

# Compliance and Factors Associated with Tuberculosis Treatment among Adult TB Patients in Harari Regional State, Eastern Ethiopia

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**ABSTRACT:** Background: Tuberculosis is a major public health problem in many parts of the world. Nearly one-third of the world's population is infected with tubercle bacilli and hence at risk of developing active disease. Treatment success remains low globally because of low compliance and other associating factors. This study designed to assess compliance and factors associated with tuberculosis treatment among adult clients.

Methods: Cross-sectional study conducted from March 1 to April 20, 2019 in Harar, Eastern Ethiopia. A total of 365 tuberculosis clients on therapy were included by convenient sample technique. Associations between selected factors with compliance identified by adjusted odds ratios and with their 95% confidence intervals for crude odds ratio with  $p < 0.25$  variables was considered a significant point to be at  $P < 0.05$ .

Result: among study participant 320 clients were compliant (87.7%, 95% CI: 84.4-91%). Those clients who had supporter (AOR: 4.58, 95% CI: 1.74-12.08), close to the facility (AOR: 6.60, 95% CI 2.51-17.37), knowledge of seriousness of TB and daily of dose (AOR: 3.36, 95% CI: 1.20-9.39), (AOR: 3.31, 95% CI: 1.01-10.88) respectively associated with high compliance.

Conclusion: Magnitude of compliance in study area was 87.7%. Patient compliance to TB treatment is associated with supporter during medication taking, having knowledge of prescribed dose, patient knowledge of TB disease and shorter distance from the facility. Ensuring patient adherence and supervision of therapy, patient support and tight introduction of follow-up strategies should be applied for better TB control.

**Keywords:** Compliance, Non-compliance, Adherence, Tuberculosis, Tuberculosis treatment

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## 1. INTRODUCTION

### 1.1 Background

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. It typically affects the lungs (pulmonary TB) but can affect other sites as well (extra pulmonary TB). The disease is spread in the air when people who are sick with pulmonary TB expel bacteria. Overall, a relatively small proportion of people infected with *Mycobacterium tuberculosis* will develop TB disease [1]. It remains a global health crisis, claiming 1.3 million deaths in 2017. There were cases in all countries and age groups, but overall, 90% were adults (aged  $\geq 15$  years). Currently, Ethiopia ranks ninth among the 22 high burden countries in the world, and one of the top three in Africa, with regard to the TB patients [2].

The most effective method to control TB is by early identification and treatment. Low treatment compliance increases TB prevalence and causes the appearance of subtypes resistant to regular therapy [3]. This is particularly important in a country like Ethiopia, which lacks sufficient laboratory capacity to identify drug resistant strains and second line treatment options. Compliance is a complex, dynamic phenomenon with a wide range of factors affecting treatment-taking behavior. This includes medical, relating to adverse effects, and also social determinants [4].

Prevention and control effort against TB and Leprosy has been launched since 1994. Ethiopia has developed and implemented strategies, which are fully aligned with the globally recommended Stop TB Strategy, specifically by developing national TB treatment guideline. As a result, the country has achieved in reducing the incidence, prevalence and deaths related to TB. However, tuberculosis (TB) still remains a major public health problem claiming the lives of thousands of Ethiopians every year [5].

Compliance of TB treatment is critical in achieving success. One of the major barriers to successful treatment outcome is fail for compliance with treatment. Early detection may become useless without TB treatment compliance for preventing progression as well as preventing new transmission

and unfavorable treatment outcomes in TB patients [6]. Patients often find it difficult to complete their course of Anti TB treatment. Most of the time when they feel well after the first few months of treatment, at the time most of the tubercle bacilli have been killed, they stop taking the prescribed drugs. In addition, Personal factors, drug side effects, drug resistance leading to prolonged treatment periods, social and economic factors, and health system factors can further contribute to poor compliance to treatment [7]. That is why treatment success remains low, at 55% globally because of low treatment compliance and other associating factors [4].

According to hospital statistics data in Ethiopia [5], tuberculosis is the leading cause of morbidity, the third cause of hospital admission, and the first cause of hospital death in Ethiopia, nationally. This truth also reflected in Harari region. Annual report of last year clearly shows compliance gap by reporting eight deaths of TB patients. Tuberculosis control program using the DOTS strategy has been set as one of the disease control programs in the region too [8]. The question, why treatment success remains low, indicated the evidence of the gap for the effort made in the past.

Several attempts were tried to enable the patients to comply with the treatment, but still there is poor compliance that leads to missing from attendance. An assessment conducted by Global Tuberculosis Control revealed that about three million cases are missed by the health system [9]. These shows that all mandatory phenomena of compliance and non-compliance were not yet explored well. There was no single published research in the Eastern Ethiopia on the given topic and the emerging of multiple drug resistance and reported death of tuberculosis cases with its contributory factors in Harari region were the main concern to plan for this study.

Therefore, this study designed to look at different variables which could affect the compliance of treatment of patients diagnosed with TB. It would identify the medical and social components that explain the phenomenon of compliance to treatment in the Harari Regional State, Ethiopia and the degree of their effect on compliance. Knowledge of these factors will also help to orientate future actions taken within the framework of the National Program for TB Control with the purpose of containing the heightened rate of therapeutic failure, the increasing of circulation of drug-resistant strains, and therefore improving the overall control of TB.

## 2. MATERIALS AND METHODS

### 2.1 Study Area, Period and Design

The Harari Regional State is one of the nine Regional States of the Federal Democratic Republic of Ethiopia. The region is located in the eastern part at a distance of 515 km away from Addis Ababa, the capital city of Ethiopia. According to the 2007 census conducted by the Central Statistical Agency, the total population of the region is estimated to be 183,344 and this makes Harari a Region with least populous in the country. Out of these, 92,316 and 91,099 were males and females, respectively [10].

The Harari Regional administrative structure is divided into six urban and three rural administrative districts. The urban district is further divided into 19 Kebele. The region neighbors to the north with kombolcha and Jarso woreda to the east with Gursum and Babile wereda, in the south by Fedis and in the west with Awoday special word of Oromia regional state. There are two Hospitals, one police hospital, two private Hospitals and eight Health Centers serving the people of the Region. This study was conducted in Harari regional, state from March 1 to April 20, 2019. The study design was institution based cross-sectional study design.

### 2.2 Study Population

TB patients, those were enrolling in intensive and continuous phase of TB treatment. TB patients, those were on intensive with a minimum of seven days of therapy and continuous phase of TB treatment found in all facilities during data collection. Patients those age were  $\geq 18$  year and oriented were participating in the study.

### 2.3 Sample Size and Sampling Procedure/technique

Various significant factors were considered, and Epi-info version 7 used to calculate sample size. The assumptions for calculation were

- 95% CI,  $d = 5\%$ , power = 80%, ratio of exposed to unexposed 1:1 was used
- % of outcome among unexposed = 6.43%
- % of outcome among exposed = 15.59% [20]
- Calculated sample size by using epi-info is  $408 + 5\%$  NR =  $408 + 20 = 428$ , Therefore 428 were the final sample size for the study.

In Harari region, there are three hospitals and seven health centers currently providing TB treatment services and had TB cases reported in their 1<sup>st</sup> quarter report of the year. The rest facilities in the region did not have cases at the given period. According to the information obtained from Harari Health Bureau 1<sup>st</sup> quarter reported on October 2018, there were about 455 adult TB patients registered in the region [8]. Because of small size of study population all TB patients who were on treatment during the study period were become candidate in the study by using proportional allocation formula to distribute along the hospitals and health centers in Harari region. Convenience method used to collect data from the study participants from each health facility. The first patient who was visitor on the day of data collection during their follow up clinic selected for the interview.

### 2.4 Data Collection Methods

#### 2.4.1 Data collection instrument

English version of structured questionnaire adapted from different similar studies conducted in Africa and Ethiopia [11-13]. Further designed by using different peer reviewed published literatures. Questionnaires designed in English and translated to local languages (Amharic and Afan Oromo). The questionnaire was consisting of socio-demographic elements,

health care related characteristics, patient related factors, and Anti-TB therapy and diseases related characteristics of TB patients. Data collectors conducted the interview.

#### 2.4.2 Data collectors and data collection procedure

Data collectors recruited from nurses i.e., nine diploma nurses for data collection and two BSc nurses for supervision. Data collectors were introducing themselves with the study participants and provide all necessary details of information about the research to get the consent of the participants. The clients assured to feel free concerning the confidentiality of the information they would provide us. Then the patients, who agreed to participate, signed for her/his consent. The interview was conducted at selected health facilities. The data collectors collected face to face interview by using designed questionnaire. The interview conducted by nurses who can speak both Amharic and Afan Oromo and trained by the investigator on the details of the questionnaire by three approaches; self-report of missed dose that occurred within seven days prior to the study period, pill count and checking the DOTs registration book at the same time during their TB clinic visit.

#### 2.5 Data Processing and Analysis

Data was checked for completeness and consistency. Cleaning was done then the coded data entered into computer. Data entered by using Epidata 3.1 version and exported into SPSS version 21 for data analysis. Descriptive statistics used to generate compliance and non-compliance rate from frequency table. The patients those missed their doses or taking properly within the last seven days prior to the study period computed to determine compliance and non-compliance rate. Associations among selected factors and adherence were identified by calculating odds ratios (ORs) and with their 95% confidence intervals (CI) from an unconditional logistic regression model. Predictive variables that were independently and significantly associate with treatment compliance in bivariate analysis were included in a multiple logistic regression model to check the existence of association among selected candidate variables. It considered the significance point to be at  $P < 0.05$  [14].

#### 2.6 Operational Definitions and Definition of Terms

**Adherence:** In this study patients are said to have adhered to their treatment when they have taken their medication daily without having missed any single dose [15].

**Compliance:** In this study patients are said to have compliance to their treatment when they have taken their medication daily without having missed any single dose and measured by Morisky Scale [15].

**Score 100** is termed as high-level adherence/ high level compliance

**Score 96** is termed as good adherence/good compliance

**Score < 96** is considered as poor adherence/ poor compliance

**Directly Observed Therapy Short-course (DOTS):** strategy of tuberculosis treatment which involves direct observation and recording of the patient taking the medication, standardized regimens, and proper diagnostic and referral systems [16].

**Defaulters:** patients who took treatment for at least one month and discontinue it for more than eight consecutive weeks [5].

**Intensive (initial) phase:** This phase consists of treatment with combination of four drugs for the first 8 weeks for new cases, and with combination of five drugs for the first eight weeks followed by four drugs for the next four weeks for re-treatment cases. It renders the patient non-infectious by rapidly reducing the load of bacilli in the sputum, usually within 2-3 weeks except in case of drug resistance [17].

**Continuous phase:** This phase immediately follows the intensive phase and is important to ensure cure or completion of treatment. It is necessary in order to avoid relapse after completion of treatment. This phase requires treatment with a combination of two drugs, to be taken for 4 months for new cases and treatment with a combination of three drugs for re-treatment cases for 5 months [17].

**New TB cases:** refers to patients have never been treated for TB or have taken anti-TB drugs for less than 1 month [5].

**Knowledge about TB disease:** Those who can identify communicability, curability, preventability and the chronic nature of TB disease based on questions prepared to assess comprehensive knowledge of TB will be labeled as having good knowledge of TB disease and those fail to identify these parameters entirely will be labeled as having poor knowledge of TB disease [15].

**Knowledge about TB treatment:** Those who can identify daily dose, treatment duration, and side effect of TB treatment based on questions prepared to assess comprehensive knowledge of TB treatment will be labeled as having good knowledge of TB treatment and those fail to identify these parameters entirely will be labeled as having poor knowledge of TB treatment [15].

**Non-adherence/noncompliance:** A patient is said to be non-adherent if he/she missed one or more of the doses of the prescribed anti-TB drugs [18].

**TB therapy side effect:** Tuberculosis medicine has many side effects, such as nausea and vomiting, yellow skin and eyes (jaundice), tingling and numbness in the hands and feet and skin rashes among others [17].

**TB patient:** One in which a health worker has diagnosed TB and has decided to treat the patient with a full course of TB treatment [19].

## 2.7 Data Quality Control

Training was given to the data collectors and supervisors on the objective, materials, communication method, interviewing, simulation of data collection, how to handle any possible problem that might appear during collection of data and how to maintain confidentiality and privacy for a day.

The validity and reliability of the instrument tested with pretest before data collection process. Pretest was conducted by data collectors at Bisidimo hospital on 5% of sample size (21 patients). Based on the pre-test, questionnaire was revised and edited with necessary modification. A close supervision of the data collectors and proper data handling data was given attention in high priority throughout the collection of data.

## 2.8 Ethics Approval

Ethical clearance obtained from Haramaya University, College of Health and Medical Sciences, Institutional Health Research Ethics Review Committee (IHRERC). A formal letter for permission and support was written to Harari Health bureau. Then Harari Health bureau in return wrote letter of cooperation for all perspective facilities those were rendering services. All the study participants informed about the purpose of the study including their right to refuse or withdraw from the study at any spot. Informed, voluntary, written and signed consent obtained from all study participants prior to conducting interview. The respondents were told that the information obtained from them treated with confidentiality and without causing any form of harm to them. Those who were found non-compliance, the team of this study communicated with head of the facility and TB focal person to take the responsibility to help the patient and secure the issue.

## 3. RESULTS

### 3.1 Sociodemographic Characteristics of the Respondents

A total of 365 respondents were involved in this study, which make a response rate of 85.3%. The mean age of the respondents was 32.75 ( $\pm 12.57$  SD) years. Majority of the study participants were male (54.8%). Most of the study participants were unmarried (51%).

The study identified that 191(52.3%) clients were in the intensive phase of treatment. Most of respondents had support during the medication taking 290 (79.4%). Concerning types of facilities those accommodating clients, 213 (58.3%) clients were in health centers (Table 1).

Variable	Frequency	Percent
<b>Sex</b>		
Male	200	54.8
Female	165	45.2
<b>Age</b>		
18-33	226	61.9
34-49	95	26.0
50-75	44	12.1
<b>Marital status</b>		
Unmarried	187	51

Married	134	37
Widow/divorced	44	12.1
<b>Educational status</b>		
Not schooling	107	29.3
First cycle (1-4)	56	15.3
Second cycle (5-8)	68	18.6
Third cycle (9-12)	85	23.3
Above 12 grade	49	13.4
<b>Occupational status</b>		
Unemployed	109	29.9
Government workers	52	14.2
Private workers	106	29.0
Students	50	13.7
Farmers	48	13.2
<b>Residence</b>		
Urban	232	63.5
Rural	133	36.4
<b>Type facilities</b>		
Hospital	152	41.6
Health center	213	58.3
<b>Support during treatment</b>		
Yes	290	79.4
No	75	20.5
<b>Type of TB</b>		
Pulmonary TB	271	74.2
Extra pulmonary TB	94	25.7
<b>Phase of treatment</b>		
Intensive phase	147	40.2
Continuous phase	218	59.7

**Table 1:** Socio-demographic characteristics of TB patients attending TB follow up clinic (n=365) in health facilities in Harari regional state, Eastern Ethiopia, 2019.

### 3.2 Knowledge of TB Related Characteristics

Majority of respondents in the study had high knowledge about TB disease transmission (95%). About 85% of the clients had knowledge of curability of TB disease. Most of study participants had low knowledge about the chronic nature of TB disease (51.5%) (Table 2).

Variable	Frequency	Percent
<b>Cause of TB</b>		
Germ	251	68.7
Hereditary	10	2.7
Smoking cigarettes	46	12.6
Blowing wind	58	16.2
<b>TB transmission</b>		
Yes	347	95.1%
No	2	0.5%
I don't know	16	4.4%
<b>Is TB preventable</b>		
Yes	315	86.3%
No	2	0.5%
I don't know	48	13.2%
<b>Is TB serious disease</b>		
Yes	274	75.1%
No	82	22.5%
I don't know	9	2.5%



Is TB curable disease		
Yes	313	85.8%
No	5	1.4%
I don't know	47	12.9%
Is TB chronic disease		
Yes	188	51.5%
No	137	37.5%
I don't know	40	11%

**Table 2:** Knowledge of TB related characteristics of TB patients attending TB follow up clinic in health facilities in Harari region, Eastern Ethiopia, 2019. (n=365).

### 3.3 TB Treatment and Facility Related Characteristics

The majority of respondents 342(95.3%) were comfortable with their site of follow up. About 36 (9.9%) study participants did not get advice on TB treatment compliance during their follow up. In this study, 36.7% of participants perceived that TB treatment had no side effect at all and 52(14.2%) of clients did not know where the drugs had side effect or not (Table 3).

Variable	Frequency	Percent
Site of follow up		
Convenient	348	95.3
Inconvenient	17	4.7
Distance from facility		
< 3 km	276	75.6
≥ 3 km	89	24.3
Waiting time		
≤ 30 minutes	317	86.8
> 30 minutes	48	13.1
Shortage of drugs		
Yes	17	4.6
No	348	95.3
Advice on treatment compliance		
Yes	264	72.3
No	101	27.7
Knowing daily dose		
Yes	339	92.9
No	26	7.1
Drugs side effect		
Yes	179	47
No	134	36.7
I don't know	52	14.2

**Table 3:** TB treatment and facility related characteristic of TB patients attending TB follow up clinic in health facilities in Harari region, Eastern Ethiopia, 2019 (n=365).

#### 3.3.1 Compliance related characteristics

The study used three approaches to assess the clients with their treatment compliances. Self-report of missed dose that occur within seven days prior to the study period, pill count and checking the DOTs registration book at the same time during their TB clinic visit.

The study identified TB treatment compliance and non-compliance rate and level as follow.

#### 3.3.2 Compliance rate and level

Compliance rate was 320 (87%) and Non-compliance 45 (12.3%) among respondents. Compliance level 320 (87.7% of the respondents those missed none of their dose) were high level compliance which score 100% level and Non-compliance 45 (12.3% of respondents those missed one or more dose). Whereas Level of compliance among non-compliance 37(10.1% of respondents those missed only one dose) had good compliance level which score 96% level, but 8 (2.2% of respondents those missed two doses) had poor compliance level which score < 96% level (Table 4).

Variable	Frequency	Percent
Compliance rate		
Compliance	320	87.7%
Noncompliance	45	12.3%
No of missed dose		
None	320	87.7%
One	37	10.1%
Two	8	2.2%
Carelessness during taking drugs		
Yes	14	3.8%
No	351	96.2%
Missing dose by forgetting		
Yes	13	3.6%
No	352	96.4%
Stopping drug when feel worse		
Yes	11	3%
No	354	97%
Stopping drug when feel better		
Yes	7	1.9%
No	358	98.1%

**Table 4:** Compliance related characteristic of TB patients attending TB follow up clinic in health facilities in Harari region, Eastern Ethiopia, 2019. (n=365).

### 3.4 Factors Associated with TB Treatment Compliance

In the analysis of multivariable logistic regression, there were significant relationship between multiple variables; participants whose educational level between 9-12 grade were 7.13 times more likely compliance with TB treatment (AOR: 7.13, 95% CI: 1.14-44.46, p value = 0.03). In the other hand, clients those understand the seriousness of TB disease 3.36 times higher comply (AOR: 3.36, 95% CI: 1.20-9.39, p-value=0.02). Participants those had supporter during treatment were 4.58 times higher comply with TB treatment (AOR: 4.58, 95% CI: 1.74-12.08, p-value = 0.002).

Clients those were know their daily dose 3 times higher comply than those fail to know their daily dose (AOR: 3.31, 95% CI: 1.01-10.88, p-value= 0.04). Patients those traveling less than three km to get services, they were 6.6 times more

likely to compliance with their treatment (AOR; 6.60, 95% CI: 2.51-17.37, p-value <0.001). Clients those were waiting  $\leq$  30 minutes to get service 4.3 times higher than those waiting

more (AOR: 4.37, 95% CI:1.45-13.14, p-value=0.008) (Table 5).

Variables	Response category	Compliance		Adjusted OR	
		Yes n (%)	No N (%)	(95%CI)	p-value
Compliance		320(87.7)	45(12.3)		
Sex	Female	151(41.4)	13(3.5)	2.39 (0.83-6.89)	0.10
	Male	169(46.3)	32(8.8)		
Age	18-33 year	199(62.2)	27(60)	0.41 (0.14-1.23) 1.74 (0.57-5.27)	0.10
	34-49 year	86(26.9)	9(20)		0.11
	50-75 year	35(10.9)	9(20)		0.32
Education level	Illiterate	98(30.6)	9(20)	7.53 (0.70-80.3) 14.46 (1.52-137) 6.93 (0.85-56.3) 7.13 (1.14-44.4)	0.09
	1-4 grade	48(15)	8(17.8)		0.02
	5-8 grade	57(17.8)	11(24.4)		0.07
	9-12 grade	71(22.2)	14(31.1)		0.03
	> 12 grade	46(14.4)	3(6.7)		0.04
Current occupation	Unemployed	97(30.3)	12(26.7)	4.77 (0.95-23.9) 0.70 (0.20-2.45) 0.97 (0.20-4.61) 0.16 (0.02-1.09)	0.04
	Gov'n't-employee	41(12.8)	11(24.4)		0.05
	Private-employee	93(29.1)	13(28.9)		0.57
	Students	44(13.8)	6(13.3)		0.97
	Farmers	45(14.1)	3(6.7)		0.06
Knowledge of TB seriousness	Yes	252(78.8)	22(48.9)	3.36 (1.20-9.4)	0.02
	No	68(21.3)	23(51.1)		
Knowledge of TB chronicity	Yes	172(53.8)	16(35.6)	1.38 (0.51-3.7)	0.51
	No	148(46.3)	29(64.4)		
Treatment supporter	Yes	269(73.7)	21(5.7)	4.58 (1.74-12.1)	0.002
	No	51(13.9)	24(6.5)		
Follow up site	Convenient	309(84.6)	39(10.7)	1.32 (0.21-8.1)	0.75
	Inconvenient	11(3.0)	6(1.6)		
Knowledge of daily dose	Yes	303(83)	36(9.8)	3.31 (1.01-10.8)	0.04
	No	17(5)	9(3.2)		
Distance from facility	$\leq$ 3 km	261(71.5)	15(4.1)	6.60 (2.51-17.4)	<0.001
	> 3 km	59(16.2)	30(8.2)		
Waiting time	$\leq$ 30 minutes	285(78)	32(8.7)	1.40 (0.24-8.24)	0.70
	> 30 minutes	35(9.5)	13(3.6)		
Advice on compliance	Yes	294(80.5)	35(9.5)	1.18 (0.33-4.23)	0.79
	No	26(7.1)	10(2.7)		

Significant at: p value less than 0.05, 1.00 = reference.

**Table 5:** Multi-variable logistic regression analysis of factors associated with non- compliance of TB patients attending at TB follow up clinic in health facilities in Harari region, Eastern Ethiopia, 2019 (n=365).

## 4. DISCUSSION

The study found that the majority of patients with TB were compliance with treatment. Factors associated with non-adherence included lack of supporter at home, traveling far to get service, poor knowledge about TB disease and treatment were significant.

This study revealed the overall compliance with TB treatment in the region was 87.7% which was higher than similar study conducted in Nepal that identified only 61% [20], 74.2% in Southeast Nigeria in Nnamdi Azikiwe. [21], 78.57% in Equatorial Guinea [13], 65% in one Kenyan rural region [13] and 70% in Southern Ethiopia, Hadiya zone, [22]. This might

be happened as a result of relatively better effort made in the Harari region.

The treatment compliance identified in this study was in consensus with the study conducted in Kosovo, 85.5% [23], 86.5% in South Africa [24], 83.6% in Kassala State, Sudan [14], 86% in Khartum, Sudan, [25], 90.5% in Kusumu East sub-country in Kenya [6]. 85.3% Arba Minch [26], 88.5% in Almata, Tigray [27], and 90% in Gondar, Northwest Ethiopia [28]. This might be due to similar trends they had followed during implementation made them to achieve similar achievement in treatment compliance.

In contrary, the research conducted in Mekele showed 97% compliance [29], but the magnitude of compliance in Harari region is much lower. This difference might be occurred due to less effort of DOTs Program implementation in Harari region.

In this study, respondents knowledgeable about seriousness of TB disease were significant with TB treatment compliance (AOR; 3.36, 95% CI 1.20-9.39; p-value =0.02). This was in line with the study conducted in Kisumu, Kenya which established significance with p-value <0.001, [6]. This might be due to similar activities of awareness creation through health education on TB.

In this study, the clients' knowledge of daily dose was significant to treatment compliance (AOR; 3.31 95% CI 1.01-10.88, p=0.04). This was similar with study conducted in Kosovo that significant with p-value <0.0001, [23]. This might be the knowledge of daily dose bring concern and encouragement to the clients for better compliance.

This study identified that patients those had supporter during treatment were 4.58 times higher compliance (AOR; 4.58, 95% CI 1.74-12.08, p= 0.002). This study showed significant variation between the compliance rate of the patients with the study conducted in Tanzania (AOR: 0.08; 95% CI: 0.02–0.25; p<0.001), [7], Southern Ethiopia, Hadiya zone, (AOR; 6.59 95% CI [2.65-16.41]), [22], and study conducted in Mekelle, Ethiopia, (AOR=3.73, 95% CI=1.15-12.11), [30]. This might be the presence of supporter during medication administration at home encouraged the patients to adhere properly.

In this study clients those travel less than 3 km to reach facility get services had 6.6 times higher comply with treatment. This study was in line with study conducted in study conducted in Hadiya, Ethiopia, (AOR=2.99 [1.06, 8.44]), [22], Patients, with far residence area away from the facility were less likely to adhere to treatment than those with less distance This significance might be due to easily accessing for treatment that might enhance compliance.

## 5. STRENGTH AND LIMITATION OF THE STUDY

Collecting data by using three approaches, that is, asking participants to self-report of missing dose, pill count and checking the registration book of DOTs for confirmation was the strength. Whereas the study included only adult patients, so generalization of the findings limited to adult TB patients' populations. Self-reporting by participants also could have led to inaccurate information either by recall bias or not wanting to be viewed as negligent in their drug-taking.

## 6. CONCLUSION

The magnitude of compliance in the study area was 87.7%. Generally, supporter during medication taking, having knowledge of prescribed dose, patient knowledge of TB disease and shorter distance from the facility have significantly contributed to patient's compliance to TB

treatment in Harari region. So one of the important things for TB control programs is to maximize TB treatment compliance. This study suggests that reducing patient waiting times at the TB clinic, improving patient TB treatment literacy, enhancing social support for the patients and improving accessibility of services would improve TB treatment compliance in Harari Region.

## 7. AUTHORS' CONTRIBUTION

Mohammed Yusuf developed proposal, conduct data collection analyzed and interpreted result, Biftu Geda draft review, and Nega Assefa draft review. All authors approved the manuscript.

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