

Prevalence of Smear Positive Pulmonary Tuberculosis and Associated Risk Factors among Pulmonary Tuberculosis Suspected Patients at Private Health Institutions in Gondar Town, Northwest Ethiopia: A Cross-sectional Study

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Abstract Tuberculosis is one of the chronic human disease and serious public health problem in developing countries all over the world. It is the major cause of morbidity and mortality especially in sub-Saharan Africa. This study aimed to assess the prevalence and associated risk factors of smear positive pulmonary tuberculosis among tuberculosis suspected patients at private health institutions in Gondar town. A cross sectional study was conducted at private health institutions on 352 suspected patients. Spot morning sputum was collected and examined by Ziehl-Nelson staining technique. Data was processed by SPSS version 20 software. Out of 352 pulmonary suspected patients who gave sputum samples the prevalence of smear positive pulmonary tuberculosis were 19(5.4%). Among these 12(3.41%) were males while the remaining 7(1.99%) were females. The age ranged from 15 to 91 with mean age of 53 years. Age, average monthly income, low educational status, patients with previous history of chronic disease, contact with tuberculosis suspected cases and ingestion of raw milk were more prone to have pulmonary tuberculosis. So to overcome this problem the responsible bodies should participate to increase the awareness of the community for the prevention and control of tuberculosis.

Keywords: Northwest Ethiopia, pulmonary, prevalence, tuberculosis

Cite This Article: Martha Alemayehu, Abiy Tigabu, Solomon Yunkura, Fana Hagos, and Birehanemeskel Tegene, "Prevalence of Smear Positive Pulmonary Tuberculosis and Associated Risk Factors among Pulmonary Tuberculosis Suspected Patients at Private Health Institutions in Gondar Town, Northwest Ethiopia: A Cross-sectional Study." *American Journal of Infectious Diseases and Microbiology*, vol. 5, no. 1 (2017): 60-65. doi: 10.12691/ajidm-5-1-3.

1. Introduction

Tuberculosis is among top ten causes of global mortality and morbidity caused by mycobacterium tuberculosis, and occasionally by other species of mycobacterium tuberculosis complex that includes *mycobacterium bovis*, *mycobacterium africanum* and *mycobacterium Canetti* [1]. Recently published estimate suggest that 32% of the world population has tuberculosis infection. About 9 million new cases occur each year and almost two million people die of tuberculosis each year [2]. Over 95% new cases and deaths occur in developing countries [3]. In Africa, at least one third of the population is already infected with *mycobacterium tuberculosis* [4].

Transmission occurs through air born-spread of infectious droplets [5]. Demographic forces such as growing population, urbanization, increased travel and migration of persons from high incidence area also additional contributing

factors to the spread of tuberculosis worldwide. The worsening socio-economic trends may also have contributed to the spread of tuberculosis [6]. Poverty, HIV/AIDS and poor general health status have shifted the odds in favor of tuberculosis; allowing over 1.6 million people develop active tuberculosis each year [4]. Once infected with *M. tuberculosis*, person remains infected for many years, probably for life. The bacillus can remain dormant for many years. Under normal circumstances only 10% of the infected person will develop TB disease at some point in their life time. Factors like acquired immune deficiency syndrome (AIDS) or other disease sufficiently weaken the immune system [7].

Ethiopia is the third most populous country in Africa and number seven in the countries with highest tuberculosis burden in the world [8]. According to World health organization report of 2011, in Ethiopia the incidence of all forms of tuberculosis was 261/ 100,000 per year and the prevalence of all forms of tuberculosis was 394/100,000 population per year [8]. Diagnosis of

pulmonary tuberculosis is difficult in resource poor countries. There was no study conducted about the prevalence and associated risk factors of pulmonary tuberculosis infection at private health institutions in Gondar town. Therefore, this study intended to assess the prevalence of smear positive pulmonary tuberculosis infection and associated risk factors among pulmonary tuberculosis suspected patients at private health institutions in Gondar town, North West Ethiopia. This study helps the community and the concerned body for the prevention and control measures of pulmonary tuberculosis dissemination.

2. Materials and Methods

2.1. Study Settings

The study was conducted at private health institutions in Gondar town, which is the city of North Gondar Zone, in Amhara region. The town has about 15 private clinics and these private health institutions give different inpatient and outpatient services including follow-up and treatment services of TB to the population in the surrounding area of Gondar town and the adjacent regions.

2.2. Study Design and Participants

A cross sectional study was conducted from January to June 2015 at private health institutions in Gondar town. A total of 352 adults age groups greater than 15 years old who are suspected for pulmonary tuberculosis at private health institutions were enrolled in this study.

2.3. Study Population

All adult TB suspected patients visiting private health institutions in Gondar town with complete informed consent were included whereas, patients of age groups greater than 15 years old who are unable to give sputum sample were excluded.

2.4. Data Collection and Laboratory Procedure

The data collection was made using structured and pre tested questionnaires through interview. Private health institutions were selected by simple random sampling technique and Spot-morning-spot sputum samples were taken from suspected TB patients. All samples were processed by conventional procedure of Zehil-Neelson AFB staining and examined microscopically for AFB. The data that were found at every course of the process was kept confidentially.

2.5. Data Processing and Analysis

The data were entered and analyzed in to SPSS version 20 statistical software. A descriptive statistics were used to present socio-demographic characteristics, frequencies and different variables. Chi-square and 95% confidence interval were used to measure the strength of association. Consequently, P-value less than 0.05 were considered to be statistically significant.

2.6. Ethical Consideration

Ethical clearance for the study was obtained from the ethics review committee of the University of Gondar, College of Medicine and Health Sciences, School of biomedical and laboratory sciences. Permission to conduct the study was also obtained from the private clinic administrators. Written Informed consent was obtained from each study participants. Any information obtained at each course of the study was kept confidential.

3. Results

3.1. Socio-demographic Characteristics

In this study, a total of 352 pulmonary tuberculosis suspected patients were involved among this 183 were males 169 were females. Most of the study participants 121 (34.4%) were aged between 15-30 years. In addition, majority of participants were married, illiterate and farmer in occupation [Table 1]. Analysis of age specific prevalence of TB showed that patients in the age group between 31-40 years were most affected followed by 15-30, 41-50 and greater than 50 years respectively [Figure 1].

Table 1. Distribution of socio-demographic characteristics among tuberculosis suspected patients at Gondar town private health institutions from January to June, 2015

Socio-demographic variables		Frequency (N=352)	Percentage (%)
Sex	Male	183	51.2
	Female	169	48
Age(years)	15-30	121	34.4
	31-40	76	21.6
	41-50	60	17
	>50	95	27
Residence	Rural	176	50
	Urban	176	50
Marital status	Single	91	26
	Married	223	63.4
	Divorced	20	5.68
	Widowed	18	5.11
Educational status	Illiterate	158	44.9
	Primary school	107	30.4
	High school	58	16.5
	Higher education	7	2
	Diploma	13	3.7
	Degree& above	9	25.6
Occupation	Employed	21	6
	Farmer	101	29
	Merchant	50	14.2
	Daily laborer	17	4.83
	Student	75	21.3
	House wife	88	25

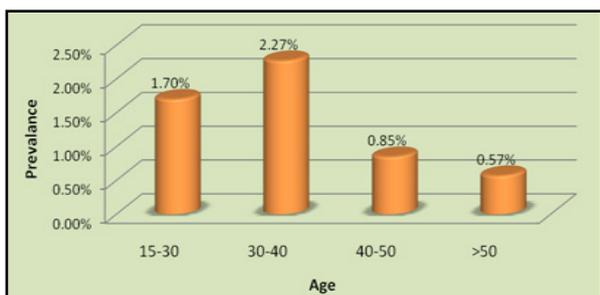


Figure 1. Prevalence of PTB infection in different age groups among PTB suspects at Privet clinics of Gondar town from January to June, 2015

3.2. Prevalence and Associated Risk Factors for Pulmonary TB

Out of 352 TB suspected patients, mycobacterium tuberculosis was detected by direct AFB microscopy in 19 of tuberculosis suspected patients (12 were males and 7

were females). Among 183 males 12 (3.41%) were positive for pulmonary tuberculosis while from 169 females 7 (1.99%) were positive for pulmonary tuberculosis [Table 2]. Therefore, the overall prevalence of pulmonary tuberculosis was 5.4% in the study population. Among clinically suspected patients cough was the most common symptom in the respondents 347(99%). In addition, chest pain 297(84.4%), fever 266(75.6%), loss of appetite 241(68.5%), and night sweating 229(65.1%) are common symptoms in those clinically suspected patients.

Table 2. Prevalence of smear positive pulmonary Tuberculosis by sex among TB suspects at Gondar town private clinics from January to June, 2015

Character	Frequency	Percent	PTB infection		
			Positive	Negative	
sex	Male	183	52%	12(3.41%)	171(48.6%)
	Female	169	48%	7(1.99%)	162(46%)
Total	352	100%	19(5.4%)	333(94.6%)	

Table 3. Risk factors associated for TB among tuberculosis suspected patients at Gondar town private health institutions from January to June, 2015

Character	PTB infection		Total n (%)	x ²	p-value
	Positive n (%)	Negative n (%)			
Sex				1.004	0.316
Male	12 (3.41%)	171 (48.6%)	183 (51.2%)		
Female	7 (1.99%)	162 (46%)	169 (48%)		
Age(years)				78.7	0.037
15-30	6 (1.70%)	115 (32.7%)	121 (34.4%)		
31-40	8 (2.27%)	68 (19.3%)	76 (21.6%)		
41-50	3 (0.85%)	57 (16.2%)	60 (17%)		
>51	2 (0.57%)	93 (26.4%)	95 (27%)		
Residence				0.056	0.814
Rural	9 (2.56%)	167 (47.4%)	176 (50%)		
Urban	10 (2.84%)	166 (47.2%)	176 (50%)		
Marital status				2.508	0.474
Single	5 (1.42%)	86 (24.4%)	91 (26%)		
Married	14 (4%)	209 (59.4%)	223 (63.4%)		
Divorced	0 (0%)	20 (5.68%)	20 (5.68%)		
Widowed	0 (0%)	18 (5.11%)	18 (5.11%)		
Educational status				2.381	0.007
Illiterate	9 (2.57%)	149 (42.3%)	158 (44.9%)		
Primary school	6 (1.7%)	101 (28.7%)	107 (30.4%)		
High school	3 (0.9%)	55 (15.6%)	58 (16.5%)		
Higher education	1 (0.3%)	6 (1.7%)	7 (2%)		
Diploma	0 (0%)	13 (3.7%)	13 (3.7%)		
Degree& above	0 (0%)	9 (25.6%)	9 (25.6%)		
Average monthly income				7.63	0.022
Less than 500	6 (1.7%)	158 (44.9%)	164 (47%)		
500-1200	12 (3.41%)	110 (31.3%)	122 (34.7%)		
Above 1200	1 (0.3%)	65 (18.5%)	66 (19%)		
Family number				5.1	0.165
1-5	9 (2.57%)	219 (62.2%)	228 (64.8%)		
6-10	9 (2.57%)	110 (31.3%)	119 (33.8%)		
>11	1 (0.3%)	4 (1.14%)	5 (1.42%)		
Occupation				6.5	0.260
Employed	0 (0%)	21 (6%)	21 (6%)		
Farmer	6 (1.7%)	95 (27%)	101 (29%)		
Merchant	6 (1.7%)	44 (12.5%)	50 (14.2%)		
Daily laborer	1 (0.3%)	16 (4.55%)	17 (4.83%)		
Student	3 (0.9%)	72 (20.5%)	75 (21.3%)		
House wife	3 (0.9%)	85 (24.1%)	88 (25%)		
Cough				2.12	0.146
Present	18 (5.11%)	329 (93.5%)	347 (98.6%)		
Non present	1 (0.3%)	4 (1.14%)	5 (1.42%)		
Previous history of tuberculosis				0.087	0.768
Present	1 (0.3%)	13 (3.7%)	14 (4%)		
Non present	18 (5.11%)	320 (90.9%)	338 (96%)		
Row milk				0.98	0.0322
User	11 (3.12%)	229 (65%)	240 (68%)		
Non user	8 (2.3%)	104 (29.5%)	112 (32%)		

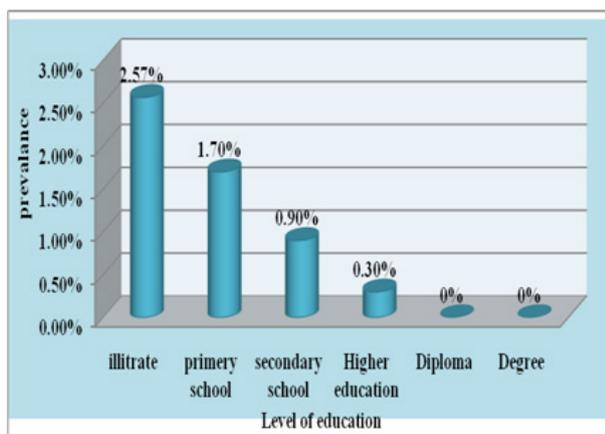


Figure 2. Prevalence of PTB infection in different level of education among TB suspects of Gondar town private health institutions from January to June, 2015

Age, average monthly income of 500-1200ET birr, raw milk and low educational status were associated with the development of active Pulmonary Tuberculosis. Whereas other risk factors like sex, residence, marital status, occupation and presence of previous history of tuberculosis were not statically associated with the development of active pulmonary tuberculosis [Table 3].

Low educational level was associated with the development of tuberculosis. Illiterate (2.57%), primary school (1.7%), secondary school (0.9%), higher education (0.3%), diploma (0%) and degree (0%). The result showed that as the educational status increase the prevalence of pulmonary tuberculosis were decreases [Figure 2].

4. Discussion

In this study, the prevalence of smear positive pulmonary tuberculosis among TB suspected patients was 5.4%. This finding is approximate with the report from Dessie (6.2%) and Gondar northwest Ethiopia (7.5%) [9,10]. However, the findings of the current prevalence of PTB among tuberculosis suspected patients in Gondar was higher than the prevalence reported in Botswana (4.2%) and central Doula (3.5%) [11,12], which might be due to the life style of the population varies from country to country. On the other hand, the burden of pulmonary tuberculosis in Gondar was lower than the prevalence reported from Southeast Ethiopia (9.2%), Tigray region (17.3%), Amhara region of private health institutions (29.6%) and north Gondar zone (10.4%) [13,14,15,16]. This variation could be due to advanced diagnostic technique was used in addition to AFB microscopy and their study participants were admitted patients who were more TB suspected cases.

The socio-demographic characteristics of pulmonary tuberculosis suspected patients and other risk factors for active pulmonary tuberculosis infection were also investigated. Several studies have shown that socio-economic status as a risk factor for the occurrence of active tuberculosis [9,10,12,13,14,15,16]. The possible reason may be due to the migration from place to place and working in crowded living conditions.

The association of sex with active pulmonary tuberculosis was not statistically significant. However, among 19 pulmonary tuberculosis patients 12(3.41%) were males

which indicates higher proportion of pulmonary tuberculosis infection among male tuberculosis patients than females 7(1.99%). The possible reason may be due to the migration and contact with various populations for their day to day activities than females. This result was consistent with study findings in Dessie and other studies [9,10]. Urban residence was also not associated with the development of pulmonary tuberculosis. The prevalence of smear positive pulmonary tuberculosis was 5.6% higher in urban dwellers than rural residents. This finding consistent with a study done in Dessie [9]. The possible reason could be due to crowded living conditions in urban districts and urban dwellers. Like other studies educational status was statistically associated with the prevalence of tuberculosis. As the result of this finding shows that low educational status was one risk factor for the development of active pulmonary tuberculosis [9,10,12,13,14,15,16]. This might be due to low awareness about the ways transmission and spread of tuberculosis.

Average monthly income was associated with the development of active pulmonary tuberculosis. Patients who had low monthly income were more prone to the development of active pulmonary tuberculosis. The possible reason may be peoples who had low monthly income were not feed well nutritious diet which makes their immune system suppressed and more prone to active pulmonary tuberculosis. This finding is consistent with the study done in Tigray and Gondar [10,14]. Sex, occupation, marital status, family sizes were not statistically associated with the development of active pulmonary tuberculosis like the study conducted in Amhara region of privet health institutions [15].

In general, this finding shows significant burden of pulmonary tuberculosis to the population. Therefore, active screening and treatment of pulmonary tuberculosis of PTB suspected patients is relevant in TB- endemic countries like Ethiopia.

5. Conclusions

The overall prevalence of smear positive pulmonary tuberculosis among PTB suspected patients in Gondar town privet health institutions was 5.4%. The major risk factors associated to this prevalence rate were age, ingestion of raw milk, low educational status and average monthly income. Therefore, improving the awareness of the community for the spread of disease and appropriate intervention mechanism such as environmental and personal hygiene, health education about transmission of TB and improving income status of population are the most important means to cleave the chain and spread of disease.

Competing Interests

The authors declare that they have no competing interests.

Acknowledgements

We would like to thank the School of Biomedical and Laboratory Sciences, University of Gondar for material

support. We also acknowledge the staffs working at privet health institutions in Gondar town for their kind co-operation and support during data collection. Our special gratitude also goes to the study participants for their voluntary participation.

References

- [1] Murry CJ, Lopez AD. Mortality by case for eight regions of the World Global Burden of disease study. *Lancet*, 1997; 1269-1276.
- [2] Dye C, Scheete S, Delin P, Pathania V, Raviglione MC. Global burden of tuberculosis: estimated incidence, prevalence and mortality by country. *JAMA*, 1999; 282(7): 677-686.
- [3] United Nations Fund Population Activities (UNFPA). Tuberculosis a Global Health Emergency, 1999; 17 (3): 1242-1265.
- [4] WHO, Africa Regional Office-Tuberculosis in Africa. WHO, Brazaville, 2001.
- [5] Jenkin A, Clinical Tuberculosis: In: Davis PDO (Ed), 2nd edition. Chapman and Hall, London. 1998; 69-79.
- [6] Narain JP, Raviglione MC, Koch A. HIV associated Tuberculosis in developing countries. *Epidemiology and strategy for prevention. Tuberculosis Lung Disease*, 1992; 73:311-321.
- [7] Eharson DA, Pavilion A, Clinical Tuberculosis in: Davis PDO (Ed), 2nd edition. Chapman and Hall, London, 1998; 35-52.
- [8] WHO report, author. Global tuberculosis control ISBN 9789241564380. 20 avenue Appia Eva 27 Switzerland: WHO press, World health organization; 2011.
- [9] Amare H, Gelaw A, Anagaw B, Gelaw B. Prevalence of smear positive PTB among diabetic patients at Dessie referral hospital. *Infectious Dis poverty*, 2013; 2: 6.
- [10] Wondimeneh Y, Muluye, Belyhun Y. Prevalence of PTB and immunological profile of Co-infected patients. *BioMed Research Notes*, 2012; 5:331.
- [11] Jhung MA, Nelson DI. Rapid assessment of tuberculosis in large preson system Btswana. *PubMed*, 2002; 28: 250-252.
- [12] Noeske J, Kuaban C, Amougou G, et al. prevalence of tuberculosis in central prison of doula. *East Africa Journal*, 2006; 83(1): 25-30.
- [13] Tulu B, Dida N, Kassa Y, Taye B. Prevalence of Smear positive pulmonary tuberculosis and its factors among tuberculosis 2014. *BMC Research notes*, 2014; 7:285.
- [14] Mesfin MM, Tasew TW, Richard M J. The quality of tuberculosis diagnosis in districts of Tigray region of northern Ethiopia. *Health dev*, 2005; 19:13-20.
- [15] Alemie AG, Gebreselassie F. Common types of Tuberculosis and co-infection with HIV at Private health institutions. *BMC Public Health*, 2014; 14: 319.
- [16] Moges B, Amare B, Asfaw F, et al. Prevalence of smear positive pulmonary tuberculosis among prisoners in North West Ethiopia. *BMC Infectious disease*, 2012; 12:352.