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Determinants of Tuberculosis among Adults in Jabi Tehnan District, West Gojjam Zone, Northwest Ethiopia: A Case Control Study

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Abstract

Introduction: Tuberculosis is a bacterial disease caused by Mycobacterium tuberculosis. Tuberculosis is the third leading causes of death among adults in sub-Saharan Africa after Human Immunodeficiency virus and malaria. Ethiopia is one of the 22 high burden countries and the country is rated 7th among the 22 burden countries.

Objectives: The main objective of this study is to identify determinants of tuberculosis among adults in Jabi tehnan district.

Method: Unmatched case control study was conducted among 100 cases and 300 controls to identify determinants of tuberculosis among adults. Simple random sampling technique was used to recruit study participants. Data were collected from the study population using structured questionnaire through observation and face to face interview. Multivariable logistic regression model was used to assess the association between outcome and independent factors.

Results: A total of 400 study subjects were participated in this study. Independent determinants which were significantly associated with TB were family size (AOR=3.605, 95% CI 1.717-7.570), composition of house floor (AOR=4.430 95% CI 1.739-11.286), family history of TB (AOR=5.374 95% CI 2.145-13.468), ever drunk alcohol (AOR=3.799 95% CI 1.237-11.666), ever drunk raw milk (AOR=7.275 95% CI 3.267-16.202), out of family contact history with TB patients (AOR=5.103 95% CI 1.024-25.418), living in poor lighting (AOR= 4.532 95% CI 1.823-11.267) and ventilation (AOR=3.736 95% CI 1.462-9.548) house.

Conclusion and Recommendations: In this study, the most important determinants to develop TB were identified such as family size, house floor, and family history of TB, ever drunk alcohol, ever drunk raw milk, ventilation and lighting status of house. Providing health education for new TB patients how to protect their family and community, on life style risk factors, regarding housing condition, importance of ventilation and lighting for the community is important to prevent and reduce TB disease in the community.

Keywords: Determinants; Tuberculosis; Jabi tehnan district; West gojjam zone; Northwest ethiopia

Introduction

Tuberculosis is a major public health problem throughout the world. It is one of the leading infectious disease and the top ten causes of death worldwide in 2015. In 2015, there were 10.4 million new cases world wide of which 90% of cases were adults [1]. In 2011, there were an estimated 8.7 million incident cases and 12 million prevalent cases of TB globally. About 26% of incident TB cases occurred in Africa [2]. Every year approximately 9 million people contract TB and close to 2 million die from the disease. The most tuberculosis cases are in Asia, the highest incidence rates are in Africa where a high rate of HIV and malnutrition weaken immune system and accelerates the spread of the disease [3].

Developing countries bear the highest burden of the TB epidemic. An estimation of 95% of TB cases and 98% of TB deaths occurs in the developing parts of world, where peoples are especially vulnerable to TB because of poor living conditions and limited access to treatment [4]. Two third of TB cases in developing countries are in the economically productive age group (15-59 years) [5,6]. TB is the third leading causes of death among adults in sub-Saharan Africa after HIV and malaria [7].

Ethiopia is one of the 22 high burden countries and the country is rated 7th among the 22 burden countries [5]. The national population based TB prevalence survey conducted in 2010/2011 revealed that the prevalence of smear positive TB among adults and all age groups was found to be 108 and 63 per 100,000 populations, respectively. The prevalence of bacteriologically confirmed TB was found to be 156/100,000 populations and the prevalence of all forms of TB in Ethiopia is estimated to be 240/100,000 populations. In 2011, there were estimated 220,000 (258 per 100,000) incident cases of TB in Ethiopia. According to the same year report the prevalence of TB was estimated to be 200,000 (237 per 100,000 populations). There were an estimated 15,000 deaths due to TB (18 per 100,000 populations) in Ethiopia in 2011. In 2012, there were an estimated 230,000 incident cases and 210,000 prevalence of TB in Ethiopia [8]. According to the 2011 health and health related indicators of the FMOH, TB is the third leading causes of death in Ethiopia.

TB affects individuals of all ages and both sexes with in every socio-economic group in the population. There is however groups, which are more vulnerable to develop tuberculosis disease in a given community. Poverty, malnutrition, crowded living condition and HIV infection have

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been reported to increase the risk of developing the diseases in poor countries like ours [2,5,9]. TB is associated with poverty, overcrowding, alcoholism and malnutrition. The disease spreads easily in overcrowded, badly ventilated places and among people who are undernourished [10]. TB disease is one of a community health problem in Jabi tehan district. In 2015/2016 the prevalence of all forms of TB among adults and all age groups were 277 and 166 per 100,000 populations respectively [11]. Therefore, this study was addressed determinants of TB in the area to improve TB prevention and control programme.

Methods and Materials

Study area and period

The study was conducted in Jabi tehnan district, Amhara regional state. Jabi tehnan district is one of the districts in west Gojam zone, northwest Ethiopia. Jabi tehnan is bordered on southwest by Dembech, on the west by Bure, on the northwest by Sekela, on the north by Kuarit, and on the east Degadamot districts. It is located at 387 kms from Addis Ababa in North West part of Ethiopia. According to the report from the district in 2016, it has 39 kebeles with a total population of 218,447 and 125,323 adults. In the district, there are 11 health centers and 39 health posts. The health centers give different clinical services such as family planning, antenatal care, delivery, testing of HIV, etc. for the nearby by community. All health centers and 28 health posts give TB DOTs program for the nearby community [12]. The study was conducted from March 19, 2009 to March 28, 2009 E.C in this area.

Study design

Community based unmatched case control study design was used.

Population

Source population

The source populations were adults greater than or equal to 15 years of age that are living in Jabi tehnan district, northwest Ethiopia.

Study population

Cases-adult patients with bacteriologically confirmed TB who were registered at health facilities for DOTs follow up in Jabi tehnan district. Controls-adult persons who are not TB suspect.

Inclusion and exclusion criteria

Inclusion criteria

- Persons whose age greater than or equal to 15 years old
- Persons with bacteriologically confirmed TB for cases
- Persons without TB suspect for controls

Exclusion criteria

- Severely ill person who could not respond to the interview
- Persons with suspect of tuberculosis

Study variables

Dependent variable

Tuberculosis (No/Yes)

Independent variables

- Environmental determinants
- Socio demographic variables
- Host related (behavioral and health status)

Operational definitions

- Overcrowded-a house is overcrowded when the area of the house per person was less than 4 meter square [13].
- Persons per room-was calculated by dividing the number of adults living in dwelling by the number of rooms [14].
- TB suspect-a person with signs and symptoms of pulmonary TB (cough of two weeks or more, chest pain, fever, loss of appetite etc.) disease but evaluation not completed (undiagnosed with laboratory or chest X-ray) [9].
- Bacteriologically confirmed TB cases -are cases with confirmed TB either by microscopy or gene expert or culture.
- Good lighting-houses considered good lighting if it is possible to read document written in pencil in the center of the house [13].
- Good ventilation-a house considered good ventilation if the house has two and above windows [13].
- Adults-an adult is considered as a person who is 15 years old or more [14].
- Diabetes-verbal confirmation of any diabetes ever diagnosed [14].
- Asthma -verbal confirmation of asthmatic disorder ever diagnosed [14].

Sample size determination

Sample size was calculated using Epi Info version 7 unmatched case control sample size calculator software based on the following assumptions:

- Power=80%
- Confidence level=95%
- sample ratio of controls to cases 3:1
- Percent of ever drunk unpasteurized milk among controls (independent factor/main exposure/of TB taken from recent study)=45.6% [15] and
- Percent of ever drunk unpasteurized milk among cases=61.1% [15]
- From similar study odds ratio (OR)=2.05. From the Fleiss continuity correction statistical methods for proportions sample size, cases=91 and controls=272 with total sample size=363. The final sample size by adding non response rate (10%) was 100 cases and 300 controls with a total of 400 study subjects.

Sampling procedure

Cases were selected from TB patients who had been on the follow up treatment at the DOTs clinics program in Jabi tehnan district health facilities. TB registration log book was used as sampling frame to recruit cases. Then based on their address data was collected at household level. Three controls were selected for each case. To recruit controls primarily controls households were selected from the same villages that yielded the cases from CHIS family folder by using simple random sampling technique/lottery method. Then after explaining the aim of the study

to the members of each selected household, one control was selected at random using lottery method based on eligibility criteria. If the selected household home closed during data collection time, another two consecutive days were revisited. Data was collected from cases and controls at house hold level.

Data collection tool

Data were collected from the study population using a structured questionnaire through observation and face to face interviews in local language by trained data collectors. The interview was made in separate place to ensure privacy and to facilitate discussion between the interviewer and respondents. The data was collected by five diploma nurses and close supervision during data collection was done by principal investigator. A material like meter was used to measure area of the house.

Data quality assurance

Training was given to data collectors and properly designed and pre tested questionnaire was used to prevent any confusion and had a common understanding about the study. The questionnaire was pre tested on 5% [16] of study population to avoid unclearity prior to actual data collection. The pilot area was Bure town administration. The filled questionnaire was checked for completeness by data collectors and principal investigators on daily basis. Consequently, any problem was discussed and solved immediately.

Data management and analysis

The collected data were entered and cleaned using Epi data version 3.1. Then were exported to SPSS version 20.0 for analysis and statistical package for social sciences software was used to process the data. Descriptive statistics like frequency tables and percentages were used. At a Bivariable analysis the effect of each variable on the dependent variable was analyzed holding other variables constant. Finally variables with p-value less than 0.2 at a Bivariable analysis were imported into multivariable analysis. In multivariable analysis, the existence of association was declared at p-values less than 0.05 with 95% CI.

Ethical consideration

The ethical approval and clearance for this study was obtained from Debre Markos University College of health science institutional research ethics review committee. At all levels officials was contacted and permission from administrators was secured. All necessary explanations about purpose of the study and its procedures were explained with the assurance of confidentiality. Consent and informed assent from the study participants were secured

Results

Socio-demographic determinants of tuberculosis

A total of 400 study participants (100 cases and 300 controls) were included in the study with a response rate of 100%. The mean age of respondents was 39 years with ± 10.40 SD. One hundred thirty two or 33% of study participants were in the age group 25-34 years. Regarding place of residence and their sex, 312 (78%) and 282 (70.5%) of them were rural residents and males respectively. Moreover, 380 (95%), 262 (65.5%) and 272 (68%) were orthodox, married and farmers respectively. In addition to this, 164 (41%) were earning 525-1400 Ethiopian birr per month while 120 (30%) of them were primary in their educational status (Table 1).

Variable	Categories	Tuberculosis		Total (N=400)
		Yes (N=100)	No (N=300)	
Residence	urban	22 (22%)	66 (22%)	88 (22%)
	rural	78 (78%)	234 (78%)	312 (78%)
Sex	male	74 (74%)	208 (69.3%)	282 (70.5%)
	female	26 (26%)	92 (30.7%)	118 (29.5%)
Age	≤ 24	11 (11%)	11 (3.7%)	22 (5.5%)
	25-34	36 (36%)	96 (32%)	132(33%)
	35-44	26 (26%)	99 (33%)	125(31.2%)
	≥ 45 years	27 (27%)	94 (31.3%)	121(30.3%)
Marital status	Single	23 (23%)	42 (14%)	65 (16.2%)
	Married	61 (61%)	201(67%)	262 (65.5%)
	Widowed	12 (12%)	40 (13.3%)	52 (13%)
	Divorced	4 (4%)	17 (5.7%)	21 (5.3%)
Religion	Orthodox	99 (99%)	281(93.7%)	380 (95%
	Muslim	1 (1%)	14 (4.7%)	15 (3.8%)
	Protestant	0 (0%)	5 (1.7%)	5 (0.2%)
Educational status	Unable to read and write	30 (30%)	83(27.7%)	113 (28.2
	able to read and write	23 (23%)	73 (24.3%)	96 (24%)
	Primary	35 (35%)	85 (28.3%)	120 (30%)
	Secondary	10 (10%)	35 (11.7%)	45 (11.2%)
	Certificate	0 (0%)	7 (2.3%)	7 (1.8%)
	Diploma and above	2(2%)	17 (5.7%)	19 4.8%)
Occupation	Farmer	70 (70%)	202(67.3%)	272 (68%)
	housewife	0 (0%)	18 (6%)	18 (4.5%)
	Daily laborer	5 (5%)	9 (3%)	14 (3.5%)
	Private employee	1 (1%)	3 (1%)	4 (1%)
	Government employee	1(1%)	9 (3%)	10 (2.5%)
	student	4 (4%)	7 (2.3%)	11 (2.8%)
	Merchant	12 (12%)	51 (17%)	63 (15.8%)
	Other*	7(7%)	1 (0.3%)	8 (2%)
Family income	<525	18 (18%)	47 (15.7%)	65 (16.2%)
	525-1400	47 (47%)	117 (39%)	164 (41%)
	>1400 birr	35 (35%)	136 (45.3%)	171 (42.8%)
Other*: Driver, enterprise worker				

Table 1: Socio-demographic determinants of tuberculosis among adults in Jabi tehnan district, 2017(N=400).

Environmental determinants of tuberculosis

All the houses of the study participants, comprising 100 (100%) cases and 300(100%) controls, were made from mud and wood with 399 (99.8%), 99 cases (99%) and 300 (100%) controls, corrugated iron sheets roof. However, only one hundred fourteen (28.5%) of the respondents, comprising 9 (9%) cases and 105 (35%) controls, houses floor were cemented. Regarding other determinants of the households, 56 (56%) cases and 228 (76%) controls had fewer than four family members. 43 (43%) cases and 254 (84.7%) controls of the houses had good ventilation while 42 (42%) cases and 258 (86%) controls of the houses had good lighting status. Moreover, 370(92.5%) of the respondents, 90 (90%) cases and 280(93.7%) controls, had separate kitchen. However, one hundred forty five (36.2%) of the respondents, comprising 40 (40%) cases and 105 (35%) controls, were getting water from well. Majority of study participants 361 (90.2%), cases 76 (76%) and 285 (95%) controls, had no family history of TB (Table 2).

Host related determinants of tuberculosis

All study participants 400 (100%) had never smoked cigarette while

Variable	Categories	Tuberculosis		Total (N=400)
		Yes (N=100)	No (N=300)	
Composition of floor	Cemented	9 (9%)	105 (35%)	114 (28.5%)
	Mud	91 (91%)	195 (65%)	286 (71.5%)
Family size	≤ 4	56 (56%)	228 (76%)	284 (71%)
	>4	44 (44%)	72 (24%)	116 (29%)
No. of adults	<3	38 (38%)	142 (47.3%)	180 (45%)
	≥ 3	62 (62%)	158 (52.7%)	220 (55%)
No. of rooms	1	45 (45%)	120 (40%)	165 (41.2%)
	≥ 2	55 (55%)	180 (60%)	235 (58.8%)
PPR	≤ 2	89 (89%)	246 (82%)	335 (83.8%)
	>2	11 (11%)	54 (18%)	65 (16.2%)
No. of windows	≤ 1	57 (57%)	47 (15.7%)	104 (26%)
	≥ 2	43 (43%)	253 (84.3%)	296 (74%)
Ventilation status	Good	43 (43%)	254 (84.7%)	297 (74.2%)
	Poor	57 (57%)	46 (15.3%)	103 (25.8%)
Lighting status	Good	42 (42%)	258 (86%)	300 (75%)
	Poor	58 (58%)	42 (14%)	100 (25%)
Space status	Not crowded	93 (93%)	299 (97.7%)	392 (98%)
	Crowded	7 (7%)	1 (0.3%)	8 (2%)
Cooking energy	Electric	1 (1%)	7 (2.3%)	8 (2%)
	Wood	95 (95%)	284 (94.7%)	379 (94.8%)
	Charcoal	4 (4%)	9 (3%)	13 (3.2%)
Separated kitchen	Yes	90 (90%)	280 (93.7%)	370 (92.5%)
	No	10 (10%)	20 (6.3%)	30 (7.5%)
Water source	Tap	22 (22%)	65 (21.7%)	87 (21.8%)
	Well	40 (40%)	105 (35%)	145 (36.2%)
	Spring	34 (34%)	104 (34.7%)	138 (34.5%)
	Other*	4 (4%)	26 (8.7%)	30 (7.5%)
Separated animal house	Yes	85 (85%)	264 (88%)	349 (87.2%)
	No	15 (15%)	36 (12%)	51 (12.8%)
Family history of TB	Yes	24 (24%)	15 (5%)	39 (9.8%)
	No	76 (76%)	285 (95%)	361 (90.2%)

Table 2: Environmental determinants of tuberculosis among adults in Jabi tehnan district, 2017(N=400).

333 (83.2%) of them, 90 (90%) cases and 243 (81%) controls, had drunk alcohol 0.378 (94.5%) of the respondents, 93 (93%) cases and 285 (95%) controls, had never chewed Kchat.339 (84.8%) study participants, 65 (65%) cases and 274 (91.3%) controls, had never consumed raw milk. Majority, 382(95.5%), comprising 93(93%) cases and 289 (96.3%) controls, and 391 (97.8%), comprising 96 (96%) cases and 295 (98.3%) controls, of the study participants had no history of asthma and diabetes respectively. However, 357 (89.2%) of the respondents, 80 (80%) cases and 277 (92.3%) controls, had a habit of ≥ 3 meals per day (Table 3).

Determinants of tuberculosis

At Bivariable analysis, variables such as age, marital status, composition of floor, family size, ventilation, space status, natural lighting, family history of TB, ever drunk alcohol, ever drunk raw milk, out of family contact history with TB patient and meals per day were found to have p-value less than 0.2 and imported to multivariable analysis.

Variable	Categories	Tuberculosis		Total (N=400)
		Yes (N=100)	No (N=300)	
Ever drunk alcohol	Yes	90 (90%)	243 (81%)	333 (83.2%)
	No	10 (10%)	57 (19%)	67 (16.8%)
Ever smoked cigarette	Yes	0 (0%)	0 (0%)	0 (0%)
	No	100 (100%)	300 (100%)	400 (100%)
Ever chewed khat	Yes	7(7%)	15 (5%)	22 (5.5%)
	No	93 (93%)	285 (95%)	378 (94.5%)
Ever drunk raw milk	Yes	35 (35%)	26 (8.7%)	61 (15.2%)
	No	65 (65%)	274 (91.3%)	339 (84.8%)
Out of family history of exposure with TB patient	Yes	7 (7%)	5 (1.7%)	12 (3%)
	No	93 (93%)	295 (98.3%)	388 (97%)
History of asthma	Yes	7 (7%)	11 (3.7%)	18 (4.5%)
	No	93 (93%)	289 (96.3%)	382 (95.5%)
History of diabetes	Yes	4 (4%)	5 (1.7%)	99 (2.2%)
	No	96 (96%)	295 (98.3%)	391 (97.8%)
Ever tested HIV	Yes	100 (100%)	181(60.3%)	281 (70.2%)
	No	0 (0%)	119 (39%)	119 (29.8%)
Meals per day	<3	20 (20%)	23 (7.7%)	43 (10.8%)
	≥ 3	80 (80%)	277 (92.3%)	357 (89.2%)

Table 3: Host related determinants of tuberculosis among adults in Jabi tehnan district,2017 (N=400).

At multivariable analysis, variables such as age[35-44 years (AOR=0.100, 95% CI (0.020-0.495)), ≥ 45 years (AOR=0.094,95% CI (0.019-0.460))], composition of floor (AOR=4.430, 95% CI (1.739-11.289)), family size (AOR=3.605, 95% CI (1.717-7.570)), ventilation status (AOR=3.376, 95% CI (1.462-9.548)), lighting status (AOR=4.532, 95% CI (1.823-11.267)), family history of TB (AOR=5.374, 95% CI (2.145-13.468)), ever drunk alcohol (AOR=3.799, 95% CI (1.237-11.666)), ever drunk raw milk (AOR=7.275, 95% CI (3.267-16.202)) and Out of family history of contact with TB patient (AOR=5.103, 95% CI (1.024-250.418)) were significantly associated with tuberculosis at p<0.05 with 95% CI (Table 4).

Discussion

The study finding showed that people living within more than four family members were 3.605 times more likely to develop TB than those living within fewer four family members. This is in line with the studies done in North West Ethiopia and Pakistan stated that larger family size increasing the risk of TB infection than small size family members [17,18]. It might be due to larger family size makes the living area more crowded. In crowded houses, a greater degree of shared airspace increases exposure to mycobacterium tuberculosis and crowding makes

Variable	Categories	Tuberculosis		COR with 95% CI	AOR with 95% CI	P-value
		Yes	No			
Age	≤ 24	11	11	1	1	
	25-34	36	96	0.375 (0.150-0.940)	0.309 (0.066-1.446)	0.136
	35-44	26	99	0.263 (0.103-0.673)	0.100 (0.020-0.495)	0.005
	≥ 45 years	27	94	0.287 (0.112-0.735)	0.094 (0.019-0.460)	0.004
Marital status	Single	23	42	1	1	
	Married	61	201	0.554 (.309-.993)	1.520 (0.562-4.112)	0.409
	Widowed	12	40	0.548 (.241-1.246)	1.628 (0.427-6.203)	0.475
	Divorced	4	17	0.430 (.129-1.429)	0.496 (0.085-2.891)	0.436
Composition of floor	Cemented	9	105	1	1	
	Mud	91	195	5.444 (2.637-11.239)	4.430 (1.739-11.286)	0.002
Family size	≤ 4	56	228	1	1	
	>4	44	72	2.488 (1.547-4.003)	3.605 (1.717-7.570)	0.001
Ventilation status	Good	43	254	1	1	
	Poor	57	46	7.320 (4.416-12.132)	3.376 (1.462-9.548)	0.006
Lighting status	Good	42	258	1	1	
	Poor	58	42	8.483 (5.074-14.181)	4.532 (1.823-11.267)	0.001
Space status	Not crowded	93	299	1	1	
	Crowded	7	1	22.505 (2.733-185.291)	4.101 (.335-50.212)	0.269
Family history of TB	Yes	24	15	6.0 (3.001-11.998)	5.374 (2.145-13.468)	0.001
	No	76	285	1	1	
Ever drunk alcohol	Yes	90	243	2.111 (1.034-4.312)	3.799 (1.237-11.666)	0.02
	No	10	57	1	1	
Ever drunk raw milk	Yes	35	26	5.675 (3.193-10.084)	7.275 (3.267-16.202)	0.001
	No	65	274	1	1	
Out of family history of contact with TB patient	Yes	7	5	4.441 (1.377-14.324)	5.103 (1.024-25.418)	0.047
	No	93	295	1	1	
Meals per day	<3	20	23	1	1	
	≥ 3	80	277	0.332 (0.174-.635)	0.420 (0.173-1.017)	0.055

Table 4: Bivariable and multivariable analysis of determinants of tuberculosis among adults in Jabi tehnan district, 2017 (N=400).

the environment more suitable for bacteria growth and to develop TB infection [16,19].

People living in a house floor made from mud were at higher risk of getting TB 4.430 times more likely to develop TB than those living in a house made from cement. The study before also found that people living within house floor which is not watertight and dusty had the risk of developing tuberculosis 16.9 times higher than those whose homes have impermeable and clean floor [20]. This finding is also similar to that of a study conducted in west Ethiopia showed that types of house floor made from mud was at higher risk of getting TB 4.5 times higher than house floor made from cement [21]. The soil floor has a role on the incidence of TB disease because the ground floor tends to cause moisture that will prolong the survival of the TB germs and will eventually lead to the potential transmission of TB to be great [20]. It might be due to mud floor are easily dilapidated and become difficult to keep them clean and become good hiding places for TB bacteria.

The study also found that the houses with poor lighting were at higher risk of getting TB 4.532 times more likely than those houses with good lighting. This is in agreement a study conducted in Indonesia showed that occupants living where the natural lighting homes do not qualify had the risk of getting TB than people with home lighting meets requirements. The study stated that people living where the natural lighting homes do not qualify 4.5 times more likely to develop TB than people living within good lighting home [20]. It might be due to lack of direct sunlight in the house that provides survival of TB bacteria and increase chance of TB infection.

The houses with poor ventilation were a risk of getting TB 3.736 times more likely than houses with good ventilation. This is in line with the studies done in Indonesia and Pakistan stated that people living with in poor ventilation houses had risk of developing TB higher than people living within good ventilation houses [19,20]. This might be due to lack of ventilation reduces oxygen levels and increases carbon dioxide and rises humidity of the rooms. The presence of elevated carbon dioxide can support bacteria growth and increases transmission of tuberculosis. Good ventilation dilutes the concentration of TB bacteria so it will decrease the transmission of tuberculosis.

Family history of TB was another profound risk factor for tuberculosis in this study. People having family history of TB were 5.374 times more likely to get TB than people not having family history of TB. This consistent with the studies done in Pakistan, India and west Ethiopia showed that family history of TB was a risk of getting tuberculosis infection as compared absence of family history of tuberculosis [19,21,22]. It might be due to unsafe contact with active disease in the family. A necessary risk factor for TB infection is contact with a person with active disease [23].

The result of this study also showed that drinking raw milk was a risk of getting TB infection. Persons who ever drink raw milk were 7.275 times more likely to develop TB than those did not exhibit such behavior. This result is in line with studies conducted in sub-Saharan Africa and southern Ethiopia stated that intake of raw milk was increased likelihood of TB infection compared to those who consume boil milk [16]. It might be due to intake of infected milk with TB bacteria.

Multivariate analysis also identified that contact history with a TB patient was a risk factor for tuberculosis. People who had history of contact with TB patient were 5.103 times more likely to develop TB than those no contact history with a TB patient. This finding is similar to a study done in northern Ethiopia showed that people who had history of contact with a TB patient were 2.05 times more likely to have TB than no contact history with a TB patient [17]. Similarly, the study done in Zambia found that person who has a history of exposure with TB patient was 1.53 times more likely to develop than those no contact history with TB patient [11]. People living or working in environments where TB prevalence is particularly high are obviously at high risk of infection, for example prison staff and inmates and certain health care worker [23]. It might be due to improper cough equity of new PTB patients.

Drinking alcohol also identified as a risk factor for TB infection in this study. Participants who consumed alcohol were 3.799 times more likely to have TB compared with those participants who did not drink alcohol. This finding is in line with studies conducted in Zambia and Pakistan showed that persons involved in drinking at higher risk of getting TB than persons not involved in drinking [10,18]. It might be due to intake more alcohol than what is recommended lowers the immune system and puts one at risk of acquiring infections.

Limitation of the Study

- Even though we did our best to minimize, there might be still social desirability bias.

Conclusion

Information about determinants of tuberculosis is important for effective prevention and control programme. This study highlighted determinants that contribute to the development of tuberculosis among adults. In this study, the most important contributing determinants for developing TB included family size, composition of house floor, poor ventilation, family history of TB, poor lighting, ever drunk alcohol, ever drunk raw milk and contact history with TB patients.

Recommendations

Based on the study findings, the following recommendations are forwarded to reduce TB infection

- New PTB patients should not spit out sputum everywhere rather should collect with cup and buried or burn it, use towel while sneezing or coughing to protect their family members and the community from TB infection.
- Community should avoid raw milk consumption and should use boiled milk.
- Community should avoid excessive alcohol drinking.
- Community should give attention and improve ventilation and lighting status of house.
- Attention should be given for good housing keeping, improved design and construction of houses.
- Health facilities should give attention early screening of TB suspects and minimize exposure time with families and community.
- District health office and health facilities should strengthen health education regarding housing condition (lighting &ventilation status house) of the community, harm of drinking raw milk, educate new TB patients and harm of alcohol drinking to prevent and reduce TB infection in the community.

Authors Contributions

MS concepted and designed the study, developed tools, supervised data collection, performed analysis and interpretation of data and drafted the paper.

MM assisted the conception and design of the study, helped in writing the proposal, developing tools, performing the analysis and writing the paper. He has also developed the manuscript.

GT assisted in the conception, design, interpretation of results and drafting the manuscript. All the authors read and approved the final manuscript.

Competing Interests

We have declared that we have no competing interests.

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