was well illustrated in a study in Hong Kong (Leung *et al.*, 2003). However, when respondents in Nigeria were engaged in a focused group discussion, they identified cost of transportation to the clinic for direct observation of treatment and unfriendly attitude of the health care workers as the major factors responsible for interruption of treatment (Ibrahim *et al.*, 2014). In the same study, false

addresses given by patients were found to be both methodological bias and risk factors for future default.

The disappearance of symptoms is an indication of clinical improvement from disease and a measure of the effectiveness of therapy. As a result of the high quality drugs used in the DOTS strategy it was common place for TB symptoms to disappear even within a few weeks of treatment. Patients with inadequate knowledge of the duration of the treatment may feel that they are cured and thus stop the treatment. A study on assessment of factors contributing to TB treatment adherence in Ndola, Zambia revealed that feeling well was the major reason for patients stopping treatment (Kaona, Tuba, Siziya, & Sikaona, 2004).

TB treatment involves a lot of interaction between patients and health care workers, from presentation at the outpatient, specimen collection, initial diagnosis, through to counseling, initiation of treatment and subsequent reviews. Thus the attitude of the health care worker towards the patient remains an important factor that can keep the patients on treatment or make them interrupt the treatment or abandon it altogether. Unfriendly attitude of health care workers might make patients feel threatened and unwelcomed leading to treatment interruption. The negative effect of bad attitude of health care workers on TB treatment has been reported in India by Jaiswal *et al.*, (2003). They noted that patients who defaulted from treatment blamed the health workers for their unpleasant behavior and attitude towards them and further described them as rude and unhelpful.

Demographic characteristics and behavior of the patients have been shown to play a significant role in the occurrence of diseases including their behavior towards treatment. The importance of age in patient adherence to treatment was reported by Wu *et al.*, (2009) in Taiwan. In this study, elderly patients had poorer treatment outcomes (Wu, Chou, Chang, Sun, & Kuo, 2009) because they needed additional social and financial support to access TB treatment. Similarly gender has been shown to influence the behavior of patients towards TB treatment (Begum *et al.*, 2001).

Cultural and religious practices are some of the important factors with great influence on female health seeking behavior including adherence to TB treatment in many developing countries. Studies from Africa, Bangladesh and Syria have shown that most married women must seek permission from their husbands to attend health care services including TB treatment (Karim *et al.*, 2008; Begum *et al.*, 2001). This might be a potential barrier to TB treatment (Yimer, Holm-Hansen, Yimaldu, & Bjune, 2009). Despite this barrier they tended to adhere to anti-TB treatment leading to better treatment outcomes than men indicating that there could be hidden factors among the female. These findings are in contrast with those by Ibrahim *et al.*, (2014) who found no significant relationship between age and gender with interruption of TB treatment.

Behavioral factors especially cigarette smoking and alcohol use have negative effects on TB treatment. Cigarette smoking has been shown to be associated with interruption of treatment similar to findings in Turkey (Balbay, Annakkaya, Arbak, Bilgin, & Erbas, 2005) and India (Bagchi, Ambe, & Sathiakumar, 2010) although the mechanism is not well understood. Alcohol suppresses the immune response. In addition, alcoholics are more likely to forget taking their treatment and hospital appointments leading to interruption. Its use and non-adherence have been reported by many studies (Vijay S *et al.*, 2003; Jaggarajamma *et al.*, 2007; Hasker *et al.*, 2008)

According to findings of a study in Haiti (Auer, Sarol, Tanner, & Weiss, 2000), Zambia and other rural communities (Wilkinson., 1994) present the challenges facing compliance with TB treatment. TB, like HIV/AIDS, is often associated with stigmatization and thus may create resistance among patients to treatment. A study carried out in Nigeria (Oduanya and Babafemi., 2004), raised an important point of delays in care seeking behavior due to stigma experienced by TB patients. Other studies have shown that stigmatization created a lot of self-denial among those with diseases like TB and Sexually Transmitted Infections (STIs); hence most of them failed to comply with the treatment regime (Pronyk *et al.*, 2001; Cramm *et al.*, 2010).

Scholars have also conducted systemic reviews to identify risk factors for TB treatment default as published in various international literature (Brasil and Braga., 2008). The review showed that the most frequently investigated risk factors for TB treatment default could be grouped as: individual patient profile; clinical status or therapy; and health services characteristics. The classification of these exposures, arranged in decreasing order was: age, gender, alcoholism, HIV/AIDS, illicit drug use, foreign nationality, illiteracy (or low schooling), unemployment, homelessness, race, income, tobacco use, imprisonment, family support, trust in treatment effectiveness, diabetes, and profession in the patient-related group of exposures; TB clinical manifestations (pulmonary or extra-pulmonary), retreatment, positive sputum smear (acid-fast bacillus), prior TB treatment default, short-course therapy, adverse effects of therapy, drug resistance, disease severity, use of steroid therapy, TB case contact, and positive culture in the group related to clinical status or therapy; directly observed treatment, difficult access to health services, incentives (financial or other), "need for hospitalization", "training or support for adherence", "delay in initiating treatment", and "long wait before medical attendance" in the group related to health services (Brasil and Braga., 2008).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

The study was conducted in Nandi County; one of the 47 counties in the Republic of Kenya. It is located in the Rift Valley region and borders Baringo, Kisumu, Uasin-Gishu, Kericho, Vihiga and Kakamega counties. The county comprises 5 administrative sub-counties; Nandi Central, Nandi North, Nandi South, Nandi East and Tinderet (Transparent Africa., 2014) (Figure 3.1). It covers a total area of 2884.2 square kilometers with temperatures ranging from 12⁰ to 26⁰ C and rainfall between 1200mm and 2000mm per annum (Nandi County., 2013). The county's capital is Kapsabet Town.

The county is home to 752,965 people in 154,073 households. This is 2% of the total national population, with a population density of 261 persons per square kilometer. The annual population growth rate is 2.9%. The population is distributed across age groups as follows; 0-14 (45%), 15-64 (51.4%) and above 65 (3.6%). Of the population, 47.4% lives below the poverty line (\$1.25, Ksh 150 for urban and Ksh 105 for rural). The age dependency ratio is 100:95.P

The county boasts of resources like arable land, livestock, forests, pasture land, water and medicinal plants. Agriculture is the main economic activity with most households earning a living from arable farming, cash crops (tea, sugarcane, pyrethrum and coffee) as well as livestock keeping for beef and dairy products.

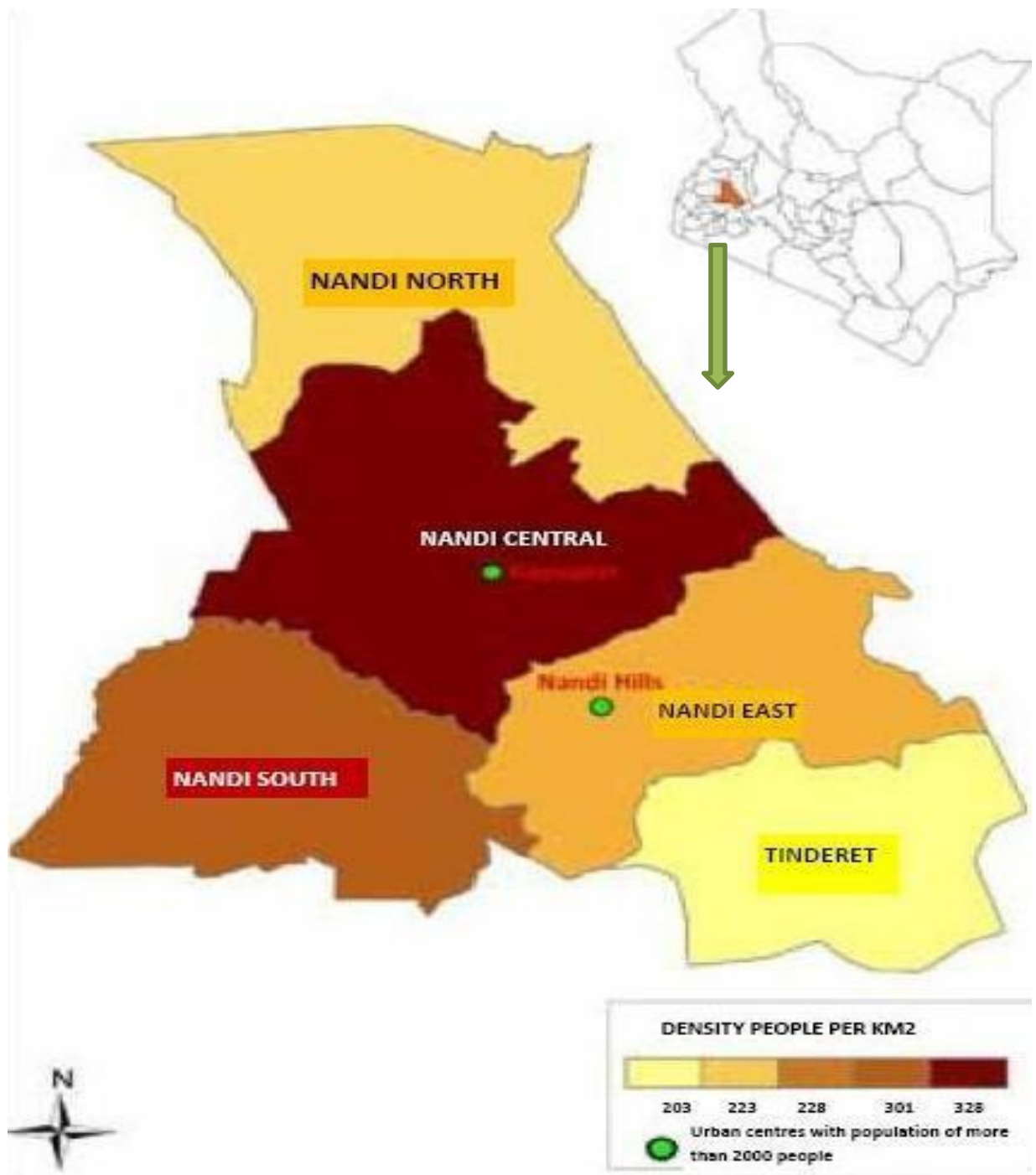


Figure 3.1: Location and Map of Nandi County

Source: Survey of Kenya, (2014)

Nandi County has a total of 138 health facilities; 2 county hospitals, 2 sub-county hospitals, 19 health centers, 103 dispensaries, 6 clinics and 5 stand-alone VCT centres (Nandi County., 2013). The main referral hospitals are Kapsabet County Referral Hospital and Nandi Hills Hospital. The County has a doctor to patient ratio of 1:80,000, an infant mortality ratio (IMR) of 66 per 1000 and an under five years' mortality rate (UFMR) of 111/1000. The main diseases affecting residents here are Malaria, Respiratory tract infections (RTI) Diarrhea diseases and Skin diseases (Transparent Africa., 2014).

3.2 Study design

A cross sectional study was conducted among patients who were initiated on treatment in the year 2013/2014. This design was appropriate since establishment of treatment interruption from the sampling frame was not possible prior to interviewing subjects and this also eliminated time needed for follow up. The design is fairly quick, easy to perform, less expensive and adapted to chronic diseases including TB.

3.2.1 Dependent variable

The dependent variable in the current study was treatment interruption.

3.2.2 Independent variable

The exposure variables included; socio-demographic characteristics, clinical information, behavioral factors, family support, health system factors, income, lifestyle, knowledge and practices.

3.3 Study population

The sampling frame was the TB 4 register from which all patients initiated on treatment between January 1st, 2013 and June 30th, 2014 were enlisted (1287 patients). Subjects were interviewed to establish those that interrupted treatment and those that did not. Treatment interruption was defined as failure to adhere to drug prescriptions for two consecutive weeks or more, with or without return to therapy or DOT non-adherence. Adherent

patients were defined as those who followed their treatment regimens or missed their drugs for periods of less than two consecutive weeks.

3.4 Inclusion criteria

The study included the following participants:

- 1) Those who gave consent to participate in the study.
- 2) Those aged 14 years and above.
- 3) Patients initiated on therapy for TB in Nandi County between January 1st, 2013 and June 30th, 2014
- 4) New cases, re-treatments, smear positive, smear negative, defaulters and non-defaulters.
- 5) Those whose diagnosis of TB was based on clinical, radiological and bacteriological (microscopy) examinations.

3.5 Exclusion criteria

The following subjects were excluded;

- 1) Children under 13 years of age.
- 2) Consent withdrawal.
- 3) Transfers outside the county.
- 4) Those reported to have died during treatment or after.
- 5) Patients initiated on treatment outside the indicated period of study.

3.6 Sample size calculation

To determine the minimum subjects to be sampled, the following considerations were made;

- 1) 95 % confidence interval
- 2) $Z_{\alpha} = 1.96$, Precision (d) = 0.05
- 3) Prevalence of treatment interruption 19% (Carter, 2009)(Carter, 2009a)
- 4) Patients initiated on treatment in Nandi county in the year 2013, N= 843

The following formula by Cochran was used (Cochran, 1977).

$$\begin{aligned} N &= Z_{\alpha}^2 \times p \times q / d^2 \\ &= 1.96^2 \times 0.19 \times 0.81 / 0.05^2 \\ &= 236 \text{ (Minimum sample)} \end{aligned}$$

Non response adjustment: 10% adjustment for non-response (24) = 236 + 24 = **260**

3.7 Ethical consideration

Ethical clearance (Appendix 9) was sought from the Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) Ethical Review Committee (ERC) before the commencement of data collection. Permission was also sought and obtained from the County health department through the Chief Officer of Health and Sanitation and the county research office (Appendix 10).

A consent form explaining the rationale and benefits of the study to the public health system was used to seek informed consent from potential interviewees (Appendix 11 and 12). Participation in the study was on a voluntary basis, the participants being at liberty to withdraw from the study at any stage without being penalized. There were no incentives for participating. The interviews were conducted in a confidential manner; participant names were not recorded. No study participant was identified by name in any report or publication derived from information collected for the study. Data collected was stored in lockable, fire proof cabinets. Databases created thereof were password protected to avoid unauthorized access.

3.8 Sampling procedure

A list of all the patients initiated on treatment for TB from January 1st 2013 to June 30th, 2014 in Nandi County was obtained. This sampling frame consisted of 1287 records. Four hundred and seven records were excluded since they did not meet the eligibility criteria earlier stated. From this subsequent sampling frame, 260 records were randomly selected

using computer generated numbers. The patients corresponding to this numbers were enrolled in the study.

With the selected patients, questionnaires (Appendix 13 and 14) were administered to establish those who interrupted treatment and their socio-demographic characteristics and compared these with those who did not. Refusals were replaced with the next consecutive numbers up to three consecutive replacements each. Beyond three consecutive refusals for a single slot, a new computer number was generated.

3.9 Pretesting of data collection tools

3.9.1 Validity

The questionnaires were pretested in Nandi Central Sub-county using patients who had not been selected for interview. Prior to pretest, the questionnaire was given to 5 sub-county TB and Leprosy coordinators and the County TB and Leprosy coordinator who assessed it for content validity. Criterion and construct validity were not assessed. JOOTRH Ethics and Research Committee also gave their expert inputs (Appendix 9). The questionnaire was revised in line with the expert opinion and the pretest results.

3.9.2 Reliability

Twenty questionnaires were administered by the same person to different respondents. This was repeated after two weeks to assess for consistency in response. The comparison in responses was done using test-retest-reliability coefficient (Coefficient of stability). A correlation coefficient of 0.81 was obtained which was above 0.7 which was the acceptable cut off.

3.10 Data collection

The sampling frame was obtained from the TB 4 register for the year 2013/2014. This was downloaded into Microsoft Excel sheet. The randomly selected subjects were interviewed by pretested questionnaires directly administered by 12 trained data collectors. The data collectors comprised mainly TB ambassadors employed by partners implementing TB

activities in the County, provided with motorbikes and bicycles which are used for home visits. They utilized these transport means to trace selected subjects and conduct interviews at their homes. Those patients who were not found were still traced with their telephone contacts available in the TB registers.

The questionnaires were both in English and the local language. This method enabled the interviewers to clarify and elaborate the purpose of the research and effectively convince the respondents about the importance of the study. The method was adopted so as to: obtain in-depth data on the subject being addressed; Obtain data required to meet the objectives; Guard against the respondents confusing the questions; Enable the interviewers to adapt to the situation and get as much information as possible; be able to extract very sensitive and personal information from the respondent by employing honest and personal interaction between the respondent and the interviewer.

To assess patient follow up, a review of all the records of the selected patients was conducted using a check list of the requirements of the recommended schedules for tests and reviews. This entailed filling of data abstraction forms that was done by a different set of clerks apart from those conducting home interviews. Using the patient registration numbers, the patients were linked with their records in the TB 4 register and data abstraction forms filled accordingly. The data abstraction form was linked to the patient questionnaire as a single tool. Thus, data, obtained from the interviews and abstraction was analyzed together for each respondent.

3.11 Data analysis

Data collected from questionnaires was reviewed daily and stored in lockable, fireproof cabinets. It was then transferred into Epi- Info Version 7 (CDC, USA Atlanta) make view software by two sets of data clerks to minimize errors. The resulting two sets of database were cleaned and validated using check codes and queries, comparisons being made between the sets. In case of discrepancies, reference was made to the original copy of the questionnaire.

Descriptive analysis was done to characterize the socio-demographic details of the study participants. This was based on univariate analysis using counts and proportions. Variables that are continuous were summarized using means and standard deviation while discrete variables were summarized using median, range and inter-quartile ranges. Bivariate analysis was done to establish determinants of treatment interruption using prevalence Odds Ratio (OR) as a measure of association, where 95% confidence interval was used with Yates corrected chi-square test of significance where factors with p-values of or below 0.05 were considered as significant. Stratification was done to check for effect modification and confounding. The independent contribution of each significant factor was assessed using unconditional logistic regression where factors with a p-value of ≤ 0.15 were run in the model. This also controlled for multiple confounding. Stepwise forward elimination method was used to select the variables in the final model.

3.12 Expected application of results

On completion of the study, feedback was given to the health care workers to incorporate the factors identified in the study in the initial counseling and identification of potential defaulters. Results from the study were written and submitted to JKUAT for thesis work. The results were also summarized into a report that would be shared with policy makers in the Ministry of Health and the Nandi County health team. Manuscripts were written and submitted for peer review and publication in the Pan African Medical Journal (PAMJ) and International Journal for Scientific Research and Publication (IJRSP) to add to the body of scientific knowledge (Appendix 15 and 16 respectively). The results will also be presented in national and international conferences.

A screening tool to identify patients at high risk of default has been developed by assigning points to each risk factor based on its coefficient in the predictive model. This will aid in early identification of potential defaulters. The audience of the study findings included but are not limited to; the general public, health workers offering TB services, Community health workers offering DOTs and Policy makers.

3.13 Study limitations

The study excluded participants aged below 14 years hence limiting generalizability to the entire population. Some of the respondents were treated more than two years prior to the interview. This was likely to introduce non-differential recall bias. The interviewers were TB ambassadors who had taken part in service provision. It was possible that the respondents would have given “expected responses” in order to please their caregivers while the interviewers could have written “correct answers” to impress their supervisors. This would have led to reporting bias. This was mitigated against by intensive training of interviewers prior to data collection and close supervision during field work. Other limitations of cross sectional studies, not unique to this one, included the fact that the design was not adapted to incidence measurement; it had limited capacity to document causality (exposure and outcome measured at the same time, difficult to establish time sequence of events) and was unsuitable when studying aetiology of disease.

CHAPTER FOUR

RESULTS

4.1 Univariate analysis

4.1.1 Socio-demographic characteristics

A total of 280 questionnaires were issued to data collectors, out of which 259 were returned. Seven questionnaires were rejected due to inconsistencies, not being fully filled and lack of unique identifiers, the remainder (252) were analyzed. This translated to a response rate of 93%. The socio-demographic characteristics of the subjects interviewed are shown in Table 4.1.

Of the respondents, 78 (30.95%) reported to have missed taking drugs for at least two weeks. Males, 149 (59.13%), accounted for most of the respondents. It was found that most of the respondents were aged 30-39; 69 (27.38%). This distribution was also observed among those that interrupted. However, among the non-interrupters, the majority 46 (26.44%) were aged 20-29 years.

The mean age at interview was 39.96 years (± 5.31) while the median age was 37.5 years (Mode 30.0, Q1=28.5, Q3=48.0). The minimum and maximum ages were 15 and 85 years respectively. Out of all the individuals interviewed, 143 (56.75%) were married. A similar distribution was discerned among the interrupters 46 (58.97%) and non-interrupters 97 (55.75%). A total of 206 (81.75%) respondents came from monogamous families while 148 (58.73%) indicated to have originated from dual parent nuclear families.

Table 4.1: Socio-demographics of patients treated for TB in Nandi County by interruption status; 2014

Variable	Total n (%)	Interrupters n (%)	Non-interrupters n (%)
Total subjects	252(100)	78(30.95)	174(69.05)
Sex			
Female	103(40.87)	33(42.31)	70(40.23)
Male	149(59.13)	45(57.69)	104(59.77%)
Age			
Below 19	10(3.97)	1(1.28)	9(5.17)
20-29	59(23.41)	13(16.67)	46(26.44)
30-39	69(27.38)	26(33.33)	43(24.71)
40-49	55(21.83)	18(23.08)	37(21.26)
50-59	29(11.51)	6(7.69)	23(13.22)
Over 60	30(11.90)	14(17.95)	16(9.20)
Marital status			
Cohabiting	3(1.19)	1(1.28)	2(1.15)
Married	143(56.75)	46(58.97)	97(55.75)
Single	86(34.13)	23(29.49)	63(36.21)
Widow/ Widower	17(6.74)	7(8.97)	10(5.75)
Other	3(1.19)	1(1.28)	2(1.15)
Type of family			
Monogamous	206(81.75)	61(78.21)	145(83.33)
Polygamous	46(18.25)	17(21.79)	29(16.67)
Education level			
Primary and below	152(60.32)	53(67.95)	99(56.89)
Secondary	72(28.57)	19(24.36)	53(30.46)
College/Tertiary	23(9.13)	6(7.69)	17(9.77)
University	5(1.98)	00	5(2.87)
Religion			
Atheist	7(2.78)	2(2.56)	5(2.87)
Catholic	113(44.84)	39(50.00)	74(42.53)
Muslim	1(0.40)	0	1(0.57)
Protestant	131(51.98)	37(47.44)	94(54.02)

Table 4.1 Continuation

Occupation			
Casual laborer	53(21.03)	19(24.36)	34(19.54)
Employed(Formal)	27(10.71)	8(10.26)	19(10.92)
Farmer	118(46.83)	34(43.59)	84(48.28)
Small scale business	43(17.06)	15(19.23)	28(16.09)
Other	11(4.37)	2(2.56)	9(5.17)
Nuclear family type			
Dual parent	148(58.73)	33(66.09%)	115(66.09%)
Single parent	104(41.27)	45(57.69%)	59(33.91%)

The most reported level of education was primary education, 152 (60.32%); 53 (67.95%) among those that interrupted and 99 (56.89%) among those who did not. It was, however, noted that interrupters recorded a slightly lower proportion of individuals above primary education 25 (32.05%) compared to non-interrupters 75 (43.10%).

With respect to religion, most of the participants were Protestants 131 (51.98%). On segregation of the two groups based on treatment adherence, the most common religion among non-interrupters remained protestant 94 (54.02%) while that among interrupters was catholic 39 (50.0%). The occupation of respondents most reported was farming 118 (46.83%), with interrupters and non-interrupters being 34 (43.59%) and 84 (48.28%) respectively.

In terms of personal income, 138 (54.76%) respondents earned monthly income below Ksh 10,000 (\$100) while 118 (47.01%) reported a similar family monthly income (Table 4.2). Most interrupters reported personal and family monthly incomes of below Ksh 10,000 (\$100); being 62 (79.49%) and 55 (71.43%), respectively. Non-interrupters reported higher monthly personal and family incomes; the most frequent being Ksh. 10,001-20,000 (\$100-\$200); 81 (46.55%) and 82 (47.13%) respectively.

Most of the subjects were residents of Nandi Central sub-county 92 (36.50%). Of the respondents 44 (17.46%) were smokers while 98 (38.89%) used alcohol. A higher proportion of interrupters were smokers 25 (32.05%) as compared to non-interrupters 19 (10.92%). This was also true with respect to alcohol intake; 51 (65.38%) for interrupters and 47 (27.01%) for non-interrupters. Most patients were attended to in level 4 facilities, with 151 (59.92%) of the cases being diagnosed in level 4 facilities and accordingly 148 (58.73%) being initiated on treatment at the same level.

Table 4.2: Other descriptive characteristics of patients treated for TB in Nandi County by interruption status, 2014

Variable	Total n (%)	Interrupters n (%)	Non-interrupters n (%)
Residence (Sub-county)			
Nandi Central	92(36.50)	23(29.49)	69(39.66)
Nandi East	41(16.27)	13(16.67)	28(16.09)
Nandi North	63(25.00)	23(29.49)	40(22.99)
Nandi South	41(16.27)	15(19.23)	26(14.94)
Tinderet	15(5.96)	4(5.13)	11(6.32)
Monthly Income(Self)			
0-10000	138(54.76)	62(79.49)	76(43.68)
10001-20000	94(37.30)	13(16.67)	81(46.55)
20001-50000	18(7.14)	3(3.85)	15(8.62)
Over 50000	2(0.79)	0	2(1.15)
Monthly Income(Family)			
0-10000	118(47.01)	55(71.43)	63(36.21)
10001-20000	99(39.44)	17(22.08)	82(47.13)
20001-50000	27(10.76)	2(2.60)	25(14.37)
Over 50000	7(2.79)	3(3.90)	4(2.30)

Table 4.2 Continuation

Level of facility of diagnosis			
Level 2	10(3.97)	3(3.85)	7(4.02)
Level 3	73(28.97)	23(29.49)	50(28.74)
Level 4	151(59.92)	43(55.13)	108(62.07)
Level 5/6	18(7.14)	9(11.54)	9(5.17)
Level of facility of initiation of treatment			
Level 2	10(3.97)	3(3.85)	7(4.02)
Level 3	82(32.54)	26(33.33)	56(32.18)
Level 4	148(58.73)	43(55.13)	105(60.34)
Level 5/6	12(4.76)	6(7.69)	6(3.45)
Smokers			
No	208(82.54)	53(67.95)	155(89.08)
Yes	44(17.46)	25(32.05)	19(10.92)
Alcohol use			
No	154(61.11)	27(34.62)	127(72.99)
Yes	98(38.89)	51(65.38)	47(27.01)

On diagnosis and treatment of respondents, the most frequently reported symptom was cough 220 (87.3%) while haemoptysis was least reported (Table 4.3). During the course of treatment, most patients 119 (47.22%) reported to have experienced change in urine colour as a side effect followed by vomiting 74 (29.37%). This trend was also observed among interrupters -change in urine colour 45 (57.69%), vomiting 30 (38.46%) and non-interrupters -change in urine colour 74 (42.53%), vomiting 44 (25.29%), respectively. The clients who interrupted treatment gave “Too many pills to swallow” 50 (64.10%), as the

most frequent explanation for their interruption. It was noted that none of them alleged to have missed their pills due to stock-outs at the health facility.

4.1.2 Patients' diagnosis and follow up

Table 4.4 revealed that at diagnosis, 209 (82.94%) of the clients had pulmonary tuberculosis while the remainder were extra-pulmonary. Most patients were “New” 221 (87.70%) while “Transfers-in” 3 (1.19%) accounted for the least proportion. The majority 244 (96.83%) of the respondents had undertaken HIV test, of whom 84 (34.43%) were positive. Of those who tested HIV positive, 83 (98.81%) were on ART. Partner HIV testing had been done for 79 (31.35%) of those interviewed.

When asked about the frequency of visits during intensive phase, most 179 (71.03%) reported to have attended clinic weekly. Family members provided for 217 (86.11%) of all the DOTs. Thirty eight (15.08%) of the respondents had not undergone nutritional counselling.

Table 4.5 presents results for sputum follow ups and outcomes of treatment. At the time of interview 158 (62.70%) had TB appointment cards. Only 103 (41.04%) of the patients had undertaken chest X-ray at diagnosis, while those who had sputum examination fell exponentially from 215 (85.32%) at diagnosis, 179 (71.03%) at three months to 166 (65.87%) at the end of treatment. The sputum positivity fell from 147 (67.43%) at diagnosis, 13 (7.30%) at 3 months to 3 (1.84%) at the end of patient treatment.

The most reported outcome of treatment was “Cured” 132 (52.38%), with 17 (6.75%) reported as being “Out of control” and 4 (1.59%) as “Failure”. Of those surveyed, 201 (79.76%) were satisfied with the services offered at the TB clinics, with the interrupters reporting slightly lower proportions 59 (75.64%) as compared to non-interrupters 142 (81.61%).

Table 4.3: Symptoms, side effects and reasons for interruption among patients treated for TB in Nandi County by interruption status, 2014

Variable	Total n (%)	Interrupters n (%)	Non-interrupters n (%)
Symptoms at diagnosis			
Cough	220(87.3)	69(88.46)	151(86.78)
Chest pains	172(68.25)	55(70..51)	117(67.24)
Hemoptysis	49(19.44)	15(19.23)	34(19.54)
Weight loss	156(61.90)	61(60.40)	95(62.91)
Loss of appetite	85(33.73)	23(29.49)	62(35.63)
Night sweats	173(68.65)	50(64.10)	123(70.69)
Other symptoms	7(2.78)	1(1.28)	6(3.45)
Reasons for interruption			
Too ill		10(12.82)	
Stock-outs		0	
Migration to new home		2(2.56)	
Afraid of Injections		2(2.56)	
Inadequate food		40(51.28)	
Medication tasted unpleasantly		37(47.44)	
Drugs not working		12(15.38)	
Too many Pills		50(64.10)	
Relief from symptoms		13(16.67)	
Stigma		12(15.38)	
Side effects		41(52.56)	

Table 4.3 Continuation

Side effects of anti-TBs			
Altered vision	26(10.32)	10(12.82)	16(9.20)
Headaches	46(18.25)	14(17.95)	32(18.39)
Vomiting	74(29.37)	30(38.46)	44(25.29)
Itching	57(22.62)	21(26.92)	36(20.69)
Jaundice	25(9.92)	11(14.10)	14(8.05)
Abdominal pains	54(21.43)	22(28.21)	32(18.39)
Change in urine colour	119(47.22)	45(57.69)	74(42.53)
Reported causes of TB			
Act of God	11(4.37)	3(3.85)	8(4.60)
Don't Know	29(11.51)	12(15.38)	17(9.77)
Infectious agent	182(72.22)	49(62.82)	133(76.44)
Smoking	15(5.95)	5(6.41)	10(5.75)
Witchcraft	4(1.59)	1(1.28)	3(1.72)
Other causes	11(4.37)	8(10.26)	3(1.72)

Table 4.4: Patient diagnosis and follow up among TB patients in Nandi County by interruption status, 2014

Variable	Total n (%)	Interrupters n (%)	Non-interrupters n (%)
Frequency of return visits as reported by patients (Initiation phase)			
2monthly	1(0.40)	0	1(0.57)
2Weekly	56(22.22)	16(20.51)	40(22.99)
Daily	11(4.37)	6(7.69)	5(2.87)
Monthly	5(1.98)	1(1.28)	4(2.30)
Weekly	179(71.03)	55(70.51)	124(71.26)
DOT provider			
CHEW	15(5.95)	5(6.41)	10(5.75)
CHW	20(7.94)	8(10.26)	12(6.90)
Family member	217(86.11)	65(83.33)	152(87.36)
TB type			
EP	43(17.06)	19(24.36)	24(13.79)
PTB	209(82.94)	59(75.64)	150(86.21)
Patient type			
Defaulter	8(3.17)	5(6.41)	3(1.72)
New	221(87.70)	64(82.05)	157(90.23)
Re-treatment	20(7.94)	8(10.26)	12(6.90)
Transfer-in	3(1.19)	1(1.280)	2(1.15)
HIV testing done			
No	8(3.17)	2(2.56)	6(3.45)
Yes	244(96.83)	76(97.44)	168(96.55)
HIV test results			
Negative	160(65.57)	42(55.26)	118(70.24)
Positive	84(34.43)	34(44.74)	50(29.76)
On art (HIV+ only)			
No	1(1.13)	0	1(2.040)
Yes	83(98.81)	35(100)	48(97.96)

Table 4.4 Continuation

Partner tested (HIV)			
No	173(68.65)	51(65.38)	122(70.11)
Yes	79(31.35)	27(34.62)	52(29.89)
Nutritional support			
FS (Food supplements)	5(1.98)	0	5(2.87)
FS &MN	1(0.40)	0	1(0.57)
FS & NC	8(3.17)	3(3.85)	5(2.87)
FS,NC & MN	4(1.59)	0	4(2.30)
MN (Micro-nutrients)	30(11.90)	10(12.82)	20(11.49)
NC (Nutrition Counselling)	143(56.75)	45(57.69)	98(56.32)
NC & MN	23(9.13)	8(10.26)	15(8.62)
ND (Nutrition counselling not done)	38(15.08)	12(15.08)	26(14.94)

Table 4.5: Patients' sputum follow ups and outcomes among TB patients in Nandi County by interruption status, 2014

Variable	Total n (%)	Interrupters n (%)	Non-interrupters n (%)
Sputum examinations			
At diagnosis	215(85.32)		
At 3 months	179(71.03)		
At End of treatment	166(65.87)		
Sputum results			
At diagnosis			
Negative	71(32.57)		
Positive	147(67.43)		
At 3 Months			
Negative	165(92.70)		
Positive	13(7.30)		
At the end			
Negative	159(97.55)		
Positive	3(1.84)		
Missing	1(0.6)		
TB appointment card available			
No	94(37.30)	33(42.31)	61(35.06)
Yes	158(62.70)	45(57.69)	113(64.94)
X-ray done at diagnosis			
No	148(58.96)	47(60.26)	101(58.38)
Yes	103(41.04)	31(39.74)	72(41.62)

Table 4.5 Continuation

Satisfied with services			
No	51(20.24)	19(24.36)	32(18.39)
Yes	201(79.76)	59(75.64)	142(81.61)
Treatment outcome			
Cured (C)	132(52.38)	31(39.74)	101(58.05)
Failure(F)	4(1.59)	2(2.56)	2(1.15)
Out of control (OC)	17(6.75)	13(16.67)	4(2.30)
Treatment complete (TC)	99(39.29)	32(41.03)	67(38.51)

4.2 Bivariate factor analysis

Several factors were found to significantly influence patient interruption. These factors were divided into patient factors, disease and facility related factors and factors related to knowledge.

4.2.1 Patient factors

Table 4.6 presents bivariate analysis of patient related factors. Alcohol use was found to have a major risk on interruption, with those who take having an OR (95% CI) of interruption of 5.024 (2.828-8.923) ($P<0.001$). Smokers had 3.848 (1.963-7.544) ($P<0.001$) times higher risk of interrupting as compared to non-smokers. Those who perceived disease severity as mild at diagnosis were at a higher risk of defaulting, OR (95% CI) 2.498 (1.424-4.381) ($P<0.05$), as were those who perceived distance as a barrier, OR (95% CI) 3.836 (2.170-6.780) ($P<0.001$) and those who perceived inadequate funds as a barrier to compliance, OR (95% CI) 4.137 (2.321-7.371) ($P<0.001$).

A personal monthly income of below Ksh 10,000 (\$100) was also associated with increased risk of interruption, OR (95% CI) 4.997 (2.672-9.344) ($P<0.001$). Those who were accompanied by relatives were protected from interrupting, OR (95% CI) 0.494 (0.287-0.849) ($P<0.05$) as were those who felt supported by family members during the course of treatment, OR (95% CI) 0.245 (0.127-0.474) ($P<0.001$).

Sex, OR (95% CI) 1.090 (0.634-1.873), Age, OR (95% CI) 0.816 (0.478-1.395), Availability of TB appointment card, OR (95% CI) 0.736 (0.426-1.272) and Education level, OR 0.623 (0.355-1.093) did not significantly ($P>0.05$) influence treatment interruption.

Table 4.6: Bivariate analysis of Patient factors among TB patients Nandi County, 2014

Exposure variable	Interrupters n (%)	Non-interrupters n (%)	Prevalence Odd's Ratio	95% CI (P-Value)
Sex				
Female	33(42.31)	70(40.23)	1.090	0.634-1.873 (P=0.864)
Male	45(57.69)	104(59.77)		
Age				
Below 40 years	40(41.28)	98(56.32)	0.816	0.478-1.395 (P=0.544)
Above 40 years	38(48.72)	76(43.68)		
Card available				
Yes	45(57.69)	113(64.94)	0.736	0.426-1.272 (P=0.337)
No	33(42.31)	61(35.06)		
Alcohol use				
Yes	51(65.38)	47(27.01)	5.024	2.828-8.923 (P<0.001)
No	27(34.62)	127(72.99)		
Smoking now				
Yes	25(32.05)	19(27.01)	3.848	1.963-7.544 (P<0.001)
No	53(67.95)	155(72.99)		
Perceived disease severity				
Mild	36(46.75)	45(26.01)	2.498	1.424-4.381 (P=0.002)
Severe	41(53.25)	128(73.99)		
Perceived distance as barrier				
Yes	41(52.56)	39(22.41)	3.836	2.170-6.780 (P<0.001)
No	37(47.44)	135(77.59)		
Family member accompanied				
Yes	33(42.31)	104(59.77)	0.494	0.287-0.849 (P=0.015)
No	45(57.69)	70(40.23)		
Felt supported				
Yes	51(65.38)	154(88.51)	0.245	0.127-0.474 (P<0.001)
No	27(34.62)	20(11.49)		
Perceived inadequate funds as barrier				
Yes	54(69.23)	63(36.21)	4.137	2.321-7.371 (P<0.001)
No	24(30.77)	111(63.79)		
Education level				
Above Primary	25(32.05)	75(43.10)	0.623	0.355-1.093 (P=0.129)
Primary and below	53(67.95)	99(56.90)		
Personal monthly income				
Below 10,000	62(79.49)	76(43.68)	4.997	2.672-9.344 (P<0.001)
Over 10,000	16(20.51)	98(56.32)		

4.2.2 Disease related factors

Presented in Table 4.7 are results for bivariate analysis of disease related factors. Patients who experienced side effects had a higher risk of interrupting treatment, OR (95% CI) 2.467 (1.345-4.524) ($P < 0.05$), as were those who took other medication during treatment that lasted over one week, OR (95% CI) 2.324 (1.326-4.073) ($P < 0.05$). Those who sought alternative treatment during the course of anti-TB treatment were 2.597 (1.502-4.490) ($P < 0.001$) times more likely to interrupt than those who did not.

The findings from the current study revealed that having a negative HIV test result, OR (95% CI) 0.519 (0.297-0.909) ($P < 0.05$) and being informed of the diagnosis prior to initiation of therapy, OR (95% CI) 0.294 (0.113-0.762) ($P < 0.05$) were protective against interruption as was among those who did not perceive the duration of treatment as being too long, OR (95% CI) 0.516 (0.277-0.961) ($P = 0.05$). As opposed to this, some factors such as TB type, OR (95% CI) 2.013 (1.027-3.945), Experiencing vomiting as a side effect, OR (95% CI) 1.792 (1.015-3.164), Being on a long term treatment regime for other diseases such as cancer, hypertension and Diabetes Mellitus prior to Anti-TB treatment as well as Sputum results at diagnosis and History of prior treatment for TB did not significantly ($P > 0.05$) influence adherence to treatment.

Table 4.7: Bivariate analysis of Disease related factors (Clinical status and Therapy) among TB patient in Nandi County, 2014

Exposure variables	Interrupters n (%)	Non- interrupters n (%)	Prevalence Odds Ratio	95% CI (P-Value)
Informed diagnosis				
Yes	67(85.90)	166(95.40)	0.294	0.113-0.762
No	11(14.10)	8(4.60)		(P=0.017)
Experienced side effects				
Yes	60(76.92)	100(57.47)	2.467	1.345-4.524
No	18(23.08)	74(42.53)		(P=0.005)
Took other medication during treatment for >1wk				
Yes	53(67.95)	83(47.70)	2.324	1.326-4.073
No	25(32.05)	91(52.30)		(P=0.004)
Were on long-term treatment before Anti-TBs				
Yes	34(43.59)	57(32.76)	1.586	0.917-2.744
No	44(56.41)	117(67.24)		(P=0.130)
Sought alternative treatment				
Yes	46(58.97)	62(35.63)	2.597	1.502-4.490
No	32(41.03)	112(64.37)		(P <0.001)
Felt treatment was too long				
No	17(21.79)	61(35.06)	0.500	0.251-0.993
Yes	61(78.21)	113(64.94)		(P=0.050)
TB Type				
EP	19(24.36)	24(13.79)	2.013	1.027-3.945
PTB	59(75.64)	150(86.21)		(P=0.060)
Sputum results at diagnosis				
Negative	18(30.00)	54(33.96)	0.833	0.438-1.584
Positive	42(70.00)	105(66.04)		(P=0.692)
HIV results				
Negative	42(55.26)	119(70.41)	0.519	0.297-0.909
Positive	34(44.74)	50(29.59)		(P=0.030)
Treated for TB before				
Yes	11(14.10)	19(10.92)	1.339	0.604-2.969
No	67(85.90)	155(89.08)		(P=0.609)
Experienced vomiting as a side effect				
Yes	30(38.46)	45(25.86)	1.792	1.015-3.164
No	48(61.54)	129(74.14)		(P=0.061)

4.2.3 Facility related factors

Analysis of the factors related to health facility (Table 4.8) revealed that patients who reported waiting time of less than 1 hour at the treatment centre were protected from interrupting, OR (95% CI) 0.205 (0.115-0.366) ($P < 0.001$). The other protective factors were “Living less than 10 Km from treatment center” OR (95% CI) 0.227 (0.127-0.405) ($P < 0.001$) and “Cost of transport below Ksh100 shillings (\$1)” OR (95% CI) 0.456 (0.261-0.791) ($P < 0.05$). However, treatment availability at nearest health facility, OR (95% CI) 0.885 (0.490-1.598), health care workers attitude, OR (95% CI) 2.020 (0.799-5.107) and satisfaction with health care at the treatment site OR (95% CI) 0.700 (0.368-1.332) did not significantly ($P > 0.05$) affect treatment interruption.

4.2.4 Knowledge, attitude and practices among TB patients

Table 4.9 presents results for knowledge, attitude and practices on TB. Patients who reported to have used herbs during treatment were 2.614 (1.364-5.007) times more likely to interrupt ($P < 0.05$) TB treatment compared to those who did not. Those who reported being ashamed because of having TB were also more likely to interrupt OR (95% CI) 3.273 (1.866-5.739) ($P < 0.001$) as were those who experienced being neglected OR (95% CI) 1.854 (1.079-3.186) ($P < 0.05$).

With respect to knowledge, those who did not know how TB was transmitted were more likely to interrupt treatment, OR (95% CI) 1.982 (1.132-3.470) ($p < 0.05$) as were the respondents who thought patients could stop treatment when they felt well prior to end of the full treatment period OR (95% CI) 4.284 (2.242-8.184) ($P < 0.001$). Those who reported to have shared utensils with other members of the community were protected from interrupting (OR 95% CI) 0.517 (0.310-0.861) ($p < 0.05$).

Table 4.8: Bivariate analysis of facility related factors among TB patients in Nandi County, 2014

Variable	Interrupters n (%)	Non-interrupters n (%)	Prevalence Odds Ratio	95 % CI (P-Value)
Is treatment available in nearest facility				
Yes	55(70.51)	127(72.99)	0.885	0.490-1.598
No	23(29.49)	47(27.01)		P=0.800
HCWs attitude**				
Bad	9(12.33)	11(6.51)	2.020	0.799-5.107
Good	64(87.67)	158(93.49)		P=0.210
Waiting Time				
<1hr	24(30.77)	119(68.39)	0.205	0.115-0.366
>1hr	54(69.23)	55(31.61)		P<0.001
Were you satisfied with services at health facility?				
Yes	59(75.64)	142(81.61)	0.700	0.368-1.332
No	19(24.36)	32(18.39)		P= 0.357
Distance from treatment site				
Below 10 km	37(47.44)	139(79.89)	0.227	0.127-0.405
Above 10 km	41(52.56)	35(20.11)		P<0.001
Cost of transport				
Below Ksh 100	26(33.33)	91(52.30)	0.456	0.261-0.796
Over Ksh 100	52(66.67)	83(47.70)		P=0.008

Table 4.9: Bivariate analysis of Knowledge, attitude and practices among TB patients in Nandi County, 2014

Variable	Interrupters (%)	Non-interrupters (%)	OR	CI (P-Value)
Do patients with TB share utensils with others?				
Yes	43(42.57)	89(58.94)	0.517	0.310-0.861
No	58(57.43)	62(41.06)		P=0.015
Were you at any time ashamed because you had TB				
Yes	52(66.67)	66(37.93)	3.273	1.866-5.739
No	26(33.33)	108(62.07)		P<0.001
Did you experience being neglected because you had TB?				
Yes	46(58.97)	76(43.68)	1.854	1.079-3.186
No	32(41.03)	98(56.32)		P=0.035
Used herbs during treatment				
Yes	23(29.49)	24(13.79)	2.614	1.364-5.007
No	55(70.51)	150(86.21)		P=0.005
Know transmission of TB				
No	33(42.31)	47(27.01)	1.982	1.132-3.470
Yes	45(57.69)	127(72.99)		0.024
Can patients stop treatment if they feel well?				
Yes	29(37.18)	21(12.14)	4.089	2.154-7.762
No	49(62.82)	152(87.86)		P<0.001
Patients Know TB cause.				
No	16(24.62)	28(17.39)	1.551	0.773-3.111
Yes	49(75.38)	133(82.61)		P= 0.291

4.3 Stratified analysis

Stratified analysis revealed that age had an effect modification on the smoking status of the respondents (Table 4.10)

Table 4.10: Stratified analysis of TB patients' smoking status in Nandi County by interruption status, 2014

Do you smoke	Interrupters	Non-interrupters	Prevalence Odds Ratio	95%CI
All				
Yes	25	19	3.848	1.963-7.544
No	53	155		
Below 40				
Yes	18	7	10.636	3.954-28.610
No	22	91		
Above 40				
Yes	7	12	1.204	0.432-3.360
No	31	64		

4.4 Multivariate analysis of factors associated with TB treatment interruption

Forward sequential elimination method was employed in carrying out unconditional regression analysis as shown in Table 4.11. This showed that Personal income AOR (95% CI) 0.254 (0.126-0.515), Alcohol use AOR (95% CI) 2.843 (1.456-5.551), Waiting time at health facility AOR (95% CI) 3.323 (1.713-6.445), Perceiving distance as a barrier AOR (95% CI) 2.046 (1.031-4.062) and Perceiving inadequate funds as a barrier AOR (95% CI) 2.800 (1.423-5.513) were independently associated with TB treatment interruption. This meant that these five factors were the most significant determinants of TB treatment interruption in Nandi County

Table 4.11: Unconditional Logistic Regression

Term	Odds Ratio	95% C.I.	Coefficient	S. E.	Z-Statistic	P-Value
Personal income over Ksh 10,000	<u>0.2543</u>	<u>0.1257</u> <u>0.5145</u>	-1.3694	0.3596	-3.8079	<u>0.0001</u>
Alcohol use during treatment	<u>2.8431</u>	<u>1.4561</u> <u>5.5511</u>	1.0449	0.3414	3.0607	<u>0.0022</u>
Long waiting time at facility beyond 1 hr.	<u>3.3227</u>	<u>1.7130</u> <u>6.4453</u>	1.2008	0.3381	3.5521	<u>0.0004</u>
Perceived distance as a barrier	<u>2.0460</u>	<u>1.0305</u> <u>4.0619</u>	0.7159	0.3499	2.0459	<u>0.0408</u>
Perceived inadequate funds as a barrier	<u>2.8003</u>	<u>1.4231</u> <u>5.5103</u>	1.0297	0.3453	2.9817	<u>0.0029</u>
Constant	*	* * *	-2.1539	0.3659	-5.8867	<u>0.0000</u>

Convergence: **Converged**

Iterations: **5**

Final -2*Log-Likelihood: **222.7190**

Cases included: **252**

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

Defaulting from treatment has been one of the major obstacles to treatment management and has indeed been an important challenge for TB control. Inability to complete the prescribed regimen is an important cause for treatment failure, relapses, acquired drug resistance and perpetuation of on-going transmission of infection.

Over the years there has been increasing emphasis on DOTS to ensure adherence, wherein each dose of treatment is given under the observation of a health worker or a family member. The adoption of DOTS has yielded impressive results with higher treatment success being reported both from developing and industrialized countries alike (Jaggarajamma *et al.*, 2007). Treatment interruption is a precursor to defaulting; and thus gives a better insight of what happens to patients prior to defaulting.

The overall interruption rate in Nandi County was 30.95%. This meant that one in every 3 patients interrupted treatment. This rate was higher than that which was found in a similar study in Nigeria (Ibrahim *et al.*, 2014) in which 19% of the patients interrupted treatment, but lower than what was found in Eastern Cape Province of South Africa (47.5%) by Kandel *et al.*, (2008). The rate was comparable to that found in Ivanovo Oblast, Russian Federation (Danilova *et al.*, 1999) where 28% of patients were interrupters and in India (Gupta, Gupta, & Behera, 2011) in which interruption rate was 34.25%. The high interruption rate could be attributed to the increasing TB burden due to HIV/Aids pandemic against a low health workforce (Muture *et al.*, 2011). This has made pre-treatment counseling unlikely to be sufficient. The inadequate knowledge would subsequently lead to high interruption rates.

Majority of the TB patients were males and aged 30-39. This age bracket was also the most reported among interrupters but the non-interrupters reported the highest frequency in the age group 20-29. The mean age of the patients was 40 years with a median age of

38 years. This constituted the most economically active group, a good indicator of the economic effect of TB on the health of the work force. These results were similar to what was found by Ibrahim *et al.* (2014) in Nigeria where a male preponderance was 61%, a mean age of 37.6 years and a high prevalence in age of 25-44 years were found.

Most of the patients in the present study had low levels of education, with over 60% having primary or lower education. These proportions were higher among interrupters, pointing to the fact that education was an important factor in determining interruption of treatment. Some scholars such as Hussain *et al.* (2003), argued that formal education was only a proxy for low socio-economic status.

The most reported occupation was farming. This did not seem to have a bearing on the risk of TB infection but rather the prevalent economic activity in the County. Most of the respondents reported personal incomes of below Ksh 10,000 (\$ 100) per month. The low economic status was associated with poor social amenities, overcrowding and poor ventilation (Corbett *et al.*, 2003). It was also found that 39% of the patients used alcohol while 17% were smokers. In a study on smoking and TB in Hong Kong (Leung *et al.*, 2003), it was demonstrated that TB patients were more likely to have smoked than population controls. This concurred with the findings of a systemic review (Lin, Ezzati, & Murray, 2007). More aggressive lung involvement was also found among smokers in the Hong Kong setting. Alcohol and smoking increased the risk of TB infection via their immune suppressor effect that increased the risk of activation of dormant TB.

Factors that influenced the patients' ability to adhere to treatment as prescribed were also considered. Patient factors, disease-related factors, facility related factors, as well as knowledge, attitude and practices were assessed by bivariate analysis. The distribution of risk factors and crude PORs for treatment interruption for each of the factors were examined and the factors that were significant statistically identified and are discussed below.

From the results, the odd of interruption was 5.024 times higher among those who took alcohol three times or more every week and 3.848 times higher among those who were smokers. These findings agreed with the findings of several other studies done elsewhere. For instance, studies carried out in Mumbai demonstrated that smoking during treatment was significantly associated with non-adherence in the newly-diagnosed patients (POR 8.2), while alcohol consumption was significant in those that were not new in the cross-sectional study (POR 4.8) (Bagchi et al., 2010). In urban Morocco, Cherkaoui *et al.*, (2014) showed that smokers had 6.6 times higher chances of defaulting compared to non-smokers. The study in Morocco did not establish the same with respect to alcohol use (Cherkaoui et al., 2014a). Muture *et al.*, (2011) also found that those who used alcohol were 6.28 times more likely to default compared to those that did not.

The association of alcohol with TB is twofold. Individuals who take alcohol frequently could be more likely to be drunk at the time when they are required to take their next dose. This makes them forget swallowing their pills. Alcohol abuse also interferes with sleep pattern, impairs judgment and induces amnesia (Ambrose *et al.*, 2001; Brower, 2001; Vetreno *et al.*, 2011; Messing., 2014). This can cause patients to forget appointments and interfere with compliance to therapy.

Another axis to the interaction is that most of the alcoholics take local brews or second generation liquor since they cannot afford the expensive drinks. These are sold in congested establishments, increasing the risk of infection among the other patrons due to poor ventilation. Both alcohol and tobacco use lower immunity, thereby predisposing subjects to re-activation with TB. Alcohol use is also associated with liver damage (Albano., 2006; National Health Service., 2013) hence concomitant use of anti-TB drugs and alcohol will increase liver damage and thus lead to higher chances of side effects (Gülbay et al., 2006). This will in turn lead to treatment interruption due to increased drug intolerance.

Respondents who perceived their disease at diagnosis as mild were 2.498 times likely to interrupt as opposed to those who viewed their disease as severe. This could be explained

by the fact that those who considered their disease as more advanced put in more effort to follow their prescribed treatment. These patients did so with the fear of the disease advancing further, ultimately leading to death. On the contrary, those who considered their malady as mild did not have much motivation to adhere to treatment.

It was also found that those who perceived distance (OR 3.836) and inadequate funds (OR 4.137) as barriers were more likely to default. Similar findings have been found in a study in Ghana (Boateng *et al.*, 2010), in which perception of finance as a barrier was associated with 7.25 and 4.67 times higher odds of defaulting among those aged above 40 and below 40 years respectively.

The influence of finance was further confirmed in the current study wherein patients who had a personal monthly income of below Ksh. 10,000 (\$100) had higher chances of interrupting (OR 4.997) compared with those with higher incomes. Muture *et al.*, (2011) found patients with lower income to be 4.5 times more likely to default. Similar findings of the socio-economic influence on treatment interruption were also recorded in Ethiopia (Demissie and Kebede, 1994; Tadesse *et al.*, 2013) and Ghana (Dodor & Afenyadu, 2005).

The influence of finance can be unpacked from an economic evaluation of the cost of TB from the patients' perspective. Economists think of cost as "consequences of choices" hence the decision to allocate money towards an illness makes these funds unavailable for food, education, clothing or housing. Apart from the cost of drugs and investigation (provided by the Government of Kenya) the patient still has to deal with costs such as transport, indirect costs such as loss of wages and other associated opportunity costs.

Only 10.71% of the study participants were in formal employment, meaning for the rest of them, getting funds for transport and other opportunity costs was a burden. This was made worse by the fact that patients had to collect drugs weekly during the first 8 weeks of treatment. For the low income cadres, this stretched the patient's budget and could have led to non-adherence.

Social support was also found to be important in this study. Patients who were reported to have been supported during the course of treatment were less likely to default (OR 0.245). This was also supported by the fact that those who were accompanied by a family member in any of the visits were protected against interrupting treatment, OR 0.494. Similar findings on social support were documented in Ghana (Boateng, Kodama, Tachibana, & Hyoui, 2010) where family support was associated with reduced risk of defaulting treatment (OR 0.29). The effect of good social support could be explained by the fact that patients accompanied by relatives were less likely to experience stigma. They were also likely to be reminded to take their pills in case they forgot and were given financial and moral support to complete treatment. Being accompanied by relatives made disclosure easy, and thus any co-morbid conditions that may affect the couple, could be easily discussed and screened. In some facilities, patients accompanied by spouses were given priority. This led to increased male involvement in maternal and child health services.

Sex, Age and Education level did not significantly affect interruption. The findings on age and sex agreed with Ibrahim *et al.*, (2014). Age, marital status and educational levels were found not significantly associated with compliance in a study in Ndola, Zambia by Kaona *et al.*, (2004). However, this finding differed with studies in Bangladesh and Syria (Begum *et al.*, 2001; Karim *et al.*, 2008), the difference could have been due to some factors intrinsic in the population considered in the Asian studies.

Among patient related factors, respondents who experienced side effects were 2.467 times more likely to default. Boateng *et al.*, (2010) also found that adverse effects were associated with default (OR 3.00). In this study, experiencing vomiting as a side effect was associated with 1.792 higher chances of default. Experiencing side effect discouraged patients from taking drugs. As indicated by the finding on vomiting, this caused intolerance to treatment and may have made patients to consider alternative treatment options.

Patients who sought alternative treatment during therapy were 2.597 times more likely to interrupt, similarly, those who took other medications that lasted more than a week had

2.324 odds of interrupting TB treatment. Use of alternative treatment such as traditional healers has been shown to be a risk factor for interruption in South Africa (Finlay et al., 2012). Seeking alternative options was an indicator that patients did not have confidence in the conventional medicine. It could also be an indicator of inadequate knowledge due to ignorance or insufficient pre-treatment counseling. The inadequate knowledge was responsible for making irrational decisions that included abandonment of treatment altogether for alternative treatment. Patients who took more than one prescription had higher chances of experiencing side effects due to the many pills and were thus prone to abandoning some of the drugs. The patients could also have just forgotten to take one of the prescribed pills since they were simply too many.

A negative HIV status was associated with reduced risk of interruption (POR 0.519). Similar findings were documented elsewhere (Muture *et al.*, 2011); Garrido *et al.*, 2012). Chakaya *et al.*, (2008) also reported poor TB outcomes among patients on re-treatment in Nairobi. Re-treatment cases have higher chances of having MDR TB strains (Chakaya et al., 2008). HIV co-infection has been shown to increase the risk of death among TB patients in Kwazulu-Natal (Brust, Gandhi, Carrara, Osburn, & Padayatchi, 2010). In the current study, TB-HIV co-infection stood at 34.43%. Some patients attended TB clinics at different sites from where they took ART. Another factor that could have increased interruption was the fact that all co-infected patients were initiated on lifelong ART as well as Co-trimoxazole therapy for prophylaxis of *Pneumocists jiroveci* pneumonia (PJP). This meant they had too many pills to swallow and were thus likely to interrupt the course of treatment.

Participants who were informed of diagnosis were protected from interruption (POR 0.294). Having more accurate information about the disease being treated meant they were able to make rational decisions from an informed point of view. The knowledge about the disease enabled them to opt for adherence since they understood the dangers associated with default.

Waiting time of less than one hour reduced a likelihood of interruption of treatment; (POR 0.205). Waiting time is an important determinant for those seeking most health care services (Thompson, Yarnold, Williams, & Adams, 1996). Long waiting time discouraged clients from making subsequent return visits. Similar findings were recorded in Tamatave, Madagascar (Comolet et al., 1998). In their study, however, cost was not found to significantly affect default, unlike in the present study which found that those who spent less than 100 Kenya shillings (\$ 1) on transport one way were less likely to interrupt treatment (POR 0.456) as well as those living within less than 10 Km from the treatment center (POR 0.227).

Distance has also been reported by Boateng *et al.*, (2010) to significantly affect default of TB treatment. Most patients live far away from the treatment centers. Living far from treatment sites acted as a barrier to adherence since there was poor road network and the means of transport were unreliable. Access was made worse during the rainy season. This in turn increased the cost of transport, straining the household budget further. Studies have documented several costs associated with TB treatment that are incurred by patients (Barter, Agboola, Murray, & Bärnighausen, 2012). Patients were thus faced with a challenge of allocation of the little available resources in which case other competing interests overrode seeking treatment. The patients then ran out of drugs since they could not access the treatment center.

Satisfaction with the care offered at the treatment site and workers attitude did not significantly affect interruption. This could probably be explained by the fact that the questionnaires were administered by CHWs who attended to patients during the course of treatment. The respondents could have given positive feedback for fear of improper services on subsequent visits to the treatment sites. This may have introduced interviewer and reporting bias.

Respondents who used herbs during treatment were 2.614 times more likely to interrupt. Like other rural settings, traditional medicine men and herbalists exist in Nandi County. They are in constant competition with conventional medical practitioners, in some areas,

and especially so where the level of education is low. In such areas it was easy for the herbalist to convince patients since they believed in witchcraft. Use of herbal medicine showed lack of confidence in the use of prescribed anti-TB drugs as well as lack of information. This meant they could easily abandon treatment in favour of the herbal medicine. Since the efficacy of the herbal medicines is not assured, the use of such herbs could lead to continued infectivity and thus increased TB burden. Similar findings were documented by Muture *et al.*, (2011) in a study carried out in Nairobi.

Apart from alternative treatment, stigma was found to significantly influence interruption. Patients who reported being ashamed of TB (OR 3.273) and those who experienced being neglected because of TB (OR 1.854) were more likely to default. This association of stigma was also sustained by the finding that those who reported to have shared utensils with other members of the community were protected from interruption (OR 0.517). Similar findings were reported in a study in Madagascar (Comolet *et al.*, 1998) about patients who “felt that TB was a shameful disease.” Stigma associated with TB and HIV/AIDS acted as a barrier to adherence since the patients were not free to disclose their condition. They hid from family members and thus ended up not getting the desired support. This ultimately led to non-adherence.

Patient knowledge was an important determinant of non-adherence. Patients who had no knowledge on how TB was transmitted were twice more likely to interrupt than those who had (OR 1.982). When asked if they could stop treatment after feeling better, those who answered in the affirmative had 4.284 times higher chances of interrupting than those who responded otherwise. The drugs used in the first two months for TB treatment were highly effective and thus killed most of the bacteria upon initiation of treatment. The reduction of the pneumatic and systemic mycobacterial load led to resolution of symptoms, making the patient feel better. This explains the reason why most patients would default early in the course of therapy. The mean time before default was found to be 5.44 (\pm 2.783) weeks, with a mode of 6.00 (Median 5.00, Q1=3.00, Q3=7.00).

To control for confounding, a forward sequential elimination method was employed in carrying out unconditional regression analysis. The final model showed that Personal income, Alcohol use, Perception of inadequate funds as a barrier, Perception of distance as a barrier and Waiting time at the treatment centre independently influenced interruption of TB treatment in Nandi County. This meant that in order to address treatment interruption in the county, these were the most important factors to be considered.

At the time of interview, 62.70% of all the respondents had TB appointment cards. There was no association between availability of card and interruption of treatment. The mean body mass index (BMI) was 18.607 (3.725). Weight was not monitored serially, making it difficult to comment on BMI of patients as treatment progressed.

At diagnosis, 82.94 % of the patients had pulmonary TB, while the rest had extra-pulmonary TB. New patients accounted for most (87.7%) while transfers-In accounted for the least (1.19%). HIV testing was done for 96.83% of the patients interviewed, out of which 34.43 % had a positive result. This gave a TB/HIV co-infection rate of 34.43%. In western Kenya, a cross-sectional study by Nyamogoba *et al.*, (2013) across 10 hospitals reported a co-infection rate of 41.8%. The present study found slightly lower than the national average of 37% indicated in the 2013 annual TB report from the National TB, Leprosy and Lung Disease Department (MOH Kenya, 2014). The study in Western Kenya also reported isolation of non-Tuberculous mycobacteria from TB suspects at a rate of 1.7% (Nyamogoba *et al.*, 2013). Of those who were positive, 98.81% were reported to have transitioned to ART. This performance was higher than the national average of 83% (MOH Kenya, 2014). However, partner testing was low at 31.35%. Coupled with the high rates of co-infection above, it meant the County was missing out on many potentially positive spouses that should be initiated on ART as well as screened for TB.

Prior to initiation of treatment, 41.04% of the patients had undertaken X-ray examinations. Most patients (75.40%) knew the frequency of visits during the intensive phase, with family members providing most of the DOT (86.11%). In terms of follow up based on sputum examinations, 85.32%, 71.03% and 65.87% of sputum samples were examined at

diagnosis, at 3 months and at the end of treatment, respectively. The sputum positivity fell exponentially from 67.43% at diagnosis, to 7.30% at 3 months and 1.84% at the end of treatment. At 2 months the results were better than findings documented by Pajankar *et al.*, (2008). They found 2-month conversion rates of 43.7% in a study conducted in Oman (Pajankar, Khandekar, Amri, & Lawati, 2008). The most reported outcome was “Cured” (52.38%), with overall cure rates standing at 91.67%. Those reported to be out of control (OOC) were 17(6.75%). This figure was above the national target of below 5% (MOH Kenya, 2014). Four patients, however, had treatment failure at the end of therapy, representing a failure rate of 1.59%. When asked about satisfaction with services at the treatment center, 79.76% of the subjects responded in the affirmative.

The study excluded patients aged below 14 years. This has the potential of limiting the generalization of the findings to the whole county. It was also noted that interviews were conducted by TB ambassadors who were part of the Primary Health Care system. The fact that they had interacted with subjects during routine health care provision prior to the study, could have led to the respondents answering questions in a predetermined way for fear of being given improper services during subsequent visits. This could possibly have led to interviewer and reporting bias. This was, however, mitigated against by thorough and intensive training and supervision of the interviewers to limit bias.

5.2 Conclusions

1. This study has shown that most TB patients were aged below 39 years (55%) with a peak prevalence in the 30-39 age group. It was also noted that the majority of the TB patients used alcohol during treatment.
2. The study established the proportion of treatment interruption in Nandi County as 31%. This high interruption rate could be attributed to lack of confidence in the prescribed treatment as shown by the high proportion of patients that sort alternative treatment while on Treatment for TB. The use of alternative treatment could also be attributed to inadequate knowledge emanating from the inadequacy of counselling prior to initiation of treatment. However, from the patients’

perspective, too many pills, suffering from side effects, unpleasant taste or smell of the pills and inadequate food were the main reasons for abandoning treatment. Most patients interrupted for the first time around the 5th to 6th week.

3. The factors that were associated with treatment interruption were in Nandi county were; alcohol use, personal monthly income, perception of inadequate funds as a barrier, perception of distance as a barrier and waiting time at the treatment center.
4. On quality of patient follow up, it was deduced that most patients had DOTs under supervision of family members(86%), the county had low sputum testing rates at the 3rd and 6th /8th months.,HIV testing of patients (96.8%) and subsequent transitioning (98.8%) to care was good, however, partner testing for HIV was very low at 31.35% .

5.3 Recommendations

1. Introduction of a TB component in the youth friendly package to address the issue of TB among the youth since the youth were the most affected age group.
2. Strategies to reduce the high interruption rates should be adopted. Such may include intensive, quality pre-treatment counselling that focuses on the importance of adhering to treatment, whether the patient has relief of symptoms, side effects or feels that the drugs are not working. This should also focus on identification of risk factors such as co-morbid conditions, inadequate food, alcohol use and smoking and linking those identified to targeted interventions including rehabilitation services for those who have alcohol addiction. Those with financial difficulties could have special sessions organized for them to be taught on initiating sustainable income generating activities via patient support groups.
3. Expansion of DOT services to reduce the distance travelled, time used to travel, cost of travel and the waiting time at treatment facilities, can be done by using other healthcare givers such as private clinics, chemists and nursing homes to implement private public mix. TB treatment should be available in all dispensaries and health centers to help in decentralization. In addition to this, it is recommended that DOT supporters in the communities can be visiting patients weekly to assess

progress and identify those that need referral. These will also facilitate defaulter re-entry and improve access to medical care via the community strategy approach.

4. Alternative care givers such as herbalists, spiritualists and traditional medicine men should be sensitized on TB and engaged in TB referral. This will form a good portal of entry into this area with culturally influenced beliefs and attitudes about TB and its treatment. This will ensure that patients are assured that TB is curable as long as they use the prescribed drugs. Messages can be packaged into information, education and communication messages to reduce the myths and misconceptions about TB.
5. To improve partner testing there is need to employ strategies such as giving first priority to those who make visits with their partners. The same can also be used upon patients accompanied by close family members during visits since that will eventually reduce stigma and lead to good family support.
6. Patient friendly services, flexible / extensive hours of operation and improved management of co-infected patients should also be implemented.

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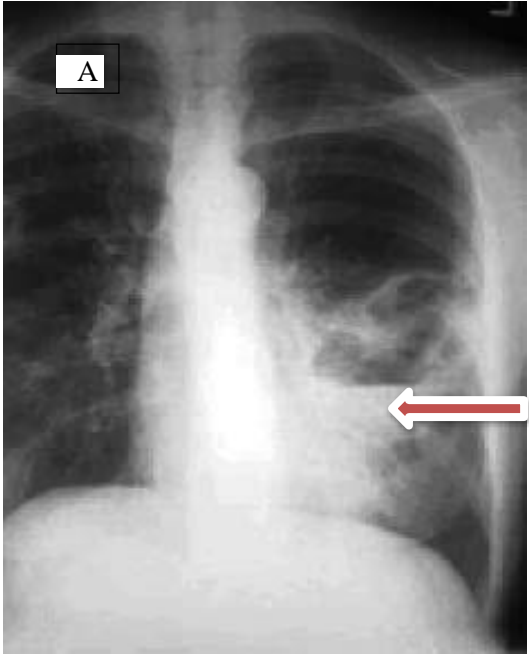
APPENDICES

Appendix 1: Stages of TB development

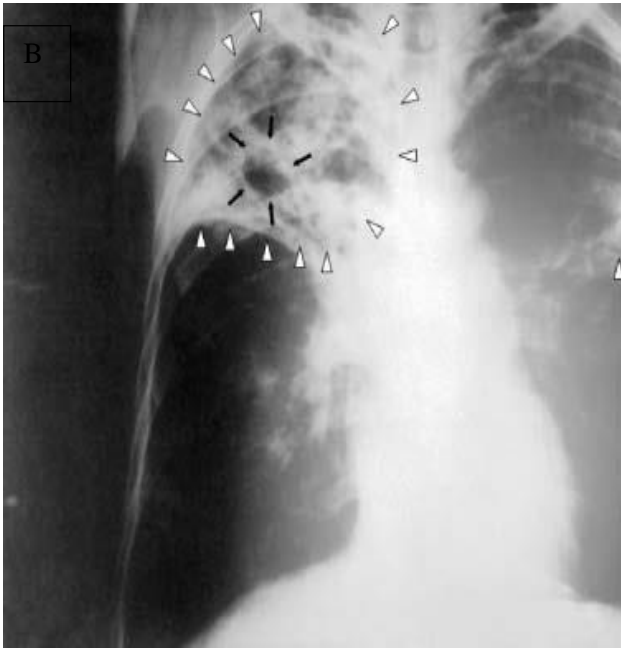
Early infection	Early primary progressive (active)	Late primary progressive (active)	Latent
<p>Immune system fights infection</p> <p>Infection generally proceeds without signs or symptoms</p> <p>Patients may have fever, Para-tracheal lymphadenopathy, or dyspnea</p> <p>Infection may be only subclinical and may not advance to active disease.</p>	<p>Immune system does not control initial infection. Inflammation of tissues ensues.</p> <p>Patients often have nonspecific signs or symptoms (fatigue, weight loss, fever).</p> <p>Nonproductive cough develops.</p> <p>Diagnosis can be difficult: findings on chest radiographs may be normal and sputum smears may be negative for mycobacteria.</p>	<p>Cough becomes Productive.</p> <p>More signs and symptoms as disease progresses.</p> <p>Patients experience progressive weight loss, rales, and anemia.</p> <p>Findings on chest radiograph are normal</p> <p>Diagnosis is via cultures of sputum</p>	<p>Mycobacteria persist in the body.</p> <p>No signs or symptoms occur.</p> <p>Patients do not feel sick.</p> <p>Patients are susceptible to reactivation of disease</p> <p>Granulomatous lesions calcify and become fibrotic, become apparent on chest radiographs</p> <p>Infection can reappear when Immune suppression occurs</p>

Source; MOH Kenya, (2013).

Appendix 2: Chest X-ray in pulmonary TB



A) Infiltrates in left lung.



B) Bilateral advanced pulmonary tuberculosis and cavitation in apical area of right lung.

Source: MOH Kenya, (2013).

Appendix 3: Classification of Drugs used in TB treatment

Group I (Oral First line drugs)	
<ul style="list-style-type: none"> • Isoniazid • Rifampicin 	<ul style="list-style-type: none"> • Ethambutol • Pyrazinamide
Group II (Injectable agents)	
<ul style="list-style-type: none"> • sStreptomycin • Kanamycin 	<ul style="list-style-type: none"> • Amikacin • Capreomycin
Group III (Quinolones)	
<ul style="list-style-type: none"> • Ofloxacin • Ciprofloxacin 	<ul style="list-style-type: none"> • Levofloxacin • Moxifloxacin
Group IV	
<ul style="list-style-type: none"> • Ethionamide • Cycloserine 	<ul style="list-style-type: none"> • Para amino salicylic acid (PAS)
Group V (other Agents)	
<ul style="list-style-type: none"> • Amoxi-clavulinic acid (AMX/CLV) • Clofazimine 	<ul style="list-style-type: none"> • Clarithromycin • Linezolid

Source: WHO, (2013).

Appendix 4: Drugs used in MDR TB treatment

Intensive Phase – 8 Km-Pto-Lfx-Cs-Z

This lasts for a minimum of 8 months and the following drugs are used

- a) Inj. Kanamycin [Km]
- b) Tabs Prothionamide [Pto]
- c) Tabs Levofloxacin [Lfx]
- d) Tabs Cycloserine [Cs]
- e) Tabs Pyrazinamide [Z]

Continuation Phase– 12Pto- Lfx -Cs-Z

This lasts for 12 months and uses the following drugs

- a) Tabs Prothionamide [Pto]
- b) Tabs Levofloxacin [Lfx]
- c) Tabs Cycloserine [Cs]
- d) Tabs Pyrazinamide [Z]

Source: MOH Kenya, (2013).

Appendix 5: Top 10 countries by TB incidence

	COUNTRY	RATE/100,000
1	Cambodia	539
2	zimbabwe	538
3	South africa	392
4	Afghanistan	333
5	Uganda	320
6	Philipines	314
7	Tanzania	308
8	Kenya	297
9	Indonesia	287
10	Ethiopia	260

Source; Dye schelles, (1999).

Appendix 6: Paediatric TB score card

Presence of 2 or more of the following symptoms

- ❖ Cough > 2 weeks
- ❖ Weight loss or poor weight gain
- ❖ Persistent fever and /or night sweats > 2 weeks
- ❖ Fatigue, reduced playfulness, less active

PLUS

Presence of 2 or more of the following:

- ❖ Positive contact history
- ❖ Respiratory signs
- ❖ CXR suggestive of PTB (where available)
- ❖ Positive Mantoux test (where available)

Then PTB is likely, and treatment justified

Source: MOH Kenya, (2013)

Appendix 7: New WHO recommended Pediatrics treatment regimen

Forms of TB	Recommended regimen*	
	Intensive phase	Continuation phase
<i>All forms of PTB and EPTB except TB Meningitis and Osteoarticular TB</i>	2 HRZE	4 HR
<i>TB meningitis and Osteoarticular TB</i>	2 HRZE	10 HR
**Retreatment	3 RHZE	5 HRE
<i>Drug resistant TB</i>	Refer to a DRTB specialist	
<p>*Numeral refers to number of months of the regimen.</p> <p>H= Isoniazid R= Rifampicin Z= Pyrazinamide E= Ethambutol</p> <p>2 HRZE refers to two months of Isoniazid, Rifampicin, Pyrazinamide and Ethambutol</p>		
<p>Ethambutol is safe and can be used in children in doses not exceeding 20mg/kg/day</p> <p>** For children on retreatment, assess for clinical improvement after one month of treatment</p>		

Source: WHO, (2013).

Appendix 8: Risk factors for development of active TB following infection

Major risk factors:

- HIV infection
- Time since infection (Recent infection)
- Poorly treated previous TB

Other factors:

- Age (extremes of age)
- Sex (males more than females)
- Malnutrition
- Diabetes
- Silicosis
- Alcoholism
- Tobacco smoking
- Other conditions e.g. immune suppressing therapy Long term treatment with oral corticosteroids Treatment with immunosuppressive agents. Cancers e.g. Leukemia

Source; MOH Kenya, (2013)

Appendix 9: JOOTRH Ethics Review Board Approval



MINISTRY OF HEALTH

Telegrams: "MEDICAL", Kisumu
Telephone: 057-2020801/2020803/2020321
Fax: 057-2024337
E-mail: ercjootrh@gmail.com
When replying please quote

JARAMOGI OGINGA ODINGA TEACHING &
REFERRAL HOSPITAL
P.O. BOX 849
KISUMU

ERC.1B/VOL.1/173

30th April, 2015

Ref:

Date

Wanyonyi Wandeba Alfred,
Reg. No. TM312-2385/2013,
JKUAT.

Dear Alfred,

RE: FORMAL APPROVAL TO CONDUCT RESEARCH TITLED: "FACTORS ASSOCIATED WITH INTERRUPTION OF TUBERCULOSIS TREATMENT AMONG PATIENTS IN NANDI COUNTY, KENYA"


The JOOTRH ERC (ACCREDITATION NO. 01713) has reviewed your protocol and found it ethically satisfactory. You are therefore, permitted to commence your study immediately. Note that this approval is granted for a period of one year (30th April, 2015 to 1st May, 2016). If it is necessary to proceed with this research beyond the approved period, you will be required to apply for further extension to the committee.

Also note that you will be required to notify the committee of any protocol amendment(s), serious or unexpected outcomes related to the conduct of the study or termination for any reason.

Finally, note that you will also be required to share the findings of the study in both hard and soft copies upon completion.

The JOOTRH ERC takes this opportunity to thank you for choosing the institution and wishes you the best in your endeavours.

Yours sincerely,


FRED OUMA AKWKATTA,
SECRETARY - ERC,
JOOTRH – KISUMU.

Appendix 10: Nandi County Health Department Clearance



REPUBLIC OF KENYA

COUNTY GOVERNMENT OF NANDI

Telephone
When replying
Please quote
Ref: CO/NC/GENH&S/1/Vol.I/15/40

Office of Chief Officer
Health and Sanitation
Nandi County
P.O.BOX 802
KAPSABET
5th May 2015

To Dr.Alfred Wandera Wanyonyi
Po Box 5
Kapsabet

RE: AUTHORITY TO CONDUCT RESEARCH IN NANDI COUNTY

Your letter dated 3/3/2015 refers.

This is to inform you that you have been given authority to conduct the study i.e factors associated with interruption of Tuberculosis treatment among patients in Nandi County Kenya.

We hope you will share with us the results of your study.

We wish you all the best.

Dr. Serem Edward
Chief Officer
Health and Sanitation
Nandi County



Appendix 11: Informed consent Form

Questionnaire number _____ Interviewer's initials:

Date of interview

Title of the study: Factors Associated with Interruption of Tuberculosis Treatment among Patients in Nandi County, Kenya, 2014

PART A

Introduction

Tuberculosis is the second leading cause of death due to infections worldwide, only second to HIV/AIDS. One of the major problems encountered in the treatment of TB is interruption of treatment. It is important to understand why some people default treatment so that this knowledge can be used when doing initial counseling preparatory to initiation of treatment. This will reduce the TB defaulter rates and thus lead to high treatment success rates.

You are therefore invited to participate in this study whose main objective is to determine the factors that are associated with TB treatment interruption. We kindly request you to read this form and ask any questions you may have before agreeing to participate in the study.

This study is being conducted by Wandeba Wanyonyi from the Institute of Tropical Medicine and Infectious Diseases, Jomo Kenyatta University of Agriculture and Technology.

Study procedures

If you agree to take part in this study, you will be asked questions about yourself and your family.

Risks of study participation

Participating in this interview has minimal risk.

Research benefits

If you agree to participate in this study, you will be interviewed and any questions you have concerning TB will be answered by the investigator. You will also be taught how to keep your family from getting respiratory diseases. The information gathered from this study will be used to design strategies to ensure that TB patients are managed better and have better chances of completing their treatment.

Study costs

If you accept to take part in this study, there will be no direct payments to you since it is entirely voluntary.

Confidentiality

The information collected from you will be strictly private and confidential and will be kept under lock and key. Your name will not be used in any report of this study, or in any reports, publications or presentations. In case the officials from Institute of Tropical Medicine and Infectious Diseases (ITROMID, KEMRI), or Jomo Kenyatta University of Agriculture and Technology will review your records for the study, they will protect your privacy.

Participation information

Participation is voluntary and there are minimal risks if any at all. If at any time you wish to withdraw from participating in the study, you can do so, and this will not affect any future participation or relations with anyone or any institution.

Contacts and questions

The researcher conducting this study is Wandeba Wanyonyi. You may ask any questions you have now, or if you have any questions later, you are encouraged to contact him through mobile telephone number: 0722991269, or email wandeba@gmail.com. If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher (s), you are encouraged to contact the following:

The Director,

Institute of Tropical Medicine and Infectious Diseases (ITROMID)

Jomo Kenyatta University of Agriculture and Technology (JKUAT)

P.O. Box 62000- 00200

NAIROBI

Telephone no: 067- 52711

Email: itromid@nairobi.mimcom.net

OR

The Chairman,

JOOTRH Ethical Review Committee,

P.O. BOX 849,

KISUMU. Email: ercjootrh@gmail.co

PART B: Participant consent form

Please read the information sheet (PART A) or have the information read to you carefully before completing and signing this consent form. If there are any questions you have which are not clear to you regarding this study, please feel free to ask the investigator prior to signing the consent form.

Participant Statement

I Mr., Mrs., Miss, hereby give consent to Wandeba Wanyonyi to include in the proposed study entitled “**Factors Associated with Interruption of Tuberculosis Treatment among Patients in Nandi County, Kenya, 2014**”. I have read the information concerning this study, and I fully understand the aim of the study and what will be required of me if I accept to take part in the study. The risks and benefits have been explained to me. Any questions I have concerning the study have been adequately answered and I am satisfied.

I understand that I can withdraw from this study anytime if I wish so without giving any reason and this will not affect my access to normal health care and management.

Name of Participant or respondent.....

(Jina la mhojiwa)

Signature/Sahihi..... **Or/Ama**

Thump print (Left)/ *Alamayakidolegumba (Kushoto)*

Date/Tarehe.....

Name of Witness.....

(Jina la shahidi)

Signature/*Sahihi*..... Date/*Tarehe*.....

...

[The name and signature of the witness is ONLY necessary if the participant is illiterate.]

Name of the person taking consent.....

(Jina la anayetoaidhini)

Signature/*Sahihi*..... Date/*Tarehe*

Name of the investigator.....

(Jina la mtafiti)

Signature/*Sahihi*.....Date/*Tarehe*.....

..

Appendix 12: Translation of Informed consent in Nandi Language

Questionnaire number..... Interviewer's initials:
.....
Date of
interview.....

KEBEBERTA A

Taunet:

T.B ko ne bo aeng' eng' mianwogik che indoi ago che ibu meet amu kanaamet eng' ng'onny komugul, nito ne rubei HIV/AIDS. Kaimutiet agenge ne o ne kinyoru eng' kanyoisetab T.B, ko kiim kanyoiset. Bo kamanut kiguiyo amu nee si kobagaktoi bik kanyoiset eng' kwen, si keboisie ng'omnatonito ye king'alaljin bik kochobok kotomo ketoi kanyoiset. Ichuchuchi nito bik che metoe kwen kanyoisetab T.B ak kogon katereret ak kasuldaet ne mi barak. Kagitaachin anyun iegu agenge eng' kasiagoni, ne kit ne o ne tokyingei ko kenai tuguk che namegei ak kaimetab kanyoiset ne bo T.B. Kisomin isoman fomini ak iteeb teebut age tugul kotom iyan itese tai kasiagetab konetisioni.

Chito ne indochin kasiagoni ko Wandeba Wanyonyi ne bunu Institute of Tropical Medicine and Infectious Diseases, Jomo Kenyatta of Agriculture and Technology.

Ole Kisubtoi Kasiaget

Ngot iyan ip kebeber eng' kasiagonito, keteebenen teebutik agobo inye ak gong'ung'.

Ng'oiyondit ne mi ye iegu agenge eng' kasiaget

Ye ibote ichek che kiteebse ko mamitei ng'oiyondit ne tia.

Tuguk Che Kinyorune Kasiagoni

Ngot iyan iegu agenge eng' kasiagoni ketebsenen ak eng' teebutik che itinye agobo T.B, kowalu chito ne tononjin. Kinetin kogeny ole kiribtoi kapchi si manam mianwogik che iboti koristo. Logoiywek che kiumi kobun kasiagonito, keboisie si kogonech kechob ortinwek che kisubi si eng' bik che tinyei T.B koribogis komie ak kanyor boroinde ne kararan kogeas kanyoisenywa.

Kamanutietab Kasiaget;

Ngot iyan iib kebeber eng' kasiagoni, ko mamitei melekto ne kegonin inye mising' amu kegonugei.

Ribetab Ng'alechu:

Ng'alek tugul che kegonech inye, keribei eng' ripset ne bo barak maging'ang'doi agot kitigin. Ma kiboisie kaineng'ung' eng' logoiywek alak tugul che bo kasiagonito, anan ko ng'olyo age tugul ne kisirei anan ko ne kimwaitoi. Ngot ko komach kandoik che bo Institute of Tropical Medicine and Infectious Diseases (ITROMID, KEMRI), anan ko Jomo Kenyatta University of Agriculture and Technology, kogetyigei ng'alek tugul che bo kasiageng'ung', koribei ichek ng'aleguk.

Logoiywek Agobo Ole Itoretitoi

Ole itoretitoi ko konunetab ge ago mami kiy ne ng'oi mising' ngo kata mi.

Ngot ibwat eng' boroinde age iistege eng' kasiagoni, ko itiatag iyai ko u noto, ak maimuchi koim nito toretet ne bo betusiek che mi tai anan ko tiliandi ak chi anan ko oldo tugul ole kiboisie.

Ole Kimi ak Teebutik

Chito ne yaei kasiagoni ko Wandeba Wanyonyi. Imuchi iteebe teebut age tugul ne itinye nguno, anan ngot itinye teebutik kogebata, kigiilin ing'alalji inendet eng' simet 0722 991 269, anan ko Email wandeba@gmail.com. Ngot itinye teebutik alak tugul anan ko kabwatut agobo kasiagonito ak imache ing'alalji chi age ne ter eng' kasiagindet, kigiilin isirchi che isubi:

The Director,

Institute of Tropical Medicine and Infectious Diseases (ITROMID),
Jomo Kenyatta University of Agriculture and Technology (JKUAT)
P.O. BOX 849,
KISUMU, Email: ercjotr@gmail.co

KEBEBERTA B: Fomit ne bo Chamjinetab Chito ne Kagiteebse

Kaigai soman Logoiywek che mi formit (kebebertab A), anan igas kesomanun logoiywechoto komie ko tomo igesu ak ingochi fominito bo chamjinet. Ngot itinye teebutik alak tugul che ma iguiye inye kotinygei ak kasiagonito kaigai iitiagat iteebe kasiagindet kotomo ing'och ak igochi fominito.

Ng'alekab chito ne Kiteebse

Ane Mr., Mrs, Miss..... agochini chamjinet Wandeba Wanyonyi kotesyi kasiaget ne kibwati keyai, ne kiguure 'Tuguk che tiinyege ak Metoet ne bo Kanyoisetab Tuberculosis eng' Kwenutab bik che miandos eng' Nandi County, Kenya, 2014.' Kasoman anan kaagas logoiywek agobo kasiagonito, ak kaguiye komie tokyinetab ge ne bo kasiagonito ak kit ne kimageno ngot ayan, atoret eng' kasiagonito. Ng'oiyondit ak tuguk che mong'une ko kagiguiyewo.

Teebutik alak tugul che atinye kotiny ge ak kasiagonito koga kewol komie ak kagoyama.

Kaguiye ale amuchi abagakta kasiagonito eng' boroindo age tugul ngot amach ayai ko u noto, ama mi ng'olyo ne bo ribet ne kemageno ak memuchi koim nito boroindanyu ne bo chametab ge ak tononjinet.

Kainetab chito ne kagiteebse anan ne kawol.....

Ng'okset/Sahihi.....

Ng'okset ne bo siyet ne o (Katam).....

Tarik.....

Kainetab Baoriat.....

Ng'okset..... Tarik.....

Kainetab chito ne igoitoi
chamjinet.....

Ng'okset.....

Tarik.....

Kainetab Segeindet

Ng'okset.....

Tarik.....

Appendix 13: Children's Assent form

Questionnaire number _____ **Interviewer's** **initials:**

_____ **Date of interview**

Title of the study: Factors Associated with Interruption of Tuberculosis Treatment among Patients in Nandi County, Kenya, 2014

Principal Investigator Alfred Wandeba Wanyonyi **Phone Number** 0722991269

Dear participant,

We want to tell you about a research study we are doing. A research study is a way to learn more about something. We would like to find out more about the things that would make someone taking treatment for Tuberculosis not take the drugs as instructed by the doctor. We also want to find out the number of people who fail to take the drugs for TB well among those who are started on treatment. You are being asked to join the study because you are aged 14 years and above and were treated for TB not so long ago. About 260 people will be asked similar questions including about 15 children of your age.

Your parents know that we are asking you to be in the study. It is okay with them. If you agree to join this study, you will be asked questions about yourself and your family and the answers you give will be recorded. This session will take about 30 minutes and it will not be repeated again.

We do not think there are any risks or harm to you in this study. You may find the discussion helpful to you or it may make you feel good to know you are helping us to help other children and adults who may have TB. You will also be taught on how to keep your family from getting chest infections.

You are a volunteer. You are helping us but you do not have to unless you want to. You can say okay now and change your mind later. All you have to do is tell us you want to stop. No one will be mad at you if you don't want to be in the study or if you join the study and change your mind later and stop.

We will not tell anyone outside the study what you or any other particular person said. We will write a report on the study that just says what the group said or did not say but no one will be able to recognize what you said as an individual. We will not tell your parents, teachers nor neighbors what you said.

Before you say YES or NO to being in this study, we will answer any questions you have. If you have questions later, you can call Alfred Wandeba at Jomo Kenyatta University at 0722991269. You can also ask your parents questions. If you join the study, you can ask questions at any time. Just tell the researcher that you have a question.

If you agree to be in this study, please sign your name on this letter below. You can have a copy of the letter to keep.

Thank you very much for your interest.

Yours Sincerely,

Investigator

.....
.....

Name of Participant

Date.....

Person obtaining Consent

Date.....

Appendix 14: Translation of children's assent form to Kiswahili

Questionnaire number _____ **Interviewer's** _____ **initials:** _____

Date of interview

Title of the study: Factors Associated with Interruption of Tuberculosis Treatment among Patients in Nandi County, Kenya, 2014

Mpelelezi Mkuu: Alfred Wandeba Wanyonyi **Nambari ya simu:** 0722991269

Kwa Mshiriki wa utafiti,

Tungependa kukuambia kuhusu utafiti tunayofanya. Utafiti ni njia ya kujifunza zaidi kuhusu kitu fulani. Tungependa kujua zaidi kuhusu vitu ambavyo vinaweza kumfanya mtu anayepate matibabu ya kifua kikuu asitumie dawa jinzi alivyoagizwa na daktari. Tunataka pia kujua idadi ya watu ambao hawawezi kuchukua madawa ya TB vizuri miongoni mwa wale ambao wameanza matibabu. Unatakiwa kujiunga na utafiti kwa sababu una umri wa miaka 14 au zaidi na ulipewa matibabu ya TB hivi maajuzi. Jumla ya watu 260 wataulizwa maswali kama hayo ikiwa ni pamoja na watoto 15 wa umri wako.

Wazazi wako wanajua kwamba tunakuomba uwe katika utafiti. Ni sawa nao. Ikiwa unakubali kujiunga na utafiti huu, utaulizwa maswali kuhusu wewe mwenyewe na familia yako na majibu unayoyatoa yatanukiliwa. Kipindi hiki kitachukua muda wa dakika 30 na haitarudiwa tena.

Hatufikiri kama kuna madhara yoyote kwako katika utafiti huu. Unaweza kupata majadiliano ya manufaa kwako au inaweza kukufanya uhisi vizuri kwa kuwa unatuwezesha kusaidia watoto wengine na watu wazima ambao wanaweza kuwa na kifua kikuu. Pia, utafundishwa jinsi ya kukinga familia yako dhidi ya magonjwa ya kifua.

Wewe ni mtu wa kujitolea. Unatusaidia lakini hulazimishwi pasipo kutataka mwenyewe. Unaweza kujitolea sasa na baadaye uamue kujiondoa. Unachohitaji tu kufanya ni

kutuambia unataka kujiondoa. Hakuna mtu atakayekukasirikia ikiwa hutaki kuwa katika utafiti au ikiwa unajiunga na utafiti na kubadili mawazo yako baadaye na kuacha.

Hatuwezi kumwambia yeyote ambaye hatushirikiani naye katika huu utafiti yale wewe au mtu mwingine yeyote mwingine alisema. Tutaandika ripoti juu ya utafiti ambao unasema tu kile kikundi kilisema au hakikusema lakini hakuna mtu atakayeweza kutambua kile ulichosema kama mtu binafsi. Hatutawaambia wazazi wako, walimu au majirani kile ulichosema.

Kabla ya kusema KUKUBALI au KUKATAA kuwa katika utafiti huu, tutajibu maswali yoyote uliyo nayo. Ikiwa una maswali baadaye, unaweza kumpigia simu Alfred Wandeba katika Chuo Kikuu cha Jomo Kenyatta kwa nambari 0722991269. Unaweza pia kuuliza wazazi wako maswali. Ikiwa utajiunga na utafiti huu, unaweza kuuliza maswali wakati wowote. Mwambie mtafiti kwamba una swali na atakupa nafasi.

Ikiwa unakubali kuwa katika utafiti huu, tafadhali andika jina lako na/au sahihi kwenye barua hii hapa chini.

Utapewa nakala ya barua ili uihifadhi.

Asante sana kwa wakati wako.

Wako mwaminifu,

Mtafiti

.....

Jina na Sahihi ya Mshiriki

.....

Mwakilishi wa Mtafiti

.....

Tarehe

.....

Tarehe

Appendix 15: Parental permission form

Title of Study: Factors Associated with Interruption of Tuberculosis Treatment among Patients in Nandi County, Kenya, 2014

Investigator:

Name: Alfred Wandeba Wanyonyi Phone: 0722991269

Parent/Guardian Name: _____

Introduction

- Your child is being asked to be in a research study about factors associated with interruption of treatment among patients in Nandi County. In this study, we seek to find the issues that contribute towards interruption of TB medication. Your child is part of 260 possible participants selected for the study, including about 15 children
- S/he was selected as a possible participant because s/he was treated for TB recently within Nandi County and is aged ≥ 14 years.
- We ask that you read this form and ask any questions that you may have before allowing your child to participate in this study.

Purpose of Study

- The purpose of the study is to understand the issues that may make patients started on TB treatment in Nandi County not to take medications as prescribed by doctors. It will also find out the people who are most affected by TB in Nandi County, the fraction of patients who don't take medications as prescribed by the doctors as well as assess how well the patient are followed up in the clinics after starting treatment.
- Ultimately, this research may be written and submitted to Jomo Kenyatta University of Agriculture and Technology (JKUAT) for thesis work. The results will also be summarized into a report to be shared by the policy makers at the County and Ministry

of Health, as well as published as a manuscripts in journals for other people to read.

Description of the Study Procedures

- If you decide to allow your child to participate in this study, s/he will be asked to do the following things: Will be asked questions about his experiences during treatment for TB. This interview will take about 30 minutes. S/he will be requested to allow the researcher to look at her/his records at the county TB register. During the interview, any question about chest infections that the child may have will be answered and the child will be taught on how to prevent chest infections.

Risks/Discomforts of Being in this Study

- There are no reasonable foreseeable (or expected) risks in this study to your child. There may be unknown risks.

Benefits of Being in the Study

- The child may find the discussion helpful to her/him or it may make her/him feel good to know s/he is helping us to help other children and adults who may have TB. S/he will also be taught on how to keep the family from getting chest infections. However, there will be no direct payments/incentives to the child.

Confidentiality

- The records of this study will be kept strictly confidential. Research records will be kept in a locked file, and all electronic information will be coded and secured using a password protected file. We will not include any information in any report we may publish that would make it possible to identify your child.

Payments

- You/your child will receive no payments for participating in this study.

Right to Refuse or Withdraw

- The decision to participate in this study is entirely up to you and your child. You are welcome to observe the interview if you wish. Your child may refuse to take part in

the study *at any time* without affecting your relationship with the investigators of this study or JKUAT or losing benefits to which you are otherwise entitled. Your child has the right not to answer any single question, as well as to withdraw completely from the interview at any point during the process; additionally, you have the right to request that the interviewer not use any of the interview material.

Right to Ask Questions and Report Concerns

- You have the right to ask questions about this research study and to have those questions answered by me before, during or after the research. If you have any further questions about the study, at any time feel free to contact me, Alfred Wandeba Wanyonyi at wandeba@gmail.com or by telephone at +254722991269. If you like, a summary of the results of the study will be sent to you. If you have any other concerns about your rights as a research participant that have not been answered by the investigators, you may contact The chairman, Jaramogi Oginga Odinga Teaching and Referral Hospital Ethical review Committee at ercjootrh@gmail.com
- If you have any problems or concerns that occur as a result of your participation, you can report them to the number above.

Consent

- Your signature below indicates that you have decided to allow your child participate as a research subject for this study, and that you have read and understood the information provided above. You will be given a signed and dated copy of this form to keep, along with any other printed materials deemed necessary by the study investigators.

Parent/Guardian Name:

Parent/Guardian

Signature:

Date:

Investigator's Signature: _____ Date: _____

Appendix 16: Translation of Parental permission in Nandi language

Title of Study: Factors Associated with Interruption of Tuberculosis Treatment among Patients in Nandi County, Kenya, 2014

Jina La Mtafiti: Alfred Wandeba Wanyonyi Nambari ya simu: 0722991269

Jina la Mzazi/Mlezi: _____

Utangulizi

- Mtoto wako anaombwa kuwa katika utafiti kuhusu mambo yanayoweza kusababisha matumizi ya dawa ya Kifua kikuu yasiyofwatana na maagizo ya madaktari katika Kata ya Nandi. Katika utafiti huu, tunatafuta kupata masuala yanayochangia matumizi mabaya ya dawa za kutibu kifua kikuu. Mtoto wako baadhi ya washiriki wapatao 260 waliochaguliwa kwa ajili ya utafiti, ikiwa ni pamoja na watoto 15.
- Alichaguliwa kama mshiriki anayeweza kuhojiwa kwa sababu alipatibiwa kwa Kifua kikuu hivi maajuzi katika kata ya Nandi na ana umri wa miaka ≥ 14 .
- Tunakuomba usome fomu hii na uulize maswali yoyote ambayo unaweza kuwa nayo kabla ya kuruhusu mtoto wako kushiriki katika utafiti huu.

Kusudi la Utafiti

- Kusudi la utafiti ni kuelewa masuala ambayo yanaweza kuwafanya wagonjwa kutumia dawa ya kutibu kifua kikuu kama ilivyoagizwa na madaktari. Itatambua pia watu wanaoathiriwa sana na Kifua Kikuu katika kata ya Nandi, sehemu ya wagonjwa ambao hawatumii dawa kama ilivyoagizwa na pia kutathmini jinsi mgonjwa anavyofuatiliwa katika katika kliniki baada ya kuanza matibabu.
- Hatimaye, matokeo ya utafiti huu yataandikwa na kuwasilishwa kwa Chuo Kikuu cha Kilimo na Teknolojia ya Jomo Kenyatta (JKUAT) kwa ajili shahada. Matokeo

yataandikwa katika ripoti ambayo itashirikiwa na watunga sera katika Kata na Wizara ya Afya, na pia kuchapishwa kama katika majarida ili watu wengine wasome.

Maelezo ya Utaratibu wa Utafiti

- Ikiwa unaamua kumruhusu mtoto wako kushiriki katika utafiti huu, ataulizwa kufanya mambo yafuatayo: Ataulizwa maswali kuhusu aliyoyapitia wakati wa matibabu ya kifua kikuu. Mahojiano haya yatachukua muda wa dakika 30. Ataombwa kuruhusu mtafiti aangalie kumbukumbu zake za matibabu zilizowekwa katika makao makuu ya kata.

Wakati wa mahojiano, swali lolote kuhusu maambukizi ya kifua ambayo mtoto anaweza kuwa nayo yatajibiwa na mtoto atafundishwa jinsi ya kujikinga na magonjwa ya kifua

Madhara kwa mhusika.

Hakuna madhara yanayotazamiwa (au kutatarajiwa) katika utafiti huu kwa mtoto wako.

Faidaza Kuwa katika utafiti

Mtoto anaweza kuona mjadala ukiwa wa manufaa kwake / au inaweza kumfanya ahisi vyema kujua yeye anatusaidia kusaidia watoto wengine na watu wazima ambao wanaweza kuwa na kifua kikuu. Yeye pia atafundishwa jinsi ya kuikinga familia kutokana kupata na magonjwa ya kifua. Hata hivyo, hakutakuwa na malipo ya moja kwa moja / motisha kwa mtoto.

Usiri

Kumbukumbu za utafiti huu zitahifadhiwa kwa siri. Rekodi za tafiti zitahifadhiwa kwa njia pasipoweza kufikiwa na mtu ila tu kwa ruhusa ya mtafiti mkuu pekee. Hatutajumuisha taarifa yoyote katika ripoti yoyote ambayo tunaweza kuchapisha ambayo itafanya iwezekanavyo iwezekanavyo kutambua mtoto wako.

Malipo

Wewe / mtoto wako hatapokea malipo kwa kushiriki katika utafiti huu.

Haki ya Kukataa au Kujiondoa

Uamuzi wa kushiriki katika utafiti huu ni hiari yako na mtoto wako. Unakaribishwa kuhudhuria mahojiano ikiwa unataka. Mtoto wako anaweza kukataa kushiriki katika utafiti wakati wowote bila kuathiri uhusiano wake na wachunguzi wa utafiti huu au kupoteza faida ambazo anatarajia.

Mtoto wako ana haki ya kutojibu swali asilolitaka, na pia kujiondoa kabisa kutoka kwa mahojiano wakati wowote; zaidi ya hayo, una haki ya kuomba mwenye kuhoji mtoto asitumie nyenzo fulani ya mahojiano.

Haki ya kuuliza Maswali

Una haki ya kuuliza maswali kuhusu utafiti huu kujibiwa nami kabla, wakati au baada ya utafiti. Ikiwa una maswali zaidi kuhusu utafiti huu wakati wowote, wasiliana nami, Alfred Wandeba Wanyonyi kutumia; wandeba@gmail.com au kwa simu +254722991269. Ikiwa ungependa, muhtasari wa matokeo ya utafiti utatumwa kwako. Ikiwa una wasiwasi wengine kuhusu haki zako kama mshiriki wa utafiti ambazo hazijajibiwa na wachunguzi, unaweza kuwasiliana na Mwenyekiti, kamati ya Ukaguzi wa Maadili ya utafiti ya Hospitali ya Jaramogi Oginga Odinga kupitia barua pepe; ercjootrh@gmail.com

- Jambo lolote kutokana na ushiriki wako, unaweza kuripotiwa kwa nambari uliopewa hapo mbeleni juu.

Kibali

- Ikiwa umelewa jinsi nilivyokuelezea/ulivyojisomea na umeamua kwa hiari kuruhusu mtoto wako ashiriki kama mhusika wa utafiti huu, tafadhali weka sahihi kama ishara ya kutupa ruhusa.. Utapewa nakala iliyowekwa sahihi na tarehe ya fomu hii ili ujiwekee.

Jina la

Mzazi/mlezi.....Tarehe.....

Sahihi.....

Jina la Mtafiti

.....Tarehe.....

Sahihi ya mtafiti.....

Appendix 17: Questionnaire

INSTRUCTIONS TO INTERVIEWER

Read the consent form to the interviewee and obtain their approval before proceeding with the interview. Read the questions carefully and where necessary translate into a language that the interviewee understands best. Clarification should be made whenever there is a problem of understanding of the question.

SECTION A: SOCIODEMOGRAPHIC DATA

QUESTIONNAIRE NO..... DATE INTERVIEWED.....

County _____ **District** _____ **Division** _____
Location _____ **Sub-location** _____
Village/Town _____

Age in yearsGender..... Ethnicity/tribe.....

TB Appointment card Available Yes/No. Clinic Registration No.....

1. What is your marital status?
 - Single
 - Married
 - Cohabiting
 - Widow
 - Widower
 - Other (Specify).....
2. What type of family do you come from?
 - Monogamous
 - Polygamous
 - Not applicable
3. What is your highest level of Education attained?
 - University
 - College(Tertiary)

- Secondary
- Primary
- Informal education
- No formal education

4. What is your religion/denomination?

- Catholic
- Muslim
- Protestant
- None(Atheist)
- Others (specify).....

5. What do you do to earn a living?

- Farmer
- Casual laborer
- Small scale business
- Large scale business
- Employed(Formal)
- Other (Specify).....

6. How much would you estimate to be your monthly income in Ksh?

- 0- 20,000 20,001-50,000 50,001-100,000 Over 100,000

7. What would you estimate to be your nuclear family's income per month on average in Ksh?

- 0- 20,000 20,001-50,000 50,001-100,000 Over100,000

8. How many people live in this house hold with you?

9. How many children live in this house hold?

- a.) aged below 5 years..... (Indicate number of children)
- b.) aged below 14 years.....(Indicate number of children)

10. Have you changed residence in the last 3 months? Yes No

11. Have you changed residence in the last 6 months? Yes No

12. During treatment for the chest problem, is there any time you travelled outside the district that lasted more than one week?

- Yes
- No

DIAGNOSIS AND TREATMENT

13. Do you know the disease you were being treated for last year (2013/2014)?

- Yes
- No

14. a) If, yes name it.....

b) Who informed you the name of the disease?

15. Where were you diagnosed to have the said disease above?

Name of facility.....

Level 1 2 3 4

16. When were you diagnosed to have the disease?

- DDMM.....YY.....
- Don't know(DK)

17 a) Were you told the diagnosis before being started on treatment?

- Yes
- No
- Can't remember

b) Were you informed the duration of treatment before starting treatment?

- Yes
- No

18. Where were you started on treatment for TB?

Name of facility.....

Level 1 2 3 4

19. When were you started on treatment for TB?

DD.....MM.....YY.....

Don't know (DK)

20. How far is the treatment center in kilometers from your home and how long would you take travelling by foot one way?

.....Km

.....Hr.

21. How much money do you spend to reach the treatment centre one way?.....

22. Did you find the distance from the treatment site as a barrier that could have prevented you from taking treatment as prescribed by the health worker?

- Yes
- No

23. Has any member of your family had cough for two weeks or more in the past 6 months?

- Yes
- No

24. Has any member of the family (apart from you) been tested for TB in the past 1 year?

- Yes
- No

25. In your opinion, is it important for members of your family to be screened for TB?

- Yes
- No

26. If yes, why is it important in your opinion?

.....

.....

.....

.....

.....

SECTION B: CLINICAL INFORMATION

27. What were your presenting symptoms?

- Cough
- Chest pain
- Hemoptysis
- Weight loss
- Anorexia/loss of appetite
- Night sweat
- Others.....

28. When starting treatment, was there someone else with TB in the family?

- Yes
- No

29. What tests were done at the health facility before you started treatment?

- Chest X-ray
- Sputum Examination
- Others Specify.....

30. Before starting treatment how did you view the severity of your disease?

- Mild(Doesn't need immediate attention/Not life threatening/May be ignored)
- Severe(Needs immediate attention/Life threatening/Should not be ignored)

31. Have you been treated for TB before this last treatment?

- Yes
- No

32. During the time you were on treatment, is there any one time you forgot swallowing drugs?

- Yes
- No

If No, then skip (33-36)

33. If yes, is there any one time you forgot swallowing drugs for two weeks or more?

- Yes
- No

34. After what duration of treatment had you missed taking drugs (indicate in weeks)?

.....weeks

35. For how long did you miss taking drugs?

.....

36. What, in your opinion, is the main reason that made you stop taking drugs for the said period above?

- Suffered from side effects
- Relief from symptoms
- Drugs not working/no improvement
- Inadequate food/ had difficulty taking drugs on an empty stomach
- Migration to new home
- Too ill
- Stigma
- Too many pills to take
- Medication tasted unpleasantly
- Afraid of injections
- Stock out in the health facility

SECTION C: EXPOSURES/BARRIERS TO COMPLIANCE

37 a) Do you smoke currently?

- Yes
- No

b) If No, have you ever smoked?

- Yes
- No

c) Were you smoking during treatment?

- Yes
- No

If 'No' to all 37 a, b & c, go to Question 41

38. If yes to any (37 a, b or c), what brand

- Processed
- Unprocessed

39. How many cigarettes per day? () 1-4 () 5-9 () ≥ 10

40. How many smokers live in the same household with you?

41. Do you take alcohol? () Yes () No

42. If yes, what brand/type do you commonly take?.... () Bottled beer () Traditional beer

43. How many bottles/Glasses per sitting on average do you take?

44. How often do you drink within a period of a week (7 days?)

- () 1-3 () 4-6 () 7-9 () Over 10

45. Who is the main provider in your family?

- Self
- Sibling
- Spouse
- Parent
- Grand parent

46. What type of family is your nuclear family? () Single parent () Dual parent

47. Who provides you with the drugs on daily basis?

- Self
- Family member

CHEW

- CHW

48. Who used to remind you to take drugs in case you forgot?

.....

FAMILY SUPPORT

49. Did any family member accompany you during diagnosis, initial counseling, initiation of treatment or other return visits? () Yes () No

50. If yes, who (indicate the relationship with subject)?

51. How many return visits did you make during the first 2 months of treatment?

.....

52. How frequent did you return to the treatment site during the first 2 months of treatment?

- Daily
- Weekly
- 2 weekly
- Monthly
- 2 monthly

53. Did you inform any family member of what you were suffering from?

- Yes
- No

54. If yes, who?

- Parent
- Spouse(wife/husband)
- Sibling(Brother/Sister)
- Child
- Grand parent

55. Did you feel that you were supported by your family during treatment? () Yes () No

NUTRITION

56. Did you get any food supplements from the treatment site?

- Yes
- No

57. In your opinion was it necessary to be given additional food / food supplements/special diet during the period you were under medication?

- Yes
- No

FINANCIAL STATUS

58. How much did you pay for TB services?

Ksh.....

59. Did you see inadequate funds as a barrier for completing treatment of TB?

- Yes
- No

ADVERSE EFFECT OF DRUGS

60. Did you experience any side effects of the drugs during treatment? () Yes () No

61. If yes, which ones

- Change in urine colour
- Itching or skin irritations
- Headaches
- Abdominal pains
- Vomiting
- Altered vision
- Jaundice
- Others (specify).....

OTHER MEDICATION USAGE

62. Did you take other medication during treatment that lasted 1 week or more?

- Yes
- No

63. If yes which ones

- ARVS
- Co-trimoxazole(Septin)
- Steroids
- Anti-hypertensive
- Herbs
- Others (Specify).....

64. Prior to starting treatment for TB, were you on any other long term treatment?

- Yes
- No

65. If yes which one(s)

- Drugs for diabetes
- Steroids
- Drugs for cancer treatment
- ARVS
- Drugs for Asthma
- Drugs for hypertension
- Other (specify).....

SECTION D: KNOWLEDGE, ATTITUDE AND PRACTICES

66. What causes T.B?

- Witchcraft
- Act of God
- Infectious agent
- Other (specify).....

67. Name any three of the symptoms of TB that you know?

.....

68. "A person who looks wasted, sometimes coughs blood and complains of chest pains may be suffering from a disease called TB?" () Yes () No

69. Can TB be spread from person to person? () Yes () No

70. If yes through what means?

- Air borne
- Sex
- Food
- Blood Transfusion
- Sharing utensils
- Drinking unclean water
- Don't Know(DK)

71. If one has TB, what should they do to avoid transmitting the disease to others?

- Covering their mouth when coughing
- Get tested and treated
- Sleep alone in the room
- Not share utensils with others
- Don't know(DK)

72. Can TB be cured by medication? () Yes () No

73. What treatment would you recommend to somebody diagnosed with TB?

.....

74. What in your opinion is the risk of interrupting treatment for TB?

.....

.....

.....

75. For how long should the drugs for TB be taken?

76. How do you feel about the duration of treatment for TB?

- Too Long

- Short
- Don't know(DK)

77. If the patient feels well during treatment, is it okay to stop taking the medications?

- Yes
- No

78. Did you seek any alternative treatments during your course of Anti-TBs?

- Yes
- No

79. If yes, which ones...

- Traditional Healer,
- Spiritualist
- Herbalist
- Other (Specify).....

80. How can people who do not have TB protect themselves from catching TB?

.....

81. Is TB treatment available in your nearest dispensary?

- Yes
- No
- DK

STIGMA

82. Do patients on treatment for TB use the same utensils with other people in your community?

- Yes
- No

83. Did you at any time feel ashamed because you had TB? () Yes () No

84. Have you experienced being neglected, ignored or avoided by people because you have TB?

- () Yes () No

85. How did you perceive the attitude of service providers during your treatment?

- Bad
- Good
- Don't know(DK)

SERVICE DELIVERY

86. On average, how long do you wait at the health facility to get medicine for TB?

< 1hr ≥ 1hr

87. Were you satisfied with the services at the health facility? Yes No

END OF PATIENT INTERVIEW

THE NEXT SECTION IS FOR HEALTH WORKERS TO CHECK IN THE TB 4

REGISTER AND FILL APPROPRIATELY

SECTION E: CHECKLIST FOR PATIENT FOLLOW UP

1. Is the patient registered? Yes No

2. Date of registration(DD/MM/YYYY)

Age.....

Wt..... Ht..... BMI.....

3. Physical address available in register Yes No

4. DOT provided by

- CHW
- CHEW
- Family member

5. Type of TB PTB EP

6. Type of patient

- New
- Retreatment
- Transfer in
- Defaulter

7. Was X-ray done at diagnosis? () Yes () No

8. Was Laboratory Sputum tests done at the following times?

a) At diagnosis

- Yes
- No

If yes indicate test results.....

b) At 2/3 months

- Yes
- No

If yes indicate test results.....

c) At 6/8 months

- Yes
- No

If yes indicate the test Results.....

9. What treatment regimen was used?

10. Date treatment started.....

11. Is HIV testing done? () Yes () No

12. If yes, indicate Date Results () Pos () Neg

13. If Yes and Test Positive, is patient on ART? () Yes () No

14. Is partner testing done? () Yes () No

Date Results () Pos () Neg

15. Is patient on co-trimoxazole () Yes () No

16. Nutrition support type

17. Treatment outcome indicated in the register

- Death
- Treatment complete
- Cured
- Out of control
- Not complete

END

Appendix 18: Translated Patient questionnaire into Nandi Language

TEEBUTIK NG'ALEK CHE BO CHITO NE INDOCHIN NG'ALALET

Somanji fomit ne bo chamjinet chito ne iteebse ak inyoru chamjinennywa kotom itestai ak teebutik. Soman teebutik komie ak ole nyolu iweech kwo kutit ne iguitos chito ne iteebse komie. Nyolu iguiyechi komie eng' ole mi kaimutietab koguiyo teebutiet.

KEBEBERTAB A: SOCIODEMOGRAPHIC DATA

QUESTIONNAIRE NO DATE
INTERVIEWED.....

COUNTY.....DISTRICT.....
.....

DIVISION.....LOCATION.....
.....

SUB LOCATION.....TOWN/VILLAGE.....

Kenyisiek.....Kwony/Muren.....Kutit.....

*Itinye kadit ne bo T.B Wei/Acha.....Nambarit ne bo
klinik.....*

1. Tos u ne katunisieng'ung'?

- *Imi kityo?*
- *Kiitunisie/kigitunin?*
- *Otebye ak chi?*
- *Mosoget*
- *Kisiirto kwondo*
- *Alak (Iboru).....*

2. *Kapchi ne u nee ole ibunu?*

- *Kwondo agenge*
- *Kwonyik aeng' anan kosiir*
- *Mami*

3. *Tos kiisoman ne tia eng' sobeng'ung'?*

- *Mawe skol*
- *Kigineta eng' ga*
- *Primary*
- *Secondary*
- *College*
- *University*

4. *Tos kiguure nee dining'ung'/kaniseng'ung'?*

- *Roman Catholic*
- *Muslim*
- *Protestant*
- *Mami (Atheist)*
- *Alak (Iboru choto).....*

5. *Nee ne iyae si itoretege?*

- *Kabatindet*
- *Boisietab otisiet*
- *Mung'aret ne ming'in*
- *Mung'aret ne o*
- *Kigisira boisiet*
- *Alak (iboru).....*

6. *Tos inyoru che negit kotya eng' arawa eng' Kshs.....*

() 20,000 () 20,001 – 50,000 () 50,001-100,000 () che siirei 100,000.

7. *Tos ibwatyini onyoru ata eng' kong'ung' komugul eng' kila arawa Kshs.? () 20,000 ()*

20,001 – 50,000 () 50,000 () 50,001-100,000 che siirei 100,000

8. *Ata bik che menyai kong'ung' koboten?*
9. *Ata lagok che menyai koito?*
- (a) *Che mi ng'ony eng' kenyisiek 5..... (Mwa ole te lagok)*
- (b) *Che mi ng'ony eng' kenyisiek 14.....(Mwa ole te lagok)*
10. *Tos koiwal meng'atet eng' arawek somok che kogosiirto? () Wei () Acha*
11. *Tos koiwal meng'atet eng' arawek lo che kogosiirto? () Wei () Acha.*
12. *Eng' boroinde ne bo kanyoisetab teget, ko tos mi boroinde ne kiirute sang'utab district ne kisiir wigit agenge?*
- *Wei*
 - *Acha*

CHIGILET AK KANYOISET

13. *Tos ingen miando ne kiginyoi eng' kenyit konye (2013/2014)?*
- *Wei*
 - *Acha*
14. (a) *Ngot ko wei, imwa miando.....*
- (c) *Ng'o ne kimwaun kainetab miando?*
-
15. *Ano ole kigichigilenen si kenai mianito kemwa eng' yu?*
- Kainetab ole kigichigilenen (koitet ole tee?) 1 2 3 4.*
16. *Tos ki auyo kechigilin si kenai miando?*
- *Tarikit.....Arawet.....Kenyt.....*
 - *Mangen ama bwati*
17. (a) *Tos kiisib kemwaun ole u chigilet ko tomo ketoi kanyoiset?*
- *Wei*
 - *Acha*
 - *Ma bwati*
- (b) *Tos kigimwaun boroinde ne ibei kanyoiset kotomo ketoi kinyain?*

- Wei
- Acha

18. *Ano ole kigitaune kanyoiseng'ung' ne bo TB?*

Kainetab *ole*
kiginyaenen.....
Koitetab ole tee 1 2 3 4

19. *Tos au ye kiitau kanyoisetab TB?*

Tarik.....*Arawet*.....*Kenyit*.....*Mangen*.....

20. *Tos tia ole kinyoise kong'eete ga oling'wong' ak tos iibe boroinde ne tia iwendi kityo eng' keldo*

.....*Km*.....*Saisiek*

21. *Tos siling'isiek ata che iboisie si imuch iit ole kinyoise kityo?*

22. *Tos kiigeer loindo kong'eete ole kinyoise ko kit ne kirindoin si menyoru kanyoiset ko u ye kiarorun chito ne inyoisei?*

- Wei
- Acha

23. *Tos mi chi ne bo kong'ung' ne kigonyor loliot eng' wikisiek aeng' anan kosiir eng' arawek lo che kogosiirto?*

- Wei
- Acha

24. *Tos mi chi ne bo kong'ung' (kobatenen inyege) ne kigechigil agobo T.B eng' kenyit agenge ne kogosiirto?*

- Wei
- Acha

25. *Eng' kabwateng'ung, ko tos bo kamanut eng' bikab kong'ung' kechigil agobo T.B?*

- Wei
- Acha

26. *Ngot ko wei, ko amu nee si ko bo kamanut eng' kabwateng'ung'?*

.....

KEBEBERTA B: NG'ALEKAB OLE KINYOISE

27. *Ki nee tuguk che kitoogune?*

- *Loliot*
- *Ng'wanindo ne bo teget*
- *Hemoptysis*
- *Kowisisit borto*
- *Kobet maget ne bo amitwogik*
- *Ng'etyinin kaot kemoi*
- *Alak (iboru).....*

28. *Ye kingitau kanyoiset, ko tos kimi chi age eng' oling'wong' ne kitinyei T.B?*

- *Wei*
- *Acha*

29. *Nee chigilet ne kigiyai eng'ole kinyoise kotomo itau kanyoiset?*

- *Kakweng'etab teget (X-ray)*
- *Chigiletat Ng'uлек*
- *Alak (iboru).....*

30. *Kotom itau kanyoiset ko kiigeerte ano kimnatetab miandang'ung'?*

- *Ma kim (Ma machei toretet ne bo chokyinet/ ma ng'oi eng' sobet/kimuchi kemeto)*
- *Ya (machei toretet ne bo chokyinet/ Ng'oi eng' sobet/ma nyolu kebagakta).*

31. *Tos kigakinyain eng' TB eng' tai kotomo inyoru kanyoisoni ko bo let?*

- *Wei*
- *Acha*

32. *Eng' betusiek che kiimi eng' kanyoiset, tos mi boroindo age ne kiiutie ilugui kerchek?*

- *Wei*
- *Acha*

Ngot ko acha isiir (33-39)

33. *Ngot ko wei, ko tos mi boroindo ne kiutye ilugui kerchek eng' boroindab wikisiek aeng' anan kosiir?*

- *Wei*
- *Acha*

34. *Kiibata boroindo ne tia eng' kanyoiset ne kiichilil inye eng' ametab kerchek (iboru eng' wikisiek)? Wikisiek.....*

35. *Kiitebi eng' boroindo ne tia ama iam kerchek?*

36. *Nee, eng' kabwateng'ung' kit ne o ne kiyain imete mata iam kerchek eng' betunoto kemwa eng' barak yu?*

- *Kiinyalilin kerchek*
- *Kiistaun tuguk che kiimin*
- *Ma boisiei kerchek/ma walak kiy*
- *Amitwogik che ng'ering' kiaimgei aame kerchek ak moet ne mami kiy.*
- *Kigiuchi kot ne leel*
- *Kiamiani mising'*
- *Kaiyweisiet*
- *Chang' kerchek che kelugui*
- *King'wanen kerichkek che keamei*
- *Makanye katok*
- *Ma komi kerchek eng' ole kinyoise.*

KEBEBERTA C: EXPOSURES/BARRIERS TO COMPLIANCE

37. (a) *Tos iguulsei eng' betusiechu*

- *Wei*
- *Acha*

(b) *Ngot ko acha, ko tos kiiguulse besio?*

- *Wei*
- *Acha*

(c) *Tos kiiguulsel ye kinginyoin?*

- Wei
- Acha

Ngot ko 'acha' eng' 37 tugul a b ak c, iwe teebutiet 41

38. Ngot ko wei eng' age tugul (eng' 37 a,b anan c) ko ngoro ne kiiguul?.....

- Ne kigichobei eng' mashinit
- Ne ma kichob eng' mashinit (kigisogot)

39. Tos kiguule sigaresiek ata eng' betut?

() 1-4 () 5-9 () ≥ 10

40. Tos ata bik che kuulsei che omenye tugul eng' got?

41. Tos iee maiyek? () Wei () Acha.

42. Ngot ko wei, ko che u nee che iee kotugul?

() Maiyek che mi chubainik

() Maiyek che bo kipгаа

43. Tos chubainik ata/glasisiek ata kogetau eng' ye ketebe che iee?

44. -Tos iee kotugul che tia eng' boroindeb wikit (betusiek 7) () 1 -3 () 4-6 () 7-9 ()
over 10

45. -Ng'o ne konu toretet ne o eng' oling'wong'?

- Inye
- Tupcheng'ung'
- Kwondong'ung'/Monong'otiot
- Sigindet
- Agui/ kogo

46. -Kapchi ne u nee kong'ung'? () Anegei ak lagok () Sigik tuwai

47. Ng'o ne konin kerchek kotugul?

- Anegei
- Chitab gonnyu
- C H E W
- C H W

48. Ng'o ne kocham kobwatun iam kerchek ngot ko keutye.....

TORETET NE BO KAPCHI

49. Tos kiobe ak chi ne bo ga ye kigichigili, ng'alalet ne bo tai, kemwaun agobo kanyoiyset anan ko rutoiywek che kiigetitoigei? () Wei () Acha.

50. Ngot ko wei, ko ng'o (Mwa tiliandit ak kit ne kigiyaun).....

51. Tos ki ata rutaiywek che kiiweege kanyoiset eng' arawek 2 che bo tai?
.....

52. Tos kiiweege ole bo kanyoiset konyil ata eng' arawek 2 che bo tai?

- Kotugul
- Wikit age tugul
- Kogebata wikisiek 2
- Arawet age tugul
- Kogebata arawek 2

53. Tos kiimwachi chi age tugul ne bo gong'ung' agobo kit ne kiamin?

- Wei
- Acha

54. Ngot ko wei, ko ng'o?

- Sigindet
- Kwondo/monong'otiot
- Tupchet (ng'etab kamet/chepkamet)
- Lakwet
- Kogo/Agui

55. Tos kiigas ile kitoretin bikab kong'ung' eng' kanyoiset? () Wei () Acha

AMITWOGIK

56. Tos kiinyoru tuguk che toreti amitwok eng' oloto kinyoise? () Wei () Acha

57. Eng' kabwateng'ung', ko tos kinyolu kegonin amitogik/tuguk che toreti amitwogik/ amitwogik che ter ak che bo kotugul eng' boroindo ne kiimi eng' kanyoiset?

() Wei () Acha

OLE U SILING'ISIEK

58. Tos kiiigoite siling' ata eng' kanyoisetab T.B?

59. Tos kiigeer rartaetab siling'isiek ko kit ne kigirinden si megesu kanyoisetab T.B?

() Wei

() Acha

KOLGOLYET NE KONU KERCHEK

60. Tos kiigas kaimetab ge age tugul eng' bortang'ung' amu kerchek ye kiinyoigei?

() Wei

() Acha

61. Ngot ko wei, ko ngorcho?

- Kiwalogis bek
- Kiiutut anan igas ng'wanindo eng' borto
- Kiamin metit
- Kiigas ng'woninwek eng' moet
- Kiing'ung'u
- Kiwalak keertoet
- Kiwalak borto koek talelyo
- Alak (iboru choto)

KERICHEK ALAK CHE KIIBOISIE

62. Tos kiiam kerchek alak ye kiitese tai ak kanyoiyset ne ki bo wikit 1 anan kosiir?

() Wei

() Acha

63. Ngot ko wei, ko che u nee?

- ARVS
- Co-Trimoxazole (Septrin)
- Steroids
- Anti-hypertensive
- Kerichkab kipgaa (Hervbs)
- Alak (iboru choto)

64. Kotomo itau kanyoiset ne bo T.B, ko tos kiitinye kanyoiset age ne bo betusiek che chang'?

() Wei

() Acha

65. Ngot ko wei, ko tos ngoro/ngorcho?

- Kerichkek che bo sugaruk (diabetes)

- *Kerchek che bo kimnatet (Steroids)*
- *Kerchek che bo bo kanyoisetab seriat (cancer)*
- *ARVS*
- *Kerchek che bo Asthma*
- *Kerichkek che bo korotik che rwaei*
- *Alak (iboru choto)*

KEBEBERTA D: NG'OMNATET, KABWATET AK BOISIONIK CHE KIYAEI

66. *Nee ne ibu T. B?*

Bonik che bonisie

Boisietab Jehovah

Miando ne namei bich

Alak (iboru choto)

67. *Mwa tuguk somok che iboru agobo T.B che ingen.....*

68. *“Chito ne toogu kosagitat, ko ngab kolaalei ak kong’utu korotik, kong’ung’unyi agobo ng’wonindo ne mi teget, komuchi kotinyei miando ne kiguure T.B?”*

Wei

Acha

69. *Tos imuchi konaam chito chito age T.B?*

Wei

Acha

70. *Ngot ko wei, ko oret ne u nee?*

- *Ibei koristo*
- *Ibetab ge*
- *Amitwogik*
- *Korotik che kitesei*
- *Yamdaetab tuguk che kiamisie*
- *Ye kie bek che matililen*
- *Mangen*

71. *Ngot ko tinyei chi T.B, ko nee ne nyolu koyai ichek si korib mat konaam miondo bik alak?*

- *Kotekta kutit ye laalei*

- *Kechigil ak kinya*
- *Koru inege eng'ole kiruei*
- *Mat koboisie tuguk che kiamisie ak bik alak.*
- *Mangen*

72. *Tos imugaksei kosoob kanyoiset T.B?* () Wei () Acha

73. *Kanyoiset ne u nee ne tos imakyi chi ne kaginyorchi T.B?*

74. *Nee eng' kabwateng'ung' ne ya ye kagiim kanyoiset ne bo T.B?*

.....

.....

.....

75. *Tos nyolu keam kerchekab T.B eng' boroindo ne tia?*

76. *Igeertoi ano boroindo ne kiibe eng' kanyoiset ne bo T.B?*

- *Koi mising'*
- *Nwach*
- *Mangen*

77. *Ngot kogas ko kagomieit chito kota kinyoi, ko tos nyolu kotonon inendet eng' ametab kerchek?*

() Wei () Acha

78. *Tos kiicheng' toretet age ne bo kanyoiset eng' boroindo ne kiitese tai kerchek che bo T.B?*

() Wei () Acha

79. *Ngot ko wei, ko che u nee?*

- *Kasobindet ne bo kipgaa*
- *Chitab tamirmirik*
- *Chepkerichot ne boisie sagitiek*
- *Alak (Iboru)*

80. *Riptoige ano bik che matinyei T. B si manam ichek mianito?*

81. *Tos mitei ole kinyoe T. B eng' Dispensary ne negitenen?*

- *Wei*
- *Acha*

- *Mangen*

KAIMETAB GE (STIGMA)

82. *Tos bik che mi eng' kanyoiset ne bo T.B, koboisie tuguk che kiamisie ak bik alak eng' oling'wong'?*

- *Wei*
- *Acha*

83. *Tos kiigas betut age kogetewerage amu T.B.?*

- *Wei*
- *Acha*

84. *Tos kigeer ko u ne kagimeten, ma magenen kiy anan koistoenegei bik amu itinye T.B?*

- *Wei*
- *Acha*

85. *Tos kiigeerte ano kabwatet ne bo boisiet eng' betusiek che bo kanyoiseng'ung'?*

- *Ya*
- *Kararan*
- *Mangen*

BOISIET NE KIYAEI

86. *Eng' keereng'ung', igenisiei ne tia eng' ole kinyoise si inyoru kerchek che bo T.B?*

() *Maitei sait agenge* () *Siirei sait agenge*

87. *Tos kiicham anan kiyamin toretet ne kigigonin eng'ole kinyoise? () Wei* ()

Acha

KAGESUNETAB NG'ALALET KOBOTO CHITO NE KINYOI

Appendix 19: Paper for Publication -PAMJ

Factors Associated with Interruption of Tuberculosis Treatment among Patients in Nandi County, Kenya 2015

Alfred Wandeba Wanyonyi^{1, 2, &}, Paul Mutebi Wanjala³, Jane Githuku², Elvis Oyugi^{1, 2} and Hellen Kutima¹

¹Jomo Kenyatta University of Agriculture and Technology, ²Field Epidemiology and Laboratory Training Program (Ministry of Health, Kenya) ³University of Eldoret, Kenya,

&Corresponding author

Alfred Wandeba Wanyonyi, FELTP Kenya, P.O. BOX 225, Nairobi, Kenya.
wandeba@gmail.com Phone +254 722-991-269

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Abstract

Background

Kenya is ranked 15th on the list of 22 high-Tuberculosis (TB) burden countries with a case notification rate of 440 cases per 100,000 persons. Interruption of TB treatment is one of the major obstacles to effective TB treatment and control. Since 2009, emphasis has been on direct observation treatment short-course (DOTS) to ensure adherence. This study assessed the factors associated with interruption of treatment among patients on DOTS in Nandi County, Kenya.

Methods

We reviewed medical records and interviewed randomly selected persons from the County TB register, among those initiated on TB treatment between 1st January 2013 and 30th June 2014. Data on socio-demographics, clinical characteristics, behavioral factors, family support, health system factors, income, and lifestyle and treatment interruption (i.e., therapy discontinuation ≥ 2 weeks) were collected. We calculated odds ratios (OR) and 95% confidence intervals (CI) to evaluate factors associated with TB interruption and performed multivariable logistic regression to examine independent risk factors.

Results

From a total of 1,287 records in the TB register, we randomly selected 280 patients for interview, out of whom 252 were traced. Of the 252 participants interviewed, 149 (59.1%) were males and the mean age was 40.0 (SD ± 15.3) years. Seventy-eight (31.0%) interrupted treatment. Treatment interruption was associated with personal monthly income $\leq 10,000$ Kenya shillings (\$100) (AOR 4.3, CI=2.13-8.62) compared to income $> 10,000$ Kenya shillings, daily alcohol consumption of > 3 days per week (AOR 3.3, CI=1.72-6.23) compared to

consumption of ≤ 3 days per week and average waiting time at the health facility ≥ 1 hour (AOR 3.5 CI=1.86-6.78) compared to waiting time < 1 hour.

Conclusion

We suggest expanding DOTS services to increase the number of service points for patients. This will probably reduce the waiting time by distributing the work load across many facilities. Intensifying patient counseling and education prior to initiation of treatment could also be adopted to cover effects of alcohol use during treatment and teach patients to take up some income generating activities.

Key words

Tuberculosis, Treatment interruption, adherence, Kenya.

Background

Tuberculosis (TB) is a chronic infectious disease caused by various species of the *Mycobacterium* genus. If untreated, an infected patient can infect an average of 10-15 persons in a year (MOH Kenya, 2013b), (WHO, 2014a)]. In 2013, two billion people in the world were infected with TB, representing about a third of the entire world population (WHO, 2013a)]. In the same year, nine million people contracted TB and 1.4 million died of it (Van't Hoog et al., 2013). In 2012, over 95% of TB deaths occurred in low and middle-income countries (“WHO | Tuberculosis,” n.d.), and it was among the top three causes of death for women aged 15 to 44 years (WHO, 2014b). Of the more than nine million new cases of active TB that occur worldwide annually, approximately 30% are in Africa (WHO, 2014b)(World Health Sciences, 2013).

In 2012, Kenya was ranked 15th among the 22 countries on the list of high-TB burden countries by the World Health Organization (WHO) (“WHO’s 2013 global report on tuberculosis: successes, ... [Lancet. 2013] - PubMed - NCBI,” n.d.), with a case notification rate of 440 cases per 100,000 persons (MOH Kenya, 2013a). In 2011, Nyanza, Rift Valley Province and Nairobi contributed 56% of the total TB burden in Kenya (Sitienei, Nyambati, Borus, et al., 2013). Since 2009, Kenya has adopted the WHO strategy for TB control using a 6-month treatment regimen (MOH Kenya, 2013c).

Interruption of treatment (therapy discontinuation ≥ 2 weeks) has been a major obstacle to treatment adherence, and is an important challenge for TB control. Inability to complete the prescribed 6-month regimen is an important cause for treatment failure, relapse, acquired drug resistance and on-going transmission of infection. Over the years, there has been increasing emphasis on direct observation treatment short-course (DOTS) to improve adherence, wherein each dose of treatment is given under the observation of a health worker. The adoption of DOTS has given impressive results with higher treatment success being reported from developing and industrialized countries (Finlay et al., 2012), (Toczek, Cox, du Cros, Cooke, & Ford, 2013b), (Jaggarajamma et al., 2007a)].

Treatment interruption is a precursor to defaulting (therapy discontinuation for ≥ 4 weeks); it thus gives insight of what happens to patients prior to defaulting. This also provides an opportunity for early intervention in the course of treatment. TB interruption rates from as low as 1% in good health systems to as high as 70% in worse performing areas have been found (Toczek et al., 2013b), (T. Kandel, Mfenyana, Chandia, & Yogeswaran, 2014). Studies conducted in Delhi, India and Nairobi, Kenya, found the average time to interrupt was six (± 3) weeks after initiation of treatment (Jaiswal et al., 2003), (Muture et al., 2011a). Others have assessed factors associated with TB treatment interruption [(Toczek et al., 2013b),(Muture et al., 2011a),(Ibrahim et al., 2014). Treatment interruption has

been associated with long transportation time to treatment centre, being male, patients with low level of information about TB, poor quality of communication between patients and health workers, distance to treatment centres, cigarette smoking, and inadequate knowledge of TB treatment duration among patients (T. Kandel et al., 2014), (Ibrahim et al., 2014), (OBoyle S. et al., 2002)].

There are limited published data on factors associated with TB treatment interruption in Kenya. While the national treatment success rate was 87% in 2014, Nandi county lags behind at 77% (MOH Kenya, 2014)]. We conducted this study to describe the frequency of treatment interruption and identify factors influencing this interruption in Nandi County, Kenya. The findings of this study will be used by the county to improve TB treatment outcomes especially in the screening of patients diagnosed with TB to identify those at risk of interrupting treatment.

Methods

Study setting, design and population

We conducted a cross-sectional study among TB patients who had been initiated on TB treatment between 1st of January 2013 and 30th June 2014 in Nandi County. Nandi county (population, 752,965) is comprised of five administrative sub-counties: Nandi Central, Nandi North, Nandi South, Nandi East and Tinderet (Transparent Africa, 2014), and has 138 health facilities, 45 of which are TB treatment sites (Nandi County, 2013). Agriculture is the main economic activity: arable farming, cash crops and livestock keeping.

Sample size determination

The estimated prevalence of interruption documented in Kenya in 2009 was 19% (Carter, 2009b). Using Cochran's 1977 formula (Cochran, 1977), the

minimum sample size was estimated to be 236, assuming a power of 80% and a precision of 5%, which was increased to 260 allowing for 10% non-response.

Sampling Procedure

A sampling frame was developed by listing all patients initiated on TB treatment in Nandi County between January 1, 2013 and June 30, 2014 from the County TB register. We generated 260 random numbers, and patients matching these assigned numbers were selected for interview. Any refusals were replaced with the next consecutive number on the registry list. For refusals for which there were more than three consecutive replacements were taken, a new random number was generated.

Eligibility and exclusion criteria

In this study, a TB patient was defined as any person who had been diagnosed with TB based on clinical, microscopic or X-ray examination. Eligible patients were those resided within Nandi County who initiated TB treatment between 1st January, 2013 and 30th June, 2014 and were aged ≥ 14 years. We included patients that were initiated on TB therapy regardless of lab confirmation (smear positive or negative), HIV status, whether initial treatment or re-treatment, or whether patient had defaulted on therapy. We excluded patients aged ≤ 13 because we believed that they would not provide objective opinions. We also excluded patients that transferred outside the county for further treatment, as well as those reported to have died during and after completion of treatment because they could not be interviewed. Treatment interruption was defined as failure to adhere to prescribed TB medication for a period of two consecutive weeks or more by persons who were already on TB treatment, regardless of whether they returned to therapy or DOTS.

Ethical approval and considerations

A consent form explaining the rationale and benefits of the study was used to seek informed consent from potential participants. Participants between 14 years and 17 years of age assented to the study and consent was obtained from their guardians. Participation was voluntary and participants could withdraw from the study at any stage without being penalized. No study participant was identified by name in any report from the study. Permission to conduct the study was obtained from Nandi county health department and ethical clearance was obtained from Jaramogi Odinga Oginga Teaching and referral hospital (JOOTRH) ethical review board (*ERC.2/VOL.1 (103)*).

Data collection

We traced the selected subjects to their homes and interviewed those found using semi-structured questionnaires. These were administered by trained data collectors using questionnaires in English, Kiswahili or Kalenjin depending on the dialect the respondent was most comfortable with. Questionnaires were back translated and pretested in non-participating units before use. Data collectors were mainly TB ambassadors, who are community health workers (CHW) with roles that include community diagnosis of TB and referral of TB patients. Data were collected on socio-demographic characteristics, clinical characteristics, family support, nutritional status, use of herbal medication, side effects experienced during treatment, knowledge on TB transmission and prevention, health system factors (care giver's attitude towards patients, distance to treatment center and average waiting time at the facility), medication history, and lifestyle and interruption status (determined by interview). We conducted a medical record review of selected patients to assess patient follow-up done during the time the patients were on treatment. A check-list of the requirements of the recommended Ministry of Health schedules of tests and TB reviews was completed by abstracting record information into an abstraction form. The abstraction form collected data on patients' socio-demographics,

registration date, DOT provider, patient type, diagnostic tests done, HIV status and testing for patients and their partners, other medications used during treatment and treatment outcome from the register. Abstracted data were linked to patient questionnaire data for analysis, using each clinic registration number as a unique identifier.

Data analysis

Descriptive statistics were generated with frequencies and proportions used to summarize categorical data and means and medians were used for continuous variables. We calculated a prevalence odds ratio (OR) and 95% confidence intervals (CI) to examine factors associated with treatment interruption. Independent factors were assessed using logistic regression, in which factors with a p-value of ≤ 0.15 were entered into the multivariate model. Factors with p-value < 0.05 were considered significant.

Results

Socio-demographic characteristics

There were 1,287 records from patients in the TB register initiated on treatment between January 1, 2013 and June 30, 2014 in Nandi County. From these, 407 patients were excluded: 193 patients were aged ≤ 13 years, 134 patients had incomplete records, 48 patients transferred out of the county, and 32 patients died prior to completion of treatment. Of the remaining 880, we randomly selected 280 patients to be interviewed. A total of 280 questionnaires were issued to data collectors. During data collection, five subjects declined interviews, three of whom indicated they did not have time for the interviews, the rest declined without giving reasons. None of the refusals was replaced more than three times. Of the questionnaires issued to data collectors, 259 were completed and 21 were not completed because the respondents were not

traced. Seven questionnaires were rejected as a result of inconsistencies, not being completely filled, or were lacking unique identifiers. The remaining 252 were included, giving a response rate of 90% (252/280). **(Figure 1)**

Among the 252 respondents 149 (59.1%) were male. The participants had a mean age of 40.0 years (SD \pm 5.3), with 69 patients (27.4%) aged 30-39 years. One hundred and fifty-two (60.3%) had at least primary level education. A hundred and sixty-one (63.9%) were self-employed, 64 (25.4%) were unemployed while the remainder 27 (10.7) were in formal employment. With respect to personal monthly income, 138 (54.8) reported earning less than Ksh.10, 000 (\$100), 112 (44.4%) between Ksh.10, 001 and Ksh 50,000, while only two (0.8) reported earnings above Ksh.50, 000. Nandi Central Sub County contributed the greatest proportion of patients (96 [36.5%]) while Tinderet Sub County contributed the fewest number of patients (15 [6.0%]).

Seventy-eight patients (31.0% [CI=25.30-37.06]) reported to have interrupted treatment, compared to the remainder (69.0% [62.94-74.70]) who did not report interruption. Patients who interrupted treatment were similar to those who did not in terms of social demographic characteristics, except for those aged above 60 years (compared to age group 20-29), and those having a monthly income of Ksh.10,001-50,000 (compared to those earning \leq Ksh.10,000). Having a personal monthly income of Ksh.10, 001-50,000 was protective against TB treatment interruption (OR 0.20, CI 0.11-0.38), while being aged \geq 60 years was associated with treatment interruption (OR 3.10, CI 1.20-7.97) **(Table 1)**.

Patient diagnosis and follow-up

Most respondents (209 [82.9%]) had pulmonary TB and 217 (86.1%) of the respondents had DOTS supported by a family member. Diagnosis of TB was mostly through sputum examination, with 218 (86.5%) having had their sputum

examination at diagnosis, 179 (71.0%) at three months and 166 (65.9%) at six months (end of follow-up). Sputum positivity declined from 67.4% at diagnosis to 1.8% at end of follow-up. One hundred and three patients (41.0%) had chest radiography. Almost all of the participants (244 [96.8 %]) were tested for HIV, of whom 84 (34.4%) were HIV positive. Two hundred and thirty-one (91.7%) successfully completed treatment for TB, 17 patients (6.8%) defaulted and four (1.6%) had treatment failures (**Table 2**).

Factors Associated with TB treatment interruption in Nandi County, Kenya 2015.

Patients who reported use of herbal medication during treatment (OR 2.6, CI= 1.36-5.00) were more likely to have treatment interruption compared to those who did not report use of herbs. Patients who reported experiencing side effects during treatment were more likely to have treatment interruption (OR 2.47, CI=1.35-4.52) compared to those who did not report experiencing side effects. Other factors associated with increased odds of TB treatment interruption included having inadequate knowledge of TB transmission (OR 2.0, CI=1.13-3.47) compared to having adequate knowledge on transmission; and average waiting time of ≥ 1 hour at the treatment centre (OR 4.9, CI=2.73-8.72) compared to average waiting time of ≤ 1 hour. Factors that decreased the odds of treatment interruption included being accompanied by a relative during visits to the treatment centre, (OR 0.49, CI= 0.29-0.85) compared to not being accompanied during visits; being informed of the diagnosis prior to initiation of therapy (OR 0.3, CI=0.11-0.76) compared to not being informed of the diagnosis and living ≤ 10 Km from treatment center (OR 0.23, CI=0.13-0.41 compared to living >10 Km from treatment center (**Table 3**). Using logistic regression to adjust for factors simultaneously, we found the following factors related to treatment interruption: personal monthly income $\leq 10,000$ Kenya shillings (\$100) (AOR 4.3, CI=2.13-8.62) compared to personal monthly income $>10,000$, frequent alcohol

consumption of >3 days in a week (AOR 3.3, CI=1.72-6.23) compared to alcohol consumption of ≤3 days in a week, and long average waiting time at the treatment centre of ≥1 hour (AOR 3.5 CI=1.86-6.78) compared to waiting time <1 hour (**Table 3**).

Discussion

Our study found that a third of the TB patients in Nandi County had interrupted their TB treatment, and factors associated with TB treatment interruption were alcohol use of more than 3 days in a week, personal monthly income ≤10,000 Kenya shillings (\$100), and waiting time longer than 1 hour at treatment centre.

Interruption rates have been documented in other African countries, such as a study by Ibrahim *et al*, 2011 (Ibrahim et al., 2014) that found one in every five patients in Plateau state in Nigeria had interrupted their TB treatment. In South Africa, Kandel *et al*, 2008 (T. Kandel et al., 2014) found a TB treatment interruption rate of 47%. The high rate of interruption in our setting could be related to the high TB burden caused by HIV/AIDS pandemic (World Health Sciences, 2013), (Muture et al., 2011a) against a low health workforce. This high number of patients interrupting treatment might have been because pre-treatment counseling was insufficient or of poor quality because health workers are overburdened. Insufficiency of counseling as a contributor to high interruption rates has also been advanced by Muture *et al* (Nairobi, Kenya,2011) (Muture et al., 2011a). Inadequate pre-counseling could subsequently lead to poor patient practices that make patients vulnerable to failing to take their pills.

Behavioral factors, such as alcohol consumption, play an important role in determining interruption of TB treatment (Van't Hoog et al., 2013),(Jaggaramma et al., 2007a),(Ibrahim et al., 2014). We found that frequent alcohol use increased the risk of interruption threefold. Individuals that

take alcohol frequently could be drunk when they are required to take their next dose which can lead to interruption (Cherkaoui et al., 2014b). Alcohol also interferes with sleep pattern (Brower, 2001), impairs judgment and induces amnesia [(Ambrose, Bowden, & Whelan, 2001), (Vetreno et al., 2011)]. This might cause patients to forget to take their pills or forget appointments, resulting in treatment interruption. In 2005, Bagchi *et al.*, in Mumbai found that alcohol consumption was associated with TB treatment interruption in those participants that were re-treatment cases (Bagchi et al., 2010). Frequent consumption of large quantities of alcohol cause liver damage [(National Health Service, 2013), (Albano, 2006)]. Concomitant use of anti-TB medication and alcohol worsens liver damage and can lead to treatment side effects (National Health Service, 2013). Side effects will discourage patients from taking drugs, hence lead to treatment interruption. In our study we did not measure the volume of daily alcohol intake and the liver function tests were not documented in the records, therefore it was difficult to document any liver damage associated with alcohol use.

The socio-economic status of TB patients is also an important factor influencing TB treatment interruption. Our study found that in Nandi County, patients who reported to have a self-reported monthly income of $\leq 10,000$ Kenya shillings (\$100) were more likely to interrupt treatment. The average earning per employee in Kenya in 2016 was Ksh.376,577.2 per annum (Ksh. 31,381.43 per month) (Kenya National Bureau of Statistics, 2016). This means a monthly income of Ksh.10, 000 is well below the average for the country. Similar findings have been reported by Dodor and Afenyandu, 2005 in Ghana (Dodor, 2004). In the study in Ghana, default from treatment was significantly associated with income per month, ability to afford supplementary drugs, availability of social support and problems relating with others while on treatment. In Kenya, the government supports TB treatment by purchasing drugs and providing free microscopy examinations, chest X-rays are paid for out of patients' pockets.

Patients also have other costs that they are responsible for, such as transport, and opportunity cost during treatment from patients' perspective. Hence, the decision to allocate money towards treating an illness makes these funds unavailable for food, clothing, housing and education. Persons with low incomes may first cater for basic needs before attending to an illness, and this may lead to interruption of treatment.

We also found that patients who reported average waiting times of more than an hour at the treatment centre were more likely to interrupt treatment as compared to those who reported less than an hour. Similar findings are recorded in Tamatave, Madagascar by Comolet *et al*, 1998 (Comolet et al., 1998), in which patients with a waiting time of >1 hour were twice more likely to treatment interruption compared to patients with shorter waiting time. Long waiting time discourages clients from making subsequent return visits since it makes patients dissatisfied with services (Thompson et al., 1996). During the tracing of respondents, we observed that most patients lived more than 20 Km away from the treatment centers which further increases the time spent to access treatment since there is a poor road network and the means of transport are unreliable in most areas of Nandi county. Access is made worse during rainy seasons (April-May; October-November).

Our study findings should be interpreted in consideration of some limitations. Our study excluded patients treated for TB aged 13 years and below, therefore our findings are restricted to adults. We also excluded patients who died prior to completing treatment (32) because their inclusion would have necessitated proxies interviews which would influence the quality and reliability of the information gathered. There may have been interviewer and reporting bias, since the TB ambassadors (interviewers) are also involved in patient care. However, we sought to reduce this bias by intensive training of data collectors. Finally, as a cross-sectional study, our findings cannot be inferred to be causal,

and further study over time on a cohort of patients would better identify risk of treatment interruption.

Conclusion

We found that treatment interruption in Nandi County was associated with long waiting time at the treatment centre, frequent alcohol consumption and low income status of TB patients. We suggest that these factors be addressed to reduce treatment interruption by expanding DOTS services through creation of more TB treatment sites, intensify patient counseling and education prior to initiation of treatment and provision of financial information to encourage patients' families to engage in income generating activities. Expansion of DOTS services could reduce the distance travelled to treatment centers, time used to travel, cost of travel and the waiting time at treatment facilities. This can be achieved by using other healthcare givers such as private clinics, chemists and nursing homes to implement private public mix. Patients should have education sessions on every visit not just one-off during therapy initiation, such sessions could address issues such as the dangers of alcohol use during treatment as well as encouraging their families to take up some income generating activities. Formation of patient support groups could also provide a good forum for sharing of experiences among patients as well as patient education by health workers.

What is known about this topic

- Kenya is one of the countries with high incidence of TB.
- Treatment interruption is a precursor of defaulting in TB treatment.

What this study adds

This study provides an estimate of proportion of patients on TB treatment who interrupt treatment and also identifies the factors associated with TB treatment

interruption in Nandi County, Kenya. It also recommends the possible ways of addressing the identified associated risk factors.

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Competing interests

We wish to state that there was no conflict of interest in this study.

Authors' contributions

Alfred Wandeba Wanyonyi: Concept development, study design, protocol writing, data collection, data analysis, results interpretation and manuscript writing. Jane Githuku: Concept development, interpretation of data, manuscript critical review and final approval. Elvis Oyugi: Manuscript review and data analysis. Paul Mutebi Wanjala: Concept development, study design, protocol review, results interpretation and manuscript approval. Hellen Kutima concept review, protocol review, results interpretation and manuscript approval. All authors read and approved then final manuscript.

Tables and figures

Table 12: Socio-demographics of patients treated for TB in Nandi County, 2013-2014.

Table 13: Diagnosis and follow-up for TB patients in Nandi County, 2013-2014.

Table 14: Factors associated with TB treatment interruption in Nandi County, Kenya 2013-2014

Figure 1: Flow chart showing recruitment of patients into the study

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Table 1: Socio-demographics of patients treated for TB in Nandi County, Kenya, 2013-2014.

Characteristic	N (%)	With interruption (%)	Without interruption (%)	OR(95% CI)	P Value
Total	252 (100)	78 (31.0)	174 (69.1)		
Sex					
Female	103(40.9)	33(42.31)	70(40.23)	1.09 (0.63-1.87)	0.864
Male	149 (59.1)	45 (57.7)	104 (59.8)	Ref	
Age					
Below 19	10 (4.0)	1 (1.3)	9 (5.2)	0.39 (0.05-3.40)	0.397
20-29	59 (23.4)	13 (16.7)	46 (26.4)	Ref.	
30-39	69 (27.4)	26 (33.3)	43 (24.7)	2.14 (0.97-4.69)	0.058
40-49	55 (21.8)	18 (23.1)	37 (21.3)	1.72 (0.75-3.97)	0.202
50-59	29 (11.5)	6 (7.7)	23 (13.2)	0.92 (0.31-2.74)	0.886
Over 60	30 (11.9)	14 (18.0.)	16 (9.2)	3.10 (1.20-7.97)	0.019
Marital status					
Cohabiting	3 (1.2)	1 (1.3)	2 (1.2)	Ref.	
Married	143 (56.8)	46 (59.0)	97 (55.8)	0.95 (0.08-10.73)	0.966
Other	20 (7.9)	8 (10.3)	12 (6.9)	1.33 (0.10-17.28)	0.826
Single	86 (34.1)	23 (29.5)	63 (36.2)	0.73 (0.06-8.44)	0.801
Education level					
Primary	152 (60.3)	53 (68.0)	99(57.0)	Ref.	
Secondary	72 (28.6)	19 (24.4)	53(30.5)	0.67 (0.36-1.25)	0.206
Tertiary	28 (11.1)	6 (7.7)	22(12.6)	0.51 (0.19-1.33)	0.170
Occupation					
Unemployed	64(25.4)	21 (26.9)	43 (24.7)	1.16 (0.44-3.08)	0.933
Employed(Formal)	27(10.7)	8 (10.3)	19 (10.9)	Ref.	
Self employed	161(63.9)	49 (62.8)	112 (64.4)	1.04 (0.43-2.53)	0.766

Table 1: Continuation

Personal monthly income					
0-10,000	138(54.8)	62(79.5)	76(43.7)	Ref.	
10,001-50,000	112(44.4)	16(20.5)	96(55.2)	0.20 (0.11-0.38)	<0.001
Over 50,000	2(0.8)	0	2(1.1)	<0.0001	0.972
Residence(District)					
Nandi Central	92 (36.5)	23 (29.5)	69 (39.7)	Ref.	
Nandi East	41 (16.3)	13 (16.7)	28 (16.1)	1.56 (0.68-3.59)	0.288
Nandi North	63 (25.0)	23 (29.5)	40 (23.0)	1.72 (0.85-3.52)	0.125
Nandi South	41 (16.3)	15 (19.2)	26 (14.9)	1.80 (0.80-4.04)	0.148
Tinderet	15 (6.0)	4 (5.1)	11 (6.3)	1.20 (0.34-4.23)	0.775

Table 2: Diagnosis and follow-up for TB patients in Nandi County, 2013-2014.

Variable	Total (%)	Patients with interruption (%)	Patients without interruption (%)
Sputum results			
At diagnosis			
Negative	71 (32.6)	18(30.0)	53(33.5)
Positive	147 (67.4)	42(70.0)	105(66.5)
At 3 Months			
Negative	165 (92.7)	45(93.8)	120(92.3)
Positive	13 (7.3)	3(6.2)	10(7.6)
At the end			
Negative	159 (98.1)	40(97.6)	119(98.3)
Positive	3 (1.9)	1(2.4)	2(1.7)
Patient underwent X-ray examination			
Yes	103 (41.0)	31 (39.7)	72 (41.6)
HIV testing done			
Yes	244 (96.8)	76 (97.4)	168 (96.6)
HIV test results			
Positive	84 (34.4)	34 (44.7)	50 (29.7)
Patient on ART(HIV+)			
No	1 (1.1)	0.0	1 (2.0)
Yes	83 (98.8)	35 (100)	48 (98.0)
Partner tested(HIV)			
No	173 (68.7)	51 (65.4)	122 (70.1)
Yes	79 (31.4)	27 (34.6)	52 (29.9)

Table 2: Continuation

DOT provider			
CHW	35(13.9)	13(16.7)	22 (12.7)
Family member	217(86.1)	65(83.3)	152 (87.4)
TB type			
Extra pulmonary TB	43 (17.1)	19 (24.4)	24 (13.8)
Pulmonary TB	209 (82.9)	59 (75.6)	150 (86.2)
Distance from treatment site			
≤10 Km	176	37(47.4)	139(79.9)
>10 Km	76	41(52.6)	35(20.1)
Treatment outcome			
Treatment complete and Cured	231 (91.7)	63(80.8)	178 (96.6)
Failure	4 (1.6)	2 (2.6)	2 (1.2)
Out of control	17 (6.8)	13 (16.7)	4 (2.3)

Table 3: Factors associated with TB treatment interruption in Nandi County, Kenya 2013-2014

Variable	Patients with interruption (%)	Patients without interruption (%)	POR(95%CI)	AOR(95%CI)
Average reported waiting time at facility	54 (69.2)	55 (31.6)	4.9 (2.73-8.72)	3.6(1.86-6.81)
≥1 Hour	24 (30.8)	119 (68.4)		
<1 Hour				
Distance from treatment center	37 (47.4)	139 (79.9)	0.2 (0.13-0.41)	
≤10 Km	41 (52.6)	35 (20.1)		
>10 Km				
Age at initiation of treatment	40 (41.3)	98 (56.3)	0.8 (0.48-1.40)	1.4(0.70-2.60)
<40 years	38 (48.7)	76 (43.7)		
≥40 years				
Ever accompanied by Family member			0.5 (0.29-0.85)	0.6(0.32-1.16)
Yes	33 (42.3)	104 (59.8)		
No	45(57.7)	70(40.2)		
Ever Experienced side effects	60 (76.9)	100 (57.5)	2.5 (1.35-4.52)	1.44(0.71-2.94)
Yes	18 (23.1)	74 (42.5)		
No				

Table 3: Continuation

History of prior TB Treatment				
Yes	11 (14.1)	19 (10.9)	1.4 (0.60-2.97)	
No	67 (85.9)	155 (89.1)		
Used herbal drugs during treatment				
Yes	23 (29.5)	24 (13.8)	2.6 (1.36-5.01)	
No	55 (70.5)	150 (86.2)		
Personal monthly income				
≤Ksh 10,000	62 (79.5)	76 (43.7)	5.0(2.67-9.34)	4.3(2.13-8.62)
>Ksh 10,000	16 (20.5)	98 (56.3)		
Alcohol use per week				
>3 days	51 (65.4)	47 (27.0)	5.0(2.83-8.92)	3.3(1.73-6.28)
≤3 days	27 (34.6)	127 (73.0)		
Sex				
Female	33 (42.3)	70 (40.2)	1.1(0.63-1.87)	
Male	45 (57.7)	104 (59.8)		
Highest Level of education			0.6(0.36-1.10)	
Primary	25 (32.1)	75 (43.1)		
Post primary	53 (68.0)	99 (56.9)		

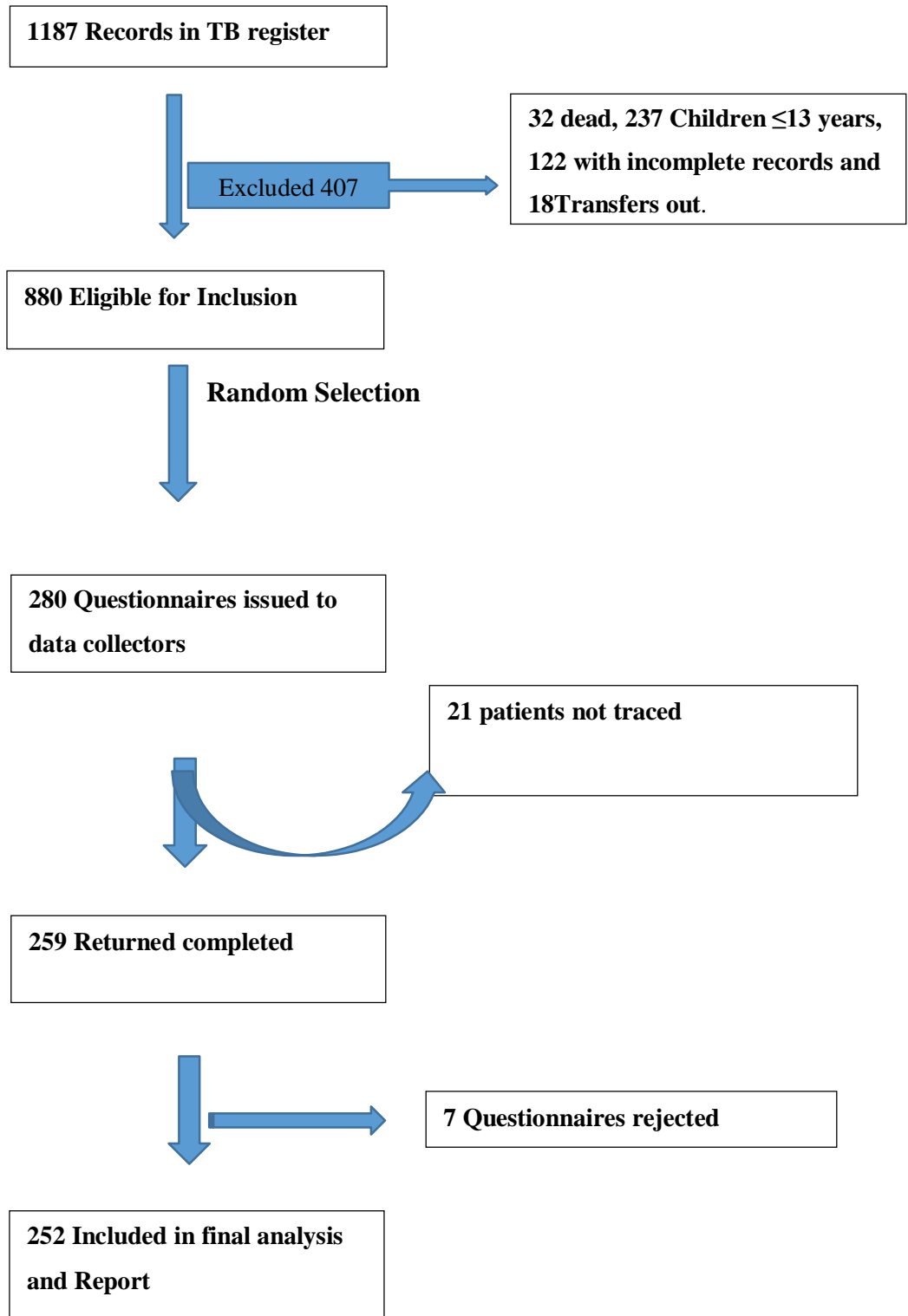


Figure 1: Flow chart showing recruitment of patients into the study.

Appendix 20: Published Manuscript-IJRSP

Reasons for Interruption, Knowledge, Attitude and Practices of Patients Treated for Tuberculosis in Nandi County, Kenya

Alfred Wandeba Wanyonyi ^{1, 2, 3 4, 5}, Paul Mutebi Wanjala ⁴, Sammy Rop ^{3, 5} Laura I. Kedode⁶, Helen Lydia Kutima ¹.

1. Jomo Kenyatta University of Agriculture and Technology.
2. Field Epidemiology and Laboratory Training Program
3. Ministry of Health Kenya
4. University of Eldoret
5. Nandi County
6. Masinde Muliro University of Science and Technology.

Corresponding author: Alfred Wandeba Wanyonyi, Field Epidemiology and Laboratory Training Program, P.O BOX 225, Nairobi, Kenya. +254722991269

Abstract

Introduction

Kenya is ranked 15th on the list of 22 high-TB burden countries as determined by the World Health Organization, with a case notification rate of 440 cases per 100 000 persons. National TB treatment success rate is 85.5% for new smear positive pulmonary TB cases, Nandi County lags behind at 77%. The country has adopted WHO recommended short course since 2007 and direct observation of treatment (DOT) since 1993 to mitigate against interruption of treatment. We conducted this study to determine the reasons for TB treatment interruption and the factors relating to patient attitude and practices that influence treatment interruption in Nandi County.

Methods

We randomly selected and interviewed 252 subjects using a pretested semi structured questionnaire. Data on social and demographic factors, lifestyle, clinical information, family support, nutritional status, medication history was collected. Analysis was conducted with Epi- Info Version 7. Outcome variable was treatment interruption. Analysis was by logistic regression at 95% CI and $P < 0.05$ significance level.

Results

We interviewed 252 respondents of whom 149 (59.1%) were males. The most common age 69 (27.4%) was 30-39 years. The most frequently given reason 50 (64.1%) for treatment interruption was “Too many pills”. Not knowing the risk of interrupting TB treatment AOR 2.8 (1.43 – 5.62), ever ashamed because one had TB AOR 2.6 (1.33 – 4.93) and ever used herbal medicine during treatment AOR 2.1 (1.04 – 4.22) were independently associated with treatment interruption.

Conclusion

Treatment interruption was associated with lack of knowledge on the risk of interrupting TB treatment, ever ashamed because one had TB and ever used herbal medicine during treatment. These can be addressed by intensive pre-treatment counselling of patients and care givers that focuses on the importance of adhering to treatment and reduction of stigma as well as sensitizing herbalists and traditional medicine men on TB and engaging them in TB patient referral.

Key words Interruption, Kenya, Knowledge, Practices, Tuberculosis, Nandi.

INTRODUCTION

Tuberculosis is a chronic infectious disease caused by *Mycobacterium tuberculosis*, a fastidious intracellular alcohol-acid fast bacteria. Currently two billion people in the world live with TB (van't Hoog et al., 2011). Nine million people a year contract the airborne

bug while 1.4 million die from it (Sharecare, 2013). This translates to a person being infected with TB every second (World Health Sciences, 2013). It is the most common cause of mortality among HIV positive patients, with 25% of HIV/AIDS fatalities actually die of TB (Nathan, 2013), (“WHO’s 2013 global report on tuberculosis: successes, ... [Lancet. 2013] - PubMed - NCBI,” n.d.). In 2012, 8.6 million people fell ill with TB and 1.3 million died of TB (“WHO’s 2013 global report on tuberculosis: successes, ... [Lancet. 2013] - PubMed - NCBI,” n.d.). Over 95% of TB deaths occur in low- and middle-income countries, and it is among the top three causes of death for women aged 15 to 44 (“WHO’s 2013 global report on tuberculosis: successes, ... [Lancet. 2013] - PubMed - NCBI,” n.d.). In 2012, an estimated 530 000 children became ill with TB and 74 000 HIV-negative children died of TB (“WHO’s 2013 global report on tuberculosis: successes, ... [Lancet. 2013] - PubMed - NCBI,” n.d.).

Of the more than nine million new cases of active TB that occur worldwide each year, approximately 30% of them are in Africa (World Health Sciences, 2013) (Chaisson & Martinson, 2008). This translates to 363 persons per 100,000 population in Africa each year being newly infected with TB. TB mortality in Africa is at 74 deaths per 100,000 of population (Zumla et al., 2015). In most cases, a heavy TB burden goes hand in hand with HIV prevalence. Twenty-two countries designated as having a high-burden of TB by the World Health Organization account for 80% of the world’s TB cases; nine are in Africa (Democratic Republic of Congo, Ethiopia, Kenya, Mozambique, Nigeria, South Africa, Tanzania, Uganda, and Zimbabwe) (Chaisson & Martinson, 2008).

In Kenya, national TB treatment success rate is 85.5% for new smear positive pulmonary TB cases (TB CARE I, 2011), Nandi county lags behind at 77% (MOH Kenya, 2013b). The case detection rate is 85% as reported in the WHO 2012 Global report (“WHO’s 2013 global report on tuberculosis: successes, ... [Lancet. 2013] - PubMed - NCBI,” n.d.). WHO estimate show that the country currently has 3024 MDR patients; this has justified the need of a surveillance system to monitor MDR TB (van’t Hoog et al., 2011). In 2010, Nyanza, Rift valley province and Nairobi all contribute 56% of the total TB burden in Kenya (Sitienei, Nyambati, & Borus, 2013).

Successful treatment of TB involves taking treatment for at least 6 months. Kenya has adopted WHO recommended short course since 2007. This involves 2 months of intensive phase and 4 months of continuation phase. During the intensive phase, patients collect treatment weekly while in continuation phase they do so fortnightly or monthly.

Treatment interruption is one of the major obstacles to TB control. Poor adherence means patients remain infectious for longer and are more likely to relapse or succumb to TB. To improve compliance to treatment, emphasis is placed on direct observation of treatment (DOT) by a health worker or a close family member. This WHO recommended strategy was introduced in Kenya in 1993, but Kenya is still among the 22 high TB burden countries in the world.

Treatment interruption appears to be significantly linked to transportation time, the sex of the patient, patient information and the quality of communication between patients and health workers (Ibrahim et al., 2014). In a study in 2011 in Nigeria, Ibrahim *et al* showed that interruption of treatment was associated with living more than 5km from the patients' treatment Centre (Ibrahim et al., 2014). This study established distance, cigarette smoking and lack of knowledge of treatment duration of TB as independent determinants of interruption. This is also supported by O'Boyle *et al* (OBoyle S. et al., 2002) in Malaysia and Kandel *et al* (T. R. Kandel et al., 2008) in South Africa. They reported long distance, costs of travel and travel time as predictors of interruption of treatment among TB patients. Association of TB and smoking is also documented in the study "Smoking and TB in Hong Kong," (Leung et al., 2003). A focused group discussion also identified cost of transportation to the clinic for direct observation of treatment and unfriendly attitude of the health care workers as the major factors responsible for interruption of treatment (Ibrahim et al., 2014).

Patient knowledge, attitude and practice are also important determinants of interruption. The disappearance of symptoms is an indication of clinical improvement from diseases and a measure of the effectiveness of the therapy. Because of the high quality drugs used in the DOTS strategy it is common place for TB symptoms to disappear even within a few

weeks of treatment (Muture *et al.*, 2011). Patients with inadequate knowledge of the duration of the treatment may feel that they are cured and thus stop the treatment. Kaona *et al* (2004) in their study on assessment of factors contributing to TB treatment adherence in Ndola, Zambia showed that feeling well was the major reason for patient stopping treatment.

The attitude of the health care worker towards the patient remains an important factor that can keep the patients on treatment or make them break the treatment or abandon it. Unfriendly attitude of health care workers might make patients feel threatened and unwelcomed leading to treatment interruption. The negative effect of untoward attitude of health care workers on TB treatment has been reported in India by Jaiswal *et al.* They noted that patient who defaulted from treatment blamed the health workers for their unpleasant behavior and attitude towards them whom they described as rude and unhelpful (Jaiswal *et al.*, 2003).

Cultural and religious practices also influence on patient health seeking behavior including adherence to TB treatment in many developing countries. Studies from Africa, Bangladesh and Syria showed that most married women must seek permission from their husband to attend health care services including TB treatment (F. Karim *et al.*, 2008) (Begum *et al.*, 2001) (Fazlul Karim, Islam, Chowdhury, Johansson, & Diwan, 2007). This might be a potential barrier to TB treatment. Despite this barrier women tend to adhere to anti-TB treatment leading to better treatment outcome than men indicating that there could be hidden factor among the female. However, Ibrahim *et al.*, (2014) found no significant relationship between age and gender and interruption of TB treatment.

Tuberculosis, like HIV/AIDS, is often associated with stigmatization and thus may create resistance among patients to treatment. A study carried out in Nigeria (Odusanya & Babafemi, 2004), raised an important point of delays in care seeking behavior due to stigma experienced by TB patients. Studies have shown that stigmatization creates a lot of self-denial among those with diseases like TB and Sexually Transmitted Infections (STIs); hence most of them fail to comply with the treatment regime (Yimer *et al.*, 2009).

Despite these multiplicity of determinants of treatment interruption, we believe the easily modifiable factors are the ones we should focus on. This is why we chose to determine the reasons for TB treatment interruption and the factors relating to patient attitude and practices that influence treatment interruption. Since Nandi County has a treatment success rate below the national target, we choose to conduct the study in this county in order to use the findings to improve the TB indicators.

METHODS

Study Site

The study was conducted in Nandi County, Kenya. The county borders Uasin-Gishu county, Kericho county, Vihiga county, Kisumu county and Kakamega county. It comprises 5 administrative sub-counties; Nandi central, Nandi North, Nandi South, Nandi East and Tinderet (Transparent Africa, 2014). It covers a total area of 2884.2 square kilometers with temperatures ranging from 12^o to 26^o c and rainfall between 1200mm and 2000mm per annum (Nandi County, 2013). The county population is 752965 people, with density of 261 persons/Km². The population is distributed across age groups as follows; 0-14 (45%), 15-64(51.4%) and above 65(3.6%). Of the population, 47.4% live below the poverty line. Agriculture is the main economic activity. Nandi County has a total of 138 health facilities, infant mortality ratio of 66 per 1000 newborns and an under five year's mortality rate of 111 per 1000 live births. The main diseases affecting residents in the county are Malaria, respiratory tract infections, diarrhea diseases and skin diseases.

Study design

We conducted a cross sectional study between April and June 2015.

Study population

Our study population was patients who had been initiated on treatment for TB between January 1st, 2013 and June 30th, 2014.

Sample size determination

We determined minimum subjects to be sampled with a consideration of 95 % confidence interval, a power of 80 %, Z_{α} of 1.96 and a precision of 0.05. In 2009, E.J Carter estimated prevalence of treatment interruption at 19%. Patients initiated on treatment in Nandi county between 1st January, 2013 and 30th June 2014 was 843. Using Cochran formula (1977) we obtained a minimum sample of 236 which we adjusted to 260 after a 10% adjustment for non-response.

Sampling Procedure

We used simple random sampling. A list of all the patients initiated on treatment for TB from January 1st, 2013 to June 30th, 2014 in Nandi County was obtained from the county TB register. Using a computer, we generated 260 random numbers between 1 and 843. The patients alongside these numbers were selected and enrolled in the study for interview. Refusals were replaced with the next consecutive numbers up to three consecutive replacements for each refusal. Beyond three consecutive refusals for a single slot, then a new computer generated number was generated.

Eligibility and exclusion criteria

We included patients in the county TB register aged 14 years and above, who had been initiated on treatment between January 1st 2013 and 30th June 2014 and gave assent and/consent. The participants in the study included new TB cases, re-treatments, smear positive, smear negative, defaulters and non-defaulters, those with known or unknown HIV status. At the time the study was conducted, the patients were expected to have completed treatment if they had observed their prescription without missing their pills.

We excluded those aged 13 years and below since they would not give objective opinions. Those patients who did not give consent were also excluded as were those transferred out of the county after initiation of treatment. We also excluded those who died after initiation of treatment to avoid interviewing proxies since this would introduce bias.

Case definitions

We used the following case definitions:

- A TB patient was defined as a person who had been diagnosed with TB based on clinical, microscopic or X-ray examination within Nandi County and initiated on treatment between January 1, 2013 and June 30, 2014.

Treatment interruption was defined as failure to adhere to prescribed TB medication for a period of two consecutive weeks or more by persons who were already on TB treatment, regardless of their return to therapy or DOTs afterwards.

Data collection

The sampling frame was obtained from the county TB register for the year 2013/2014. This was downloaded into Microsoft Excel sheet. The randomly selected subjects were interviewed by directly administered pretested questionnaires by trained data collectors. The data collectors comprised mainly the TB ambassadors who are employed by partners implementing TB activities in the county. They are provided with motorbikes and bicycles which they use to do home visits. They used these means to trace subjects and conduct interviews at their homes. Those patients not found were still traced with their telephone contacts available in the TB registers. The questionnaires were both in English and the local languages (Nandi, Luhya and Luo).

This method enables the interviewers to clarify and elaborate the purpose of the research and effectively convince the respondents about the importance of the study. The method was adopted so as to: obtain in-depth data on the subject being addressed; Obtain data required to meet the objectives; Guard against the respondents confusing the questions; Enable the interviewers to adapt to the situation and get as much information as possible; be able to extract very sensitive and personal information from the respondent by employing honest and personal interaction between the respondent and the interviewer.

We collected information on socio-demographics, clinical presentation, side effects, reasons for interruption if any, patient knowledge on TB, attitudes and practices. We used the clinic registration number as the unique identifier during data collection. The questionnaires were reviewed daily and stored in lockable cabinets.

Data analysis

Data from questionnaires were then transferred into Epi- Info Version 7(CDC, USA Atlanta) make view by two sets of data clerks to minimize errors. The resulting two sets of database were cleaned and validated using check codes and queries, comparisons being made between the sets. In case of discrepancies, reference was made to the original copy of questionnaire.

Univariate analysis using frequency and proportions. Variables that are continuous were summarized using means and standard deviation while discrete variables were summarized using median, range and inter-quartile ranges. Bivariate analysis was done to establish determinants of treatment interruption using prevalence odds ratio as a measure of association, where 95% confidence intervals were used with Yates corrected chi-square test of significance where factors with p-values of ≤ 0.05 were considered as significant. The outcome variable was treatment interruption. The independent contribution of each significant factor was assessed using unconditional logistic regression where factors with a p-value of ≤ 0.15 were considered. This also controlled for multiple confounding. Stepwise forward elimination method was used to select the variables in the final model.

Ethical approval and considerations

A consent form explaining the rationale and benefits of the study was used to seek informed consent from potential participants. Participants between 14 years and 17 years of age assented to the study and consent was obtained from their guardians. Participation in the study was voluntary and participants were at liberty to withdraw from the study at any stage without being penalized. No study participant was identified by names in any report from the study. The study had minimal risks.

Permission was obtained from Nandi county health department. Clearance was also obtained from Jaramogi Odinga Oginga Teaching and referral hospital (JOOTRH) ethical review board prior to data collection (*ERC.2/VOL.1 (103)*)

RESULTS

Socio-demographic of TB patients

We interviewed 252 respondents of whom 149 (59.1%) were males. The most common age 69 (27.4%) was 30-39 years. The mean age was $40.0 \pm (15.3)$ years, median age was 37.5 years (IQR 28.5 – 48.0) while mode was 30.0 years. One hundred and forty-three (56.8%) were married while the rest were in other types of relationships. Monogamy was reported among 206 (81.8%). Most 152 (60.3%) had attained primary education while the rest had post-primary education (Table 1).

Symptoms, Side effect profile and reasons for interruption of TB treatment

A total of 220 (87.3%) presented with cough at diagnosis while the rest did not. Night sweat 173 (68.7%) was the second commonest symptom followed by chest pains 172 (68.3%). The most frequently given reason 50 (64.1%) for treatment interruption was “Too many pills”. Other reason given included side effects 41 (52.6%), Inadequate food 40 (51.3%) and Unpleasant medication 37 (47.4%). None of those interviewed indicated having interrupted treatment due to drug stock outs. The most 119 (47.2%) reported side effect was change in urine colour. One hundred and eighty-two (72.2%) reported that TB is caused by an infectious agent, the rest either gave a wrong response or did not know the cause of TB (Table 2).

Predictors of treatment interruption based on knowledge and practice of patient

Sharing utensils with others in the community during treatment OR 0.5 (0.31 – 0.86), Ever ashamed because of having TB 3.3 (1.87 – 5.74), Ever experiencing being neglected because of TB OR 1.9 (1.08 – 3.19), Use of herbs during treatment OR 2.6 (1.36 – 5.01), Lack of knowledge on TB transmission OR 2.0 (1.13 – 3.47) and Lack of knowledge on

risk of treatment interruption OR 4.1 (2.15 – 7.76) were found to be statistically significant on bivariate analysis. Sex and age were not statistically significant (Table 3).

On Logistic regression, not knowing the risk of interrupting TB treatment AOR 2.8 (1.43 – 5.62), ever ashamed because one had TB AOR 2.6 (1.33 – 4.93) and ever used herbal medicine during treatment AOR 2.1 (1.04 – 4.22) were independently associated with treatment interruption (Table 4).

DISCUSSION

We determined the reasons for TB treatment interruption and the factors relating to patient attitude and practices that influence treatment interruption in Nandi County. We found that one in every three patients initiated on treatment for TB would interrupt. The major factors associated with treatment interruption were not knowing the risk of interrupting TB treatment, ever ashamed because one had TB and ever used herbal medicine during treatment.

Similar findings on interruption rates are also documented by Ibrahim et al, 2011 (Ibrahim et al., 2014) who found one in every five patient in Plateau state in Nigeria to have interrupted. In South Africa, Kandel et al, 2008(T. R. Kandel et al., 2008)found interruption rates of 47% in a similar setting. This high rate could be attributed to the increasing TB burden due to HIV/AIDS pandemic (Van't Hoog et al., 2013) (van't Hoog et al., 2011) against a low health workforce. This has made pre-treatment counseling to be insufficient and of poor quality since health workers are overburdened. Insufficiency of counseling as a contributor to high interruption rates has also been advanced by Muture *et al.*, (2011) (Muture et al., 2011a).Inadequate pre-counseling would subsequently lead to poor patient practices that make patients vulnerable to failing to take their pills.

Use of herbal medicine during treatment increased the risk of interrupting treatment twofold. Similar findings have been documented by Muture *et al.* ,2011 (Muture *et al.* , 2011) who found that use of herbal medication was associated with a six fold increase in risk of interruption(AOR 5.70).Boateng *et al.* , 2010 also found that defaulters were more

likely to receive other health care (Spiritualists and traditional healers) more than non-defaulters (OR 2.96) in a study in Ghana. Like most rural settings in Africa, traditional medicine men and herbalists exist in Nandi County. They are in constant competition with conventional medical practitioners, in some areas, especially so where the level of education is low. In such areas, it is easy for the herbalist to convince patients since they believe in witchcraft. Use of herbal medicine as an alternative showed lack of confidence in the use of prescribed anti-TB drugs as well as inadequate information. This meant they could easily abandon treatment in favour of the herbal medicine. Since the efficacy of the herbal medication is not assured, this leads to continued infectivity and thus increased TB burden. Use of herbal medicines is also associated with liver and kidney damage. Since anti-TB drugs are also associated with liver damage, their concurrent use with herbal medicines would make increase the damage, leading to exacerbation of the unpleasant side effect. Side effects discourage patients from taking their pills.

Apart from use of herbal medication, stigma was found to significantly influence interruption. Being ashamed because one had TB was associated with three times risk of interrupting treatment. Similar findings were reported in a study in Madagascar (Comolet et al., 1998) about patients who “ felt that TB was a shameful disease” who had three times the risk of defaulting treatment compared to those who did not (OR 2.97). Stigma associated with TB and HIV/AIDS acts as a barrier to adherence since patients are not free to disclose their condition. They hide from family members and thus end up not getting the desired support. This ultimately ends up in non-adherence. A study in South Africa assessing effect of attitude and knowledge on TB treatment initiation and adherence concluded that stigma influenced TB patients’ decisions in health seeking behavior and adherence (Cramm et al., 2010).

We also found that knowledge on TB was an important predictor of interruption. Patients who did not have knowledge on the dangers of interruption were three times (AOR 2.8) more likely to interrupt as compared to those who did. Several studies have documented the role of knowledge on TB in determining interruption (Boateng et al., 2010) (Muture

et al., 2011) (OBoyle S. *et al.*, 2002). Boateng *et al.*, (2010) established that knowledge on how people get TB, whether TB is curable and knowledge on symptoms of TB were important determinants of TB interruption. The drugs used in the first two months of treatment are highly effective and thus kill most of the bacteria on initiation of treatment (Pardeshi, 2010) (Liu, Shilkret, & Ellis, 1999). The reduction of the bacteria load leads to resolution of symptoms making the patients feel better. This explains why most patients would default early in the course of therapy. This is due to inadequate knowledge on TB leading to interruption of treatment. . Kaona *et al* in their study on assessment of factors contributing to TB treatment adherence in Ndola, Zambia showed that feeling well was the major reason for patient stopping treatment (Kaona *et al.*, 2004). Their finding is similar with our results which revealed that lack of knowledge of duration of treatment was significantly associated with interruption of treatment.

Our study findings should be interpreted in consideration of some limitations. The study excluded patients treated for TB aged 13 years and below. This accounts for 11% of all TB patients (WHO, 2014b). This may affect generalization of the study on the entire population. The study was also prone to interviewer bias since the TB ambassadors (interviewers) are also involved in patient care. We reduced this bias by intensive training of data collectors.

CONCLUSION

This study has shown that treatment interruption in Nandi County is high. This was attributed to poor pre-treatment counselling leading to inadequate knowledge of TB and poor patient practices. It was also deduced that the most important factors associated with treatment interruption were lack of knowledge on the risk of interrupting TB treatment, ever ashamed because one had TB and ever used herbal medicine during treatment. We suggest that these factors be addressed to reduce treatment interruption by intensive pre-treatment counselling of patients and care givers that focuses on the importance of adhering to treatment and reduction of stigma. Herbalists and traditional medicine men should be sensitized on TB and engaged in TB patient referral.

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Competing interests

We wish to state that there was no conflict of interest in this study.

Authors' contributions

Alfred Wandeba Wanyonyi: Concept development, study design, protocol writing, data collection, data analysis, results interpretation and manuscript writing. Paul Mutebi Wanjala: Concept development, study design, protocol review, results interpretation and manuscript review. Sammy K. Rop: Concept development, study design, data abstraction and analysis. Hellen Kutima concept review, protocol review, results interpretation and manuscript review.

. TABLES

Table 1; Socio-demographics of patients on treatment for TB, Nandi County, 2014

Description	Total (%)	Interrupters (%)	Non-interrupters (%)
Total subjects	252(100)	78(31.0)	174(69.0)
Sex			
Female	103(40.9)	33(42.3)	70(40.2)
Male	149(59.1)	45(57.7)	104(59.8)
Age			
14-19	10(4.0)	1(1.3)	9(5.2)
20-29	59(23.4)	13(16.7)	46(26.4)
30-39	69(27.4)	26(33.3)	43(24.7)
40-49	55(21.8)	18(23.1)	37(21.4)
50-59	29(11.5)	6(7.7)	23(13.2)
Over 60	30(11.9)	14(18.0)	16(9.2)
Marital status			
Cohabiting	3(1.2)	1(1.3)	2(1.2)
Married	143(56.8)	46(59.0)	97(55.8)
Other	3(1.2)	1(1.3)	2(1.2)
Single	86(34.1)	23(29.5)	63(36.2)
Widow/ Widower	17(6.7)	7(9.0)	10(5.8)
Type of family			
Monogamous	206(81.8)	61(78.2)	145(83.3)
Polygamous	46(18.2)	17(21.8)	29(16.7)

Table 1: Continuation

Education level			
Primary and below	152(60.3)	53(68.0)	99(56.9)
Secondary	72(28.6)	19(24.4)	53(30.5)
College/Tertiary	23(9.1)	6(7.7)	17(9.8)
University	5(2.0)	00	5(2.9)
Religion			
Atheist	7(2.8)	2(2.6)	5(2.9)
Catholic	113(44.8)	39(50.0)	74(42.5)
Muslim	1(0.4)	0	1(0.6)
Protestant	131(52.0)	37(47.4)	94(54.0)
Occupation			
Casual laborer	53(21.0)	19(24.36)	34(19.54)
Employed(Formal)	27(10.7)	8(10.26)	19(10.92)
Farmer	118(46.8)	34(43.59)	84(48.28)
Other	11(4.4)	2(2.56)	9(5.17)
Small scale business	43(17.1)	15(19.23)	28(16.09)
Nuclear family type			
Dual parent	148(58.7)	33(42.3)	115(66.1)
Single parent	104(41.3)	45(57.7)	59(33.9)

Table 2; Symptoms at diagnosis, Side effect profile and reasons for interruption among patients on Treatment for TB, Nandi County, 2014

Variable	Total (%)	Interrupters (%)	Non-interrupters (%)
Symptoms at diagnosis			
Cough	220(87.3)	69(88.5)	151(86.8)
Chest pains	172(68.3)	55(70.5)	117(67.2)
Hemoptysis	49(19.4)	15(19.2)	34(19.5)
Weight loss	156(61.9)	61(60.4)	95(62.9)
Loss of appetite	85(33.7)	23(29.5)	62(35.6)
Night sweats	173(68.7)	50(64.1)	123(70.7)
Other symptoms	7(2.9)	1(1.3)	6(3.5)
Reasons for interruption			
Too ill		10(12.82)	
Stock-outs		0	
Migration to new home		2(2.6)	
Afraid of Injections		2(2.6)	
Inadequate food		40(51.3)	
Medication tasted unpleasantly		37(47.4)	
Drugs not working		12(15.4)	
Too many Pills		50(64.1)	
Relief from symptoms		13(16.7)	
Stigma		12(15.4)	
Side effects		41(52.6)	

Table 2: Continuation

Side effects of anti-TBs			
Altered vision	26(10.3)	10(12.8)	16(9.2)
Headaches	46(18.3)	14(18.0)	32(18.4)
Vomiting	74(29.4)	30(38.5)	44(25.3)
Itching	57(22.6)	21(26.9)	36(20.7)
Jaundice	25(9.9)	11(14.1)	14(8.1)
Abdominal pains	54(21.4)	22(28.2)	32(18.4)
Change in urine colour	119(47.2)	45(57.7)	74(42.5)
Causes of TB			
Act of God	11(4.4)	3(3.9)	8(4.6)
Don't Know	29(11.5)	12(15.4)	17(9.8)
Infectious agent	182(72.2)	49(62.8)	133(76.4)
Other causes	11(4.4)	8(10.3)	3(1.7)
Smoking	15(6.0)	5(6.4)	10(5.8)
Witchcraft	4(1.6)	1(1.3)	3(1.7)

Table 3; Predictors of interruption of Treatment for TB, Nandi County, 2014

Variable	Interrupters (%)	Non-interrupters (%)	OR CI (P Value)
Sex			
Female	33(42.31)	70(40.23)	1.1(0.63-1.87)
Male	45(57.69)	104(59.77)	P=0.86
Age			
Below 40 years	40(41.28)	98(56.32)	0.82(0.48-1.40)
Above 40 years	38(48.72)	76(43.68)	P=0.54
Card available during interview			
Yes	45(57.69)	113(64.94)	0.74(0.43-1.27)
No	33(42.31)	61(35.06)	P=0.34
Patients shared utensils with others in the community during treatment.			
Yes	43(42.6)	89(58.9)	0.52(0.31-0.86)
No	58(57.4)	62(41.1)	P=0.02
Ever ashamed because of having TB			
Yes	52(66.7)	66(37.9)	3.27(1.87-5.74)
No	26(33.3)	108(62.1)	P<0.001
Ever experienced being neglected because of TB			
Yes	46(58.9)	76(43.7)	1.85(1.08-3.19)
No	32(41.1)	98(56.3)	P=0.04
Used herbs during treatment			
Yes	23(29.5)	24(13.8)	2.61(1.36-5.01)
No	55(70.5)	150(86.2)	P=0.01

Table 3: Continuation

Know transmission of TB			
No	33(42.3)	47(27.0)	1.98(1.13-3.47)
Yes	45(57.7)	127(73.0)	0.02
Lack knowledge on risk of interruption.			
Yes	29(37.2)	21(12.1)	4.09(2.15-7.76)
No	49(62.8)	152(87.9)	P<0.001
Patients Know the cause of TB			
No	16(24.6)	28(17.4)	1.55(0.77-3.11)
Yes	49(75.4)	133(82.6)	P= 0.29

Table 4; Multi-Variate analysis of factor associated with TB Treatment interruption, Nandi County 2013-2014.

Term	Odds Ratio	95% C.I	P-Value
Having knowledge on TB transmission	0.6	0.35-1.20	0.170
Not knowing risks of interrupting treatment	2.8	1.43-5.62	0.003
Did share utensils with others during treatment	0.9	0.47-1.55	0.598
Ever ashamed because one had TB	2.6	1.33-4.93	0.005
Ever neglected because one had TB.	1.1	0.58-2.12	0.760
Ever used herbal medicine during treatment.	2.1	1.04-4.22	0.040

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