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RISK FACTORS FOR MULTI DRUG-RESISTANT TUBERCULOSIS AMONG TUBERCULOSIS PATIENTS OF NEKEMTE REFERRAL HOSPITAL, OROMIA REGIONAL STATE, WESTERN ETHIOPIA, 2017.

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ABSTRACT

Multidrug-Resistance Tuberculosis (MDR-TB) is tuberculosis (TB) that is resistant to two first-line drugs; both isoniazid and rifampicin. Globally in 2015, there were an estimated 480, 000 new cases of multidrug-resistant TB. According to the anti-tuberculosis drug resistance survey conducted nationwide in Ethiopia in 2012 among 804 newly diagnosed TB cases 1.6 % were found to be infected with MDR-TB. The continuous challenge in the occurrence and management of Multidrug-Resistant Tuberculosis (MDR-TB) in the country in general and Nekemte Referral hospital in particular prompted this study which seeks-to investigate the risk factors for MDR-TB.Unmatched case control study design was conducted to identify the risk factors for multi-drug resistant tuberculosis among tuberculosis patients of Nekemte Referral Hospital. All MDR-TB (21 cases) and Non-MDR-TB (44 controls) patients' registered from September 2016to August 2017 in this Hospital were included in the study. Face-to-face interview and Patient medical records review were used to collect the data. In bivariate analysis; variables which had P-value <=0.25 wereentered into multi-variate logistic regression model. P-value <0.05 taken as statistically significant. A total of 65 tuberculosis patients (21 cases and 44 controls) included in this study; response rate 100 %. Previous tuberculosis treatment (AOR = 0.975, 95 % CI = 0.957 – 0.994), history of defaulter (AOR=0.055, 95 % CI=0.008-0.391), history of Smoking (AOR=74.833, 95 % CI=1.563-36.248), number of rooms in the house (AOR=5.410,95

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% CI=1.579-18.536) and presence of HIV/infection (AOR=0.232,95 % CI=0.065-0.823) were statistically significant predictors of having multidrug-resistance tuberculosis.History of- previous tuberculosis treatment; defaulter and smoking, number of rooms in the house, and presence of human immune virus infection were significant predictors in this study.Health education on adherence to anti-tuberculosis drugs and risky behaviorshould be given a special attention.

Key words: Multidrug-resistant, Tuberculosis, Nekemte, Risk factor, Case-control.

INTRODUCTION

Tuberculosis (TB) is an infectious disease caused by the bacillus mycobacterium tuberculosis(Global tuberculosis report by World Health Organization -WHO, 2014). Multidrug resistance Tuberculosis (MDR-TB) is TB that is resistant to two first-line drugs both isoniazid and rifampicin (WHO, 2013). It results from either primary infection with resistant bacteria or may develop in the course of a patient's treatment (Multidrug and extensively drug-resistant TB (M/XDR-TB): 2010 global report on surveillance and response). The main reason for the emergence of MDR-TB is improper treatment. This may be caused by non-compliance, poor treatment regimes, and poor quality of drugs or concomitant medical diseases (Clinical Practice Guidelines (CPG)-Management of DR-TB (First Edition), December 2016).

Ethiopia is one of among the 22 high burden countries (HBCs). According to the anti-TB drug resistance survey conducted nationwide in Ethiopia in 2012 among 804 newly diagnosed TB cases 1.6 % were found to be infected with MDR-TB(Guidelines for clinical and programmatic management of TB, Leprosy and TB/HIV in Ethiopia,5th ed.,2012).Treatment for drug-resistant TB is much more expensive, toxic and takes much longer than treatments for 'normal' TB (Simon Logan,2013).

Globally in 2015 there were an estimated 480,000 new cases of MDR-TB and an additional 100,000 people with rifampicin-resistant tuberculosis (RR-TB) who were also newly eligible for MDR-TB treatment (Global tuberculosis report by WHO, 2016). In 2014 an estimated 190,000 people died of MDR-TB globally. Only 50 % of MDR-TB patients were successfully treated globally(Global tuberculosis report by WHO, 2015, 20th edition). As identified by World Health Organization (WHO) in its 2007-2008 global response plan Ethiopia is one of the top 25 priority MDR-TB and XDR-TB countries (A survival guide for clinicians, Epidemiology and Background of drug-resistant tuberculosis,2016).

A study of MDR-TB patient costs in March 2013 indicated that the average total out-of-pocket cost for an MDR-TB patient to get diagnosis and treatment was US$ 1,341 and each patient lost on average US$ 293 of income due to time spent seeking and receiving care (TB CARE I,2014). Multidrug-resistant tuberculosis (MDR-TB) caused 250,000 deaths in 2015(MDR-TB, 2016 update by WHO). Risk factors for MDR-TB as revealed by different studies includes: - history of previous anti-TB treatment, TB treatment outcome, lack of TB treatment adherence, having a larger size of family, smoking habit, contact with MDR-TB patients, gender, age, history of imprisonment, level of education, occupation, industrial work, low socio-economic status, social behavior like alcohol addiction, and co-morbidities like HIV-AIDS were significantly associated with MDR-TB (Parvaneh B, Payam T, Ehsan C, Atieh N, Narges A, Mehdi K, et.al.,2009;Nsiande AL et al.,2016; Dr. Shiv Kumar Yadav et al.,2016; TB Elimination,2012; Alena S et al.,2013; Kebede T et al.,2016; Wondemagegn M et al.,2015). However, in Nekemte Referral Hospital there is lack of information with regard to possible associated risk factors for the occurrence of MDR-TB. Thus, the aim of this study is to identify the possible risk factors for MDR-TB which in turn is vital in order to prevent and treat TB and MDR-TB.

MATERIALS AND METHODS

Study area and Period

This study was conducted in Nekemte referral hospital which is found at a distance of 331 kilometers west of nation's capital, Addis Ababa. It gives different health service for more than 2.5million populations. This hospital has 8 wards (Obstetrics, Gynecology, Surgical, Medical, Pediatrics, Orthopedic and Emergency), one TIC (treatment initiative center) which was established at 2013 and served as the only treatment center for MDR-TB patients' in the western part of the country. This study was conducted from September 1st 2016 to August 30th2017.

Study design

Unmatched case-control study design was carried.

Population

All 65 TB patients(21 case and 44 controls)confirmed to be MDR-TB and non-MDR-TB registered from September 1, 2016 to August 30th2017 in this hospital were taken as source population, and those who had willing to give informed consent were taken as the study population.

Inclusion and exclusion criteria

TB patients whose registries were not found in the hospital or information on the register were incomplete for the variables of interest were excluded from the study. Since the sample size was manageable; all TB patients' who fulfills the inclusion criteria were included in the study.

Data collection techniques and instruments

Face-to-face interview was carried out using a structured and pre-tested questionnaire to collect primary datawhereas secondary data were collected by reviewing patient medical

charts. The questionnaire was first prepared in English from different literatures (WHO report, 2011;Feleke M et al.,2015;WHO report, 2013;Abate G et al.,1998; Agonafir M et al.,2010; Hussein B et al.,2013;Geisa F et al.,2017;Ahsan MA et al.,2012;Abdulhalik W et al.,2017;Muluken D et al.,2016;Mulisa G et al.,2015;Marahatta SB et al.,2010;Marta G et al.,2014;Fikadu TN et al.,2012;Selamawit H et al.), andtranslated into Afan Oromo and then back to English. Three diploma nurses to collect the data and two BSc nurse graduate to supervises the data collection process were selected and assigned from outside of this hospital to minimize bias related to the interviewer. Data collectors were used the N-95 respiratory mask (covers both the mouth and nose and filters more than 95% of particles) during data collection. Study subjects wore a surgical mask to reduce the risk of TB transmission.

Study variables

Dependent variable

Risk factors for MDR-TB

Independent variables

Socio-demographic characteristics (age, sex, educational level, Religion, Ethnicity, Marital status, Monthly family income, Place of residence and occupation)

TB Patients' related factors: -Being in prison, History of (previous TB treatment, TB contact, traditional treatment, defaulter), Alcohol use, Illicit drug use, Chat chewing, Habit of smoking, Number of times of previous treatment and Previous treatment outcome.

Environmental related factors: -Had or had not have house to live in, Number of rooms, Family size and Presence of television(TV).

Clinical related factors: - Mental illness, Contract by diabetes mellitus and Having HIV infection.

Operational definitions

Cases (MDR- TB patients): -were all culture-proven to be resistant to both isoniazid and rifampicin with or without resistance to other anti-TB drugs.

Controls (non-MDR-TB patients): - were all TB patients who were either not resistant to anti-TB drugs or resistant to isoniazid or rifampicin.

Defaulter: all patients whose treatment was interrupted for two or more consecutive months.

DR-TB patients: -All forms of TB resistant to one or more drugs different from isoniazid and rifampicin togetherSensitive TB cases: -All forms of TB which is sensitive to first line TB drugs.

Data quality management

A week before the actual data collection; a pre-test was done on 5 % of the sample atJimmaArjo district hospital and then a necessary adjustment was made. Training was given for one day for data collectors and supervisors on the objectives of the study and data collection process.

Data Analysis and Presentation

Collected data were coded and entered into EPI-DATA version 3.1 and then exported to SPSS windows version 20.0. Bivariate analysis was performed and all variables having a p-

value <=0.25 were entered into multivariate logistic analysis in order to assess the independent predictors of MDR-TB. Crude and adjusted odd ratios with their 95% confidence was computed to show the association between dependent and independent variables. Statistical significance was determined using p<0.05 as a cut-off point.

RESULT

Socio-demographic characteristics of the respondents

A total of 65 patients (21 cases and 44 controls)were included in this study of which 21 were MDR-TB and the remaining were non-MDR-TB patients with the response rate of 100 %. Of these 8(38 %) and 26 (59.1 %) were males in cases and controls respectively. Sex, residence, marital status, educational status, occupation and monthly family income were candidate variables for multivariate logistic regression (detail characteristics of study participants presented on table 1).

Tuberculosis disease related factors

TB Patients' related characteristics

From the total of 21 MDR-TB cases fifteen (71.4 %) of them had history of previous TB treatment while only three (6.8 %) of controls (non-MDR-TB) had this history. Imprison history, previous anti-TB treatment, history of TB contact, history of smoking, history of defaulter, history of chat chewing and TB treatment outcome were candidate variables for multivariate logistic regression (for more detail see table 2).

Environmental related characteristics

Only number of rooms in the house become the candidate variable for multivariate logistic regression analysis (for more detail see table 3).

Clinical related characteristics

As indicated in the table 4 eleven (52.4 %) of cases and eight (18.2 %) of controls are HIV infected patients. Presence of HIV co-infection and having history of mental illness were variables which had p-value of <= 0.25 at bivariate analysis among clinical related characteristics (for more detail see table 4).

MULTIVARIATE LOGISTIC REGRESSION ANALYSIS

The Final Predictors of developing MDR-TB

All candidate variables explained above under result part of bivariate analysis were entered into multi-variatelogistic regression analysis. After adjusting for possible confounding factors MDR-TB was significantly associated with history of previous TB treatment (AOR = 0.975, 95 % CI = 0.957 – 0.994), history of defaulter (AOR=0.055, 95 % CI=0.008-0.391), history of Smoking (AOR=74.833, 95 % CI=1.563-36.248), number of rooms in the house (AOR=5.410,95 % CI=1.579-18.536) and presence of HIV infection (AOR=0.232,95 % CI=0.065-0.823) (table 5).

The study participants' who had have previous history of TB treatment had 97.5 % increased risk of having MDR-TB when compared to TB patients who had not have history of previous TB treatment. TB patients who had no history of defaulter had decreased risk of developing

MDR-TB when compared with those TB patients' who had such history. The study participants who had history of smoking had 75 % higher risk of developing MDR-TB compared to those who did not had history of smoking. Moreover, those TB patients who had live in one room were 5.41 times more likely to develop MDR-TB compared to those who had live in two and above rooms. The study participants with TB/HIV co-infection had 77 % increased risk of getting MDR-TB compared to those TB patients without TB/HIV co-infection (table 5).

DISCUSSION

This study has provided relevant information about the predictors associated with MDR-TB infection which can support activities being implemented to decrease the burden of TB in the study area specifically and Oromia regional state broadly.

The study conducted in Belarus indicated that the majority of TB patients who have had previous treatment for the disease have MDR-TB(Alena S et al.,2013). In line with this, the current study revealed that the chance of having MDR-TB was higher in TB patients who had history of previous TB treatment. Another study conducted at St. Peter's TB Specialized Hospital in Addis Ababa of Ethiopia indicated that patients who had previous history of treatment for TB had 21 times higher risk of developing MDR-TB than patients who did not have (Abdulhalik W et al.,2017). Similar study conducted in Portugal by Marta G. et al showed that previous TB treatment was a well-known risk factor for drug-resistant TB (Marta G et al.,2014). In line with the current study, a study conducted in central Nepal revealed that previous treatment of tuberculosis was strongly associated with MDR-TB (Marahatta SB et al.,2010).

Study conducted in Oromia region showed that previous TB treatment outcome were predictors of MDR-TB (Mulisa G et al.,2015). Our finding infers that the association between history of defaulter and having MDR TB is significant (AOR=0.055,95 % CI 0.008-0.391(p=0.004).

In the present study TB patients who had history of smoking showed significantly increased risks of developing MDR-TB. This is similar to the corresponding values previously reported in Belarus (Alena S et al.,2013). Similar finding from another study conducted in Northern Tanzania indicated that the odds of developing MDR-TB among smokers was 2.3 times higher compared with non-smokers (Nsiande AL et al.,2016). In contrary to the current study finding, the study conducted in Oromia region revealed that personal behaviors like smoking were not predictors of MDR-TB (Mulisa G et al.,2015). In line with the current study finding the study conducted in central Nepal showed that having a history of smoking and MDR-TB was significant (Marahatta SB et al.,2010).

This study revealed that patients living in the house with only one rooms were five times more likely to develop MDR-TB than those living in a house with greater than and equal to

two rooms. The possible description may be due to the crowded places which favors high risk of acquiring resistant strains from infected hosts. A finding from the study conducted at St. Peter's TB Specialized Hospital in Addis Ababa of Ethiopia similarly indicated that patients living in a household with only one room were five times at higher risk of having MDR-TB than those living in a household with more thanone room (Abdulhalik W et al.,2017).

It is revealed by this study: - TB patients with HIV co-infection were high risk to develop MDR-TB when compared with those without HIV co-infection.Similar study conducted in Belarus showed that HIV-positive TB cases were found to have a significantly higher risk of MDR-TB than their HIV-negative counterparts (Alena S et al.,2013). Another similar study conducted in Addis Ababa at St. Peter's TB Specialized Hospitalshowed that study participants who had HIV infection were three times at higher risk than those who had no HIV infection to develop MDR-TB (Abdulhalik W et al.,2017).

The study conducted in Oromia Region by Girma M. et al also showed that HIV infection was significantly associated with the occurrence of MDR-TB (Mulisa G et al.,2015). In contrary to this the study conducted by Selamawit H. et al in Addis Ababa revealed that HIV status was not significantly associated with MDR-TB among individuals who had been previously treated with first-line anti-TB drugs (Selamawit H et al.,2013). Similarly, the study conducted in Northern Tanzania indicated: - being HIV infection was not independently associated with MDR-TB (Nsiande AL et al.,2016). The study conducted at St. Peter Hospital Addis Ababa by MulukenD et al also showed that there is no a significant association between HIV/AIDS co-infection and MDR-TB (Muluken D et al.,2016). Another study conducted in Portugal also indicated that there was no a significant association between HIV co-infection and drug-resistance (Marta G et al.,2014).

CONCLUSION AND RECOMMENDATION

In this survey history of (previous TB treatment, defaulter, smoking), number of rooms in the house, and presence of HIV infection were found to be the major predictors for having MDR–TB. Nekemte referral hospital management bodies should give emphasis on TB patient's adherence to anti-TB drugs and special attention should be given to health education and promotion activities to decrease risky behaviors like smoking habit. Besides, they should give due attention to strength the collaboration between TB and HIV control programs.

ABBREVIATIONS/ ACRONOMY

- AOR: -Adjusted Odds Ratio
- COR: -Crude Odds Ratio
- FMOH: -Federal Ministry of Health
- HBCs: -High Burden Countries
- HIV: -Human Immune Virus
- MDR-TB: -Multi-drug resistant Tuberculosis
- TIC: -Treatment Initiative Center
- WHO: -World Health Organization

AUTHORS' CONTRIBUTIONS

ZK conceived and designed the study, drafting the article, analyzed the data critically for intellectual content and wrote the manuscript. **KT**, **FA**, **TD** and **AF** were participated in the design of the study, statistical analysis and interpretation of data. All authors read and approved the final manuscript.

AUTHORS' INFORMATION

ZK is currently working at East Wollega Zonal Health Office as Quality Officer. **KT and AF** are currently working at USAID/JSI Transform: Primary Health Care Project as Zonal Program officer.**FA** is currently working as high Quality Clinical Care Technical Advisor at Oromia Regional Health Bureau, Addis Ababa. **TD** is currently a Lecturer at Jimma University department of health economics, management and policy, College of Health Sciences.

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CONFLICT OF INTERESTS

"The authors have not declared any conflict of interests."

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ETHICAL APPROVAL

Permission was obtained to undertake the study from Nekemte referral hospital administrative bodies. All the study participants were informed about the objective and importance of the study and their verbal consent was obtained before conducting data collection and they were also being informed about their right of not participating in the study and terminating at any time.Confidentiality of study participants was assured by using questionnaire identification number and privacy by removing names and other identifiers during the interview.

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Table 1: Bivariate Analysis of the Sociodemographic characteristics of study participants with MDR-TB at Nekemte referral hospital, Oromia regional state, Western Ethiopia, September 1st 2016 to August 30th2017**.**

Variables		**Case-**	**Control-**	**COR(95%CI)**	**P-value**
Age	<=25 years	5(23.8)	12(27.3)	0.595(0.144-2.467)	0.474
	26-45 years	9(42.9)	22(50.0)	0.584(0.169-2.017)	0.395
	>=46 years	7(33.3)	10(22.7)	1	
	Total	21(100)	44(100)		
Sex	Male	8(38.1)	26(59.1)	0.426(0.147-1.237)	0.117*
	Female	13(61.9)	18(40.9)	1	
	Total	21(100)	44(100)		
Residence	Rural	7(33.3)	6(13.6)	3.167(0.907-11.06)	0.071*
	Urban	14(66.7)	38(86.4)	1	
	Total	21(100)	44(100)		
Religion	Orthodox	9(42.9)	13(29.5)	1.780(0.526-6.020)	0.354
	Protestant	7(33.3)	18(40.9)	0.989(0.256-3.820)	0.87
	Muslim	5(23.8)	13(29.5)	1	
	Total	21(100)	44(100)		
Ethnicity	Oromo	17(81)	36(81.8)	1	
	Amhara	4(19)	8(18.2)	1.059(0.280-4.010)	0.933

Marital status	Married	14(66.7)	22(50.0)	2(0.677-5.906)	0.210*
	Single	7(33.3)	22(50.0)	1	
	Total	21(100)	44(100)		
Educational status	Unable to read and write	8(38.1)	5(11.4)	3.520(0.756-16.3)	0.109*
	Primary school	2(9.5)	9(20.5)	0.489(0.076-3.1)	0.451
	Secondary school	6(28.6)	19(43.2)	0.695(0.171-2.8)	0.610
	College and above	5(23.8)	11(25)	1	
	Total	21(100)	44(100)		
Occupation	House wife	5(23.8)	5(11.4)	3.500(0.662-18.4)	0.140*
	Government employed	6(28.6)	15(34.1)	1.400(0.325-6.0)	0.651
	Private employed	6(28.6)	10(22.7)	2.100(0.467-9.4)	0.333
	Farmer	4(19.0)	14(31.8)	1	
	Total	21(100)	44(100)		
Monthly family income	<=500 ETB	5(23.8)	11(25.0)	0.758(0.211-2.71)	0.670
	501-1500ETB	2(9.5)	9(20.5)	0.370(0.068-2.00)	0.250*
	1501-2000ETB	2(9.5)	4(9.1)	0.833(0.132-5.25)	0.846
	>=2001ETB	12(57.1)	20(45.5)	1	
	Total	21(100)	44(100)		

Key *Variables that showed significant association during bivariate analysis at P-value <=0.25, **P-Value<=0.05, COR. The last was taken as reference group.

Table 2: Bivariate analysis of TB Patients' related factors with MDR-TB at Nekemte referral hospital, Oromia regional state, Western Ethiopia, September 1st 2016 to August 30th2017**.**

Variables		**Case-21(N,%)**	**Control-44(N,%)**	**COR(95 % CI)**	**P-value**
History of being in prison	Yes	2(9.5)	1(2.3)	4.526(0.387-53.002)	0.229*
	No	19(90.5)	43(97.3)	1	
History of previous TB Treatment	Yes	15(71.4)	3(6.8)	34.167(7.572-154.173)	0.001**
	No	6(28.6)	41(93.2)	1	
History of TB contact	Yes	11(52.4)	35(79.5)	0.283(0.092-0.87)	0.001**
	No	10(47.6)	9(20.5)	1	
Number of times of previous treatment	*1time*	15(71.4)	10(22.7)	1	
	>=2times	6(28.6)	34(77.3)	0.118(0.036-0.383)	0.001**
History of defaulter	Yes	15(71.4)	19(43.2)	3.289(1.074-10.072)	0.037**
	No	6(28.6)	25(56.8)	1	
History of traditional treatment	Yes	7(33.3)	15(34.1)	0.967(0.322-2.906)	0.952
	No	14(66.7)	29(65.9)	1	
History of illicit drug use	Yes	7(33.3)	11(25.0)	1.500(0.482-4.668)	0.484
	No	14(66.7)	33(75.0)	1	
History of Smoking	Yes	2(9.5)	20(45.5)	0.126(0.026-0.609)	0.010**
	No	19(90.5)	24(54.5)	1	
History of alcohol use	Yes	4(19.0)	14(31.8)	0.504(0.143-1.778)	0.287
	No	17(81.0)	30(68.2)	1	
History of chat	Yes	2(9.5)	10(22.7)	0.358(0.071-1.806)	0.213*
	No	19(90.5)	34(77.3)	1	

chewing					
Chronic Antacid use	Yes	2(9.5)	5(11.4)	0.821(0.146-4.627)	0.823
	No	19(90.5)	39(88.6)	1	
Previous TB treatment outcome	*Cured*	5(23.8)	5(11.4)	1	
	Completed	8(38.1)	6(13.6)	3.600(0.736-17.599)	0.114*
	Failure	3(14.3)	15(34.1)	4.800(1.126-20.460)	0.034**

Key *Variables that showed significant association during bivariate analysis at P-value <=0.25, **P-Value<=0.05, COR. The last was taken as reference group.

Table 3: Bivariate analysis of Environmental related factors with MDR-TB at Nekemte referral hospital, Oromia regional state, Western Ethiopia, September 1st 2016 to August 30th2017**.**

Variables		**Case-21(N,%)**	**Control-44(N,%)**	**COR(95 % CI)**	**P-value**
Have a house to live in	Yes	15(71.4)	35(79.5)	0.643(0.194-2.128)	0.469
	No	6(28.6)	9(20.5)	1	
Number of rooms in the house	*One*	14(67)	6(14)	1	
	>=two	7(33)	38(86)	6.800(2.155-21.455)	0.001**
Total number of family size	*<=5*	2(9.5)	6(13.6)	1	
	>5	19(90.5)	38(86.4)	1.500(0.276-8.149)	0.639
Have a TV	*Yes*	12(57.1)	25(56.8)	1	
	No	9(42.9)	19(43.2)	0.987(0.345-2.820)	0.980

Key *Variables that showed significant association during bivariate analysis at P-value <=0.25, **P-Value<=0.05, COR. The last was taken as reference group.

Table 4: Bivariate analysis of Clinical related factors with MDR-TB at Nekemte referral hospital, Oromia regional state, Western Ethiopia, September 1st 2016 to August 30th2017**.**

Variables		**Case-n=21(%)**	**Control-n=44(%)**	**COR(95%CI)**	**P-value**
Contract diabetes mellitus	Yes	5(23.8)	13(29.5)	0.745(0.226-2.462)	0.630
	No	16(76.2)	31(70.5)	1	
Presence of HIV/infection	*Yes*	11(52.4)	8(18.2)	4.950(1.569-15.618)	0.006**
	No	10(47.6)	36(81.8)	1	
History of mental illness	*Yes*	6(28.6)	5(11.4)	3.120(0.827-11.771)	0.093*
	No	15(71.4)	39(88.6)	1	

Key *Variables that showed significant association during bivariate analysis at P-value <=0.25, **P-Value<=0.05, COR. The last was taken as reference group.

Table 5: Multiple logistic regression analysis for risk factors of multidrug-resistant tuberculosis among tuberculosis patients at Nekemte referral hospital, Oromia regional state, western Ethiopia, September 1st 2016 to August 30th 2017**.**

Variables		**COR(95 %CI)**	**AOR(95 %CI)**	**P-value**
History of previous TB Treatment	Yes	34.167(7.572-154.173)	0.975(0.957-0.994)	0.011
	No	1	1	
History of defaulter	Yes	3.289(1.074-10.072)	0.055(0.008-0.391)	0.004
	No	1	1	
History of Smoking	Yes	0.126(0.026-0.609)	74.833(1.563-36.248)	0.029
	No	1	1	
Number of rooms in the house	*One*	6.800(2.155-21.455)	5.410(1.579-18.536)	0.007
	>=two	1	1	
Presence of HIV/infection	*Yes*	4.950(1.569-15.618)	0.232(0.065-0.823)	0.024
	No	1	1	