



Factors Associated With Non-Adherence to Tuberculosis Treatment in Kenya



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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
ЕРТВ	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
ТАВ	Treatment Adherence Behaviour
ТВ	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 4th 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.

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	1 300 (910-1700)				
pulmonary TB cases	1,300 (310 1700)				
Treatment success rate (New and relapse TB	87%				
cases)					
Treatment success rate MDR/RR TB	72%				
TB treatment sites	4,225				
TB microscopy sites	2,124				

Table 1: Kenya Tuberculosis Profile 2016



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.

$$N = z\alpha^2 * [p * q] / d^2$$

Where N is the required sample size, $z\alpha$ 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

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

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 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 antimedicines 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	Total	Non-Adhe	rent	Adherent	
characteristics	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	Total	Non-Adheren	t	Adherent	
Characteristics	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%
	1				
Type of TB			-		
РТВ	1212	404	33%	808	67%
ЕРТВ	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%





	Total	Non-Adh	Non-Adherent		Adherent	
Treatment and Health Characteristics	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 4: Social-economic characteristics of the respondents

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

Treatment	and	Health	Total	Non-Adherent		Adheren	t
Characteristics			n=1487	n=527(perce	ent)	n=960(pe	ercent)
Staff Attitude							
Friendly			1,470	520	35%	950	65%
Not friendly	Not friendly			7	41%	10	59%
Knowledge of T	B Sympto	ms					
Know at least o	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)

Characteristics	Catagony	Univariate A	nalysis	Multivariate Analysis			
Characteristics	Category	OR	[95% CI	p-value	OR	[95% CI	p-value
Age		0.997	(0.989,1.005)	0.405			
Ago Group	18 – 24	(ref)					
Age Group	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

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



Characteristics	Catagony	Univariate A	ivariate Analysis			Multivariate Analysis			
Characteristics	Category	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		
	-		·			·			
	Formal								
Employment	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		



Characteristics	Category	Univariate Analysis				Multivariate Analysis			
characteristics	category	OR	[95% CI		p-value	OR	[95% CI		p-value
HIV Status	Positive	(ref)							
	Negative	0.753	(0.613,0.99	98)	0.039	0.753	(0.568,0).997)	0.048
Substance Use	Yes	(ref)							
	No	0.582	(0.410,0.82	25)	0.002	0.450	(0.294,0).687)	0
Side Effects	No	(ref)							
	Yes	0.709	(0.572,0.87	79)	0.002	0.729	(0.572,0).929)	0.01
	Intensive phase	(ref)							
Patient Phase	Continuation phase	2.648	(2.120,3.30)7)	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	2.461)	0.081
		·							
	New	(ref)							
Patient Type	Previously treated	0.986	(0.701,1.38	38)	0.937	0.932	(0.634,2	L.371)	0.722
	Treatment history								
	unknown	Omitted							
	1	ſ	1			1	r		
Type of TB	ЕРТВ	(ref)							
	РТВ	0.618	(0.474,0.80	06)	0.000	0.710	(0.028,0).523)	0.963

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

Charactoristics	Catagory	Univariate	e Analysis	Multivariate Analysis			
Characteristics	Category	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	20 to 50 shillings	(ref)					
Transport	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	More than 5 kilometres	(ref)					
Facility	Less than 5 kilometres	1.185	(0.950,1.479)	0.132			
			•				
Patient	Household member	(ref)					
Supporter	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
	L						1

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

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

Characteristics	Category	Univariate An	alysis		Multivariate Analysis		
Characteristics		OR	[95% CI	p-value	OR	[95% CI	p-value
Knowledge on TB	Know	(ref)					
Symptoms	Don't know	1.110	(1.611,2.016) 0.000		1.245	(0.839,1.846)	0.277
I							
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.

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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.



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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
Wombasa	Bomu Medical Hospital Changamwe
	Kenya Ports Authority Staff Clinic
	Magongo MCM Dispensary
	Magongo MCM Dispensary Mvita Dispensary
	Magongo MCM Dispensary Mvita Dispensary Port Reitz District Hospital
	Magongo MCM Dispensary Mvita Dispensary Port Reitz District Hospital Tudor District Hospital Mombasa
Nairobi	Magongo MCM Dispensary Mvita Dispensary Port Reitz District Hospital Tudor District Hospital Mombasa
Nairobi	Magongo MCM Dispensary Mvita Dispensary Port Reitz District Hospital Tudor District Hospital Mombasa Dreams Centre Dispensary Lang'ata Karen Health Centre
Nairobi	Magongo MCM Dispensary Mvita Dispensary Port Reitz District Hospital Tudor District Hospital Mombasa Dreams Centre Dispensary Lang'ata Karen Health Centre Lang'ata Health Centre
Nairobi	Magongo MCM Dispensary Mvita Dispensary Port Reitz District Hospital Tudor District Hospital Mombasa Dreams Centre Dispensary Lang'ata Karen Health Centre Lang'ata Health Centre Lang'ata Hospital
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Nairobi	Magongo MCM DispensaryMvita DispensaryPort Reitz District HospitalTudor District Hospital MombasaDreams Centre Dispensary Lang'ataKaren Health CentreLang'ata Health CentreLang'ata HospitalMbagathi District HospitalNairobi West Hospital
Nairobi	Magongo MCM DispensaryMvita DispensaryPort Reitz District HospitalTudor District Hospital MombasaDreams Centre Dispensary Lang'ataKaren Health CentreLang'ata Health CentreLang'ata HospitalMbagathi District HospitalNairobi West HospitalNairobi West Men's Prison Dispensary
Nairobi	Magongo MCM DispensaryMvita DispensaryPort Reitz District HospitalTudor District Hospital MombasaDreams Centre Dispensary Lang'ataKaren Health CentreLang'ata Health CentreLang'ata HospitalMbagathi District HospitalNairobi West HospitalNairobi West Men's Prison DispensaryNgong Road Health Centre
Nairobi	Magongo MCM DispensaryMvita DispensaryPort Reitz District HospitalTudor District Hospital MombasaDreams Centre Dispensary Lang'ataKaren Health CentreLang'ata Health CentreLang'ata HospitalMbagathi District HospitalNairobi West HospitalNairobi West Men's Prison DispensaryNgong Road Health CentreSt Mary's Mission Hospital



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	(dd/mm/yy)	
	not interviewed during first		//
	visit)		
	Sex	1 Male	
		2 Female	
		Current age in completed	
	Age	years	
		1 Christian	
	Religion	2 Muslim	
		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	
		2 Conabiting	
		3 inever married	
		4 Separated	
		6 Other (Specify)	
1			



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

SECTION B: PATIENT RELATED FACTORS

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



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

SECTION C: SOCIOECONOMIC FACTORS

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

SECTION D: HEALTH-CARE SYSTEM RELATED

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



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

SECTION E: PATIENT KNOWLEDGE ON TB

No	Item	Optio	ns	Response
	Coughing is a symptom of TB?	1	Yes	
		2	No	
		3	Don't know	
	Night sweats is a symptom of TB?	1	Yes	
		2	No	
		3	Don't know	
	Loss of weight is a symptom of TB?	1	Yes	
		2	No	
		3	Don't know	

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

SECTION F: MEDICINE RELATED ISSUES

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



In the past 4 days, on how many days have	1	None	
you missed taking <u>all your pills</u> ?	2	1 day	
	3	2 days	
	4	3 days	
	5	4 days	
Over the last four weeks, how often did you	1	Daily	
miss taking your anti TB drugs?	2	More than once	
		a week	
	3	Once a week	
	4	Once every two	
		weeks	
	5	Once a month	
	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%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	

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	Optior	าร	Response
	If patient misses taking drugs sometimes,	1	Side effect	
	what are the reasons for this?	2	Feeling well	
		3	Too many drugs	
		4	Stigma	
		5	Lack of support	
		6	No food	
		7	Alternative	
			treatment	
		8	Not feeling	
			better on drugs	
		9	Forgetfulness	
		10	No reason	
		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