

## Adherence To Pulmonary Tuberculosis Treatment In Murang'a County, Kenya

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### ABSTRACT

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*Non-adherence to Tuberculosis treatment is a major barrier for TB control programs because incomplete treatment may result in prolonged infectiousness, drug resistance, relapse and death. Successful treatment of TB involves taking anti TB drugs for at least six months as per the doctors advise. Currently, Tuberculosis has become a resurgent public Health problem in developing countries and is the leading cause of death from any single infectious agent. The purpose of the study was to identify factors contributing to non-adherence to TB treatment amongst pulmonary TB patients in Maragua Sub-County of Murang'a County. The objectives included were to determine the social-economic related, healthcare-related, patient-related and disease and medicine related factors associated with non-adherence of TB treatment amongst patients in Murang'a County. The study was guided by the Health Belief model as the theoretical framework. A cross-sectional survey study design was used. Census method was used and all 270 people were considered. Data was collected using a mixed method approach of interview guides, questionnaires and Focus Group Discussions. A total of 270 adult Pulmonary TB patients, amongst whom 59 (47%) were adherents and 67(53%) non adherents with TB treatment, who received treatment in 2017 and had completed treatment, Community Health workers, and Health Personnel in the TB clinic participated in the study. Data was entered to EPI INFO version 3.5.3 and analysed using Statistical Package for Social Sciences (SPSS) version 22. Multiple logistic regressions was used to identify associations and to control potential confounding variables. Chi Square was used to test independence of categorical variables with p value of less than 0.05 at 95% confidence interval being considered significant. Data presentation was done using figures and tables. From the results of the study only the distance taken to collect drugs in the health facility was found to be associated with non-adherence to TB treatment (n=9 ,13%). The study recommends that measures should be undertaken so as to reduce the non-adherence level to TB treatment by ensuring anti-Tb treatment is accessible to patients at the nearest Health facility from their residence. Additionally, the study proposes that the patients should be sensitized on the importance of adherence to TB drug medication. Interventions with Health promotion initiatives emphasizing the benefits of treatment adherence should be enhanced in the communities by further large scale multicentred studies and that an enabling environment which is conducive for good patient interactions should be created. The study concludes that there are challenges facing adherence of TB treatment which ought to be addressed. The study, suggests that measures to improve drug adherence such as improving health conditions, increasing the availability of drugs and conducting health educations to the patients is essential in minimizing the drug non-adherence to TB drugs.*

**Key Words:** Adherence To Pulmonary Tuberculosis Treatment, Socio-Economic Related Factors, Healthcare, Patient-Related Factors, Disease And Medicine

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**1. Introduction**

Tuberculosis (TB) is the top infectious killer worldwide with 1,7 million deaths attributed to it in 2014 (World Health Statistics, 2015). Tuberculosis is a highly communicable disease that is brought about by the infectious agent being transmitted from an infected individual or animal to a susceptible host. The disease is contagious and caused by a number of airborne microorganisms including; *M. Africanum*, *M. Tuberculosis*, and *M. bovis*, which are spread when infected persons cough, sneeze or speak and susceptible persons inhale the infected air, (Karumbi & Garner, 2015). Tuberculosis is highly ranked in all the lists of countries having high per capita burden of TB, TB/HIV list. And MDR-TB (WHO, 2017). Its however easily preventable (BCG at birth) and treatable if medication is taken as prescribed. The effectiveness of treatment is dependent on a combination of correct dosage, sufficient time and adequate drugs (Tang, Zhao, Wang, Yin, & Zhao, 2015). According to WHO, (2018) there were at least 2.5 million individuals in Africa who fell ill as a result of TB in 2016 alone which accounts for at least a quarter of the new cases in the world. Additionally, 417,000 people in Africa died due to TB which accounts for 25% of all TB deaths occurring in the African region. The most affected countries in Africa include Nigeria and South Africa with TB also acting with the leading killer of HIV positive people in the region (40% of HIV deaths in 2016) (WHO, 2018).

Kenya uses a standard six months treatment for TB as guided by WHO but treatment adherence remains a major challenge to the effectiveness of treatment (GOK, 2007). Adherence to treatment is described as the extent to which the patients follow instructions on how the medication prescribed is to be undertaken (Osterberg & Blaschke, 2005). Factors associated with non-adherence can be categorised into Health- Care- System related or Individual (social Economic or Behavioural) related (Ali & Prins, 2016). In Ethiopia non-adherence was attributed to forgetfulness, medicine side effects, travelling, and distance to the health facility (Theron, Peter, Zijenah & Chanda, 2015). Stigma was found to be a hindrance to adherence in India (Kastien, Abulfathi, Rosenkranz, & Bennett, 2016). Other factors found to impact on adherence were lack of knowledge about TB, smoking, distance travelled to collect medicine and patient feeling well after few months of treatment (Kastien et al., 2016). However, the factors contributing to non-adherence of TB treatment have not been previously studied in Maragua, therefore to identify the real factors influencing adherence in Maragua in the social context, a cross sectional survey design was carried out with the goal of providing policy makers with recommendations to improve on adherence which would benefit the individual, program and society at large.

**2. Problem Statement**

According to WHO, treatment is availed free of charge to all TB patients and the disease being highly treatable, the world should be tb free by 2030, among other epidemics (WHO, 2013). The national Strategic Plan on TB in Kenya aims to reduce TB incidence by 5%, reducing mortality by 3%, and raising treatment success to 95%, from 2014 figures, by 2018 (GOK, 2019). However, despite the fact that a lot of resources have been directed towards making the world tb free, available data reveal that the incidence rate in Kenya ranges between 213-515 per 100,000 population, treatment success rate of 87%, and mortality rate ranges between 33-93% (GOK, 2019). Cases that are not notified to NTLLDP are unacceptably high at 55%, with prevalence: Notification ratio of 2.5:1. Murang'a county is not exempted from this data with

its incidence rate confirmed at 513 per 100000 population and over 10% none adherence rate (GOK, 2018). Maragua has an incident rate of 522 per 100,000 population and non-adherence rate of over 22% (GOK, 2018) making it rank top amongst all other sub counties in Murang'a. Tuberculosis is ranked 4<sup>th</sup> leading cause of death in Kenya, accounting for 6.3% of all deaths (KNBS, 2014) and 4<sup>th</sup> among the top 10 killer diseases in Murang'a. (GOK, 2016). Treatment adherence is a key factor for treatment success and non-adherence is associated with adverse outcomes like high morbidity and mortality, development of Multi-Drug-Resistant TB (which is very expensive to treat), relapse among others. (NTLLDP, 2014). This study therefore aimed to determine the indices that influence non-adherence to pulmonary tuberculosis (*Mycobacterium Tuberculosis*) treatment in Murang'a County.

### **3. Objectives of the Study**

The main objective of the study was to determine the indices that influence non-adherence to pulmonary tuberculosis (*Mycobacterium Tuberculosis*) treatment in Murang'a County.

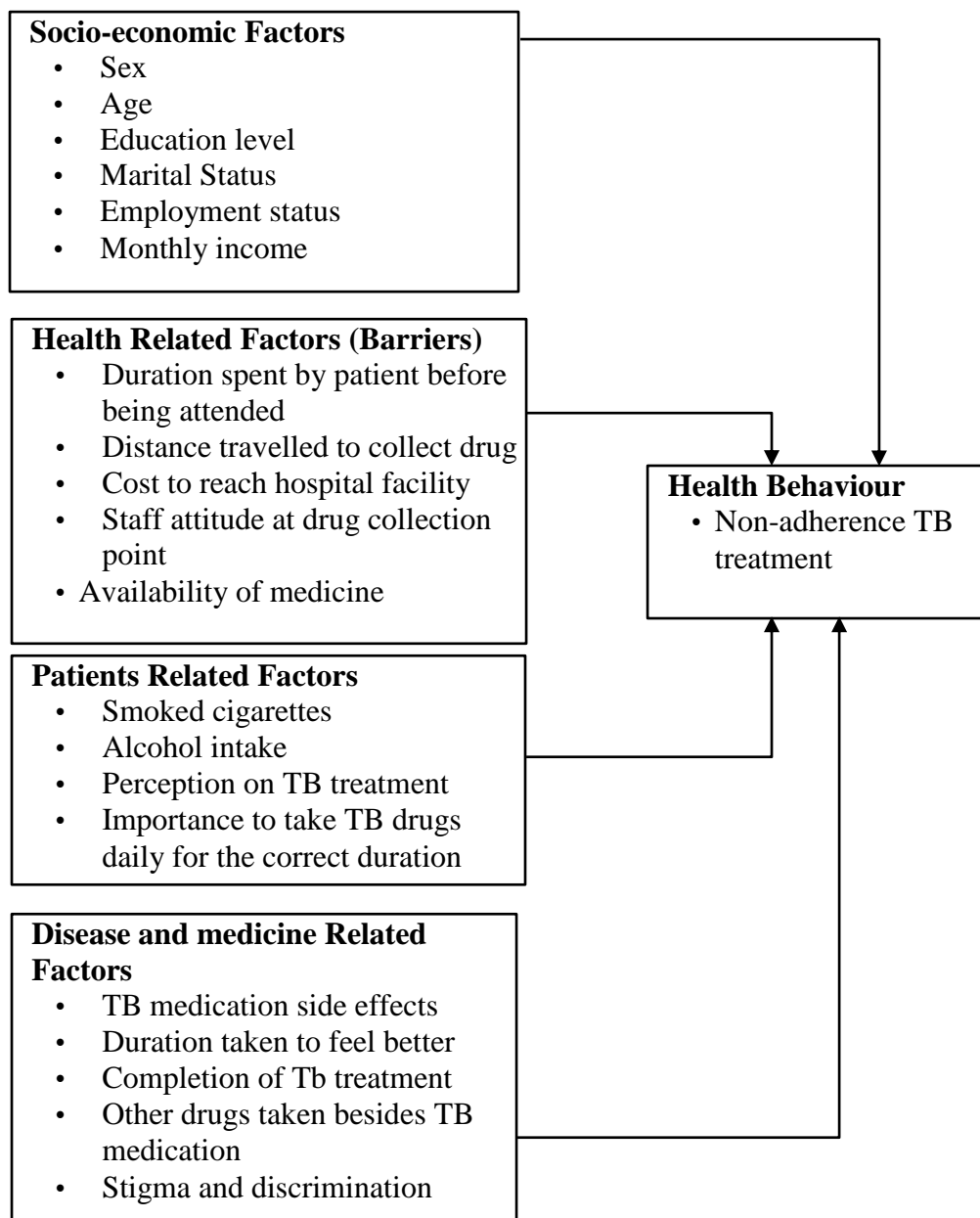
Specific objectives were:

- i. To determine the socio-economic related factors associated with non-adherence of TB treatment amongst patients in Murang'a County.
- ii. To identify healthcare-related factors associated with non-adherence of treatment amongst TB patients in Murang'a County.
- iii. To establish the patient-related factors associated with non-adherence of TB treatment amongst patients in Murang'a County.
- iv. To establish the disease and medicine related factors associated with non-adherence of TB treatment amongst patients in Murang'a County.

**4. Conceptual Framework**

**Independent Variables**

**Dependent Variable**



**Figure 1: Conceptual Framework**

Source: Author (2020)

**5. Literature Review**

Tuberculosis control in Kenya conforms to the WHO strategy which was previously eight months but a shorter six months’ regime was introduced in 2007. Directly observed treatment was recommended in Kenya by the WHO in 1993. Currently, Kenya is ranked thirteenth among the twenty-two countries having a high burden of TB internationally (WHO, 2013). The TB incidences increased almost nine times from 11,625 cases in 1990 to 116,723 cases in 2007 mainly due to HIV pandemic (MOH, 2007). Treatment success stagnated at 8%; despite the government’s policies in providing free treatment. As such, a low adherence to the treatments given was the main contributor to the 85% global target not being met. The poor adherence to

the TB treatment means the patients will remain infected for a long duration of time and are more prone to succumb to the illness or, in the worst case scenario, develop drug-resistant TB which would result in additional costs of treatment (Karumbi & Garner, 2015). All patients who reveal the following symptoms are investigated for TB; fatigue, night sweats, and fever, loss of appetite and weight, sputum production which may be bloodstained, shortness of breath and chest pains and persistent cough for two weeks or more (Cindy, 2013). Two sputum specimens are collected from patients with such symptoms. The standard treatment procedure for TB patients aged eight years and above includes four drugs – *rifampicin*, *isoniazid*, *pyrazinamide*, and *ethambutol* – to the initial 2 months which are in the intensive phase. Following this is two drugs that are combined, that is *isoniazid* and *rifampicin* which are administered to the patient for four months (MOH, 2007). Those patients, who have interrupted their prescribed treatment for two months consecutively, are termed to be out of control as per WHO (WHO, 2011).

Adherence occurs when a patient picks drugs from the clinic on schedule, takes the prescribed medication without any interruptions for a period not less than two months and ensures the course is complete. This, in turn, pre-determines greatly whether the outcomes were positive or not (Pandit & Chaudhery, 2008). Adherence to TB treatment refers to taking TB treatment daily at the stated times and recommended dosages in line with the guidelines for TB treatment for about half a year until the patient is declared to be completely free from the infection (Mokgoadi, 2002). Adherence can also be termed as the level to which medical recommendations coincide with the patient's acceptance and behavior (Gandhi *et al.*, 2006). Local and appropriate measures should be taken to establish the various obstacles that may cause the patient to be non-compliant to the TB treatment (WHO, 2010). This has seen Kenya observe and adopt the DOTS strategy (WHO, 2011) and can either be Clinic-Based DOT, workplace DOT or Community-Based DOT (WHO, 2011). The patients not being compliant to the TB treatment can be attributed to a number of factors. According to a study conducted in Colombo, these factors may include the medical personnel's incompetency in addressing the illness and the patients feeling to be cured and thus do not complete the dosage (Chani, 2010). Similarly, a study conducted in Thailand established that poor adherence to the TB treatment will result in various adverse medical conditions (Anuwatnonthakate *et al.*, 2008). Tuberculosis non-adherence rate in Kenya is now at 82% (MOH, 2015). Murang'a County at 81% with Maragua Sub-County recording the highest non-adherence and lowest cure rate of 78% (GOK, 2014). The main contributing factors to non-adherence are the long-term treatment and drug toxicity (Chowdary *et al.*, 2017). Adherence leads to reduced TB morbidity and mortality and hence disease burden reduction (WHO, 2011).

Factors influencing adherence to TB treatment include patient-related factors, health service delivery factors, condition-related factors and social economic factors (Chani, 2010). These include age, sex, level of knowledge about TB disease, stigma, smoking habit and ignorance on the need to comply with treatment (Comlet *et al.*, 2010). TB patients aged more than 25 years tend to be more compliant to the given TB treatment as compared to those below that age. Being younger than 25 years may lead to patients being more impatient in acquiring medications (Fagundez, Perez-Freixo, Evene, Momo, & Bive, 2016). With regard to education, the adherence increased drastically with the literacy levels. Education promotes good health by not only generating economic resources through better jobs but also by providing knowledge and skills by which people are able to manage illnesses and disease themselves (Danso *et al.*, 2015). Knowledge of TB – It is also called treatment literacy. Adherence with TB treatment is significantly higher among patients who have knowledge on TB (Cremers, de Laat, & Kapata, 2015). Knowledge and attitude towards TB and its treatment vary due to culture, religion, and tradition. Lack of knowledge on symptoms and signs of TB may lead to late diagnosis and

treatment. Stigma, discrimination and co-morbidities – The fear that the patients will be stigmatized may prevent them from disclosing the disease (Chani, 2010). As such the TB and HIV patient stigmatization causes the patient to delay in seeking medical assistance (Furber, Hodgson, Desclaux, & Mukasa, 2004). Particularly, the HIV co-infected patients were found to have double the risk of defaulting during treatment in Nigeria (Daniel, Oladapo, & Alausa, 2006). Perceived severity of ill health condition – This includes failure of the patient to acknowledge the dangers of not completing TB treatment because of subsiding TB symptoms or feeling better (Cindy, 2013). Studies conducted in various countries such as Malawi and Zambia showed that non-adherence was mainly brought about the patients being free from symptoms (Chani, 2010).

Socio-Economic Factors- These factors include low-income levels, low awareness, inadequate social support and not being able to purchase the medications (Dodor & Afenyadu, 2005). The duration and expenses involved in TB management will determine how the patients become compliant (Cindy, 2013). However, a study in India yielded contrary results as it didn't find any significant association between social economic status and treatment adherence (Pandit & Chaudhery, 2008). According to a research done in Nairobi by Muture *et al.* (2011) inadequate food, being unmarried and low level of education are the major social factors associated with default. Health Care System Factors- These constitute the poor attributes pertaining to the health care provision, which may range from the service providers' attitudes to their incompetence in delivering TB Treatments, TB drug shortages and long travelling time to treatment centre, long waiting time and accessibility or living near a facility (Daniel *et al.*, 2006; Wasonga, 2006). However, the proper and enhanced relationship between the provider and the patients will improve compliance (Dodor & Afenyadu, 2005). Additionally, the patient counseling and education, accompanied by TB care which is convenient to the patient will enhance the adherence levels to the TB treatments.

## 6. Materials and Methods

This study employed a descriptive cross-sectional survey study design which aims at describing and identifying relationships among variables, this being the relationship between non-adherence to TB treatment and social-economic, healthcare systems and patient-related factors. This study design most suited the project as the study was conducted over a specified period of time. The Study was conducted in Maragua Sub-County. It is one of the eight sub-counties of Murang'a County. The study area is located along Murang'a – Sagana road it borders Kirinyaga, Embu, Machakos, and Kiambu counties in the North, East, South and west respectively (see the map appendix x). It's characterized by high poverty levels with over 34% living below absolute poverty line. It has a total population of over 300,000 with a male: female ratio of 1:1 and annual growth rate of 0.3%. Fifty-five (55%) of the population is above 18 years while 9.3% are elderly men and women above 60 years. This study area was selected because tuberculosis is prevalent (at 81% with Maragua Sub-County recording the highest non-adherence and lowest cure rate of 78% (GOK, 2014) in this area owing to high poverty levels, alcoholism and poor infrastructure and housing problems. It has 11 health facilities with TB patients being referred to, after registration at, Maragua level four, hospital (GOK, 2014).

The study population included all TB patients (pulmonary, adults, new and retreated patients) transferred in and out of the study area from 1<sup>st</sup> January to 31<sup>st</sup> December 2017 totaling to 270. (GOK, 2017). The hospital staff identified patients who registered between January 2017 and December 2017, had completed treatment and classified them to adherent or non-adherents. Their details were available in the treatment cards. Patients' register was used as the sampling frame to select the patients attending clinic from 1<sup>st</sup> January 2017 to 31<sup>st</sup> December 2017. The researcher approached eligible participants, explained about the study and recruited those who agreed to participate simple random technique.

Since the study population was small (270 from Maragua level four, hospital) census method was applied.

This study was framed within phenomenology and a mixed method approach of structured questionnaires, interviews and focus group discussions. This was done by using structured, interviewer-administered questionnaires, interview guide and Focus Group Discussion administered by the data collector. Each participant was traced to his/her home, or was summoned to the treatment center with the help of CHW who are actively involved in TB activities and thereafter an in-depth interview was conducted with randomly selected TB patients. Key Informant Interview (KII) was conducted to capture insights among staff in TB clinic. The research assistants visited the facility on their clinic days and used an observational checklist for assessment. To access the relationship between the research variables, regression analysis was undertaken. Variables in the univariate model which had p-values of less than 0.2 were included in the model with odds ratio and 95% confidence intervals calculated for each variable calculated. Specifically, p-values of less than 0.05 were termed to be significant. Data was analysed using SPSS version 22. Where the expected value in the 2x2 table was <5, Fisher's test was used to test significance. Data presentation was done using figures and tables.

## 7. Results and Discussions

### 7.1 Socio-demographic Variables versus Adherence

In relation to the bivariate analysis conducted, none of the socio-demographic factors were found to be associated with adherence as shown in Table 1.

**Table 1: Socio-demographic Variables versus Non-Adherence**

Variable	Category	Adherence				Chi-square test		
		non-adherent		adherent		$\chi^2$	df	p-value
		N	%	n	%			
<b>Age</b>	18 – 25	22	37.3	20	29.9	3.989	5	0.551
	26 – 33	10	16.9	14	20.9			
	34 – 41	13	22.0	13	19.4			
	42 – 49	10	16.9	9	13.4			
	50 – 57	3	5.1	6	9.0			
	58 – 65	1	1.7	5	7.5			
<b>Gender</b>	Male	30	50.8	41	61.2	1.365	1	0.243
	Female	29	49.2	26	38.8			
<b>Education</b>	None	2	3.4	3	4.5	0.905	3	0.824
	Primary	10	16.9	9	13.4			
	Secondary	18	30.5	25	37.3			
	Tertiary	29	49.2	30	44.8			
<b>Marital Status</b>	Single	23	39.0	25	37.3	3.322	4	0.505
	Married	14	23.7	21	31.3			
	Separated	11	18.6	11	16.4			
	Divorced	8	13.6	4	6.0			
	Widow/widowe	3	5.1	6	9.0			

Source: Author (2020)

## 7.2 Economic Variables versus Adherence

A bivariate analysis was conducted on economic/social variables which included the employment status, monthly income, food situation when taking drugs and individuals who offered assistance when taking drugs. The analysis revealed that none of the factors were found to be associated with adherence as shown in Table 2.

**Table 2: Economic Variables versus Adherence**

Variable	Category	Adherence				Chi-square test		
		non-adherent		Adherent		$\chi^2$	df	p-value
		n	%	n	%			
Employment status	Formal Employment	20	33.9	25	37.3	2.323	2	0.313
	Self Employed	15	25.4	23	34.3			
	Unemployment	24	40.7	19	28.4			
What's your monthly income	< 3000 Ksh	23	39.0	29	43.3	1.087	2	0.581
	3000 – 6000 Ksh	19	32.2	16	23.9			
	> 6000 Ksh.	17	28.8	22	32.8			

Source: Author (2020)

## 7.3 Healthcare Factors versus Adherence

The number of healthcare factors were tested against adherence of medication which included distance travelled to collect drugs most convenient TB clinic opening time, Place of collecting TB drugs, waiting time, Cost to reach the facility, Staff Attitude, informed of importance of taking drugs regularly and to completion, and Drug Availability. The analysis depicted that only distance travelled to collect drugs ( $\chi^2(4) = 10.270$ ,  $p=0.036$ ) was statistically significantly associated with adherence despite all the factors being barriers in the access of medication and adherence to TB medication.

**Table 3: Healthcare Factors versus Adherence**

Variable	Category	Adherence				Chi-square test		
		non-adherent		adherent		$\chi^2$	df	p-value
		n	%	n	%			
Convenient TB clinic opening time	<8.00 a.m. – 5.00 p.m	8	13.6	16	23.9	2.842	3	0.417
	8.00 a.m. – 5.00 p.m	9	15.3	8	11.9			
	8.00 a.m. – >5.00 p.m	17	28.8	21	31.3			
	< 8.00 a.m. – >5.00 p.m	25	42.4	22	32.8			
Distance travelled to collect drugs	< 5	8	13.6	20	29.9	10.270	4	0.036*
	5 – 10	8	13.6	16	23.9			
	11 – 15	12	20.3	9	13.4			
	8 – 20	17	28.8	9	13.4			
	> 20	14	23.7	13	19.4			
Nothing <sh 20	Nothing	16	27.1	20	29.9	2.220	3	0.528
	<sh 20	11	18.6	14	20.9			



Variable	Category	Adherence				Chi-square test		
		non-adherent		adherent		$\chi^2$	df	p-value
		n	%	n	%			
Cost to reach the facility	sh 20 – 40	12	20.3	18	26.9	0.612	4	0.962
	sh > 40	20	33.9	15	22.4			
Staff Attitude	Very friendly	14	23.7	15	22.4	0.018	1	0.897
	Friendly	9	15.3	12	17.9			
	Indifferent	12	20.3	16	23.9			
	Unfriendly	13	22.0	12	17.9			
Drug Availability	Very unfriendly	11	18.6	12	17.9	0.018	1	0.897
	Always available	31	52.5	36	53.7			
	Sometimes not available	28	47.5	31	46.3			

Source: Author (2020)

#### 7.4 Patient Related Factors versus Adherence

The analysis revealed that there were no patient related factors that were significantly associated with adherence as depicted in Table 4.

**Table 7: Patient Related Factors versus Adherence**

Variable	Category	Adherence				Chi-square test		
		non-adherent		adherent		$\chi^2$	df	p-value
		n	%	n	%			
Tobacco Use (6 months)	Yes	24	40.7	23	34.3	1.835	2	0.400
	No	22	37.3	22	32.8			
	Cannot recall	13	22.0	22	32.8			
Alcohol use (6/12 months)	Yes	17	28.8	26	38.8	1.509	2	0.470
	No	22	37.3	23	34.3			
	Cannot recall	20	33.9	18	26.9			
Did you have treatment support	Yes	27	45.8	28	41.8	0.201	1	0.654
	No	32	54.2	39	58.2			
Informed of importance of taking drugs regularly and to completion	Yes	32	54.2	3	47.8	0.526	1	0.468
	No	27	45.8	3	52.2			

Source: Author (2020)

#### 7.5 Discussion

Tuberculosis constitutes a main public health problem as it results in many cases of morbidity and mortality both locally and globally. However, a huge population of the TB patients tends to not comply with the treatment specified. This study aimed at determining whether the same situation of non-adherence exists in Murang'a County and the exact underlying factors. This

study employed a cross-sectional study design which aims at describing and identifying relationships among variables, these being the relationship between non-adherence to TB treatment and the social- economic, health care systems and patient-related factors. The respondents were active adult TB patients diagnosed with pulmonary TB at the TB clinic in 2017 and were identified through the Sub-county TB control program register, and health personnel working in the clinic. The study found out the following as per the study's objectives;

### **7.5.1 To establish the patient-related factors associated with non-adherence of TB treatment amongst patients in Murang'a County.**

The study aimed at determining the patient-related factors that influence the patients' nonadherence to TB treatment. Most respondents were found out to have smoked cigarettes and taken alcohol. Drug and substance abuse is an inducer to non-adherence in that patients may tend to forget when to take the medicines or portray negligence. This is thus highly discouraged when undertaking the TB treatment. On whether the respondents believed that TB can be cured if treatment is taken daily for the correct treatment duration, most respondents agreed. On whether the respondents perceived to be suffering from TB, most of them were affirmative. All the respondents were fully aware of non-treatment to TB resulting in death and this was a source of encouragement to the patients to seek medication promptly to avoid the consequences. With regards to the importance of taking TB drugs daily for the correct duration, prevention of death and TB spread were the main reasons for taking drugs. The results obtained further showed that only a few patients were given support by friends and family. This implies that the patient-related factors did have an influence on the non-adherence to the TB medications. However, the nature of the effect varied with some discouraging non-adherence while others encouraged it. Chi-square test results indicated that patient related factors had no significant effect on Health Behaviour - Non-adherence or adherence to TB treatment.

### **7.5.2 To identify healthcare-related factors associated with non-adherence of treatment among TB patients in Maragua Sub-County.**

The study also sought to determine the health care related factors that influenced the patients' nonadherence to TB treatment. The findings show that the clinics operated for a considerable duration of time so as to ensure the patients had an ample time to get the services offered with majority operating between 8 am and 5 pm. On the waiting duration in the hospitals, majority of the respondents had to wait more than 1 hour before being attended to. On the distance travelled to collect the drugs, most of the respondents (78%) had to walk more than 10 kilometers so as to collect the drugs. On the cost incurred to reach to the hospitals, only 29% incurred no expenses at all in reaching the hospital facility while the remaining 71% had to spend so as to get to the hospital. On the staff's attitudes, majority of the staff at the collection points were indifferent (42%), with only 3% being very friendly. The low friendly levels may be an inducer to non-adherence. Concerning the Knowledge about the importance of drugs, 81% agreed, while only 19% disagreed on the drug availability, majority of the patients indicated that the drugs were not readily available. The inadequate drug supply acted as a discouragement to the patients to go to the drug collection centers. The healthcare-related factors therefore mostly acted to induce the patients not to complete their treatment due to the unfavorable environment created. Chi-square test results indicated that health related factors had significant effect on Health Behaviour - Non-adherence or adherence to TB treatment.

### **7.5.3 To determine the social-economic related factors associated with non-adherence of TB treatment amongst patients in Murang'a County.**

The study also sought to determine the social-economic related factors associated with non-adherence of TB treatment among patients in Murang'a County. In relation to the employees'

employment status, the majority were either unemployed or self-employed. However, due to the drugs being provided free of charge, it had minimal impact on the non-adherence levels. On the monthly income, the majority had an income of less than Ksh. 6,000. This implies that most respondents were under low living standards. Pertaining to the availability of foods when taking TB drugs, most respondents indicated that food was always available with only a few not having food regularly. However, on the assistance of drugs, only a few individuals had treatment support. Hence the low living standards and lack of support played a huge role, in influencing non-adherence to TB treatment. Chi-square test results indicated that social economic related factors had no significant effect on Health Behaviour - Non-adherence or adherence to TB treatment.

## **8. Conclusions**

The study found out that the adherence to TB treatment is a multidimensional phenomenon that is determined by several factors which include; patient-related conditions, social economic conditions related to the patients and healthcare conditions. The study concludes that the social-economic related factors associated with non-adherence of TB treatment among patients in Murang'a County in the bivariate analysis include the employment status, monthly income, and assistance in taking drugs. Particularly, the low income and lack of assistance in taking the TB drugs are concluded to be the social-economic related factors with the most influence. The study also concludes that the health-care related factors associated with non-adherence of TB treatment amongst patients in Murang'a County include; TB clinic opening time and duration at the clinic before being attended, location of collecting TB drugs, distance travelled to collect drugs, cost to reach hospital facility and staff attitude on drug collection points. The unfavorable health-care related factors have been concluded to demotivate the patients from collecting and taking the TB drugs.

Comparatively, the study concluded that the patient-related factors that influence the patients' non-adherence to TB treatment to be cigarettes smoking, alcohol intake, the importance of taking TB drugs daily for the correct duration and availability of treatment support. The patients' related factors are concluded to have the least impact on non-adherence to the TB drugs and thus may be easily prevented through educating the patients. Finally, the study concludes that there are challenges facing adherence of TB treatment which ought to be addressed. The study, suggests that measures to improve drug adherence such as improving health conditions, increasing the availability of drugs and conducting health educations to the patients is essential in minimizing the drug non-adherence to TB drugs.

## **9. Recommendations**

The study established that non-adherence does exist among the TB patients in Murang'a County. The study thus recommends that measures should be undertaken so as to reduce the non-adherence level. The study established that some patients traveled away or were unavailable from the treatment centers and this resulted in non-adherence. The mistreatment of patients from health personnel and poor service delivery from health facilities also forces the patient not adhere to their medication. This study recommends health facilities implement strategies to ensure that patients are better served and treated in the health facility. Therefore, the study recommends that additional drugs should be provided so as to cater for the duration in which the patients will be away. The patients should also be encouraged to take drugs from the nearest drugs centers to them in case they run out of drugs. Patients mostly consumed alcohol and smoked cigarettes which contributed to the non-adherence as substance abuse is associated with forgetfulness and negligence. This study recommends that these individuals should be taken to counselling and constantly followed up with the health facility to ensure they take their medication. Patients who tested positive for TB were unwilling to disclose their

status as a result of stigmatization. Measures like counselling should be put in order to help patients in such circumstance to deal with these issues and to progress with their treatment


## REFERENCES

- Al-Hajjaj, M. S., & Al-Khatim, I. M. (2000). High rate of non-compliance with anti-tuberculosis treatment despite a retrieval system: a call for implementation of directly observed therapy in Saudi Arabia. *The International Journal of Tuberculosis and Lung Disease: The Official Journal of the International Union Against Tuberculosis and Lung Disease*, 4(4), 345–349.
- Ali, A., & Prins, M. (2016). Patient non adherence to tuberculosis treatment in sudan: Socio-demographic factors influencing non-adherence to tuberculosis therapy in Khartoum State. *The Pan African Medical Journal*, 25.
- Ali, N. S. (2002). Prediction of coronary heart disease preventive behaviors in women: a test of the health belief model. *Women & Health*, 35(1), 83–96. [https://doi.org/10.1300/J013v35n01\\_06](https://doi.org/10.1300/J013v35n01_06)
- Anuwatnonthakate, A., Limsomboon, P., Nateniyom, S., Wattanaamornkiat, W., Komsakorn, S., Moolphate, S., ... Varma, J. K. (2008). Directly Observed Therapy and Improved Tuberculosis Treatment Outcomes in Thailand. *PLOS ONE*, 3(8), e3089. <https://doi.org/10.1371/journal.pone.0003089>
- Becker, H., & Maiman, A. (1975). Social behavioral determinants of compliance with health and medical care recommendations. *Med Care*, 10–24.
- Chani, K. (2010). *Factors Affecting Compliance to TB Treatment in Andana Karango Region, Namibia* (Unpublished Masters Dissertation). University of South Africa, Pretoria, South Africa.
- Chowdary, K. P. R., Sumalatha, G., Gouri, K. S., & Dani, K. J. S. (2017). A prospective observational study on prescription pattern, drug utilization and audit for the treatment of tuberculosis in a tertiary care hospital in Andhra Pradesh. *Indo American Journal of Pharmaceutical Sciences*, 4(6), 1636–1640.
- Cindy, N. D. (2013). *Factors Contributing to Non-Compliance to Pulmonary Tuberculosis Treatment among Patients in Waterberg District, Limpopo Province* (Unpublished Master in Public Health Thesis). University of South Africa, Pretence, South Africa.
- Cockerham, W. C. (2001). *Medical Sociology*. Upper Saddle River, NJ: Prentice Hall.
- Cremers, A., de Laat, M., & Kapata, N. (2015). Assessing the consequences of stigma for tuberculosis patients in urban Zambia. *PLOS ONE*, 10(3).
- Daniel, O. J., Oladapo, O. T., & Alausa, O. K. (2006). Default from tuberculosis treatment programme in Sagamu, Nigeria. *Nigerian Journal of Medicine: Journal of the National Association of Resident Doctors of Nigeria*, 15(1), 63–67.
- Danso, E., Addo, I. Y., & Ampomah, I. G. (2015). Patients' Compliance with Tuberculosis Medication in Ghana: Evidence from a Periurban Community [Research article]. <https://doi.org/10.1155/2015/948487>
- De Vos, A. S. (2007). *Research at Grassroots* (3rd ed.). Pretoria, South Africa: Van Schaik.
- DeRiemer, K. (2001). *Risk Factors for Defaulting from Treatment Among SputumSmear Positive Pulmonary Tuberculosis Cases: A Matched Case-Control Study in Rio de Janeiro City, Brazil*. London, UK: Lancet.
- Dodor, E. A., & Afenyadu, G. Y. (2005). Factors associated with tuberculosis treatment default and completion at the Effia-Nkwanta Regional Hospital in Ghana. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 99(11), 827–832. <https://doi.org/10.1016/j.trstmh.2005.06.011>

- Fagundez, G., Perez-Freixo, H., Evenc, J., Momo, J., & Bive, L. (2016). Treatment adherence of tuberculosis patients attending two reference units in Equatorial Guinea. *PLOS ONE*, *11*(9).
- Friedman, H. S. (2002). *Health Psychology*. Upper Saddle River, NJ: Prentice Hall.
- Furber, A. S., Hodgson, I. J., Desclaux, A., & Mukasa, D. S. (2004). Barriers to better care for people with AIDS in developing countries. *BMJ: British Medical Journal*, *329*(7477), 1281–1283.
- Gandhi, N. R., Moll, A., Sturm, A. W., Pawinski, R., Govender, T., Lalloo, U., ... Friedland, G. (2006). Extensively drug-resistant tuberculosis as a cause of death in patients co-infected with tuberculosis and HIV in a rural area of South Africa. *Lancet (London, England)*, *368*(9547), 1575–1580. [https://doi.org/10.1016/S0140-6736\(06\)69573-1](https://doi.org/10.1016/S0140-6736(06)69573-1)
- GOK. (2011). *National Tuberculosis Control Programme (NLTP)* [Annual report]. Nairobi, Kenya: Government of Kenya.
- GOK. (2014). *Murang'a County* [Annual report]. Nairobi, Kenya: Government of Kenya.
- GOK. (2019). *National Strategic plan on TB*. Government of Kenya.
- Hailu, T., Azar, T., & Shojaezadeh, D. (2015). Tuberculosis treatment non-adherence and lost to follow-up among TB patients with or without HIV in developing countries: A systematic review. *Iranian Journal of Public Health*, *44*(1), 1.
- Herrero, M., Ramos, S., & Arrossi, S. (2015). Determinant of non-adherence to tuberculosis treatment in Argentina: Barriers related to access to treatment. *Revista Brasileira de Epidemiologia*, *18*, 287–298.
- IUATLD. (2010). *Management of tuberculosis: a guide to the essentials of good practice*. Paris, France: International Union against Tuberculosis and Lung Disease.
- Jakubowiak, W. M., Bogorodskaya, E. M., Borisov, S. E., Borisov, E. S., Danilova, I. D., Danilova, D. I., ... Kourbatova, E. K. (2007). Risk factors associated with default among new pulmonary TB patients and social support in six Russian regions. *The International Journal of Tuberculosis and Lung Disease: The Official Journal of the International Union Against Tuberculosis and Lung Disease*, *11*(1), 46–53.
- Karumbi, J., & Garner, P. (2015). Directly observed therapy for treating tuberculosis. *The Cochrane Database of Systematic Reviews*, *1*.
- Kastien, T., Abulfathi, A., Rosenkranz, B., & Bennett, B. (2016). Health-related quality of life and its association with medication adherence in active pulmonary tuberculosis. *Health and Quality of Life Outcomes*, *14*(1), 42.
- Kenya Law Review. (2014). Petition 329: A Legal Challenge to the Involuntary Confinement of TB Patients in Kenyan Prisons [Health and Human Rights Journal]. Retrieved July 20, 2018, from <https://www.hhrjournal.org/2016/06/petition-329-a-legal-challenge-to-the-involuntary-confinement-of-tb-patients-in-kenyan-prisons/>
- Kothari, C. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Delhi, India.: New International.
- Kothari, C. (2009). *Research Methodology: Methods and Techniques* (2nd ed.). New Delhi, India: Age publishers.
- Maragua Level 4 Hospital. (2017). *Central Tuberculosis Registry*. Maragua, Kenya: Maragua Level 4 Hospital.
- MOH. (2007). *Annual Report*. Nairobi, Kenya: National Tuberculosis, Leprosy and Lung Disease Program.
- MOH. (2014). *National Strategic Plan for Tuberculosis, Leprosy and Lung Health 2015-2018*. MOH.
- MOH. (2015). *National Strategic Plan and Tuberculosis, Leprosy and Lung Health 2015-2018*. Nairobi, Kenya: Government of Kenya.

- Mokgoadi, B. D. (2002). *Knowledge, Beliefs and Feelings about Tuberculosis Among Hospitalised Patients at Dr Machupe Mphahlele Memorial Hospital in the Limpopo Province of South Africa*. Polokwane, South Africa: University of Limpopo.
- Mugenda, M., & Mugenda, G. (2003). *Research Methods: Quantitative and Qualitative Approaches*. Nairobi, Kenya: African Center for Technology Studies.
- Murray, M., Oxlade, O., & Lin, H.-H. (2011). Modeling social, environmental and biological determinants of tuberculosis. *The International Journal of Tuberculosis and Lung Disease: The Official Journal of the International Union Against Tuberculosis and Lung Disease*, 15(6), 64–70. <https://doi.org/10.5588/ijtld.10.0535>
- Muturu, B. N., Keraka, M. N., Kimuu, P. K., Kabiru, E. W., Ombeka, V. O., & Oguya, F. (2011). Factors associated with default from treatment among tuberculosis patients in Nairobi province, Kenya: A case control study. *BMC Public Health*, 11, 696. <https://doi.org/10.1186/1471-2458-11-696>
- Obwoye, R. O. (2016). Factors Contributing to Patient Default of Tuberculosis Treatment in Health Facilities Within Nakuru East and West Sub-Counties-Kenya. *Journal of Family Medicine and Health Care*, 2, 108. <https://doi.org/10.11648/j.jfmhc.20160204.23>
- Osterberg, L., & Blaschke, T. (2005). Drug therapy: Adherence to Medication. *The New England Journal of Medicine*, 353, 487–497.
- Pandit, N., & Chaudhery, S. K. (2008). A Study of Treatment Compliance in directly observed Therapy for Tuberculosis. *India Journal of Communist Medicine*, 31(4), 241–243.
- Raviglione, M., & Poznyak, V. (2017). Targeting harmful use of alcohol for prevention and treatment of tuberculosis: A call for action. *European Respiratory Journal*, 50(1).
- Rosenstock, I. M. (1974). Historical Origins of the Health Belief Model. *Health Education Monographs*, 2(4), 328–335. <https://doi.org/10.1177/109019817400200403>
- Ruru, Y., Matasik, M., Oktavian, A., Senyorita, R., & Mirino, Y. (2018). Factors associated with non-adherence during tuberculosis treatment among patients treated with DOTS strategy in Jayapura, Papua Province, Indonesia. *Global Health Action*, 11(1).
- Tang, Y., Zhao, M., Wang, Y., Yin, X., & Zhao, A. (2015). Non-adherence to anti-tuberculosis treatment among internal migrants with pulmonary tuberculosis in Shenzhen, China. *BMC Public Health*, 15(1), 474.
- Theron, G., Peter, J., Zijenah, L., & Chanda, D. (2015). Psychological distress and its relationship with non-adherence to TB treatment. *BMC Infectious Diseases*, 15(1), 253.
- Tola, H., Shojaeizadeh, D., Tol, A., & Garmaroudi, G. (2016). Psychological and educational intervention to improve tuberculosis treatment adherence in Ethiopia based on the health belief model. *PLOS ONE*, 11(5).
- Triasih, R., Padmawati, R., & Duke, T. (2016). A mixed-methods evaluation of adherence to preventive treatment among child tuberculosis contacts in Indonesia. *The International Journal of Tuberculosis and Lung Disease*, 20(8), 1078–1083.
- UN. (2015). *The Sustainable Development Goals 2015-2030*. United Nations.
- van Hoorn, R., Jaramilo, E., & Collins, D. (2016). The effects of psycho-emotional and socio-economic support for tuberculosis patients on treatment adherence and treatment outcomes. *PLOS ONE*, 11(4).
- Vernon, A. (2013). Treatment of latent tuberculosis infection. *Seminars in Respiratory and Critical Care Medicine*, 34(1), 67–86. <https://doi.org/10.1055/s-0032-1333544>
- Wasonga, J. (2006). *Factors contributing to Tuberculosis Treatment Defaulting among Slum Dwellers in Nairobi, Kenya*. Nairobi, Kenya: the Gardiner/Cardwell Group.
- WHO. (2004). *Guidelines for implementing community-based TB care programmes*. Geneva, Switzerland: WHO.

- 
- WHO. (2010). *Management of tuberculosis training for health facility staff*. Geneva, Switzerland: WHO.
- WHO. (2011). *Community Involvement in Tuberculosis Prevention*. Geneva, Switzerland: WHO.
- WHO. (2012). *Global Tuberculosis Control Report*. Geneva, Switzerland: WHO.
- WHO. (2013). *Global TB Control, Surveillance Plans, and Financing Report*. Geneva, Switzerland: WHO.
- WHO. (2018). *Tuberculosis (TB)*. Geneva, Switzerland: World Health Organization.
- World Health Statistics. (2015). *WHO Library Cataloguing-in-Publication Data*. World Health Organisation.

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