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Adherence to Tuberculosis Treatment and Its Associated Factors among Drug-susceptible Tuberculosis Patients in Lira District, Northern Uganda

Jannat Nabaziwa[1], Eustes Kigongo[1], Amir Kabunga[2], Walter Acup[1], Sean Steven Puleh[3]

[1]Department of Environmental Health and Disease Control, Faculty of Public Health, Lira University, [2]Department of Psychiatry, Faculty of Medicine, Lira University, [3]Department of Epidemiology and Biostatistics, Faculty of Public Health, Lira University

Corresponding Author Email: akabunga@lirauni.ac.ug

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Abstract

Uganda has a high incidence of tuberculosis infection at 200 cases per 100,000 people. With effective therapy and adherence to medications is essential for reducing the spread of tuberculosis in the community. However, many of the initiated patients do not get to finish the entire course of treatment. The purpose of this study was to investigate the level of and factors associated with tuberculosis treatment adherence among drug-susceptible tuberculosis patients in the Lira district. A facility-based cross-sectional survey was conducted among 234 randomly selected tuberculosis patients between October and December 2022. The Morisky medication adherence scale was used to measure adherence. Using a structured questionnaire to collect data on socio-demographic characteristics, community factors, and health service delivery factors associated with adherence. Binary logistic regression analysis was used to determine the correlates of adherence to tuberculosis drugs at a p value of 0.05. Most of the respondents (135, 57.7%) were males, (93, 39.7%) aged above 45 years, and (135, 57.7%) in a marital relationship. The prevalence of adherence to tuberculosis drugs was 84.6% (198/234) and was associated with marital status (AOR: 0.307; 95% CI: 0.13-0.0724, p=0.007) and the experience of stigma (AOR: 4.39; 95% CI: 1.612-11.958, p=0.004). The study reported that 2 in 10 drug-susceptible tuberculosis patients are non-adherent, which is lower than the targeted 90%. Marital status and stigma experience are predictors of non-adherence. Interventions by the ministry of health should target how to improve tuberculosis treatment and reduce stigma.

Keywords: Adherence, Resistance, TB Patient, Tuberculosis

Introduction

Tuberculosis is one of the top ten causes of death globally, and the leading cause is a single infectious agent, Mycobacterium tuberculosis (*WHO*, 2021). In 2021, an estimated 10 million people worldwide fell ill with tuberculosis (TB), including 5.5 million men, 3.3 million women, and 1.1 million children (*WHO*, 2021). TB is present in all countries and among all age groups(Snow et al., 2018). However, the highest burden lies in Sub-Saharan Africa, with 12% of the world's population generating 29% of the 9 million, where health services are already overstretched (Boru et al., 2017). In 2015, SSA generated 29% of the 9 million TB cases and had 254,000 TB-related deaths (Zumla et al., 2015). The region also bears the highest global TB/HIV burden, with over 50% of TB cases co-infected with HIV (Zumla et al., 2015). Uganda is one of the 30 WHO-designated countries with a high burden of TB and HIV. In 2019, the estimated incidence rate for TB was 200 per 100,000 population, and the mortality rate was 35 per 100,000 population (*Uganda – TREAT TB*, 2019). In 2017, the greater Northern region, including Karamoja, Lango, and West Nile, with a population of 7.2 million people, had an estimated incidence of 18,000 TB cases(Ug & A, 2020).

Study findings attribute TB incidence to the high level of non-adherence to treatment (Olwortho, 2019). This compromises the global target of successful treatment of 85% of detected TB cases. In Uganda, adherence estimates as measured by TB treatment completion rates range from 67 to 77% (Sekandi et al., 2020a). Different studies have been conducted to assess factors associated with adherence to tuberculosis drugs, but they have reported dissimilar factors. A recent study in Eritrea in 2018 reported short distances to health facilities, good communication, and acceptance of health care providers as facilitators of treatment adherence(Gebreweld et al., 2018). Another study in Ethiopia reported having a treatment supporter, perceived benefit, and perceived self-efficacy as independently associated with adherence to tuberculosis treatment (Gebreweld et al., 2018). Other studies have reported patient financial status, distance of health facility, marital status, drug side effects, stigma and discrimination, negative provider interactions, and long waiting hours at the health facility to affect adherence (Tesfahuneygn et al., 2015). However, there is a paucity of information about TB adherence in Lira district, and the above findings cannot be generalized given the unique context of Lira district.

The level of adherence to tuberculosis medications in Lira City is suboptimal. Over 631 patients were expected to be on TB treatment by the end of the fiscal year 2021/2022.However, only 321 were detected, of which only 63% completed treatment (USAID, 2022). A similar study in the Amolator district revealed a low level of adherence of 83.5% (Okuja, 2014). Non-adherence to tuberculosis treatment among patients is still a major barrier to successful TB treatment. This is likely to lead to prolonged periods of infectiousness, relapse, and emergence of drug resistance, increased morbidity and mortality, and cases of multidrug-resistant TB that are not easy to treat. This study aimed to examine the prevalence and factors associated with tuberculosis treatment adherence among drug-susceptible tuberculosis patients in Lira district, providing additional information for TB management and prevention decision-making, and providing a foundation for future research.

Methodology

Study Design and Setting

Between October and December 2022, a descriptive cross-sectional study was conducted in the Lira district of Northern Uganda. The research was carried out at Lira Regional Referral Hospital (LRRH), a public health facility in Lira district that serves the Lango sub-region. The

hospital provides general and specialist medical services, including treatment for TB, free of charge. Lira district is bordered by Pader district to the north, Otuke district to the northeast, Alebtong district to the east, Dokolo district to the southeast, Apac district to the southwest, and Kole district to the west. Lira district is dominated by the Lango people, with an estimated population of about 403,100.

Study Population

The study was conducted among drug-susceptible tuberculosis patients seeking treatment at Lira Regional Referral Hospital.

Inclusion and Exclusion Criteria

All patients were 18 years of age or older and had been on treatment for at least one month prior to data collection. They were approached to participate in the study. The study excluded health workers and other patients who were critically ill or bedridden at the time of data collection.

Sampling and Sampling Size

The study sample was calculated using the Kish Leslie formula (1965), using a proportion of 83.5% (Okuja, 2014), a Z value of 1.96 and a precision of 5%. After adjusting for 10% non-response, a total sample of 234 participants was obtained. A consecutive sampling procedure was used to obtain participants on every clinic day until the sample of 234 was attained.

Data Collection Materials

The study was conducted in October and December 2022. After approval of the study protocol, the district health authorities were approached and informed about the study. Sampling was done, and study participants were identified and approached to participate in the study after signing informed consent forms. Data were physically collected by five trained research assistants, and the process took around 15 minutes. Adherence was measured using the Morisky measurement scale. The questionnaire consisted of four sections: socio-demographic characteristics (7 questions), adherence to tuberculosis drugs (4 questions), and factors (10 questions). The tool was pretested among 24 patients in Ober Health Center IV in Lira district, and adjustments were made. The Cronbach alpha for the reliability of the tool was calculated and generated a coefficient of 0.83.

Statistical Analysis Methods

Data was entered into Microsoft Excel, where it was checked for errors, cleaned, and coded before final analysis in STATA (Stata Corp LLC, TX, USA) version 17 at three levels: descriptive, bivariate, and multivariate analysis. At a descriptive level, categorical variables were summarized as frequencies and proportions, while continuous variables were summarized as the mean (with standard deviation) or median (with interquartile range). Univariate logistic regression was done at the bivariate level to test the association between adherence to tuberculosis medication and factors, and crude odds ratios were reported. A binary logistic regression analysis was run to estimate the net effect of each independent factor on adherence at a 95% confidence interval. All variables with a p value of less than 0.05 were considered significant.

Results

Sociodemographic Characteristics

A total of 234 patients with drug-susceptible tuberculosis participated in the study, with a response rate of 100%. The majority of the participants were over the age of 45 (93.7%), male (135.7%), and (135.7%) in a marital relationship. More than half of the respondents (119, or 50.9%) were unemployed; only 8 (3.4%) were civil servants. The majority of respondents (112, 47.9) had completed primary school. See Table 1.

Table 1
Demographic characteristics

Variable	Frequency (N=234)	Percentage (%)
Sex		
Males	135	57.7
Females	99	42.3
Age		
24 and below	17	7.3
25-34	71	30.3
35-44	53	22.6
45 and above	93	39.7
Marital status		
In marital relationship	135	57.7
Not in a marital relationship	99	42.3
Religion		
Christian	222	94.9
Muslim	8	3.4
Others	4	1.7
Occupation		
Civil servant	8	3.4
Self-employed	89	38.0
Student	18	7.7
Unemployed	119	50.9
Level of education		
No formal education	58	24.8
Primary	112	47.9
Secondary	41	17.5
Tertiary	23	9.8

Adherence to Tuberculosis treatment

According to Table 2, 198 (84.6%) of 324 TB patients adhered to tuberculosis treatment.

Table 2
level of adherence to Tuberculosis medication

Adherence	Frequency	Percentage
Yes	198	84.6
No	126	16.4

Factors Determining Adherence to Tuberculosis Treatment

Table 3 shows that 212 (90.6%) of the respondents had adequate knowledge on tuberculosis and had heard from the hospital, while 107(45.7%) had insufficient knowledge. Only 24 (10.3%) of those polled said they were afraid of people finding out they had tuberculosis. Almost all of the 225 respondents (96.2%) had informed their family members that they had tuberculosis. Most of the respondents (221, or 94.4%) reported getting health education on tuberculosis at the facility, and more than half of the respondents (149, or 63.7%) stay more than 5 kilometers away from the hospital.

Table 3
Factors determining adherence to tuberculosis treatment

Factor	Frequency (N=234)	Percentage (%)
Knowledge on TB		
Knowledgeable	212	90.6
Not knowledgeable	22	9.4
Source of TB information		
Hospital	107	45.7
School	27	11.7
Radio	50	21.4
Friends\relatives	43	18.4
Others	7	3.0
Smoking status in 6 months		
Yes	8	3.4
No	226	96.6
Number of meals a day		
1meal	12	5.1
1-2 meals	168	71.8
>2 meals	54	23.1
Experience TB stigma		
Yes	24	10.3
No	210	89.7
Family know about TB status		
Yes	225	96.2
No	9	3.8
Presence of drugs at the hospital		
Always available	232	99.1
Sometimes available	2	0.9
Number of refills per month		
1-2 times	226	96.6
2-3 times	6	2.6
None	2	0.9
Receive health education at the hospital	221	94.4
Yes	13	5.6
No		
Distance to the hospital		
Within 5km	85	36.3
Above 5km	149	63.7

Bivariate Analysis of Treatment Adherence and Associated Factors

A bivariate analysis was conducted to determine factors associated with adherence to tuberculosis medication. Table 4 shows that the associated factors were marital relationship ($p = 0.03$), occupation ($p = 0.04$), level of education ($p = 0.01$), experience of stigma ($p = 0.01$), family support ($p = 0.003$), and access to health education ($p = 0.03$).

Table 4
Bivariate analysis of treatment adherence and associated factors

Variable	Adherence		COR	95% CI	P value
	Yes N (%)	No N (%)			
Age category					
<24 years	15(88.2)	2(11.8)	0.693	1.177-12.467	0.65
25-34 years	58 (81.7)	13 (18.3)	1.166	1.991-30.734	0.71
35-44 years	47(88.7)	6 (11.3)	0.664	0.308-7.86	0.43
>44 years	78 (83.9)	15 (16.1)	Ref		
Sex					
Female	85 (84.5)	14 (14.1)	0.846	0.409-1.750	0.65
Male	13 (83.7)	22 (16.3)	Ref		
Marital status					
In a relationship	109 (80.7)	26 (19.3)	3.272	1.097-9.759	0.03
Not in a relationship	89 (89.9)	10 (10.1)	Ref		
Religion					
Christian	189 (85.1)	33 (14.9)	Ref		
Muslim	9 (62.5)	3 (37.5)	1.909	0.491-7.424	0.35
Occupation					
Civil servant	0 (0)	8 (100)			
Self-employed	73 (82.0)	16 (18.0)	2.389	1.027-5.555	0.04
Student	16 (88.9)	2 (11.1)	1.352	0.273-6.791	0.71
Unemployed	109 (91.6)	10 (8.4)	Ref		
Level of education					
No formal education	52 (89.7)	6 (10.3)	0.216	0.771-5.358	0.01
Primary	98 (87.5)	14 (12.5)	0.212	1.098-8.759	0.01
Secondary	33 (80.5)	8 (19.5)	0.181	0.835-3.504	0.18
Tertiary	15 (65.2)	8 (34.8)	Ref		
Knowledge about TB					
Not knowledgeable	17 (77.3)	5 (22.7)	1.717	0.591-4.994	0.32
Knowledgeable	181 (85.4)	31 (14.6)	Ref		
Smoking					
No	192 (85.0)	34 (15.0)	0.333	0.265-9.717	0.45
Yes	6 (75.0)	2 (25.0)	Ref		
Meals in a day					
1 meal	9 (75.0)	3 (25.0)	3.267	0.661-16.150	0.15
1-2 meals	140 (83.3)	28 (16.7)	1.960	0.717-5.358	0.19
>2 meals	49 (90.7)	5 (9.3)	Ref		
Experience of stigma					
No	182 (86.7)	28 (13.3)	0.304	0.121-0.786	0.01
Yes	16 (66.7)	8 (33.3)	Ref		
Family support					
No	4 (44.4)	5 (66.6)	7.823	1.991-30.734	0.003
Yes	194 (86.2)	31 (13.88)	Ref		
Access to health education					
No	8 (61.5)	5 (38.5)	3.831	1.177-12.467	0.03

Yes	190 (86.0)	15 (16.1)	Ref		
Distance to Hospital					
Within 5kms	68 (80.0)	17 (20.0)	1.711	0.835-3.504	0.14
Beyond 5kms	130 (87.2)	19 (12.8)	Ref		

Predictors of Adherence to Tuberculosis Treatment

From the various factors assessed, marital status (AOR: 0.307; 95% CI: 0.13-0.0724, p = 0.007) and experience of stigma (AOR: 4.39; 95% CI: 1.612-11.958, p = 0.004) had statistically significant associations with adherence to tuberculosis treatment. Respondents who were not in a marital relationship were less likely to adhere to TB treatment compared to those who were in a marital relationship. Respondents who did not experience stigma were more likely to adhere to tuberculosis treatment compared to those who were stigmatized.

Table 5
Predictors of Adherence to Tuberculosis treatment

Treatment adherence	Adjusted Odds Ratio	p-value	95% Confidence Interval
Marital status			
In a marital relationship	1.00		
Not in a marital relationship	0.307	0.007	0.13-0.0724
Experience stigma			
Yes	1.00		
No	4.39	0.004	1.612-11.958

Discussion

Our results showed the adherence rate among drug-susceptible TB patients was 84.6% (79.4%–88.7%), and its predictors were marital status (AOR: 0.307; 95% CI: 0.13-0.0724, p=0.007) and experience of stigma (AOR: 4.39; 95% CI: 1.612-11.958, p=0.004). The 84.6% adherence rate observed in this study is lower than the 90% targeted by the national TB and leprosy program (USAID, 2022). Our findings are also lower than the 90.6% reported in Ethiopia (Gebremariam et al., 2021) but higher than 67% to 77% in Uganda in 2019 (Sekandi et al., 2020b), 64.2% in Ethiopia in 2021 (Gashu et al., 2021), 56.5% in South Korea in 2021(Bea et al., 2021), and 78.7% pooled prevalence from a systematic review conducted in Ethiopia in 2019 (Zegeye et al., 2019). This discrepancy may be attributed to differences in cultures, sample size, and settings. However, there is a need for more interventions to achieve the required target of 90%.

Our findings show that participants who were not in a marital relationship were less likely to adhere to TB treatment compared to those who were in a marital relationship. This may be attributed to the social support given by the partners. A spouse acts as a treatment advocate and also serves as a reminder for upcoming medical appointments. In line with our findings, a study conducted in Eastern China showed that patients who were divorced or widowed were more likely to miss medications compared to those who were married (Fang et al., 2019). Similarly, a study in China reported that single patients had difficulties meeting medical appointments and were more likely to default from routine multi-drug resistant (MDR) tuberculosis treatment (Li et al., 2021). In another similar quantitative survey conducted among migrant workers, divorce or being bereft of a spouse was a significant correlate of a non-adherence level of 16% (Zhou et al., 2012).

Our study also reported that respondents who experienced stigma were less likely to adhere to tuberculosis treatment compared to those who were not subject to stigma. Stigma plays a significant role in determining health and prevents the global eradication of tuberculosis (Daftary et al., 2018; Hatzenbuehler et al., 2013). Stigma that is either perceived, predicted, or experienced by people with tuberculosis is a complicated issue encompassing institutional and societal attitudes as well as personal experience (Courtwright & Turner, 2010). As a result of its negative impact on prompt diagnosis, medication uptake and adherence, and the psychological wellbeing of tuberculosis patients, there is growing recognition that TB stigma breaks the cascade of TB care (Cremers et al., 2015; Xu et al., 2017). Similar to our results, in Cambodia, it was discovered that delayed tuberculosis diagnosis was linked to tuberculosis stigma, rural living, seeking private healthcare, and self-medication prior to tuberculosis diagnosis (Teo et al., 2020). Other studies have demonstrated that the stigma associated with tuberculosis hindered people from seeking care, compromised their adherence to treatment, and had an adverse effect on their psychological wellbeing (Cremers et al., 2015; Xu et al., 2017). In general, stigma has negative consequences for one's health.

Study Limitations

The study reports some limitations. The study only involved patients attending the Lira regional referral hospital; those who stopped coming were therefore not represented. The study was cross-sectional and could not assess causality.

Conclusion

The study reported that 2 in 10 drug-susceptible tuberculosis patients are non-adherent, which is lower than the targeted 90%. Marital status and stigma experience are predictors of non-adherence. Interventions by the ministry of health should target how to improve tuberculosis treatment and reduce stigma.

Conflict of Interest Statement

No conflict of interest declared.

Contributorship

All authors greatly contributed to the writing of this paper. JN and SSP conceived the research concept. JN, EK, SSP and AK wrote the protocol. JN, AW and EK analyzed the data. JN, EK, AK and AW wrote the manuscript. AK made the final review of the manuscript and SSP gave overall guidance to the study.

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Data Availability Statement

The data is available from the corresponding author up on a reasonable request.

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