

# Determinants for tuberculosis in HIV infected patients in Debre Birhan town, Amhara national regional state, Ethiopia: a case control study

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## Research article

**Keywords:** Tuberculosis Infection, HIV Positive Patients, Debre Birhan Town, Ethiopia

**Posted Date:** May 9th, 2019

**DOI:** <https://doi.org/10.21203/rs.2.9315/v1>

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# Abstract

**Abstract Background:** Tuberculosis (TB) is one of the most frequent opportunistic infections in people living with the Human Immunodeficiency Virus (HIV). It is a leading cause of morbidity and mortality in high HIV prevalent population. There are various factors contributing for the occurrence of TB/HIV co-infection that are not well studied in this area. The purpose of this study is to assess determinants of Tuberculosis infection among HIV positive patients attending ART clinics in governmental health facilities at Debre Birhan town North Shoa, Ethiopia. **Methods:** A case control study design was conducted from February 15, 2017 to April 30, 2017 in governmental health facilities at Debre Birhan town. A total of 276 individuals were to participated in this study (92 cases and 184 controls). Cases were adult patients with TB/HIV who were co-infection and controls were adult HIV patients without TB. A pre- tested interviewer administered structured questionnaire was used to collect data on Socio demographic variables, housing characteristics and personal behaviours. Host, clinical and immunological variables were taken from ART card and log books. **Result:** In this study participants who; earn low monthly income (AOR) 0.024; 95% CI 0.004 to 0.14), smoker (AOR 10.53; 95% CI 1.53 to 72.18), kerosene (AOR 2.49; 95% CI 1.22 to 5.07), alcohol (AOR=5.48; 95% CI 1.29 to 23.56), family history of TB (AOR=2.51; 1.03,6.15) were at high risk of tuberculosis. While patients with opportunistic infections (AOR=3.35; 95% CI 1.62 to 6.91), bronchial asthma (AOR=14.77; 95% CI 6.25 to 34.91), diabetes mellitus (AOR 10.62; 95% CI 2.77 to 40.50) and low CD4 level (AOR=6.03; 95% CI 2.27 to 16.18) were at high risk of TB. **Conclusion:** HIV patients with risk behaviours, opportunistic infections, diabetes, asthma, low CD4, kerosene user and poor were at risk of TB. To reduce the risk of TB health care providers and government should work to reduce risk behaviours, early screening and initiation of treatment for opportunistic infections, health education for chronic diseases, early staging and initiation of treatment for HIV, working with poor to improve their life were recommended. **Key words:** Tuberculosis Infection, HIV Patients, Debre Birhan Town, Ethiopia

## Introduction

Tuberculosis (TB) causes ill health for approximately 10 million people each year and is one of the top ten causes of death worldwide (1) and it shares 25 % of all causes of the deaths (2). Globally, one third of people living with HIV (PLWH) are infected with the bacterium that causes TB (3).

In 2013, WHO estimated 9 million new TB cases and 1.5 million TB deaths occurred globally, of which 80 % of the cases and 70 % of deaths were reported in low income and middle income countries (4) and it was estimated that only 70% of notified TB patients co-infected with HIV were receiving anti retroviral therapy (ART) (5).

The life time risk of developing active TB in HIV negative individuals is approximately 10%. Which similar with the annual risk of developing TB among HIV infected patients, while the lifetime risk of developing TB among HIV infected patients is nearly 50% (6). Even though ART is known to decrease incidence of TB, still studies have reported TB incidences among HIV patients who are on ART (7, 8).

TB and HIV co-infection is when people have both HIV infection and TB disease. When a person has both HIV and TB each disease speeds up the progress of the other (9). The risk of death in co-infected individuals is twice that of HIV infected individuals without TB even when antiretroviral therapy is taken into account (10).

Tuberculosis is a leading cause of morbidity and mortality, and the first presenting sign in majority of people living with Human Immune deficiency Virus (11). The HIV associated TB epidemic remains a huge challenge to the public in resource limited settings. Reducing half million TB related deaths per year has been identified as a key priority strategy to combat tuberculosis (12).

For adults with both TB and HIV infection the WHO guidelines recommend starting HIV anti retroviral between 2 and 8 weeks after starting TB treatment for those individuals who have a CD4 count of less than 200mm<sup>3</sup> (13).

Globally, more than 13 million people are TB/HIV co-infected. Among them 70% are living in sub-Saharan Africa. Ethiopia is among the 22 high TB and the 27 high multi drug resistant tuberculosis (MDR TB) burden Countries in the world (14). In 2007, TB was the cause of 76,000 deaths, of which 30 % were among HIV positive patients (15, 16). HIV infected peoples are more likely to have severe forms of TB than patients without HIV (17). TB has been associated with excess mortality in HIV infected patients who were not treated with ART (18).

A study done in Bihar, India the prevalence of TB/HIV co infection was 28.6% (19), 11.4% in Dabat, Ethiopia (20), 27.7% Amhara region, Ethiopia (21), 20.3% Butajira Hospital, Ethiopia (22) and 2.6 % in Dessie and Debre Birhan towns, Ethiopia (23).

In Ethiopia from 2003 to 2016 TB treatment outcomes amounts to 83.7%. Treatment success rate was low Amhara region which was 19.0%. The unsuccessful TB treatment outcome was found to be two times higher among HIV/TB co-infected cases (24). Studies showed the major determinants of HIV/TB co-infection were identified to be low CD4 counts, ART and WHO clinical stages, being divorced/widowed, not attending formal education, underweight, diabetic mellitus, smoking, TB in the family, alcohol consumption and chewing khat were the determinants for tuberculosis in HIV-infected adults in Northwest Ethiopia (25-27).

Therefore, this study was aimed to assess determinants of tuberculosis infection among HIV positive patients public health facilities at Debre Birhan town, Amhara Regional state, Ethiopia.

## Methods

### Study area and setting

A case control study was conducted from January 2017 to June 2017. The study was carried out in one public hospital and in one health center found in Debre Birhan town, North Shoa, Amhara Region. It is located 130 km to the North East of Addis Ababa and 695 km far from Bahir Dar. The town has an

estimated population of 81,776, from which 57.3% are males. There is one public and one private hospital and one public health center. During the study period there were 1535 patients in the hospital and 410 patients in the health center were receiving ART and among them 99 were TB/HIV co infected.

### **Sample size determination**

The sample size was calculated using the two population proportion formula by considering the following assumptions: proportion of CD4 < 200 cells/ $\mu$ l 73.2% among cases and 53.6% among controls in a study done in Addis Ababa (28), 5% significance level, 80% power, a case to control ratio of 1:2. The calculated sample size was 86 for cases and 172 for controls after adding 10% for non response rate, the final sample size was 286 (92 cases and 194 controls). The sample size was calculated using different variables of significant predictors of tuberculosis; diabetes mellitus, body mass index (BMI<18 kg/m<sup>2</sup>), CD4<200 cell/ $\mu$ l, and low Hgb level. Finally, CD4 count<200 cells/ $\mu$ l was used as it gave the largest sample size than other variables.

### **Sampling procedure**

First identification of cases and controls was done by using ART and TB patient registers. All TB/HIV co-infected patients were found on anti TB treatment (cases) were included in the study. Controls (HIV patients without tuberculosis) were selected based on the number of cases available in each facility using case based technique with the control to case ratio of 2:1. For each case the next two consecutive controls were used for the study.

### **Data collection and analysis**

The data was collected by trained nurses and laboratory technologists using structured questionnaire, which was translated into Amharic from English, back translated and pre-tested for consistency. Fifteen questionnaires were pretested (ten from controls and five from cases). Data collectors were trained by preparing a training guide about the objective of the study, the study participants, collection techniques and procedures before the actual time of data collection for a day. Data were collected using two to one (2:1) ratio of controls to cases. The data were collected from two sources: The primary data collected by face to face interview of patients to assess: socio demographic variables, housing characteristics and personal behaviours using structured interviewer administered questionnaire which was constructed by adopting from previous research done on similar topic and modified accordingly (26, 28, 29). Patient cards and log books were used to collect secondary data; clinical information like CD4 cell count, haemoglobin level, world health organization (WHO) clinical stage, opportunistic infection, chemoprophylaxis and other variables.

The collected data were checked manually for completeness and consistencies. And it was coded and entered in EPI info version 3.5.1 and exported to SPSS version 16 for analysis. Bivariate analysis was performed to examine the effect of each variable on the risk of tuberculosis. To identify factors associated with the risk of tuberculosis first bivariate analysis performed. Variables which has a p value <

0.25 in the bivariate analysis were included in the final multivariate logistic regression analysis. Strength of association was measured using odds ratio, and 95% confidence intervals. Statistical significance was declared at P value < 0.05.

### **Ethical consideration**

Ethical clearance was obtained from the research ethical review committee of Debre Birhan University, and permission letter was obtained from each selected health institutions. The data collectors informed each respondent and confirmed the willingness of the participants by signing on the informed consent sheet. Therefore consent was obtained from each study participants and confidentiality was assured for all the information provided. Moreover, personal identifiers were not being included on questionnaire

**Patient and public involvement:** There was no patient or public involvement in this study.

## **Results**

### **Socio demographic characteristics of the study participants**

A total of 286 (92 cases and 194 controls) study subjects were participated in this study. Majority (86%) of the study participants were urban residents (80 cases and 166 controls). More proportions of cases (32.6%) and controls (37.1%) were between the age group of 32 – 40 years. One hundred seventy (57 in cases and 113 controls) participants attended elementary school and above. Regarding to occupation, house wife and daily labourers covered more proportions (40.3% for cases and 41.7% for controls). Nearly half of the study subjects (48.8%) earn 20 - 43 united states dollar (USD) month. From total participants the study, only 10 (8 from cases and 2 from controls) were smokers. While 18 (6.3%) were alcohol drinker (12 from cases and 6 from controls) and 23(18%) were chat chewers (11 from cases and 12 from controls) (**Table 1**).

### **Bivariable analysis**

In the bivariate analysis; income less than 43 USD (crude odds ratio (COR) 0.105; 95% CI 0.029 to 0.373), smoking (COR 9.14; 95% CI 1.901 to 43.9), alcohol drinking (COR 4.7; 95% CI 1.71 to 12.96) were associated with risk of tuberculosis (**Table 2**).

History of TB in the family (COR 2.79; 95% CI 1.496 to 5.206), using kerosene for cooking in the house (COR 2.31; 95% CI 1.391 to 3.831), opportunistic infections (COR 3.46; 95% CI 2.058 to 5.81), bronchial asthma (COR 9.64; 95% CI 5.29 to 17.56), diabetes mellitus (COR 6.05; 95% CI 2.53 to 14.43), anaemia (COR 4.15; 95% CI 2.007 to 8.586), low CD4 cell count (COR 2.61; 95% CI 1.301 to 5.23), WHO clinical stage III and IV (COR 1.96; 95% CI 1.162 to 3.303) were associated with the risk of TB infection (**Table 3**).

### **Multivariable Analysis**

Variables which have P-value of less than 0.25 in bivariate analysis were entered in the multivariate logistic regression analysis to measure the independent effect of each variable on the risk of tuberculosis. After adjusting for confounding variables; cigarette smoking (AOR 10.53; 95% CI 1.535 to 72.175), alcohol drinking (AOR 5.48; 95% CI: 1.287 to 23.564) were remained independent predictors for TB. History of TB in the family (AOR 2.51; 95% CI 1.027 to 6.150), presence of opportunistic infections (AOR 3.35; 95% CI: 1.622 to 6.912), bronchial asthma (AOR 14.77; 95% CI 6.246 to 34.91), diabetes mellitus (AOR 10.62; 95% CI 2.767 to 40.503), low CD4 count (< 200 cells/ $\mu$ l) (AOR 6.03; 95% CI 2.266 to 16.178) and using kerosene or gas as energy source for cooking in the house (AOR 2.49; 95% CI 1.220 to 5.072) were independently associated with increased risk of TB infection. While participants who earn 43 - 73 USD per month were less likely to develop TB compared to those who earn less than 20 USD (AOR 0.24; 95% CI 0.04 to 0.14) (**Table 4**).

## Discussion

Economic status was found to be significantly associated with the occurrence of TB which is consistent with the study in South West Ethiopia (29). This might be due to those study participants with higher income or socio-economic status would have more health care seeking behaviors (30, 31) to protect themselves from other HIV related infections than those having lower income status (4).

In this study smoking was the independent predictors for the occurrence of tuberculosis. On the other hand using kerosene as a source of energy for cooking in the household increases the risk of tuberculosis among HIV patients. This could be since smokes from cigarette increases TB risk may be through decreasing immune response, mechanical disruption of cilia functions, defects in macrophage immune response and/or CD4+ lymphopenia by increasing the susceptibility to pulmonary TB (18, 21, 23, 27). In line with the studies conducted in South West Ethiopia and Addis Ababa indicated that using Kerosene (gas) as energy source for cooking in the household was associated with TB as it was generally used as cooking fuels in urban areas (28, 29). It might be explained by increased indoor air pollution that could contribute to the respiratory infections including tuberculosis (26).

In this study alcohol drinkers were almost five times more likely associated with TB as compared to non drinkers. Which is similar with studies conducted in North west Ethiopia and Amhara region, Ethiopia (21, 27). This may be through direct toxic effects of alcohol on the immune system rendering the host more susceptible to TB disease, that cell mediated immunity and macrophage functions are directly impaired by chronic and acute alcohol consumption.

Having past history of diabetic mellitus was seven times more likely associated with TB as compared to those who did not have known history of diabetic mellitus a study in Nekemte East Wollega (26, 32). This could be explained as diabetes mellitus related complications increase the acquisition of TB due to increased in both reactivated and recently transmitted infection. Diabetes mellitus (DM) TB co-infection is associated with poor glycemic control and decreased immunity. Reactive hyperglycaemia often

accompanies chronic infections like tuberculosis due to the associated proinflammatory state and release of counter regulatory stress hormones (33).

Opportunistic infection was more common among TB/HIV co-infected patients compared to merely HIV infected patients. Similar findings were found in studies done in Gondar, North Ethiopia and South West Ethiopia (29, 34). This could be opportunistic infection can lead to the development of active TB through enhancing the helper T-cell type immune response and by further decreasing the immunity of the patient (11). Similarly study participants having history of bronchial asthma was strongly associated with active TB compared to non asthmatic participants which was in consistent with a study in Addis Ababa (28). This could be due to drugs/steroids used to control asthma are known to decrease the immunity and the inflammation of the lungs, which can lead to bronchospasm severe enough to suffocate and make it fertile for infection. Corticosteroids cause immune system suppression through peripheral blood monocytopenia and inhibition of monocyte functions, including chemotaxis, bactericidal activity, and production of interleukin (35).

Having family history of TB patient was significantly associated with TB which was consistent with previous findings (26, 29, 36). This could be due to frequent contact with TB patients in a household could lead to increased transmission of TB. Besides, the presence of TB in families could also show a genetic susceptibility which could predispose an individual to TB infection (29). In addition, the extent and persistence of contact with an infected person are the main factors for the transmission of TB. Thus, transmission of TB occurs most frequently as a result of prolonged contact in enclosed environments with an infectious person. Persons who are at the greatest risk of exposure to TB are those who live and sleep in the same household with infected person (37).

Low CD4 lymphocyte count was significantly associated with the risk of active TB which was consistent with many other studies (26, 28, 29, 34, 36-39). Low CD4 cells in HIV infected persons indicate severely depressed immunity that makes them susceptible to TB infection or reactivation of latent infection and rapid degradation of clinical condition. Likewise it was well established that advanced clinical stages of HIV (WHO stages) and low haemoglobin value were major risk factors of TB (26, 28, 29, 34, 36, 39). This could be due anaemia and advanced stage of HIV (stage IV) directly decreases the immunity of the person and decreases the ability to fight against tuberculosis infection.

As a limitation, temporal relationship of exposure and disease could not be established due to the nature of the study design.

## Conclusions

HIV infected adults with; risk behaviours (smoking, drinking), opportunistic infection, diabetes mellitus, bronchial asthma, low CD4 count, low monthly income and using kerosene for cooking in house should be screened for tuberculosis. Therefore, to reduce the impact of TB on HIV patients the health care providers and the government should work to reduce risk behaviours like smoking and alcohol drinking; early screening and initiation of treatment for opportunistic infections, and health education to and for

those with other chronic diseases, appropriate staging and initiation of treatment for HIV, working with those who are poor to improve their life were recommended.

## Abbreviations

AIDS: Acquired Immunodeficiency Syndrome

ART: Anti-Retroviral Therapy

CD4: Cluster of Differentiation on T<sub>4</sub>Lymphocyte Cells

FMOH: Federal Ministry of Health

HAART: Highly Active Anti-Retroviral Therapy

HIV: Human Immunodeficiency Virus

IRB: Institutional Review Board

OIs: Opportunistic Infections

PLWHA: People Living With HIV/AIDS

PTB: Pulmonary Tuberculosis

TB: Tuberculosis

WHO: World Health Organization

## Declarations

**Ethics approval and consent for participation:** Ethical approval was obtained from the research ethical committee of the Debre Birhan University, and permission letter was obtained from each selected health institutions. The data collectors informed each respondent about the study and verbal consent was obtained. Verbal consent was obtained from each study participants and confidentiality was assured for all the information provided. Moreover, personal identifiers were not being included on questionnaire

**Consent for publication:** Not applicable

**Availabilities data and materials:** The date of this study can't be shared publically due to presence of sensitive (confidential) participants' information

**Competing interests:** The author declared that there is no any competing interest.

**Funding:** This project received financial support from Debre Birhan university.



**Authors Contribution:** TT, GZ, AM contributed to the design of the study, collected, analyzed and interpreted data. TT drafted the manuscript for important intellectual content. All authors reviewed and revised the draft further and approved the final version for submission.

**Acknowledgment:** We thank to Addis Ababa university college of health science to give the chance to conduct this research. We also thank to Debre Birhan referral hospital administration for their permission and valuable information. Finally, we would like to acknowledge our friends who encouraged us to do these research project.

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## Tables

Table 1: Socio demographic characteristics and risk behavior of the study participants on TB infection among HIV infected adults, in Debre Birhan town governmental health institutions, Ethiopia, 2017.

Variables	Cases n (%)	Controls n (%)	Total
<b>Resident</b>			
Urban			
Rural	80 (87)	166 ( 85.6)	246 (86)
	12 (13)	28 (14.4)	40 (14)
<b>Age</b>			
18-24			
25-32	7 (7.6)	17 (8.8)	24 (8.4)
33-40			
>40	26 (28.3)	53 (27.3)	79 (27.6)
	30 (32.6)	52 (37.1)	102 (35.7)
	29 (31.5)	52 (26.8)	81 (28.3)
<b>Sex</b>			
Male			
Female	36 (39.1)	73 (37.6)	109 (38.1)
	56 (60.9)	121 (62.4)	177 (61.9)
<b>Religion</b>			
Orthodox			
Muslim	83 (90.2)	169 (87.1)	252 (88.1)
Protestant			
Catholic	7 (7.6)	19 (9.8)	26 (9.1)
	1 (1.1)	2 (1)	3 (1.1)
	1 (1.1)	4 (2.1)	5 (1.7)
<b>Ethnicity</b>			
Amhara			
Oromo	85 (91.3)	182 (93.8)	267(93.4)
Tigre			
Afar	4 (4.3)	8 (4.2)	12(3.8)
	1 (1.1)	2 (1)	3 (1.1)
	3 (3.3)	2 (1)	5 (1.7)
<b>Marital status</b>			
Single	13 (14.1)	22 (11.3)	35 (12.3)
Married	50 (54.4)	110 (56.7)	160 (55.9)
Divorced/Widowed	29 (31.5)	62 (32)	91(31.8)
<b>Educational status</b>			
No formal education			
Elementary	35 (38)	81 (41.8)	116 (40.6)
Secondary			
Above secondary	43 (46.7)	72 (37.1)	115 (40.2)
	10 (9)	32 (16.5)	42 (14.7)
	4 (4.3)	9 (4.6)	13 (4.5)
<b>Occupation</b>			
Farmer			
House wife	14 (15.2)	22 (11.3)	26 (12.6)

Daily labourer	18 (19.6)	41 (21.1)	59 (20.6)
Merchant			
Governmental employed	19 (20.7)	40 (20.6)	59 (20.6)
Prostitute	15 (16.3)	30 (15.5)	45 (15.7)
	12 (13.0)	26 (13.4)	38 (13.3)
	14 (15.2)	35 (18.1)	49 (17.2)
<b>Monthly income</b>			
3 - 20 USD*			
20- 42.9 USD	31 (33.7)	39 (20.1)	70 (24.5)
43- 73 USD	42 (45.6)	97 (50)	139 (48.6)
Above 73USD	3 (3.3)	36 (18.6)	39 (13.6)
	16 (17.4)	22 (11.3)	38 (13.3)
<b>Having own house</b>			
Yes			
No	60 (65.2)	112 (57.7)	172 (60.1)
	32 (34.8)	82 (42.3)	114 (39.9)
<b>Smoking status</b>			
Smokers			10 (3.5)
Non- smokers	8 (8.7)	2 (1)	276 (96.5)
	84 (91.3)	192 (99)	
<b>Alcohol drinking status</b>			
Yes			
No	12 (13)	6(3.1)	18 (6.3)
	80 (87)	188 (96.9)	268 (93.7)
<b>Chat chewing status</b>			
Yes			
No	11 (12)	12 (6.2)	23 (8)
	81 (88)	182 (93.8)	263 (92)

\* 1 USD= 27.72 Ethiopian birr

Table 2: Bivariate analysis of socio demographic characteristics and risk behavior of the study participants on TB infection among HIV infected adults, in Debre Birhan town public health institutions, Ethiopia, 2017.

Variables	Cases n (%)	Controls n (%)	COR	95% CI	p-value
<b>Resident</b>					
Urban			1.12	0.544, 2.33	
Rural	80 (87)	166 ( 85.6)			0.75
	12 (13)	28 (14.4)			
<b>Age</b>					
18-24					
25-32	7 (7.6)	17 (8.8)	1.191	0.439-3.230	
33-40			1.012	0.381-2.690	
>40	26 (28.3)	53 (27.3)	1.35	0.503-3.647	0.731
	30 (32.6)	52 (37.1)			0.981
	29 (31.5)	52 (26.8)			0.548
<b>Sex</b>					
Male			0.94	0.564-5.56	
Female	36 (39.1)	73 (37.6)			0.81
	56 (60.9)	121 (62.4)			
<b>Religion</b>					
Orthodox			1.96	0.216-17.85	
Muslim	83 (90.2)	169 (87.1)	1.47	0.14-15.55	0.549
Protestant			2.00	0.078-51.593	
Catholic	7 97.6)	19 (9.8)			0.747
	1 (1.1)	2 (1)			0.676
	1 (1.1)	4 (2.1)			
<b>Ethnicity</b>					
Amhara			0.311	0.051-1.898	
Oromo	85 (91.3)	182 (93.8)	0.25	0.027-2.319	0.206
Tigre			0.33	0.017-6.653	
Afar	4 (4.3)	8 (4.2)			0.223
	1 (1.1)	2 (1)			0.473
	3 (3.3)	2 (1)			
<b>Marital status</b>					
Single	13 (14.1)	22 (11.3)	0.769	0.359-1.649	0.500
Married	50 (54.4)	110 (56.7)	0.769	0.350-1.789	0.574
Divorced/Widowed	29 (31.5)	62 (32)			
<b>Educational status</b>					
No formal education			0.972	0.281-3.369	
Elementary	35 (38)	81 (41.8)	1.344	0.390-4.629	0.965
Secondary			0.703	0.178-2.782	
Above secondary	43 (46.7)	72 (37.1)			0.64
	10 (9)	32 (16.5)			0.616
	4 (4.3)	9 (4.6)			
<b>Occupation</b>					
Farmer					

House wife	14 (15.2)	22 (11.3)	0.69	0.289-1.646	
Daily labourer			0.749	0.314-1.772	
Merchant	18 (19.6)	41 (21.1)	0.786	0.315-1.957	0.403
Governmental employed			0.725	0.278-1.890	
Prostitute	19 (20.7)	40 (20.6)	0.629	0.252-1.566	0.507
	15 (16.3)	30 (15.5)			0.605
	12 (13.0)	26 (13.4)			0.511
	14 (15.2)	35 (18.1)			0.319
<b>Monthly income</b>					
3 - 20					
20- 42.9	31 (33.7)	39 (20.1)	0.545	0.301-0.987	
43- 73			0.105	0.029-0.373	
Above 73	42 (45.6)	97 (50)	0.915	0.412-2.033	0.340
	3 (3.3)	36 (18.6)			<0.001*
	16 (17.4)	22 (11.3)			0.827
<b>Having own house</b>					
Yes			1.37	0.82-2.97	
No	60 (65.2)	112 (57.7)			0.2
	32 (34.8)	82 (42.3)			
<b>Smoking status</b>					
Smokers			9.14	1.901-43.9	0.009*
Non- smokers	8 (8.7)	2 (1)			
	84 (91.3)	192 (99)			
<b>Alcohol drinking status</b>					
Yes			4.7	1.71-12.96	0.003*
No	12 (13)	6(3.1)			
	80 (87)	188 (96.9)			
<b>Chat chewing status</b>					
Yes			2.06	0.872-4.86	0.093
No	11 (12)	12 (6.2)			
	81 (88)	182 (93.8)			

Table3. Housing, host, clinical and immunological for the occurrence of TB among HIV infected adults, in Debre Birhan town governmental health institutions, Ethiopia, 2017.



Variable	Cases n (%)	Control n (%)	COR	95% CI	p-value
<b>Presence TB patient in the HH</b>			2.79	1.496-5.206	0.001*
Yes	26 (28.3)	24 (12.4)			
No	66 (71.7)	170 (87.6)			
<b>Peoples in the HH</b>					
1-5	84 (91.3)	181 (93.3)	1.33	0.53-3.32	0.547
>5	8 (8.7)	13 (6.7)			
<b>Types of wall of the house</b>					
Mud/mud brick	82 (89.1)	174 (89.7)	0.94	0.422-2.1	0.885
Cement	10 (10.9)	20 (10.3)			
<b>Floor type</b>					
Mud	75 (81.5 )	156 (80.4)	1.08	0.57-2.6	0.824
Cement	17 (18.5)	38 (19.6)			
<b>Presence of separate Kitchen</b>					
Yes	77 (83.7)	160 (82.5)	1.09	0.56-2.12	0.79
No	15 (16.3)	34 (17.5)			
<b>Availability of Electricity</b>					
Yes	34 (37)	51 (26.3)	1.64	0.967-2.79	0.06
No	58 (63)	143 (73.7)			
<b>Using Kerosene for cooking</b>					
Yes	50 (54.3)	66 (34)	2.31	1.391-3.831	0.001*
No	42 (45.7)	128 (66)			
<b>Availability of latrine</b>					
Yes	83 (90.1)	166 (85.6)	1.56	0.702-3.443	0.277
No	9 (9.9)	28 (14.4)			
<b>Place of waste system</b>					0.09
In the compound	63 (68.5)	113 (58.2)	1.56	0.922-2.63	
Outside the compound	29 (31.5)	81 (41.8)			
<b>opportunistic infection</b>					
Yes	52 (56.5)	53 (27.3)	3.46	2.058-5.81	<0.001*
No	40 (43.5)	141 (72.7)			
<b>Bronchial Asthma</b>					
Yes	74 (80.4)	58 (29.9)	9.64	5.29-17.56	<0.001*
No	18 (19.6)	136 (70.1)			
<b>Diabetes mellitus</b>					
Yes	19 (20.7)	8 (4.1)	6.05	2.53-14.43	<0.001*
No	73 (79.3)	186 (95.9)			
<b>Haemoglobin value (g/dl)</b>					
<10	3 (3.3)	3 (1.6)	2.64	0.52-13.41	0.241
10-12.5	22 (23.9)	14 (7.2)	4.15	2.007-8.586	<0.001*
>12.5	67 (72.8)	177 (91.2)			

<b>CD4 count (cells/<math>\mu</math>L)</b>					
<200	34 (37)	42 (21.7)	2.61	1.301-	0.007*
200-350	23 (25)	52 (26.8)	1.43	5.23	0.336
351-500	17 (18.5)	42 (21.6)	1.31	0.693-	0.500
>500	18 (19.6)	58 (29.9)		2.932	
				0.602-	
				2.824	
<b>WHO clinical stage</b>					
Stage I and II	29 (31.5)	92 (47.4)	1.96	1,162-	0.012*
Stage III and IV	63 (68.5)	102 (52.6)		3.303	
<b>Isoniazid Therapy</b>					
Yes	29 (31.5)	75 (38.7)			
No	63 (68.5)	119 (61.3)		0.43-1.24	0.24
			0.73		
<b>Cotrimoxazole prophylaxis</b>					
Yes	90	188 (96.9)			
No	(97.8)	6 (3.1)	1.44	0.284-	0.66
	2 (2.2)			7.256	
<b>Body mass index (BMI)</b>					
<18.5	27 (29.3)	36 (18.6)	2.026	0.797-	0.136
18.5-24.5	57 (62)	136 (70.1)	1.153	5.337	0.745
>24.5	8 (8.7)	22 (11.3)		0.485-	
				2.741	

Table 4: Determinants for tuberculosis among HIV infected adults, in Debre Birhan town governmental health institutions, Ethiopia, 2017.

Variables	Cases (%)	n Controls n(%)	COR		95% CI	p-value
			AOR			
<b>Monthly income</b>						
3 - 20	31 (33.7)	39 (20.1)				
20- 42.9	42 (45.7)	97 (50)	0.43	0.21	0.079-0.555	0.002*
43- 73	3 (3.3)	36 (18.6)	0.08	0.02	0.004-0.140	<0.001*
Above 73	16 (17.4)	22 (11.3)	0.92	0.25	0.075-0.825	0.023*
<b>Presence of TB patient in the HH</b>						
Yes	26 (28.3)	24 (12.4)	2.79	2.51	1.027-6.150	0.044*
No	66 (71.7)	117 (87.6)				
<b>Smoking status</b>						
Smokers	8 (8.7)	2 (1)	9.14	10.53	1.535-72.175	0.017*
Non smokers	84 (91.3)	192 (99)				
<b>Alcohol drinking status</b>						
Yes	12 (13)	6(3.1)	4.70	5.48	1.287-23.364	0.021*
No	80 (87)	188 (96.9)				
<b>Using kerosene for cooking</b>						
Yes	50 (54.3)	66 (34)	2.31	2.49	1.220-5.072	0.012*
No	42 (45.7)	128 (66)				
<b>History of opportunistic infection</b>						
Yes	52 (56.5)	53 (27.3)	3.46	3.35	1.622-6.912	0.001*
No	40 (43.5)	141 (72.7)				
<b>History of Bronchial Asthma</b>						
Yes	74 (80.4)	58 (29.9)	9.64	14.77	6.246-	0.001*
No	18 (19.6)	136 (70.1)			34.910	
<b>History of Diabetes mellitus</b>						
Yes	19 (20.7)	8 (4.1)	6.05	10.62	2.767-40.503	0.001*
No	73 (79.3)	186 (95.9)				
<b>CD4 lymphocyte count (cells/ µL)</b>						
<200	34 (37)	42 (21.6)	2.61	6.03	2.266-16.178	0.001*
200-350	23 (25)	52 (26.8)	1.43	3.04	1.106-8.378	0.031*
351-500	17 (18.5)	42 (21.6)	1.30	2.46	0.809-7.461	0.113
>500	18 (19.6)	58 (29.9)				

\*=p-value <0.05