REPUBLIC OF KENYA


MINISTRY OF HEALTH

# Factors Associated With Non-Adherence to Tuberculosis Treatment in Kenya


2018

## TABLE OF CONTENTS

## ACKNOWLEDGEMENT

The Ministry of Health appreciates the financial support provided by the Global Fund for AIDS, Tuberculosis and Malaria towards the planning and implementation of this study.

In addition, we acknowledge the technical expertise provided by the World Health Organisation (WHO), Centre for Health Solutions – Kenya (CHS), Amref Health Africa, under the leadership of the National Tuberculosis, Leprosy and Lung Disease Program (NTLD-Program).

We also thank the contributors who supported the planning, data collection, analysis and writing of this report.

**Dr Kamene Kimenye**
**Head, National Tuberculosis, Leprosy and Lung Disease Program (NTLD-Program)**

## LIST OF ACRONYMS

| | |
|---|---|
| AMREF | African Medical and Research Foundation |
| CDC | U.S Centers for Disease Control and Prevention |
| CDH | County Director of Health |
| CHV | Community Health Volunteer |
| CNR | Case Notification Rate |
| CTLC | County Tuberculosis and Leprosy Coordinator |
| DOT | Directly Observed Treatment |
| DR TB | Drug Resistant Tuberculosis |
| EPTB | Extra Pulmonary Tuberculosis |
| HCW | Health Care Worker |
| INH | Isoniazid |
| NTLD-Program | National Tuberculosis, Leprosy and Lung Disease Program |
| NTRL | National Tuberculosis Reference Laboratory |
| Patient type N | New |
| Patient type PT | Previously Treated |
| Patient type R | Retreatment |
| Patient type TF | Treatment Failure |
| Patient type THU | Treatment History Unknown |
| Patient type TLF | Treatment After Lost to Follow Up |
| SCTLC | Sub County TB and Leprosy Coordinator |
| TAB | Treatment Adherence Behaviour |
| TB | Tuberculosis |
| TIBU | National TB Electronic Surveillance System |
| WHO | World Health Organisation |

## EXECUTIVE SUMMARY

Tuberculosis (TB) is a disease of major public health importance in Kenya. Despite the considerable investment done by the government and partners in TB care and prevention in the past 20 years, the disease is still the 4th leading cause of death, with Kenya listed by the World Health Organisation (WHO) among the 30 high burden states.

Therefore, finding all people with TB disease and successfully treating them is an important priority for the country. Treatment adherence is a key factor for treatment success and inadequate adherence is associated with various adverse outcomes like the development of Multi-Drug Resistant TB (MDR-TB), relapse, continued transmission of the disease and even death.

The aim of this cross-sectional survey was to assess the level of adherence to TB treatment and determine associated factors. It was conducted through interview with 1,487 drug susceptible TB patients on treatment for at least one month across 156 public and private health facilities in 15 counties of Kenya.

The study established that the proportion of the patients found to be non-adherent was 35%. The results from this study suggest a range of (risk) factors associated with non-adherence to TB medication. These risks include: older age, male gender, presence of extra-pulmonary TB (EPTB), being HIV negative, intensive phase of treatment, having a treatment supporter, limited availability of food, experiencing medication-related side effects and increased cost of transport to health facility. The identification of these non-adherence risk factors indicate that specific strategies should be developed to address them.

The study recommends the National Tuberculosis, Leprosy and Lung Disease Program (NTLD-Program) should actively focus on supporting TB patient treatment adherence through health communication and awareness while leveraging the use social media platforms to help increase the reach of its public messages, paying special attention to key affected populations like men. In addition, the NTLD-Program and stakeholders should consider introducing digital health interventions like Short Messaging Services (SMS) reminders and medication monitors to help support patient adherence while strengthening TB/nutrition programs collaboration to help identify TB patients with food shortages and develop mechanisms for their support.

## CHAPTER ONE: INTRODUCTION

Kenya continues to experience a large burden of Tuberculosis (TB). In 2016, the country was placed by the World Health Organisation (WHO) in all the three lists of countries with either a high absolute or per capita burden of TB, TB/HIV and Multi Drug Resistant Tuberculosis (MDR-TB). TB is ranked the 4$^{th}$ leading cause of death in Kenya accounting for 6.3% of all deaths (KNBS 2014).

In the last decade, Kenya appeared to be on track to achieve recommended TB care and prevention targets with a high estimated TB treatment coverage and a high treatment success rate. However, the results of the recently completed national TB prevalence survey show that the proportion of incident TB cases that are not notified to the National Tuberculosis, Leprosy and Lung Disease Program (NTLD-Program) is unacceptably high, in the region of about 55%. This implies that Kenya may be very much off track to achieve the target to end TB as a public health threat by 2030.

In view of this, the NTLD-Program has made the timely identification of TB as well as the effective treatment of the disease important priorities. It is known that the effectiveness of the treatment depends on a combination of the use of adequate drugs, and correct doses for sufficient time. Like several other countries, Kenya uses a standardized six-month treatment regime for TB. Treatment non-adherence persists as a major challenge to the effectiveness of tuberculosis treatment (Ong'ang'o et al, 2014). As a key strategy for treatment success, the NTLD-Program uses directly observed treatment (DOT), an element of the Directed Observed Therapy Strategy (DOTS) to strengthen patient adherence to treatment (Marciel et al, 2018).

While there are many ongoing interventions to improve TB case finding in Kenya, less focus is placed on improving the treatment success rate. This is despite the fact that adverse patient outcomes of loss-to follow up, treatment failure and deaths continue to constitute major challenges of TB care and prevention in the country (WHO Global Report 2017).

Non-adherence to TB treatment adversely affects its control, maintaining transmission of the disease, and favouring the occurrence of multidrug-resistant tuberculosis, treatment failure and deaths. Therefore, adoption of specific and effective measures against determinants of noncompliance with treatment is important for TB care and prevention (Raviglione, 2009, Kulkami et al., 2013, Tesfahuneygn et al., 2015).

Adherence to TB treatment has been defined variably. According to one definition, adherence is 'the extent to which patient history of therapeutic drug intake coincides with prescribed treatment,' (Kulkami et. al., 2013). There are also other definitions referred to as either primary or secondary adherence (Medonca et. al., 2016). According to Medonca, primary non-adherence

is when patients do not even fill a new prescription i.e. do not go for drugs from a health facility in the first place, while secondary non-adherence is when prescriptions are filled but the medication is not taken as prescribed. A more general definition of adherence is described as regular medication intake and attending all follow up medical appointments as per the provided guidelines (Medonca et. al., 2016). In line with this definition, missing even one dosage or one follow up visit can be defined as non-adherence. Lack of consistent definition of what adherence to treatment is makes it difficult to compare results of studies conducted to assess levels, impact, and factors associated with non-adherence to treatment.

Despite this lack of a universal definition of adherence, several studies have demonstrated the importance of understanding levels of adherence to treatment in a population. Adherence plays a key role in the fight against TB. Treatment adherence is a reflection of the active role played by TB patients in self-management of treatment and the extent of patient-provider interaction. Non-adherence to treatment has been shown to affect the patient, a program and the community at large. At individual level, poor adherence to treatment may lead to poor treatment outcomes including death, treatment failure, and even emergence of drug resistant strains (Kulkami et al., 2013, Tesfahuneygn et al., 2015). At community level, non-adherence affects treatment outcomes and may influence the spread of the disease, leading to new infections in the community (Kulkarni et al., 2013).

Levels of adherence to treatment differ across populations and settings. In one study conducted in China, it was reported that 12% of patients missed one dose within a period of two weeks, another 21% missed two doses within a period of two weeks and overall, 33% of patients were non-adherent (Tang et al., 2016). In another study conducted in Ethiopia, overall non-adherence was 12% (Tesfahuneygn et al., 2015). In Nigeria, 19% of patients assessed in a study interrupted treatment within the course of treatment (Ibrahim et al., 2011), while in Peru, non-adherence level has been shown to be about 10% (Lackey et al., 2015). One study in India has shown adherence levels to be about 23% (Satti et. al., 2016). Levels of adherence have also been shown to differ with type of patients with those diagnosed with latent TB infection and put on INH having lower adherence. In a study in US and Canada, adherence for patients on INH was only 63%.

Factors associated with non-adherence to TB treatment have been categorised as either individual or health care system related. Individual factors can either be social economic or behavioural (Tola et. al., 2015). The factors associated with non-adherence differ from one region to another. In Ethiopia, non-adherence has been attributed to forgetfulness, being away from home, side effects of anti TB drugs, being hospitalized, and not being able to go to the hospital (Tesfahuneygn et al., 2015). The same study argued that good communication can reduce instances of non-adherence (Tesfahuneygn et al., 2015). Stigma has been shown to be a big hindrance to adherence to TB treatment in India, (Khan et al., 2015). In a study conducted in

India, non-adherence was associated with being observed by a family member and paying a service fee (Lei et al., 2016). The study showed that patients supervised through home visits and phone calls were more likely to be adherent. In another study, factors found to be significant predictors of non-adherence were lack of knowledge on TB transmission and treatment, and long travel from home to a nearby community health facility (Tang et al., 2015).

Homelessness has also been associated with non-adherence to treatment. In a study conducted in Canada, the researchers found that homeless people with latent TB and put on a nine-month INH regimen were eight times more likely not to finish treatment compared to non-homeless patients (Malejczyk et al., 2014). This was attributed to their elevated likelihood of being immunosuppressed, being drug users or using excessive alcohol. Deshmukh et.al. have reported that the leading causes of non-adherence among multi-drug resistant TB patients are: side effects, lack of provider support, financial constraints, conflict within timing of treatment services, social stigma and alcoholism (Deshmukh et al. 2015).

Psychological distress is also related to non-adherence (Theron et al., 2015). It has also been shown that lack of knowledge during treatment, smoking, distance from health facility, patients feeling well after a few months of treatment, and lack of fare to travel to health facility, are factors associated with non-adherence (Ibrahim et al., 2011). In a study conducted in Peru, factors associated with non-adherence were illegal drug use, being not tested for HIV, alcohol use, underweight, and having not completed secondary education (Lackey et al., 2015). Unskilled occupation, lower economic class, small family size, smoking, and not satisfied with services at health facility are also factors associated with non-adherence (Satti et. al., 2016).

**Study Justification**

Despite the immense benefits associated with patient adherence to TB treatment, Kenya had not conducted a national study to determine levels of adherence to treatment and the associated factors. Previous studies on this subject have been localised and utilised varying methodologies limiting the ability to generalise findings. In one such study, adherent patients were defined as those who had such treatment outcomes as cured, treatment complete, died, and treatment failure, while those who were lost to follow up and transferred out were regarded as non-adherent (Ong'ang'o et. al., 2014). Other studies have used other definitions of adherence such as number of pills taken against the recommended number.

Achieving targets set in the national strategic plan of increasing the treatment success rate to over 90% and reducing mortality among TB patients to less than 5% requires TB care and prevention interventions in Kenya to address all factors associated with adverse treatment outcomes. However, the lack of national data on TB treatment adherence and associated factors

has denied (the NTLD-Program) important information to help guide the development of relevant policies. This study is therefore aimed at providing this key information.

**Study Objectives**

The main objectives of the study were:

1. To assess level of adherence to TB treatment among adult TB patients in Kenya.
2. To assess factors associated with non-adherence to TB treatment among adult TB patients in Kenya.

## CHAPTER TWO: METHODS

### Study Design and Population

This was a cross sectional clustered survey. The study population was all TB patients on Category 1 treatment aged 18 years and above. Both patients on intensive and continuation treatment phases were included in the study. For patients on intensive phase, only patients who had been on treatment for more than one month were included.

### Study Setting

The study was conducted at the homes of patients receiving treatment at 156 public and private health facilities across 15 counties of Kenya (See Appendix Two).

TB treatment in Kenya consists of a standardized regime of two initial months of Rifampicin Isoniazid, Pyrazinamide and Ethambutol (RHZE) and continuation phase of four months of Rifampicin and Isoniazid (RH). Patients visit the health facility weekly, and fortnightly in the intensive and continuation phases respectively, for monitoring and drug refills. Patient counselling and DOT supporter is available for all patients, while those with severe malnutrition (Baseline BMI <18.5) receive additional nutritional support. Table 1 below provides a summary of Kenya's TB profile in 2016.

**Table 1: Kenya Tuberculosis Profile 2016**

| | |
|---|---|
| Incidence | 169,000 cases (103,000-250,000); Rate per 100,000 348 (213-515) |
| Mortality | 29,000 deaths (range, 16,000–45,000); Rate per 100,000 - 60 (33-93) |
| Population | 46 million |
| Total TB cases new and relapse notified | 75,097 |
| Total MDR/RR TB cases notified | 326 |
| Estimated MDR/RR TB among notified pulmonary TB cases | 1,300 (910-1700) |
| Treatment success rate (New and relapse TB cases) | 87% |
| Treatment success rate MDR/RR TB | 72% |
| TB treatment sites | 4,225 |
| TB microscopy sites | 2,124 |

| | |
|---|---|
| Health facilities with GeneXpert | 146 |
| HIV prevalence in the 15-49 years population (%/N) | 5.9%/1.5 million |
| TB patients with known HIV-status who are HIV-positive | 26,288 (33%) |

**Sample Size Determination**

Due to financial constraints, a 30% randomly selected sample of counties was obtained. This sample was regarded adequate to represent the country going by previous national studies including the mid-term review of TB program strategic plan in 2014 (MoH, 2014c). Nairobi County was divided into two, South and North giving a total of 48 counties. Out of these, a representative sample of 15 counties (30%) was be obtained. The sample size of patients to was included in the study from each of these 15 counties was determined using the following fisher's formula used for cross sectional studies.

$$N = z\alpha^2 * [p * q]/_{d\text{^}2}$$

Where N is the required sample size, zα is the level of significance, p is the adherence level and d is the precision of the estimate of the adherence in relative terms. Using a 95% significance level, a conservative figure of 80% adherence level obtained as an average from previous studies and 10% precision of the estimate, the calculated sample size was

$$N = 1.96^2 * [80 * 20]/_{8\text{^}2}$$

This gave a total of 96 TB cases to be interviewed in each of the sampled counties. Allowing for 10% non-response rate, a total of 106 patients were sampled from each of the 15 sampled counties giving a total of 1,580 national sample size.

**Sampling Procedure**

The sample of 15 counties was obtained by first dividing the counties into three clusters as per the classification in the 2015-2018 national strategic plan: 16 counties with case notification rate (CNR) of <175 cases/100,000 population, 22 counties with CNR of 175-250 cases/100000 population and 9 counties with CNR of >250 cases/100,000 population. The final sample was proportional to total number of counties per cluster. In the low burden cluster, a total of (16/48*15) =5 counties were obtained randomly from the list of 16. Using similar calculation, the total number of mid CNR counties that contributed to the total sample was seven and high CNR counties contributed three counties to the total sample.

From each of the sampled counties, the county referral hospitals were purposefully sampled, and a sub county hospital was sampled from among the sub county hospitals in the county. The two hospitals shared the total sample of 106 patients proportionately based on the total number of adult TB patients starting treatment in the most recent quarter prior to data collection.

Sampling frame for both the sub county hospitals and patients were obtained from TIBU. Sampling of counties, hospitals and patients was done at the national office from the national database prior to field visit. If a sampled hospital or county could not be visited for one reason or the other, the lead investigator replaced the county or the hospital through the process of random sampling.

**Data Collection**

Interviews were conducted using a structured questionnaire that collected socio-demographic information about the patient and established the number of times they had missed taking drugs in the last one month and last four days prior to the interview. There was also a visual analogue scale to help patients visually estimate their adherence.

A team of two field study assistants (consisting of a health care worker and a social worker) were recruited for each of the facilities sampled and they received a one-day standardized training conducted by NTLD-Program staff. The assistants were then given the list of sampled patients together with the necessary information to help them locate the patients. The team made a phone call prior to visiting the patient (one day notice) and then made home visits and collected the necessary information. The data collection exercise was done within a period of four (4) weeks during the month of July 2016.

**Ethical Consideration**

Ethical approval was sought from the Amref Health Africa ethical review committee. Authority to collect data from the counties was also sought from County Directors of Health. Patients were required to give their informed oral consent prior to the start of the interviews. The final data set obtained did not contain any information that can be used to identify respondents such as names. Research assistants were properly trained on issues of confidentiality and high levels of data security were maintained.

**Data Processing and Analysis**

Each team of Research Assistants was provided with a tablet to collect data using the Kobo Collect toolkit. Once they entered data directly into the tablet, it was synchronized with the national database. No data was collected using physical copies. A dedicated Data Manager sat at the

national office to review the data as it was synchronised and alert the Lead Investigator in case of any gaps in the data already collected. The research team was supervised continuously by the Lead Investigator throughout the data collection period. Spot check visits were done to validate the collected data on a regular basis.

The data was analysed using Stata® Version 13 (StataCorp. 2013). Descriptive analysis was done to understand the socio-demographic, economic and clinical characteristics of the respondents. Both univariate and multivariate logistic regression analysis were done to assess factors associated with adherence.

## CHAPTER THREE: RESULTS

### Participant Characteristics

A total of 1,487 patients were interviewed, comprising 64% males. Their demographic and clinical characteristics are presented in Table 2. The median age of the participants was 34 years (range: 18-96), 54% were married at the time of the study, 68% had basic or no formal education and 65% lived within a five-kilometre radius of the facility.

Four hundred and thirty-two participants (29%) were HIV positive, 89% were new to TB treatment, 82% had pulmonary TB and 65% were on the continuation phase of treatment.

### Levels of Adherence and Factors Associated with Non-Adherence

Adherence was initially divided into three levels: not adherent, satisfactory level of adherence and complete adherence using the following cut off points:

1. Complete adherence was considered when no pill had ever been missed or when a patient scored more than 100% on the visual analogue scale.
2. Satisfactory adherence was considered in any patient who:
    i. reported to have missed pills for one day in the four days prior to the interview and/or
    ii. once every week or once every month for the four months prior to the interview and/or
    iii. scored 80-99% on the visual analogue scale
3. Non-adherence was considered in any patient who:
    i. missed taking pills for more than two days in the four days prior to the interview and/or
    ii. missed taking pills more than once every week or daily in the four months prior to the interview and/or
    iii. scored less than 80% on the visual analogue scale

For the purpose of reporting results, all respondents who reported complete and satisfactory adherence were further classified as being adherent. This yielded an overall, 527 (35%) respondents who were non-adherent. The demographic and clinical characteristics of the respondents who were non-adherence are presented in Tables 2, 3 and 4.

The team developed one main theme and four sub-themes for the content analysis. The main theme was factors contributing to non-adherence to tuberculosis treatment and the four (4) subthemes were client related factors, health service related, medication related and social factors.

*Client related factors to non-adherence*

There was no statistically significant difference in adherence rate based on gender, age-group, level of education and marital status. The highest level of non-adherence was reported among the respondents who were unemployed with the lowest among those in formal employment.

*Social influence factors to non-adherence*

There was no significant association between substance or alcohol use and non- adherence to TB treatment. There was a higher non-adherence rate among patients who reported to have treatment supporters than those who did not have. (38% vs 31 vs: p<0.005%). While patients who reported any form of limited availability of food (food availability some of the time or never available) had a significantly higher rate of non-adherence. (41%: p<0.041).

*Health system factors to non-adherence*

Increased cost of transport to the service delivery points was significantly associated with higher rates of non-adherence. However, the distance to the health facility did not show any significant association with non-adherence to TB treatment. Respondents who reported to have waited for more than 30 minutes to be served when collecting TB medicines at the health facility were significantly non-adherence (49%; p<0.005). Despite a higher rate non-adherence among patients who encountered non-friendly health care workers, negative staff attitude was not significantly associated with non-adherence.

*Medication related factors to non-adherence*

There was a significant association between occurrence of side effects associated with anti-medicines non-adherence (39% vs 31% p<0.005).

*Clinical factors related to non-adherence*

Patients with extra-pulmonary Tuberculosis (EPTB) reported higher levels of non-adherence to TB treatment compared to those of with pulmonary TB (45% vs 33%: p <0.005). The intensive phase of TB treatment registered significantly a higher rate of non-adherence to treatment than to those on continuation phase (50% vs. 27%: p<0.005). Among those with known HIV status, those with a HIV negative status reported a higher level of non-adherence to TB treatment than those who were HIV positive (37% vs.31%: p<0.005%). There was no significant difference in adherence to TB treatment among new vs previously treated patients.

**Table 2: Socio-demographic characteristics of the respondents**

| Treatment and Health characteristics | Total | Non-Adherent | | Adherent | |
|---|---|---|---|---|---|
| | N=1487 | n=527 | (%) | n=960 | (%) |
| **Sex** | | | | | |
| Male | 956 | 339 | 35% | 617 | 65% |
| Female | 531 | 188 | 35% | 343 | 65% |
| | | | | | |
| **Religion** | | | | | |
| Christian | 1,227 | 392 | 32% | 835 | 68% |
| Muslim | 234 | 121 | 52% | 113 | 48% |
| Others | 26 | 14 | 54% | 12 | 46% |
| | | | | | |
| **Age Group** | | | | | |
| 18 – 24 | 249 | 76 | 31% | 173 | 69% |
| 25 – 34 | 496 | 190 | 38% | 306 | 62% |
| 35 – 44 | 401 | 139 | 35% | 262 | 65% |
| 45 – 54 | 170 | 50 | 29% | 120 | 71% |
| 55 – 64 | 103 | 42 | 41% | 61 | 59% |
| 65+ | 68 | 30 | 44% | 38 | 56% |
| | | | | | |
| **Education** | | | | | |
| None | 553 | 214 | 39% | 339 | 61% |
| Primary | 468 | 147 | 31% | 321 | 69% |
| Secondary | 300 | 100 | 33% | 200 | 67% |
| Tertiary | 166 | 66 | 40% | 100 | 60% |
| | | | | | |
| **Marital Status** | | | | | |
| Never Married | 377 | 142 | 38% | 235 | 62% |
| Currently Married | 807 | 281 | 35% | 526 | 65% |
| Separated | 208 | 63 | 30% | 145 | 70% |
| Widowed | 95 | 41 | 43% | 54 | 57% |
| | | | | | |
| **Employment** | | | | | |
| Formal Employment | 325 | 95 | 29% | 230 | 71% |
| Self Employed | 648 | 203 | 31% | 445 | 69% |
| Handouts | 194 | 80 | 41% | 114 | 59% |
| Unemployed | 257 | 125 | 49% | 132 | 51% |
| Student | 63 | 24 | 38% | 39 | 62% |

**Table 3: Clinical characteristics of the respondents**

| Treatment and Health Characteristics | Total | Non-Adherent | | Adherent | |
|---|---|---|---|---|---|
| | n=1487 | n=527(percent) | | n=960(percent) | |
| **Substance Use** | | | | | |
| Yes | 186 | 47 | 25% | 139 | 75% |
| No | 1,292 | 475 | 37% | 817 | 63% |
| Decline | 9 | 5 | 56% | 4 | 44% |
| | | | | | |
| **Patient Phase** | | | | | |
| Intensive Phase | 523 | 262 | 50% | 261 | |
| Continuation Phase | 964 | 265 | 27% | 699 | |
| | | | | | |
| **Side Effects** | | | | | |
| No | 779 | 243 | 31% | 536 | 69% |
| Yes | 695 | 271 | 39% | 424 | 61% |
| **Alcohol Use** | | | | | |
| No | 1,377 | 485 | 35% | 892 | 65% |
| Yes | 110 | 42 | 38% | 68 | 62% |
| | | | | | |
| **HIV Status** | | | | | |
| Negative | 1,045 | 388 | 37% | 657 | 63% |
| Positive | 432 | 136 | 31% | 296 | 69% |
| | | | | | |
| **Type of TB** | | | | | |
| PTB | 1212 | 404 | 33% | 808 | 67% |
| EPTB | 275 | 123 | 45% | 152 | 55% |
| | | | | | |
| **Type of Patient** | | | | | |
| New | 1324 | 470 | 35% | 854 | 65% |
| Previously treated | 162 | 57 | 35% | 105 | 65% |
| Treatment History Unknown | 1 | 0 | 0% | 1 | 100% |

**Table 4: Social-economic characteristics of the respondents**

| Treatment and Health Characteristics | Total | Non-Adherent | | Adherent | |
|---|---|---|---|---|---|
| | n=1487 | n=527(percent) | | n=960(percent) | |
| **Treatment Supporter** | | | | | |
| Household member | 839 | 317 | 38% | 522 | 62% |
| Non HH members | 158 | 60 | 38% | 98 | 62% |
| No supporter | 490 | 150 | 31% | 340 | 69% |
| | | | | | |
| **Cost of Transport** | | | | | |
| No cost | 544 | 193 | 35% | 351 | 65% |
| 20_to_50_shillings | 516 | 139 | 27% | 377 | 73% |
| 60_to_100_shillings | 211 | 88 | 42% | 123 | 58% |
| over_100_shpillings | 216 | 107 | 50% | 109 | 50% |
| | | | | | |
| **Distance to Facility** | | | | | |
| >5Kms | 524 | 199 | 38% | 325 | 62% |
| <<5 Kms | 963 | 328 | 34% | 635 | 66% |
| | | | | | |
| **Waiting Time** | | | | | |
| >30 minutes | 178 | 87 | 49% | 91 | 51% |
| <30 minutes | 1,309 | 440 | 34% | 869 | 66% |
| | | | | | |
| **Food Availability** | | | | | |
| Always available to take with medicines | 941 | 344 | 37% | 597 | 63% |
| Available most of the time | 400 | 123 | 31% | 277 | 69% |
| Available some of the time | 146 | 60 | 41% | 86 | 59% |

**Table 5: Respondents knowledge of TB symptoms and attitude of health care workers**

| Treatment and Health Characteristics | Total | Non-Adherent | | Adherent | |
|---|---|---|---|---|---|
| | n=1487 | n=527(percent) | | n=960(percent) | |
| **Staff Attitude** | | | | | |
| Friendly | 1,470 | 520 | 35% | 950 | 65% |
| Not friendly | 17 | 7 | 41% | 10 | 59% |
| | | | | | |
| **Knowledge of TB Symptoms** | | | | | |
| Know at least one | 1,331 | 475 | 36% | 856 | 64% |
| Don't know | 156 | 52 | 33% | 104 | 67% |

The multivariate analysis revealed that there was a statistically increased risk of non-adherence in the groups 25-34, 35-44 and 55-64 years compared to age group 18-14 years ($p<0.05$). Even though gender differences were not statistically significant at bivariate level, after adjusting for confounding variables, males were 25% less likely to be adherence to TB treatment than their female counterparts (OR 0.758, 95% C.I 0.578-0.993). Socio-demographic factors of marital, education and employment status did not influence the levels of adherence to the TB treatment.

Patients who reported to have no DOT support were 1.4 times more adherent than those who had a household member as their supporter ($p<0.05$). There was a significant and progressive decrease the level of adherence as the cost transport to the health facility increased. Respondents who paid more than 1 USD were 60% less likely to adhere to TB treatment than those who paid less than 0.5 USD. (OR 0.0 95% CI 0.28-). However, waiting time to be served at the health facility and staff attitude to the respondents did not determine their level of adherence.

HIV negative respondents were less adherence to TB treatment than their HIV positive counterparts (OR 0.749, 95% C.I 0.565- 0.99). Respondents with EPTB were less adherence to treatment than those with PTB. (OR 0.69 95% CI 0.50-0.93). Patients in the continuation phase were 2.5 times more adherence compared to those in the intensive phase. (C1 1.93-3.19). Patient type (new or previously treated), knowledge of TB symptoms not influence adherence. Patients who reported side effects from anti-TBs medication had lower levels of adherence (OR 0.717(95% c1 0.56-0.91)

**Table 6: Univariate and multivariate analyses of socio-demographic factors associated with adherence to TB medication**

| Characteristics | Category | Univariate Analysis | | | Multivariate Analysis | | |
|---|---|---|---|---|---|---|---|
| | | OR | [95% CI | p-value | OR | [95% CI | p-value |
| Age | | 0.997 | (0.989,1.005) | 0.405 | | | |
| | | | | | | | |
| Age Group | 18 – 24 | (ref) | | | | | |
| | 25 – 34 | 0.522 | (0.511,0.979) | 0.037 | 0.522 | (0.348,0.781) | 0.002 |
| | 35 – 44 | 0.625 | (0.590,1.162) | 0.276 | 0.625 | (0.397,0.982) | 0.041 |
| | 45 – 54 | 0.967 | (0.689,1.615) | 0.808 | 0.967 | (0.559,1.673) | 0.904 |
| | 55 – 64 | 0.533 | (0.396,1.028) | 0.065 | 0.533 | (0.291,0.977) | 0.042 |
| | 65+ | 0.628 | (0.321,0.964) | 0.037 | 0.628 | (0.315,1.25) | 0.185 |
| | | | | | | | |
| Sex | Female | (ref) | | | | | |
| | Male | 0.998 | (0.753,1.245) | 0.983 | 0.753 | (0.574,0.990) | 0.042 |
| | | | | | | | |

| Characteristics | Category | Univariate Analysis | | | Multivariate Analysis | | |
|---|---|---|---|---|---|---|---|
| | | OR | [95% CI | p-value | OR | [95% CI | p-value |
| Religion | Others | (ref) | | | | | |
| | Christian | 2.485 | (1.139,5.423) | 0.022 | 2.602 | (1.044,6.481) | 0.04 |
| | Muslim | 1.090 | (0.483,2.455) | 0.836 | 1.374 | (0.527,3.583) | 0.515 |
| | | | | | | | |
| Marital Status | Currently married | (ref) | | | | | |
| | Never married | 0.799 | (0.878,1.458) | 0.341 | 0.799 | (0.564,1.132) | 0.206 |
| | Separated | 1.075 | (0.969,1.997) | 0.074 | 1.075 | (0.738,1.564) | 0.708 |
| | Widowed | 0.778 | (0.504,1.256) | 0.327 | 0.778 | (0.461,1.313) | 0.347 |
| | | | | | | | |
| Education | None | (ref) | | | | | |
| | Primary | 1.378 | (1.063,1.787) | 0.015 | 1.333 | (0.983,1.808) | 0.065 |
| | Secondary | 1.263 | (0.940,1.695) | 0.121 | 1.062 | (0.741,1.522) | 0.745 |
| | Tertiary | 0.956 | (0.671,1.364) | 0.806 | 0.927 | (0.600,1.430) | 0.73 |
| | | | | | | | |
| Employment | Formal employment | (ref) | | | | | |
| | Self-employed | 0.436 | (0.310,0.614) | 0.000 | 0.723 | (0.518,1.009) | 0.057 |
| | Handouts (Casual) | 0.589 | (0.405,0.854) | 0.005 | 0.669 | (0.431,1.040) | 0.074 |
| | Others | 0.905 | (0.677,1.211) | 0.504 | 0.447 | (0.303,0.661) | 0 |

**Table 7: Univariate and multivariate analyses of clinical factors associated with to TB medication**

| Characteristics | Category | Univariate Analysis | | | Multivariate Analysis | | |
|---|---|---|---|---|---|---|---|
| | | OR | [95% CI | p-value | OR | [95% CI | p-value |
| HIV Status | Positive | (ref) | | | | | |
| | Negative | 0.753 | (0.613,0.998) | 0.039 | 0.753 | (0.568,0.997) | 0.048 |
| | | | | | | | |
| Substance Use | Yes | (ref) | | | | | |
| | No | 0.582 | (0.410,0.825) | 0.002 | 0.450 | (0.294,0.687) | 0 |
| | | | | | | | |
| Side Effects | No | (ref) | | | | | |
| | Yes | 0.709 | (0.572,0.879) | 0.002 | 0.729 | (0.572,0.929) | 0.01 |
| | | | | | | | |
| Patient Phase | Intensive phase | (ref) | | | | | |
| | Continuation phase | 2.648 | (2.120,3.307) | 0.000 | 2.555 | (1.984,3.289) | 0 |
| | | | | | | | |
| Alcohol Use | Yes | (ref) | | | | | |
| | No | 0.880 | (0.590,1.314) | 0.532 | 1.529 | (0.950,2.461) | 0.081 |
| | | | | | | | |
| Patient Type | New | (ref) | | | | | |
| | Previously treated | 0.986 | (0.701,1.388) | 0.937 | 0.932 | (0.634,1.371) | 0.722 |
| | Treatment history unknown | Omitted | | | | | |
| | | | | | | | |
| Type of TB | EPTB | (ref) | | | | | |
| | PTB | 0.618 | (0.474,0.806) | 0.000 | 0.710 | (0.028,0.523) | 0.963 |

**Table 8: Univariate and multivariate analyses of socio-economic factors associated with non-adherence to TB medication**

| Characteristics | Category | Univariate Analysis | | | Multivariate Analysis | | |
|---|---|---|---|---|---|---|---|
| | | OR | [95% CI | p-value | OR | [95% CI | p-value |
| Food Availability | Always available to take with medicines | (ref) | | | | | |
| | Available most of the time | 1.571 | (1.061,2.326) | 0.024 | 1.470 | (1.107,1.953) | 0.008 |
| | Available some of the time | 1.211 | (0.849,1.727) | 0.291 | 0.894 | (0.595,1.344) | 0.591 |
| | | | | | | | |
| Cost of Transport | 20 to 50 shillings | (ref) | | | | | |
| | 60 to 100 shillings | 0.515 | (0.368,0.721) | 0.000 | 0.594 | (0.410,0.861) | 0.006 |
| | None walking distance | 0.671 | (0.516,0.871) | 0.003 | 0.642 | (0.478,0.861) | 0.003 |
| | Over 100 shillings | 0.376 | (0.270,0.522) | 0.000 | 0.408 | (0.280,0.593) | 0 |
| | | | | | | | |
| Waiting Time | More than 30 minutes | (ref) | | | | | |
| | Less than 30 minutes | 1.888 | (1.377,2.589) | 0.000 | 1.357 | (0.941,1.957) | 0.103 |
| | | | | | | | |
| Distance to Facility | More than 5 kilometres | (ref) | | | | | |
| | Less than 5 kilometres | 1.185 | (0.950,1.479) | 0.132 | | | |
| | | | | | | | |
| Patient Supporter | Household member | (ref) | | | | | |
| | Non-household member | 0.992 | (0.699,1.408) | 0.964 | 1.104 | (0.740,1.646) | 0.629 |
| | No supporter | 1.377 | | 0.008 | 1.386 | (1.053,1.825) | 0.02 |
| | | | | | | | |

**Table 9: Univariate and multivariate analyses of knowledge and attitude factors associated with non-adherence to TB medication**

| Characteristics | Category | Univariate Analysis | | | Multivariate Analysis | | |
|---|---|---|---|---|---|---|---|
| | | OR | [95% CI | p-value | OR | [95% CI | p-value |
| Knowledge on TB Symptoms | Know | (ref) | | | | | |
| | Don't know | 1.110 | (1.611,2.016) | 0.000 | 1.245 | (0.839,1.846) | 0.277 |
| | | | | | | | |
| Attitude | Not friendly | (ref) | | | | | |
| | Friendly | 1.279 | (0.484,3.380) | 0.620 | 1.348 | (0.452,4.026) | 0.592 |
| | | | | | | | |
| Cons | | | | | 1.662 | (0.334,8.280) | 0.535 |

## CHAPTER FOUR: DISCUSSION

Improving TB treatment success is an important goal of TB care and prevention in Kenya.

Treatment adherence is a key factor for treatment success and inadequate adherence is associated with various adverse outcomes like the development of *M. tuberculosis* strains resistant to the medication, relapse, continued transmission of the disease and even death. For this reason, the World Health Organization (WHO) recommends that patients diagnosed with TB take medication daily at recommended dosages for at least six months (Ong'ang'o et al, 2014, WHO, 2017).

This study conducted in 15 counties across Kenya aimed to assess level of adherence to TB treatment and determine the associated factors among patients on first line TB treatment. The proportion of the patients found to be non-adherent was 35%. Older age, male gender, presence of extra-pulmonary TB (EPTB), being HIV negative, intensive phase of treatment, having a treatment supporter, limited availability of food, experiencing medication-related side effects and increased cost of transport to health facility were associated with non-adherence. The identification of these risk factors of non-compliance with anti-TB treatment, indicates that strategies should be formulated towards them.

The higher rate of non-adherence to anti-TB medication in this study compared to other studies in the sub-Saharan Africa region could be because it applied a more stringent definition to adherence. Studies in Zambia, Nigeria and Ethiopia have reported non-adherence rates of between 11%-30% (Kaona et al, 2004; Ibrahim et al., 2013; Tesfahuneygn et al., 2015) all used varying operational definitions for adherence.

The results from the current study suggest a range of risk factors associated with non-adherence to TB medication. The client-related factor found to be associated with non-adherence in our study and which have also been reported in other studies include older age and the male gender (Shargie et al., 2007; Munro et al., 2007; Johansson et al., 1999; Ifebunandu et al, 2012; Alobu., 2014; Kulkarni et al., 2013). However, a study in Zambia reported age as not affecting adherence (Kaona et al, 2004). Other client-related factors like a higher level of education, marital and employment status were not found to independently contribute to non-adherence, just like in other studies (Kaona et al, 2004; Ibrahim et al, 2013). Similar to other studies, (Alobu et al., 2014; Ifebunandu et al, 2012; Ibrahim et al., 2013), clinical factors reported to contribute to non-adherence in our study include having EPTB, being HIV negative and being in the intensive phase of treatment. An interesting finding in this study was that alcohol/substance use and the previous history of TB were not associated with non-adherence.

In addition to the variation in adherence by gender found in this study, the country TB surveillance data also reports a higher risk of treatment default among men. This relationship has frequently been attributed to their poor health-seeking behaviour. Males are also more likely to be employed outside the home, with non-routine schedules and prone to alcohol consumption, all likely to negatively affect clinic attendance and medication adherence. These findings suggest the need for gender-inclined patient-centred support towards TB medication adherence. The current gender specific TB initiatives to find missing TB cases among men in Kenya (that include health communication, outreaches at events frequented by men like sports tournaments and workplace programs) provide a good avenue to incorporate the adherence communication component.

While it is not clear why older TB patients were more likely to be non-adherent, we hypothesize that forgetfulness in this cohort could bear the association, suggesting that elderly TB patients may require planning for additional patient-centred DOT assistance to facilitate full compliance with medication.

Several studies have found illiteracy rate relatable to treatment non-adherence highlighting that the level of schooling may affect the level of knowledge and the ability to seek a good level of health, (Mitchel et al, 2017, Ginsburg et al, 1975, WHO, 2015, Lewis, 2016). However, the data from the current study does not corroborate this. This paradoxical finding that a higher level of education is not associated with better adherence could partially be explained by the fact that health education, rather than level of education per se, may be the factor that drives improved adherence (Kaona et al, 2004; Munro et al., 2007).

EPTB is frequently a severe disease, which is unfortunately accorded less attention by the health system due to its perceived less infectious nature. This could explain the higher risk of non-adherence in patients with this form of TB. We also hypothesize that the infrequent interaction of HIV-negative TB patients with the health system compared to those that are co-infected and may have contributed to the observed higher level of non-adherence among the HIV-negative TB patients. Frequent interactions with HIV care leads to more health education, continuous counselling, early identification of challenges and the provision of necessary support. While it may be challenging to design health education and adherence messages around these patients (HIV-negative TB patients), overall strengthening of public health communication including use of social media platforms would likely be beneficial.

Patients who reported to have no directly observed treatment (DOT) support were 1.4 times more adherent than those who had a household member as their supporter. This finding feeds into the increasing view that the current DOT approach should gradually cede to a more patient-centred approach with emphasis on patient counselling and structural aid in adherence

promotion. In strengthening this strategy, we have to find answers to the questions as to whether DOT, though a well-meaning public health intervention, reinforces negative stereotyping of people with TB as being at risk of non-adherence and loss-to-follow up, and as to whether the requirement of a DOT supporter further drivers TB patients into isolation by actually impeding individual autonomy to make decisions about their treatment (Frick et, al 2016, Maciel et al, 2018).

Even though the 'well-being' feeling occurring later in the course of treatment has been reported to be associated with non-adherence (Kaona et al, 2004; Jaiswal et al, 2003; Munro et al., 2007; Ibrahim et al., 2013; Tola et al., 2014), in this study, patients in the intensive phase of treatment reported more non-adherence. This may be explained by the higher frequency of side effects associated with this early phase of treatment. The relationship of medication side-effects and non-adherence is well documented in several studies (Kaona et al, 2004; Gebremariam et al, 2010; Jaiswal et al, 2003; Boru et al., 2016; Deshmukh et al., 2015; Satti et al, 2015; Tesfahuneygn et al., 2015).

Several studies have reported that alcohol and substance intake are generally associated with non-adherence (Jaiswal et al, 2003; Munro et al., 2007; Tola et al., 2014; Lackey et al., 2014; Deshmukh et al., 2015), a fact we could not establish in this study. However, our definition of alcohol use factored consumption of any amount rather than abuse or excess use. Our finding of a lack of association between alcohol and substance use with adherence levels may have been masked by this.

The association between limited availability of food among TB patients and non-adherence underscores the need to integrate TB care with patient support programs. Limited food availability is often due to poverty which in turn is associated with low access to information, unemployment and other unfavourable living conditions (Lonnroth et al, 2009, Silva et al, 2016). Considering that food support to TB patients in Kenya is neither well aligned to the needs of the patients, nor sufficient to reach all the vulnerable patient groups, this data affirms the need to prioritise the provision of food as part of a package of enablers to improve TB treatment adherence while linking poor and vulnerable patients to existing social protection mechanisms. In addition, it underscores that success in tuberculosis control depends on the implementation of steps that reduce social inequity, allowing the diagnosis and effective treatment of the disease (Marciel et al, 2018).

An important strength of this study is that it was implemented in county tuberculosis clinics and captured diverse settings that included urban and rural areas. Consequently, our findings are likely to be generalised to Kenya and similar settings.

**Study Limitation**

Even though the study had a national outlook and therefore easy to generalise across the country, it did not include children who constitute about 10% of the TB cases in the country and may have differing adherence patterns influenced by either their parents/guardians or their early teen years. We were also not satisfactorily able to capture food security and other socio-economic status indicators. These include use of food with medication and income. We were also not able to correlate the distance to health facility and adherence levels. Lastly, just as is the case with many other similar studies, there is no clear and generally acceptable gold standard definition of adherence to anti-TB medications, both nationally and globally, hindering direct comparison of studies.

## CHAPTER FIVE: RECOMMENDATIONS

In light of the findings of this study, the recommendations detailed below are presented for consideration.

The NTLD-Program should actively focus on supporting TB patient treatment adherence through health communication and public awareness as important components of TB care and prevention in Kenya. In addition, the messaging should incorporate age and gender specific communication while leveraging the use of social media platforms that can help increase message reach to include key affected populations like men.

The NTLD-Program and stakeholders should consider introducing electronic and mobile health interventions like Short Messaging Services (SMS) reminders and medication monitors to help support patient adherence.

The DOTs approach should be strengthened by introducing more flexible follow-up clinic appointment and return dates, more integration into primary health care, introducing flexible hours and reasonable allowance for HCW-driven DOTs.

There is need to strengthen the collaboration between TB and nutrition programs to identify TB patients with food shortages and develop mechanisms that ensure improved food support.

## CHAPTER SIX: CONCLUSION

The study found a high level of non-adherence to anti-TB medication in Kenya and recommends strengthening of the current DOT approach through innovative health communication, use of digital health interventions and social support mechanisms to improve adherence.

## REFERENCES

Alobu, I., Oshi, S.N., Oshi, D.C. & Ukwaja, K.N. (2014) Risk factors of treatment default and death among tuberculosis patients in a resource-limited setting. *Asian Pacific Journal of Tropical Medicine*. [Online] 7 (12), 977–984. Available from: doi:10.1016/S1995-7645(14)60172-3.

Gebremariam, M.K., Bjune, G.A. & Frich, J.C. (2010) Barriers and facilitators of adherence to TB treatment in patients on concomitant TB and HIV treatment: a qualitative study. *BMC public health*. [Online] 10 (1), 651. Available from: doi:10.1186/1471-2458-10-651.

Gugssa Boru, C., Shimels, T. & Bilal, A.I. (2017) Factors contributing to non-adherence with treatment among TB patients in Sodo Woreda, Gurage Zone, Southern Ethiopia: A qualitative study. *Journal of Infection and Public Health*. [Online] 10 (5), 527–533. Available from: doi: 10.1016/j.jiph.2016.11.018.

Ifebunandu, N.A. & Ukwaja, K.N. (2012) Tuberculosis treatment default in a large tertiary care hospital in urban Nigeria: Prevalence, trend, timing and predictors. *Journal of Infection and Public Health*. [Online] 5 (5), 340–345. Available from: doi:10.1016/j.jiph.2012.06.002.

Jaiswal, A., Singh, V., Ogden, J.A., Porter, J.D.H., et al. (2003) Adherence to tuberculosis treatment: lessons from the urban setting of Delhi, India. *Tropical medicine & international health: TM & IH*. 8 (7), 625–633.

Johansson, E., Long, N.H., Diwan, V.K. & Winkvist, A. (1999) Attitudes to compliance with tuberculosis treatment among women and men in Vietnam. *The international journal of tuberculosis and lung disease: the official journal of the International Union against Tuberculosis and Lung Disease*. 3 (10), 862–868.

*(Mitchell EMH, Daftary A. TB stigma: clearing the fog. Int J Tuberc Lung Dis2017;* ***21:1****.doi:10.5588/ijtld.17.0651;*

*Sharpe L, Ginsburg G, Gordon G, et al Trying to make the personal political: feminism and consciousness-raising - a reprint of consciousness raising guidelines (1975). Chicago: Women's Action Alliance, Half Letter Press, 2017;*

*WHO. The End TB Strategy. Geneva: World Health Organization, 2015.*

*Lewis S. A Call to Action for TB Plenary. 47th Union World Conference on Lung Health. Liverpool, 2016.).*

*(Lönnroth K, Jaramillo E, Williams BG, Dye C, Raviglione M. Drivers of tuberculosis epidemics: The role of risk factors and social determinants. Soc Sci Med. 2009;68: 2240–2246. pmid:19394122).*

*Patients with low per capita income have been found to be at higher risk of treatment non-adherence. (Silva APB, Hill P, Belo MTCT, Rabelo SG, Menzies D, Trajman A. Non-completion of latent tuberculous infection treatment among children in Rio de Janeiro State, Brazil. Int J Tuberc Lung Dis. 2016;20: 479–486. pmid:26970157)*

Kaona, F.A.D., Tuba, M., Siziya, S. & Sikaona, L. (2004) An assessment of factors contributing to treatment adherence and knowledge of TB transmission among patients on TB treatment. *BMC public health*. [Online] 468. Available from: doi:10.1186/1471-2458-4-68.

*Social determinants of pulmonary tuberculosis treatment non-adherence in Rio de Janeiro, Brazil. Elvira Maria Godinho de Seixas Maciel, Juliana de Souza, Amancio, Daniel Barros de Castro, José Ueleres Braga. PLOS. Published: January 5,2018. https://doi.org/10.1371/journal.pone.0190578*).

*Frick M, Henry I, Lessem E, Falling Short of the Rights to Health and Scientific Progress: Inadequate TB Drug Research and Access. Health Hum Rights 2016; **18**:9–24*

Mishra, P., Hansen, E.H., Sabroe, S. & Kafle, K.K. (2005) Socio-economic status and adherence to tuberculosis treatment: a case-control study in a district of Nepal. *The international journal of tuberculosis and lung disease: the official journal of the International Union against Tuberculosis and Lung Disease*. 9 (10), 1134–1139.

Munro, S.A., Lewin, S.A., Smith, H.J., Engel, M.E., et al. (2007) Patient adherence to tuberculosis treatment: a systematic review of qualitative research. Barbara Rylko-Bauer (ed.). *PLoS medicine*. [Online] 4 (7), e238. Available from: doi:10.1371/journal.pmed.0040238.

Raviglione MC. TB prevention, care and control, 2010–2015: framing global and WHO strategic priorities. 40th Union World Conference on Lung Health; 2009; Cancun, Mexico.

Shargie, E.B. & Lindtjørn, B. (2007) Determinants of Treatment Adherence Among Smear-Positive Pulmonary Tuberculosis Patients in Southern Ethiopia Philip Hopewell (ed.). *PLoS medicine*. [Online] 4 (2), e37. Available from: doi: 10.1371/journal.pmed.0040037.

World Health Organization. (2017) Guidelines for treatment of drug-susceptible tuberculosis and patient care, 2017 update. Geneva, Switzerland. WHO/HTM/TB/2017.05

## APPENDICES

### 1. List of Contributors

| Name | Role | Organisation |
|---|---|---|
| Dr Enos Masini | Principal Investigator | NTLD-Program |
| Faith Ngari | Study Coordinator | NTLD-Program |
| Aiban Rono | Data Manager | NTLD-Program |
| Dr Newton Ang'wa | Co - Investigator | NTLD-Program |
| Dr Maureen Kamene | Co - Investigator | NTLD-Program |
| Dr Kiogora Gatimbu | Co - Investigator | NTLD-Program |
| Dr Eunice Omesa | Co - Investigator | NTLD-Program |
| Richard Kiplimo | Co - Investigator | NTLD-Program |
| Wendy Nkirote | Co - Investigator | NTRL |
| Titus Kiptai | Co - Investigator | Amref Health Africa |
| Alice Wairia | Co - Investigator | CHS |
| Hillary Kipruto | Co - Investigator | WHO |
| John Njenga | Co - Investigator | CHS |
| Dr Jane Nabongo | Reviewer | KEMRI |
| Janice Njoroge | Editor | CHS |

**Investigating Agency**

National Tuberculosis Leprosy and Lung Disease Program (NTLD-Program), Ministry of Health Kenya

## 2. List of Counties and Health Facilities

| County | Health Facilities |
|---|---|
| **Baringo** | Chesongo Dispensary |
| | Eldama Ravine Sub County Hospital |
| | Equator Dispensary |
| | Esageri Health Centre |
| | Kabarnet County Referral Hospital |
| | Kampi Samaki Health Centre |
| | Kaptimbor Dispensary |
| | Kituro Health Centre |
| | Loboi Dispensary |
| | Marigat Sub District Hospital |
| | Salawa Health Centre |
| | Tenges Health Centre |
| | Timboiywo Dispensary |
| | Timboroa Health Centre |
| | Torongo Health Centre |
| | |
| **Busia** | Angurai Health Centre |
| | Busia District Hospital |
| | Busibwabo Dispensary |
| | Esikulu Dispensary |
| | GK Prisons Dispensary Busia |
| | Malaba Dispensary |
| | Matayos Health Centre |
| | Munongo Dispensary |
| | Nasewa Health Centre |
| | Nasira Dispensary |
| | Tanaka Nursing Home |
| | Teso North Sub County Hospital |
| | |
| **Garissa** | Al Faruq Dispensary |
| | Garissa Provincial General Hospital |
| | GK Prison Dispensary Garissa |
| | Hagadera Hospital |
| | Iftin Sub District Hospital |
| | Medina Hospital |

| | |
|---|---|
| | Police Line Dispensary Garissa |
| | |
| **Homa Bay** | Homa Bay County Teaching and Referral Hospital |
| | Kendu Adventist Hospital |
| | Kendu Sub District Hospital |
| | Koduogo Dispensary |
| | Makongeni Health Centre |
| | Marindi Health Centre |
| | Ndhiwa Sub District Hospital |
| | Nyalkinyi Jersey Dispensary |
| | St Paul's Health Centre |
| | Wagwe Health Centre |
| | |
| **Kisii** | GK Prisons Dispensary Kisii |
| | Hema Hospital |
| | Iranda Health Centre |
| | Kisii Hospital Level 5 |
| | Matongo Dispensary |
| | Nyacheki Sub District Hospital |
| | Oresi Health Centre |
| | Ram Hospital |
| | St Barbara Mosocho Health Centre |
| | |
| **Kitui** | GK Prison Dispensary Kitui |
| | Ikanga Sub District Hospital |
| | Ikutha Health Centre |
| | Kasyala Dispensary |
| | Katulani Sub District Hospital Kitui |
| | Kitui District Hospital |
| | Miambani Health Centre |
| | Muthale Mission Hospital |
| | |
| **Kwale** | Diani Beach Hospital |
| | Gombato Dispensary CDF |
| | Kinango District Hospital |
| | Kinondo Kwetu Community Clinic |
| | Kwale District Hospital |
| | Mafisini Dispensary |

| | |
|---|---|
| | Mbuwani Dispensary |
| | Mkongani Dispensary |
| | Msambweni District Hospital |
| | Muhaka Dispensary |
| | Ndavaya Dispensary |
| | Tiwi RHTC |
| | Waa Dispensary |
| | |
| **Meru** | Akachiu Health Centre |
| | Antubetwe Njoune |
| | GK Prison Dispensary Meru |
| | Kangeta GK Prison Dispensary |
| | Kiegoi Dispensary |
| | Laare Health Centre |
| | Maua Methodist Hospital |
| | Meru District Hospital |
| | Mutuati Sub District Hospital |
| | Nyambene District Hospital |
| | Theere Health Centre |
| | |
| **Mombasa** | Bomu Medical Hospital Changamwe |
| | Chaani MCM Dispensary |
| | Kenya Ports Authority Staff Clinic |
| | Magongo MCM Dispensary |
| | Mvita Dispensary |
| | Port Reitz District Hospital |
| | Tudor District Hospital Mombasa |
| | |
| **Nairobi** | Dreams Centre Dispensary Lang'ata |
| | Karen Health Centre |
| | Lang'ata Health Centre |
| | Lang'ata Hospital |
| | Mbagathi District Hospital |
| | Nairobi West Hospital |
| | Nairobi West Men's Prison Dispensary |
| | Ngong Road Health Centre |
| | St Mary's Mission Hospital |
| | Uhuru Camp Dispensary (O P Admin Police) |

| | |
|---|---|
| | |
| **Nakuru** | Elburgon Sub District Hospital |
| | Kapkures Dispensary Nakuru Central |
| | Keringet Health Centre Kuresoi |
| | Kiptagich Dispensary |
| | Molo District Hospital |
| | Nakuru Provincial General Hospital (PGH) |
| | Nakuru West Health Centre |
| | Olenguruone Sub District Hospital |
| | Rhonda Dispensary and Maternity |
| | |
| **Nyamira** | Bosiango Health Centre |
| | Esani Sub District Hospital |
| | Gesima Health Centre |
| | Gianchore Health Centre |
| | Kenyambi Health Centre |
| | Kenyerere Health Centre |
| | Kijauri Sub District Hospital |
| | Magombo Health Centre |
| | Masaba District Hospital |
| | Mochenwa Dispensary |
| | Nyamaiya Health Centre |
| | Nyamira District Hospital |
| | Nyangweta Health Centre |
| | Riakinaro Health Centre |
| | Rigoma Dispensary |
| | Rikenye Dispensary Masaba |
| | Riongige Health Centre |
| | Tindereti Dispensary |
| | Tinga Health Centre |
| | |
| **Nyandarua** | Bamboo Health Centre |
| | Engineer District Hospital |
| | Mirangine Health Centre |
| | Murungaru Dispensary |
| | Ngorika Health Centre |
| | Njabini Health Centre |
| | North Kinangop Catholic Hospital |

| | |
|---|---|
| | Ol Kalou Sub District Hospital |
| | |
| **Nyeri** | Consolata Mission Hospital Mathari |
| | Emmanuel Community Health Clinic |
| | Gatitu Dispensary |
| | GK Prison Dispensary Kingongo |
| | Itiati Dispensary |
| | Karatina District Hospital |
| | Kiganjo Health Centre |
| | Kimathi University |
| | Kinunga Health Centre |
| | Mt. Kenya Sub District Hospital |
| | Ngorano Health Centre |
| | Nyaribo Dispensary |
| | Nyeri Provincial General Hospital (PGH) |
| | Nyeri Town Health Centre |
| | |
| **Tana River** | Garsen Health Centre |
| | GK Prisons Dispensary Public |
| | Hola District Hospital |
| | Pumwani Dispensary |

### 3. Adherence to TB Treatment Questionnaire

Interviewer's Name _____

Instructions: ENTER THE OPTION IN THE BOX FOR ALL THE QUESTIONS USING FIGURES

SECTION A: DEMOGRAPHIC INFORMATION

| | Item | Options | Response |
|---|---|---|---|
| | Patient ID Number | Enter the 2-digit number from the sample list | ☐☐ |
| | Date of first visit | (dd/mm/yy) | --/--/-- |
| | Date of second visit (if patient not interviewed during first visit) | (dd/mm/yy) | --/--/-- |
| | Sex | 1 Male<br>2 Female | |
| | Age | Current age in completed years | |
| | Religion | 1 Christian<br>2 Muslim<br>3 Others (Specify) | |
| | Name of facility where patient collects anti-TB drugs | | |
| | Sub-county where facility is located | | |
| | County where facility is located | | |
| | Marital Status | 1 Currently married<br>2 Cohabiting<br>3 Never married<br>4 Separated<br>5 Widowed<br>6 Other (Specify) | |

| | | | |
|---|---|---|---|
| | Highest level of education attained | 1 None<br>2 Primary<br>3 Secondary<br>4 Tertiary | |
| | Type of TB | 1 PTB+<br>2 PTB-<br>3 EPTB | |
| | Type of patient | 1 New<br>2 Relapse<br>3 Treatment Failure<br>4 Treatment after Lost to Follow up<br>5 PT<br>6 Treatment History Unknown | |
| | Patient HIV status | 1 Positive<br>2 Negative<br>3 Unknown | |

SECTION B: PATIENT RELATED FACTORS

| No | Item | Options | Response |
|---|---|---|---|
| | Are you currently a smoker? | 1 Yes<br>2 No<br>3 Decline | |
| | Are you currently using alcohol? | 1 Yes<br>2 No<br>3 Decline | |
| | Do you have a treatment supporter? | 1 Yes<br>2 No<br>3 Decline | |
| | If yes, what is your relationship with the treatment supporter? | 1 Spouse<br>2 Mother<br>3 Father<br>4 Sister<br>5 Brother<br>6 Daughter<br>7 Son | |

| | | | |
|---|---|---|---|
| | | 8 Other relatives<br>9 Friend<br>10 HCW/HCV | |
| | Have you informed your significant others that you are on anti TB drugs? | 1 Yes<br>2 No<br>3 Decline | |

SECTION C: SOCIOECONOMIC FACTORS

| No | Item | Options | Response |
|---|---|---|---|
| | Are you currently employed? | 1 Yes<br>2 No<br>3 Decline | |
| | What would you say is your current situation in terms of food availability? | 1 Always available to take with medicines<br>2 Available most of the time<br>3 Available some of the time<br>4 Never available | |

SECTION D: HEALTH-CARE SYSTEM RELATED

| No | Item | Options | Response |
|---|---|---|---|
| | Who collects drugs for you from the health facility? | 1 Self<br>2 Treatment supporter<br>3 HCW/HCV<br>4 Other (specify)<br>5 Decline | |
| | How often are you expected to collect your drugs from the health facility? | 1 Daily<br>2 Once a week<br>3 Once a month<br>4 Only once<br>5 Don't know | |
| | When you collect drugs from the health facility, what time of the day are you expected to be at the facility to pick drugs? | 1 Any time of the day<br>2 Morning hours | |

| | | | |
|---|---|---|---|
| | How long does the facility take to serve you (the whole day, 6 hrs, 3hrs, 2hrs, 1 hr, 30mins, less than 30mins) | 3 Afternoon<br>4 Don't know | |
| | Approximately how far from here is the health facility where you collect drugs | 1 Within 1 km<br>2 2-5 km<br>3 6-10 km<br>4 11-15km<br>5 16-20 km<br>6 Over 20 km | |
| | How much does it cost you to get to the health facility (one way)? | 1 None (walking distance)<br>2 20-50 shillings<br>3 60-100 shillings<br>4 Over 100 shillings | |
| | How would you rate the attitude of staff who attends you at the health facility? | 1 Very friendly<br>2 Friendly<br>3 Indifferent<br>4 Unfriendly<br>5 Very unfriendly | |
| | When you go to pick your medicines at the TB clinic, what would you say about the availability of medicines there? | 1 Always available<br>2 Sometimes not available | |

SECTION E: PATIENT KNOWLEDGE ON TB

| No | Item | Options | Response |
|---|---|---|---|
| | Coughing is a symptom of TB? | 1 Yes<br>2 No<br>3 Don't know | |
| | Night sweats is a symptom of TB? | 1 Yes<br>2 No<br>3 Don't know | |
| | Loss of weight is a symptom of TB? | 1 Yes<br>2 No<br>3 Don't know | |

| | | | |
|---|---|---|---|
| | Chest pains is a symptom of TB? | 1 Yes<br>2 No<br>3 Don't know | |
| | Anti TB drugs should be taken until? | 1 6 months and then stop on your own<br>2 One feels better and then stop on your own<br>3 Until HCW tells one to stop taking drugs | |

SECTION F: MEDICINE RELATED ISSUES

| No | Item | Options | Response |
|---|---|---|---|
| | Since you started taking anti TB drugs, have you experienced any side effects? | 1 Yes<br>2 No<br>3 Don't know | |
| | If you have experienced any side effects, which one? (tick all the apply) | 1 Diarrhoea & Vomiting<br>2 Skin rash<br>3 Headaches<br>4 Numbness<br>5 Painful joints<br>6 Yellow eyes<br>7 Others (specify) | |
| | Are you currently on any other medicines other than anti TBs? | 1 Yes<br>2 No<br>3 Decline | |

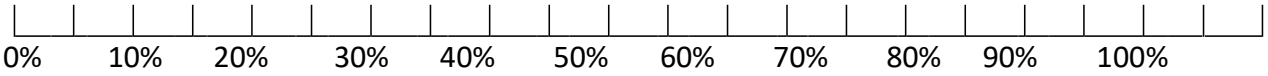
SECTION G: ASSESSMENT OF ADHERENCE TO TB TREATMENT

| No | Item | Options | Response |
|---|---|---|---|
| | Do you ever miss taking your anti TB drugs | 1 Yes<br>2 No | |

| | | | |
|---|---|---|---|
| | In the past 4 days, on how many days have you missed taking all your pills? | 1 None<br>2 1 day<br>3 2 days<br>4 3 days<br>5 4 days | |
| | Over the last four weeks, how often did you miss taking your anti TB drugs? | 1 Daily<br>2 More than once a week<br>3 Once a week<br>4 Once every two weeks<br>5 Once a month<br>6 Never | |

**VAS (Visual Analog Scale)**

How much of anti TB drugs have you taken as prescribed in the last three to four weeks?




0% means you have taken no drugs at all
50% means you have taken half of the drugs
100% means you have taken all required pills of the drugs

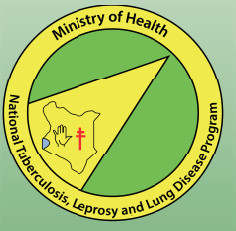
**Pill Count**

| No | Item | Options | Response |
|---|---|---|---|
| | Date of last pill refill (Drug collection) | dd/mm/yy | |
| | Number of tablets collected | | |
| | Number of days since last drug collection | | |
| | Number of remaining pills expected today | | |
| | Actual number of remaining pills | | |

Reported reasons for non-adherence

| No | Item | Options | Response |
|---|---|---|---|
| | If patient misses taking drugs sometimes, what are the reasons for this? | 1 Side effect<br>2 Feeling well<br>3 Too many drugs<br>4 Stigma<br>5 Lack of support<br>6 No food<br>7 Alternative treatment<br>8 Not feeling better on drugs<br>9 Forgetfulness<br>10 No reason<br>11 Other (Specify) | |

----------THANK YOU VERY MUCH FOR YOUR TIME AND COOPERATION----------




National Tuberculosis, Leprosy and Lung Disease Program
First Floor, Afya Annex,
Kenyatta National Hospital Grounds
P.O. Box 20781 – 00202 Nairobi
Telephone: +254 773 977 440
Email: info@nltp.co.ke
www.nltp.co.ke