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THE EFFECT OF THE COMMUNITY-BASED- DIRECTLY OBSERVED THERAPY ON THE TREATMENT OUTCOME OF TUBERCULOSIS PATIENTS IN MITOOMA DISTRICT, WESTERN-UGANDA

Tananzio Nabimanya[1], Novatus Nyemara[1,2]*, and Francis Kazibwe[1]

[1]Faculty of Public Health and Nursing Science, Bishop Stuart University, P.O Box 9, Mbarara, Uganda

[2]Faculty of Medicine, Mbarara University of Science and Technology, P.O Box 1410, Mbarara, Uganda

*Corresponding author e-mail; nnyemara@must.ac.ug

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ABSTRACT: *Tuberculosis (TB) remains the ninth leading cause of death in the world and a leading cause of death among infectious diseases. Sub-Saharan Africa has nearly all high TB burden countries including Uganda which contributes to the highest Tuberculosis related mortality globally. Poor adherence to Tuberculosis treatment can lead to prolonged infection and poor treatment outcomes. Directly Observed Treatment (DOT) seeks to improve adherence to TB treatment by observing patients while they take their anti-TB medications. The aim of the study was to determine the effect of the Community Based- DOT on the Treatment Outcomes of Tuberculosis Patients in Mitooma District, Western Uganda. A cross-sectional survey research design was adopted and data were collected from the TB patients. Results revealed that TB patients who were not educated were 9.01 times more likely to get cured compared to the educated patients (AOR=9.01; 95% CI (1.6-5.9); p=0.013). Duration or time spent on TB medication was associated with TB treatment outcome because the patients who had spent 6 months on TB medication (AOR=2.9; 95% CI (1.14 – 7.9); p=0.004) were threefold more likely to get cured compared to those who had spent less than one month. Similarly, patients who had spent six months and above (AOR=4.1; 95%CI (0.07 – 0.87); p=0.026) were more than four times more likely to get cured compared to those who had spent less than one month. Results further showed that patients who were neutral in attributing their health state to the way they swallowed the TB medication (AOR = 0.33; 95%CI (0.12 – 0.9); p=0.001) were 67% less likely to get cured compared to patients who strongly agreed that their health status were attributed to the way they swallowed TB medication. Majority of the TB patients described the program as vital in treatment of TB disease as health caregivers would work closely with TB patients to adhere to treatment. Further, the study revealed that CB-DOT improved TB treatment outcomes. Monitoring the swallowing of TB drugs by health workers, health education and regular visits were highly recommended. Therefore, studies on policies for implementation of patient-centered and community-centered CB-DOT deserve further attention.*

KEYWORDS: Tuberculosis, community based-directly observed therapy (CB-DOT), Treatment outcome, Mitooma.

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INTRODUCTION

Tuberculosis (TB) remains the ninth leading cause of death in the world and a leading cause of death among infectious diseases (WHO, 2019). TB has been a major public health concern since the mid-1980s that has resulted in high rates of morbidity and mortality worldwide, especially in poor countries. Despite treatment has been available for over 50 years, an estimated 1.8 million people died from TB in 2017, making it among the top ten causes of death worldwide (WHO, 2017).

Africa is home to over 1 billion people and is disproportionately affected by TB with 2.6 million of the 10.4 million global TB cases (WHO, 2017), making the continent a key geographical area for health interventions (Mbona, et al 2022). Sub-Saharan Africa, in particular, saw rates rapidly escalate in the early 1990s due to a delayed response to the emergent HIV epidemic at the time (Karim et al 2009; Harries et al 2001). These failures resulted in incidence rates that are the highest in the world and have made the task to end TB even more challenging (Mbona, et al 2022). In Uganda alone, it is estimated that annually, 136 new smear-positive cases of TB occur per 100,000 population; and the incidence of TB in all forms in Uganda is estimated at 330 cases/100,000 population (MOH, 2010)

WHO adopted, directly observed treatment short course (DOTS) and the Stop TB strategy (WHO 2003; Naidoo et al 2009), an inexpensive strategy that could prevent millions of TB cases and death (Jassal et al 2010). Dots consist of five key elements: government commitment to sustained TB control; detection of active TB cases through sputum smear microscopy among people with symptoms; regular and uninterrupted supply of high-quality anti-TB drugs; six to eight months of regularly supervised treatment (including direct observation of drug taking for at least the first 2 months), and reporting systems to monitor treatment progress and program performance (Jassal, 2010; Zumla 2013). CB-DOTs were meant to increase patient adherence to tuberculosis medications. Patients are assisted through their treatment regimen and encouraged to treatment completion in order to prevent resistance to the available anti-TB drugs. DOTS have been delivered by health workers, community volunteers, lay health workers and even family members.

Despite the adoption of the DOTS by almost all countries, it is estimated that up to 2.3 billion of the world's population is infected with TB (Zumla, 2013); 8 million people get infected with Mycobacterium tuberculosis every year and up to 3 million people die from the resultant disease (Kunnath-Velayudhan, et al 2010; Jassal et al, 2010; Naidoo et al 2013). In Africa, Ministries of health have previously approached TB control by the provision of curative services through a limited number of specialised institutions located in selected urban centres. This approach was met with only limited success, largely due to the problem of inadequate accessibility (Fiseha, 2015). TB case notifications continue to depend heavily on symptomatic individuals voluntarily seeking care at health facilities in many developing countries.

In Uganda, the Directly Observed Treatment Short Course strategy was adopted by the Ministry of Health to eliminate tuberculosis (Ministry of Health, 2015). The standardised treatment as recommended by WHO consists of a 2-month intensive phase, in which patients take drugs directly under the observation of health care providers, and a 4-month continuation phase for new TB cases while the retreatment cases have a 3-month intensive phase and a 5-month continuation phase. It was established that the number of people with TB disease not diagnosed or started on treatment (missed people of TB) reduced from about half to a quarter

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of the 88,000 people in 2020. Despite these efforts, Uganda remains one of the 30 high-burden TB/HIV countries in the world. On average, 88,000 (maximum 130,000) people in Uganda fall ill with TB every year. The treatment outcomes in Mitooma district currently stand at a cure rate of 31 per cent and a treatment completion rate of 91 per cent which is still low compared to the required national standards of 95 per cent and 100 per cent respectively (MOH, 2020).

Therefore, this study determined the effects of Community-based directly observed Therapy on the Treatment outcomes of Tuberculosis patients in the Mitooma district. Specifically, the study aimed at establishing the overall outcome of Community based-directly observed Therapy on Patient adherence, Cure rate, and Knowledge of patients on Tuberculosis. If the treatment outcome of Tuberculosis patients is not assessed, it would lead to a low rate of patient adherence to TB medications, high TB treatment failure, increase death rate due to TB, and increased cases of multi-drug resistant strains of Mycobacterium. Conversely, early diagnosis and adequate treatment of infectious patients with pulmonary TB are necessary to reduce transmission of tuberculosis and ultimately to achieve the elimination of TB (Sagbakken & Bjune, 2008). If TB is detected early and properly treated using a combination of medicines for 6 to 9 months, the patients quickly become non-infectious and are eventually cured.

Objectives:

The overall objective of the study was to determine the effect of community-based-directly observed therapy on the Treatment outcomes of Tuberculosis patients in the Mitooma district and specifically we aimed to;

i. Determine the level of adherence of the Tuberculosis patients under Community-Based-Directly Observed Therapy.

ii. Establish the cure rate among tuberculosis patients under Community-Based-Directly Observed Therapy.

Research questions

The following research questions guided the study:

i. What is the level of adherence of the Tuberculosis patients under Community-Based-Directly Observed Therapy?

ii. What is the cure rate among tuberculosis patients under Community-Based-Directly Observed Therapy?

METHODS

Research design

This study adopted a quantitative cross-sectional survey research design. Patients' files for the

specified study period were retrieved from the health facility and demographic data was abstracted and recorded for study inclusion participants.

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Study area and Setting

The study was carried out in the Mitooma district in Western Uganda. Mitooma District is bordered by Bushenyi district to the north, Sheema district to the east, Ntungamo district to the south, and Rukungiri district to the west. The district headquarters are located some 25 kilometres (16 miles), by road, southwest of Bushenyi, the nearest large town. This location lies approximately 85 kilometres (53 miles), by road, west of Mbarara, the largest city in the Ankole sub-region. The coordinates of the district are: 00 36S, 30 00E. The district has one county, 10 Sub Counties, 2 Town councils, 62 Parishes and 554 Villages with an estimated population of 185,519 and a density of 400 persons per square Kilometer (UBOS, 2020). Mitooma is a rural district in which the program of CB-DOTs under the Ministry of Health (MOH) was being implemented and there weren't any recorded results of known research studies that were ever done on the evaluation of the CB-DOTs program. However, the treatment outcomes in Mitooma district currently stands at a cure rate of 31 per cent and a treatment completion rate of 91 per cent which was still low compared to the required national standards of 95 per cent and 100 per cent respectively (MOH, 2020).

Target Population

The study population consisted of Tuberculosis patients. All registered TB patients were recorded in the TB health unit register. We enrolled patients that were bacteriologically confirmed tuberculosis patients (P-BC) who had at least spent six (6) months of treatment. This was done for the tuberculosis patients who had completed both the initial phase and continuation phase of the TB treatment in order to measure the success of the treatment outcomes of those patients.

Sampling and Sample Size Composition

Sample size

The sample size was determined using the Krejcie and Morgan Tables (1970). According to the available data in the Mitooma district the estimated target population, N was 350 tuberculosis patients determined by the Ministry of Health based on WHO targets per year. The target population (N), 350 were the estimated patients in the health facilities then the sample size (S) was 191 patients in the TB unit register.

Table showing the Sample Size Determination

Population Classification	Target Population (N)	Sample Size (S)	Techniques for Sampling
Tuberculosis patients	350	191	Probability Proportion Sampling (PPS)
Total	350	191	

Source: Mitooma unpublished Annual reports (2017); EGPAF annual reports (2018)

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Sampling Techniques and Procedure

The Researcher used probability Proportion sampling technique to determine the size of study samples in this research study hence recruiting the specific samples of tuberculosis patients that were used in this study. This technique of probability proportional to size sampling was used to select all Tuberculosis patients registered in the TB unit register who were bacteriologically confirmed tuberculosis patients (P-BC) at the time of enrolment on treatment and had at least spent 6 months on TB treatment at the time of data collection. This enabled each respondent an equal chance of being selected to take part in the study (Amin, 2005).

Data Collection Instruments

Questionnaire

The questionnaire was administered by the researcher and research assistants that were structured with closed-ended questions that were utilised to gather quantitative data from Tuberculosis patients (P-BC) who had at least spent 6 months on treatment as it allowed them to provide independent opinions without fear, as their identity was not indicated on the questionnaire.

Interview Guide

The Interview guide was used to obtain qualitative data on the level of patient adherence, knowledge of the tuberculosis patients on the significance of the program and cure rate of tuberculosis patients that were treated under the CB-DOTs program in Mitooma district. The choice of questions depended on the study attributes such as patient knowledge of the program and consistency of treatment supporter. This instrument was adopted because it allowed the researcher to follow up leads to obtain in-depth data and greater clarity and ensure its reliability as well as being flexible, with a high response rate and enabling the researcher to control the environment (Sarantakos, 2005)

Ethical considerations

Ethical approval was obtained from Mbarara University Research Ethics Committee (MUST-REC). Clearance to conduct the study was obtained from the Uganda National Council for Science and Technology (UNCST) and the Research Secretariat in the President's Office (Approval Number; SS1363ES). Permission to conduct the study was sought from the dean of the school of postgraduate studies at Bishop Stuart University. When a permission letter was obtained, the researcher proceeded to the Mitooma district local government, to seek more permission from the district authorities. which was also granted. The process of data collection then began.

Procedure

Clearance letters from MUST-REC and UNCST were presented to the Chief Administrative Officer and District Health Officer in Mitooma district to allow the Researcher to conduct the study in the district. Before consent was obtained, participants were given information concerning the purpose of the study, voluntary participation, benefits as well as the would-be risks involved. Consent participants understood and give their informed consent to participate in the study. They were also informed of the confidential nature of the information shared as it

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would not affect the treatment and care that they were receiving from the health unit. Only respondents who gave their informed consent were voluntarily involved in the study.

Data Quality Control

A pilot test was conducted among TB cases outside of the study area to ascertain the validity and reliability of the instruments.

Validity

The questionnaire and interview guide were first evaluated to determine their correctness and appropriateness in gathering accurate data. In addition, items were developed based on earlier studies and were reviewed by the supervisor. Content validity was determined based on the extent to which questions signify the issue they were supposed to measure (Kumar, 2014).

This was done through the expert judgment of the two Research supervisors where each of them was given the research instruments to rate out valid items. Content Validity Index (CVI) for every instrument was determined by summing up the number of items rated as valid by each expert judge divided by the total number of items in the instrument. That is CVI = Number of items valid by all judges/Total number of items in the instruments X100. Accordingly, the survey instrument yielded a CVI of 0.78 which was considered valid and acceptable for this study.

Reliability

The researcher pre-tested all the instruments used in this research study on ten (10) tuberculosis patients in Kitagata hospital because they were not participating in the study. After a period of two weeks, the same instruments were given to the same group of respondents in order to ensure consistent results. Accordingly, the instrument yielded a Cronbach's Coefficient Alpha of 0.8 and hence was considered acceptable for this study.

Data analysis:

Data was entered and cleaned using Microsoft Excel and later exported to STATA version 13 for analysis. The univariate analysis incorporated descriptive summary statistics for each variable. To study the characteristics of the respondents, techniques for summarising data for continuous variables were used and these include: mean, variance and standard deviation while frequencies or proportions and percentages were used for categorical variables. Cross tabulations were done to test any possible associations between each of the independent variables and the dependent variable. All significant variables ($p \leq 0.05$) were considered for further analysis at the multivariate level analysis. Multivariate analysis was performed to assess which factors were more associated with the dependent variable. Binary logistic regression analysis was used to find the independent association for each independent/predictor variable with the dependent/criterion variable.

Measurement of variables

Treatment outcome was the dependent variable and was measured as a binary variable it was coded as 0 for non-successful (lost to follow-up/defaulters) and coded as 1 for successful treatment (cured or treatment completion). The patient's knowledge of the importance of the CB-DOTs program was categorical-nominal and coded as 1 for knowledge and coded as 2 for

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no knowledge. It was defined as; if the patient was aware of the importance of the program. Consistency of the caregiver was a categorical-nominal variable and coded 1 for consistent and coded 2 for non-consistence and defined as; if the caregiver is able to check on the TB patient in a period of fewer than two weeks. TB medication was a categorical-nominal variable and coded 1 for adhered (reported taking 90% of doses) and coded 2 for not adhered (reported taking less than 90% of doses) and defined: TB has been on drugs and swallowing daily as doctor's prescription. A Likert-type scale of responses; strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1) was also used to collect some information. The outcome of patient adherence to the TB medications was measured as a binary variable that is adhered or not adhered. Depending on the period spent on treatment, the patients were categorised as being adhered to if reported taking at least 90% of their doses and not-adhered to those who took less than 90% of their doses. The outcome of the cure rate was measured as a binary variable that is cured or not cured. The outcome of the knowledge of the tuberculosis patients on the importance of CB-DOTS was measured as a binary variable that has knowledge or has no knowledge. The tuberculosis patients were knowledgeable about the CB-DOTs if he/she was health educated on the start of TB medications given to caregiver and was regularly visited at home while on treatment.

RESULTS

Socio-demographic characteristics of TB patients

Data analysis revealed that 191 TB patients were enrolled on the study under the Community Based- Directly. Out of 191 TB patients who participated in the study, 143 (74.9%) were male and 48 (25.1%) were female. The majority of participants 156(81.7%) were above 30 years of age, were not educated 154(81%), not employed 180(94%) and were married 144(75%). More details are shown in Table 4.1.

Socio-demographic characteristics of TB patients (n = 191) in Mitooma district

Socio-demographic Characteristics	***Frequency***	***Percentage***
Gender		
Male	143	74.87
Female	48	25.13
Age group		
Less than 30 years	35	18.32
Above 30 years	156	81.68
Level of Education		
Educated	37	19.37
Not educated	154	80.63
Employment Status		
Employed	11	5.76
Not employed	180	94.24

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Marital Status		
Married	144	75.39
Not married	47	24.61

Tuberculosis patients adherence to medications while enrolled under the CB-DOTS program care

Participants were asked questions regarding the TB adherence to medications, of the 191 patients, the majority 112 (59%) reported that were given relatives as their TB treatment supporter. The majority of patients 180 (99%) declared that their caregivers were consistently observing them swallowing their TB medications while 113 (60%) of the patients had spent 6 months on the TB treatment and 73 (37%) had spent six months and above on the TB medication. 187(98%) of the TB patients reported that they have been so adherent to the medication because they have been at least swallowing the medication according to the treatment supporter guide instruction (as demonstrated in table 4.2)

The Tuberculosis patients' adherence to medications while enrolled under the CB-DOTS program care (n=191)

Socio-demographic Characteristics	*Frequency*	*Percentage*
TB Treatment support		
Health worker	56	29.32
Village Health Team	17	8.90
Relative	112	58.64
Not given at all	6	3.14
Consistence in taking medication		
Consistent	180	97.83
Not consistent	4	2.17
Time spent on treatment		
Less than I month	4	1.59
Between 1 month and 6 months	113	59.79
More than 6 months	73	38.62
Adherence basing on treatment guide		
Adhered	187	97.91
Not adhered	4	2.09

The Cure rate of TB among the tuberculosis patients (P-BC) who have spent 6 or more months on treatment.

Figure 4.1 also shows that of the 191 TB patients, the cure rate after treatment completion and then sputum check was 191 accounting for 176 (93%).

The Cure rate of TB among tuberculosis patients (P-BC) who have spent 6 or more months on treatment.

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Characteristics	n(%)
Sputum check after treatment completion	182(95.29)
	9(4.71)
Declared cured after completion of the TB treatment	176 (92.63)
	14 (7.37)
If not cured, why (n=9)	4 (44.44)
	3 (33.33)
	2 (22.22)
Do you attribute your current health state to the way you swallowed the TB medication	97 (50.79)
	87 (45.55)
	6 (3.14)
	1(0.52)
	0(0.00)

The Effect of the Community Based- Directly Observed Therapy on the Treatment Outcome of Tuberculosis Patients

Bivariate logistic regression Analysis.

At the bivariate level, the factors that were found to be significantly associated with CB-DOT treatment outcome of tuberculosis were age, level of education of the TB patients, marital status, duration/time spent on TB treatment, Adherence to TB treatment, attribution of health status to the way the patient swallowed the TB medication and knowledge of the importance of CB-DOT program. The results in table 4.2 reveal that age Unadjusted Odds Ratio (UOR); (UOR=3.80; 95% CI (1.23-11.8; p=0.021). The TB patients who were aged 30 years and above were 4 times more likely to get cured of TB under the CB-DOT program compared to their counterparts aged below 30 years. The results further revealed that TB patients who were not educated were 4 times more likely to get cured under the CB-DOT compared to their colleagues who were educated (UOR=3.51; 95%CI(1.14-10.8); p=0.029). Furthermore, Patients who were not married were 79% less likely to get cured under the CB-DOT program compared to patients who were married (UOR=0.21; 95%CI (0.07-0.65); p=0.007). The results further show that the TB patients who have spent 6 months on TB medication were 3 fold more likely to get cured under the CB-DOT program compared to those who have spent less than 1 month (UOR=2.6; 95%CI(2.1-3.1);p=0.007). Similarly, TB patients who had spent 6 months and above were 3.4 times more likely to get cured compared to those who had spent less than 1 month (UOR= 3.4; 95%CI(2.6-6.61); p=0.008. Results further revealed that TB patients who were not swallowing the TB medications according to the treatment supporter guide instructions were 99.98% less likely to get cured compared to those who adhered and swallow the TB medications according to the treatment supporter guide instructions (UOR=0.02; 95%CI(0.02-0.15);p<0.001). TB patients who reported that they had no knowledge about the importance of the CB-DOT program were 99.78% less likely to get cured compared to their counterparts who were health educated, received regular visits and acquired knowledge of the importance of the CB-DOT program (UOR=0.22; 95%CI(0.06-0.78); p=0.20).

Multivariate analysis was performed to assess which factors were more associated with the treatment outcome of the tuberculosis patients. All factors which had p-values below the

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threshold of 0.05 at the bivariate analysis were included in the multivariate model (Table 4.5). A reference category was selected for each categorical variable.

The multivariate analysis showed that the level of education of the TB patients under the CB-DOT program statistically impacts the treatment outcome of tuberculosis. TB patients who were not educated were 9 times more likely to get cured of TB disease compared to patients who were educated Adjusted Odds Ratio (AOR) (AOR=9.01; 95%CI (1.6-5.9**);** p=0.013). Furthermore, the duration or time spent on TB treatment was also associated with the treatment outcome of the tuberculosis patients. Patients who had spent six months on TB treatment were 2.9 times more likely to get cured compared to those who had spent one month on Treatment (AOR=2.9; 95%CI (1.14 – 7.9); p=0.004). Similarly, patients who had spent six months and above on TB medication were 4.1 times more likely to get cured of TB disease compared to those who had spent one month on treatment (AOR = 4.1; 95%CI(0.07 – 0.87); p=0.026). Participants who were neutral in attributing their current health state to the way they swallowed the TB medication were 0.33 times less likely to get cured compared to those who strongly agree that their current health state is attributed to the way they swallowed the TB medication (AOR=0.33; 95% CI (0.12-0.9); P=0.001).

Bivariate and multivariable analysis results of factors associated with Treatment Outcome of Tuberculosis Patients under Community Based- Directly Observed Therapy in Mitooma district (n =191)

		Treatment outcome of TB patients					
		Cured	**Not cured**	**Bivariate analysis**		**Multivariable analysis**	
Variables		n(%)	n(%)	**UOR (95%CI)**	**p-value**	**AOR (95%CI)**	**p-value**
Gender	Male	134(76.14)	9(64.29)	1			
	Female	42(23.86)	5(35.71)	0.56 (.18-1.78)	0.328		
Age group	Less than 30 years	29(16.48)	6(42.86)	1		1	
	Above 30 years	147(83.52)	8(57.14)	3.80 (1.23-11.8)	**0.021***	2.8 (0.47-16.6)	0.252
Level of Education	Educated	31(17.61)	6(42.86)	1		1	
	Not educated	145(82.4)	8(57.14)	3.51 (1.14-10.8)	**0.029***	9.01 (1.6-5.9)	**0.013 ****
Employment Status	Employed	9(5.11)	2(14.29)	1			
	Not employed	167(94.89)	12(85.71)	3.1 (0.6-15.9)	0.177		
Marital Status	Married	137(77.84)	6(42.86)	1		1	
	Not married	39(22.16)	8(57.14)	0.21 (0.07-0.65)	**0.007***	0.2 (0.02-1.1)	0.064

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TB Treatment supporter given	Health worker	49(27.84)	7(49.9)	1			
	Village health team	17(9.66)	1(0.1)	1.05(0.30-3.70)	0.936		
	The relative	104(59.09)	7(49.9)	2.12(0.71-6.38)	0.180		
	Not given at all/self	6(3.41)	1(0.1)	1.57(0.57-4.34)	0.381		
With caregiver, patient was consistent in taking medication	Yes consistent	166(98.22)	13(92.86)	1			
	Not consistent	3(1.78)	1(7.14)	0.23(0.02-2.42)	0.224		
Duration on TB Treatment	Less than 1 month	1(0.57)	2(14.29)	1		1	
	1 to 6 months	104(59.8)	8(57.14)	2.6(2.1-3.1)	**0.011***	2.9(1.14 – 7.9)	**0.004 ****
	6 months & above	69(39.66)	4(28.57)	3.4(2.6-6.61)	**0.008***	4.1(0.07-0.87)	**0.026 ****
Patient adhered to medications according to the treatment supporter guide	Yes adhered	174(98.86)	12(85.71)	1		1	
	Not adhered	2(1.14)	2(14.29)	0.07(0.01-0.53)	**0.010***	2.2(0.9 – 5.7)	0.102
After treatment completion patient did sputum check	Yes	176(100.0 0)	5(35.71)	1			
	No	0(0.00)	9(64.29)	1.40(0.57-3.43)	0.464		
Patients' current health state is due to taking TB medications	Strongly agree	89(50.57)	7(50.00)	1		1	
	Agree	85(48.30)	2(14.29)	3.34(0.67-16.5)	0.139	1.3(0.74-2.23)	0.377
	Neutral	1(0.57)	5(35.71)	0.02(0.02 – 0.2)	**0.000***	0.33(0.12-0.9	**0.001 ****
	Disagree	1(0.57)	0(0.00)	0.55(0.26-1.17)	0.120	0.64(0.3-1.61)	0.344

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Patient received health education on important message concerning CB-DOTS program	Yes/health educated	166(94.32)	13(92.86)	1			
	No/health educated	10(5.68)	1(7.14)	0.78(0.09-6.6)	0.822		
Health worker made regular visits to patients' homestead	Yes/Regular	137(78.29)	10(71.43)	1			
	No/not regular	38(21.71)	4(28.57)	0.69(0.21-2.3)	0.554		
Patient had knowledge on the importance of CB-DOT program	Has knowledge	161(92.00)	10(71.43)	1		1	
	No knowledge	14(8.00)	4(28.57)	0.22(0.06-0.78)	**0.020***	3.08(0.2-4.6)	0.416

**Statistical significant at bivariate analysis (p< 0.05)*

***Statistical significant at Multivariate analysis (p< 0.05)*

DISCUSSION

This research study found that Treatment outcome of the Tuberculosis was associated with participants' level of education. Patients who were not educated were more than 9 times more likely to get cured of TB disease. This is because according to a previous study done by Court Wright & Turner (2010), it was found that TB status is sometimes hidden because it may result in divorce or reduced prospects of marriage and people encounter TB stigma in many settings and considering those settings being the institutions the educated people occupy for formal employment than its most likely that in educated people, TB stigma is higher than in uneducated people, hence better adherence of the uneducated people. Efforts must be put into thorough education of patients before they are enrolled on treatment.

The study found that the duration of time spent on TB treatment had an impact on the Treatment outcome. Patients who had spent 6 months or more on TB medication were fourfold more likely to get cured compared to their counterparts who had spent one month on treatment., This is because Tuberculosis patients who had been enrolled for a period of 6 months usually had improved counselling, good communication skills and patient choice of DOT supporter with reinforcement of supervision activities. In a similar study, Thiam, (2017) found that poor adherence to TB treatment remains a major obstacle to efficient TB control in developing countries.

This is attributed to the reasoning that direct observation of treatment is an integral and essential component of directly observed therapy and the observation of treatment time increases with

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the number of months enrolled on the drugs for TB. This is similar to a study done by Frieden & Sbarbaro et al. (2017) that discovered that some of the particular issues of promotion of adherence to treatment for tuberculosis were direct observation and some other specific strategy-based factors such as political commitments by governments, improved laboratory services and reporting system of documentation. In the same study, it was found that direct observation is an integral and essential component of CB-DOTs.

One study showed that factors that influenced adherence to TB treatment were beliefs in the curability of TB, and beliefs in the severity of TB (Grebremariam et al, 2010). This study proved the same. Thus, Patients who were neutral in attributing their current health state to the way they swallowed the TB medication were 99.7% less likely to get cured compared to those who strongly agreed that their current health state is attributed to the ways they swallowed the TB medications.

The knowledge of Tuberculosis patients on the importance of Community Based-Directly Observed Therapy was another factor that was established. TB patients who reported that they had no knowledge about the importance of the CB-DOT program were 99.78% less likely to get cured compared to their counterparts who were health educated, received regular visits and acquired knowledge of the importance of the CB-DOT program. This finding was in agreement with a study done by Dimitrova et al. (2006) in Russia which explored the existing barrier to accessing TB services in urban and rural areas. The study established barriers associated with patients' personal characteristics like the level of knowledge and awareness on the significance of the treatment intervention by the patients which usually modifies personal behaviour.

The qualitative component in this research study of the 48 tuberculosis patients found out that CB -DOTS helped TB patients build good relationships with the health care provider and their families were given enough information about TB disease. This is similar to the qualitative study of medication-taking behaviour in primary care. In this study, Dowell & Hudson (1997) found out that patients show different disease and treatment backgrounds which explains the mechanisms of understanding, acceptance, scepticism and rejection within the treatment cycle. The study proposes new approaches to enhance treatment adherence, safe medication and patient satisfaction.

CONCLUSIONS AND RECOMMENDATION

The findings of this study indicated that the treatment outcome of the tuberculosis patients enrolled under the CB-DOTS program in the Mitooma district was associated with socio-economic factors (level of education), adherence to medications and the way Patients swallow their TB medication. The study further concludes that CB-DOT did improve TB treatment outcomes. Monitoring the swallowing of TB drugs by health workers/relatives, health education and regular visits were highly described and recommended by the patients. Therefore, studies on policies for the implementation of patient-centred and community-centred CB-DOT deserve further attention.

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Limitations to the Study

The study like any other inquiry was prone to a number of challenges constraining the process. In the first instance, it has been negatively affected by the pandemic of COVID -19 by delaying the research process and there was difficulty in accessing and having some respondents since some of them would have completed their treatment and remembered patients and their caretakers are mobile. The researcher tried to develop a rapport with available respondents at various places and ensure that the questionnaires are simplified to save time for the respondent. There could be concealment of data, especially by the tuberculosis patients due to previous stigma from the disease.

It is always considered that some information is confidential, and may not be easily used by the public, for purposes of getting the necessary information for the study, the researcher used the triangulation method so as to ensure accuracy in data collection.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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