

Trends of Smear Positive Pulmonary Tuberculosis Prevalence at Ambagiorgis Health Center, Northwest Ethiopia: A Ten Year Retrospective Study

Martha Alemayehu^{1*}, Gizat Bizuaye², Meseret Yimer², Frehiwot Mequanint², Abate Assefa¹

¹Department of Medical Microbiology, School of Biomedical and Laboratory Sciences, University of Gondar, Gondar, Ethiopia

²School of Biomedical and Laboratory Sciences, University of Gondar, Gondar, Ethiopia

*Corresponding author: marthialex2011@gmail.com

Abstract Tuberculosis caused by *Mycobacterium tuberculosis* continues to be the most important causes of morbidity and mortality worldwide. Due to health service coverage and poorly developed health information system in Ethiopia, the actual magnitude of the tuberculosis epidemic and burden of tuberculosis is not yet reported from Ambagiorgis Health Center. This study assessed the trend of smear positive pulmonary tuberculosis prevalence at Ambagiorgis Health Center, Northwest Ethiopia. A retrospective study was conducted from February 1 to May 30, 2015 at Ambagiorgis Health Center. Data from tuberculosis laboratory registration log book from September 2005 to August 2014 were collected using data abstraction sheet. The data were entered and analyzed using SPSS version 16 statistical package. Three thousand and six hundred ten pulmonary tuberculosis suspected patients were reviewed for smear microscopy result. The majority of the patients were females (53.8%). From the total patients, 237(6.6%) were positive for pulmonary tuberculosis by smear microscopy of which, 3.35 % were males and 3.21% were females. The higher pulmonary tuberculosis positive patients were in the age group of 15-24 years old. Age is significantly associated with pulmonary tuberculosis positivity. However, no statistical significant association was observed between tuberculosis infection and gender difference. The overall prevalence of smear positive pulmonary tuberculosis cases from 2005-2014 was 6.6% with the most susceptible groups are amongst the age ranges between 15–24 years. Sex played no role in the prevalence of pulmonary tuberculosis as there was no much difference in prevalence among male and female. In addition, low prevalence of smear positive pulmonary tuberculosis in the year 2013(3.9%) and higher prevalence was observed in 2008(17.4%).

Keywords: tuberculosis, *mycobacterium tuberculosis*, smear microscopy

Cite This Article: Martha Alemayehu, Gizat Bizuaye, Meseret Yimer, Frehiwot Mequanint, and Abate Assefa, "Trends of Smear Positive Pulmonary Tuberculosis Prevalence at Ambagiorgis Health Center, Northwest Ethiopia: A Ten Year Retrospective Study." *American Journal of Epidemiology and Infectious Disease*, vol. 4, no. 4 (2016): 68-71. doi: 10.12691/ajeid-4-4-1.

1. Introduction

Tuberculosis (TB) continues to be the most important causes of morbidity and mortality worldwide, and caused mainly by *Mycobacterium tuberculosis* and occasionally by other species of *M. tuberculosis* complex such as *Mycobacterium bovis*, *Mycobacterium africanum* and *Mycobacterium canneti* [1]. TB typically affects the lungs, but can affect other parts of the body called extra pulmonary TB [2]. The route of infection is inhalation of infectious aerosols which are able to reach the terminal air way [3]. Globally around 8.8 million people develop TB and 1.5 million people die every year due to TB [4]. The incidence of co-infection with the human immunodeficiency virus and multi-drug resistant TB (MDR TB) is also increasing [2].

According to the Ministry of Health Hospital statistics data, TB is one of the leading cause of morbidity, the fourth cause of hospital admission, and the second cause of hospital death in Ethiopia [2]. The average TB prevalence and mortality rates in Ethiopia are 623 and 42 per 82,950

individuals respectively [5]. However, hospital reports complained and analyzed by the health information processing & documentation team of the federal ministry of health over the years indicate that TB is among the leading cause of morbidity & mortality in the country [6].

Due to health service coverage and poorly developed health information system in Ethiopia, the actual magnitude of the TB epidemic has not been accurately determined and no available data about smear positive pulmonary TB prevalence in Ambagiorgis Health Center. Therefore, the aim of this study was to assess the trend of smear positive pulmonary TB prevalence in Ambagiorgis Health Center, North west Ethiopia.

2. Materials and Methods

2.1. Study Area and Period

The study was conducted at Ambagiorgis Woreda (a rural district), in the North Gondar, Ethiopia. Ambagiorgis

has 41 kebeles (the lowest administrative units) and a population of 250,000 (132,500 were males and 117,500 were females). The Health Center has different sections which provide service for the population such as outpatient department (OPD), TB clinic, TB diagnosing laboratory using acid fast-bacilli (AFB) smear microscopy technique and treatment service have given in Directly Observed Treatment, Short-course clinic (DOTS) [7]. The study was conducted from February to May, 2015 at Ambagiorgis Health Center, North west Ethiopia.

2.2. Study Design and Participants

A retrospective study was conducted from smear positive pulmonary TB suspected patients that are diagnosed and recorded their results at Ambagiorgis Health Center registration book from September, 2005 to August, 2014. Spot-morning-spot sputum samples was taken from the study participants and all patient samples were diagnosed by conventional procedure of Zehil-Neelson AFB staining and examined microscopically for AFB. Full information that contains age, sex and AFB results recorded in microbiology laboratory AFB registration book were included in our study whereas all patient records that lack age or sex or AFB results were excluded.

2.3. Ethical Consideration

The study was reviewed and approved by the ethical committee of the school of Biomedical and Laboratory Sciences, University of Gondar. In addition, official

permission letter was obtained from the higher management of Ambagiorgis Health Center. Information obtained at any course of the study was kept confidential.

2.4. Data Collection Methods and Quality Control

The data was collected using data abstraction sheet. To ensure the quality of data, all recorded information's were checked for completeness and consistency before analysis.

2.5. Data Analysis Process

The data was entered and analyzed using SPSS version 20 statistical package. Descriptive statistics was used to describe the trend of overall prevalence of smear positive pulmonary TB. Chi-square was used to measure the association between demographic variables (age and sex) and TB.

3. Results

Three thousand and six hundred ten pulmonary TB suspected patients registered on TB laboratory log book of Ambagiorgis Health Center for the past ten years (from 2005 to 2014) were reviewed. Majority of the study participants were females 1942 (53.8%) and the mean age of the study participants was 35.56 year ranging from 4-90 years. The majority of the study participants were between age group of 25-34 years old (Table 1).

Table 1. Demographic characteristics and prevalence of smear positive pulmonary TB among pulmonary TB suspects attended Ambagiorgis Health Center from 2005-2014, Northwest Ethiopia

Characteristics	Total N (%)	Smear positive N (%)	Smear negative N (%)	χ^2	P-value
Gender					
Male	1668(46.2)	121(3.35)	1547(42.9)	2.4	P=0.069
Female	1942(53.8)	116(3.21)	1826(50.6)		
Total	3610	237(6.56)	3373(93.4)		
Age (year)					
<15	208	13(0.36)	195(5.4)	29.88	P<0.001
15-24	839	80(2.22)	759(21)		
25-34	853	61(1.69)	792(21.93)		
35-44	612	44(1.22)	568(15.73)		
45-54	525	22(0.60)	503(13.93)		
>55	573	17(0.47)	556(15.4)		
Total	3610	237(6.56)	3373(93.43)		

Of the total 3,610 pulmonary TB suspected patient records, 237(6.6%) were positive for AFB. Higher positivity of pulmonary TB 80(2.22%) was observed in 15-24 age groups, where as the least prevalence of pulmonary TB was recorded in age groups <15years (Table 1).

The total number of pulmonary TB suspected cases attended the Ambagiorgis Health Center was higher 685 (19%) in 2013. And among pulmonary TB suspects examined for AFB the higher positivity of pulmonary TB was noticed in the year 2008 (17.4%), whereas lower pulmonary TB cases were recorded in 2013(3.9%) (Table 2).

In the past 10 years the trend of overall pulmonary TB prevalence showed decreasing (Figure 1). However, the decrement of pulmonary TB cases in the area was not uniform.

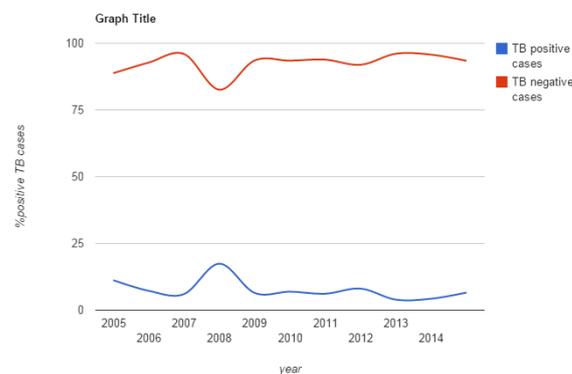


Figure 1. Trends of pulmonary TB suspected patients registered from September 1, 2005 to August 30, 2014 at Ambagiorgis Health Centre Northwest Ethiopia.

Table 2. A ten year trends of smear positive Pulmonary TB (2005-2014) at Ambagiorgis Health Center, Northwest Ethiopia

Year	Total examined	Total Positive (%)	Male			Female		
			Examined	Positive N (%)	Negative N (%)	Examined	Positive N (%)	Negative N (%)
2005	214	24 (11.21)	96	12 (12.5)	84 (87.5)	118	12 (10.13)	106 (89.83)
2006	152	11 (7.23)	88	7 (7.95)	81 (92.0)	64	4 (6.25)	60 (93.75)
2007	134	8 (6)	78	4 (5.12)	74 (94.8)	56	4 (7.14)	52 (92.85)
2008	138	24 (17.4)	79	14 (17.7)	64 (81.0)	59	10 (19.4)	49 (83.0)
2009	652	42 (6.44)	295	15 (5.08)	280 (94.9)	357	27 (7.56)	330 (92.43)
2010	377	26 (6.9)	178	13 (7.3)	165 (92.7)	199	13 (6.53)	186 (93.46)
2011	261	16 (6.13)	117	7 (5.98)	110 (94.0)	144	9 (6.25)	135 (93.75)
2012	434	35 (8.06)	209	20 (9.56)	189 (90.4)	225	15 (6.6)	210 (93.3)
2013	685	27 (3.9)	269	17 (6.31)	252 (93.68)	416	10 (2.4)	406 (97.6)
2014	563	24 (4.26)	259	12 (4.63)	247 (95.36)	304	12 (3.9)	292 (96.05)
Total	3610	237 (6.56)	1668	121 (7.25)	1547 (92.74)	1942	116 (5.97)	1826 (94.0)

4. Discussion

This study showed that the trend of overall prevalence of smear positive pulmonary TB was 6.6%. The highest percent distribution of smear positive pulmonary TB was observed among age group of 15-24 years old having prevalence of 2.22 % and there is no significant difference in present distribution of pulmonary TB among the sexes of participants, male subjects has prevalence of 3.35 % (121/3610) and females has 3.21% (116/3610). The prevalence of pulmonary TB in this study is lower as compared to the finding from Rwanda [8], Nigeria [9], and Agaro health center Ethiopia [10], with prevalence rate of 17.3%, 9.57% and 10.9%, respectively. The reason for this disparity might be due to the number of population in Ambagiorgis less dense than the number of population in countries stated above, as we know the risk of being infected with TB is higher in densely populated area. The other reason may be also due to Ethiopia established a strategy which is created awareness about TB through home to home community health workers which was not practical in other African countries.

However, our finding is a little bit higher when compared with a study done in Southern part of Ethiopia which revealed a prevalence rate of 3% [11]. This might be associated with the health institution intended purpose difference the above mentioned studies screened population who may show sign and symptom or not for surveillance purpose. In our case patients that have sign and symptoms were tested for early detection and treatment of TB. On the other hand our finding showed agreement in terms of prevalence with the study done in Gondar poly health center, where the prevalence of pulmonary TB was 6.7% [12].

This study also revealed that statistical significant association was demonstrated between age and smear positive pulmonary tuberculosis, which is in consistent with the study done in Bangladesh [8], Rwanda [9],

Kano, Nigeria [18], Jos Nigeria [10] that tuberculosis infection rate is high at age range of 15-24 years. However, there is no evidence of statistically significant association between rate of pulmonary tuberculosis and sex of

participants, which is in line with the study done in Agaro, Ethiopia [10] and differs from the study done in Bangladesh [8]. The possible justification for this discrepancy might be the number of patients examined in Bangladesh was higher than the current study (sample size difference).

The overall trend of pulmonary TB was lower along the years. However; the prevalence of pulmonary TB in 2008 was higher. Even though the prevalence of pulmonary TB was decreasing in the past ten years and higher prevalence of pulmonary TB was observed in 2008. The possible reason for higher prevalence in 2008 may be due to health facilities linkage each other was in progress at the same year this help the people to come the health center and case detection becomes increase.

5. Conclusions

The trend of overall prevalence of sputum smear positive pulmonary TB cases in the study area from 2005 to 2014 was 6.6% with the most susceptible groups are among the age ranges of 15-24 years (2.22%). The lowest number of pulmonary TB was observed in the age group < 15 year. Therefore, government bodies and health authorities should have to design special preventive strategy to prevent TB transmission, especially among age group of 15-24.

Competing Interests

The authors have no competing interests.

Acknowledgements

We would like to express our gratitude to the School of Biomedical and Laboratory Science University of Gondar, College of Medicine and Health Science for material support. We also thank the laboratory staff members working at Ambagiorgis Health Center for their support during the data collection.

References

- [1] Jenkins A. In: Davies PDO clinical tuberculosis. Second edition. Chapman and hall, London; 1998, 69-79.
- [2] Admasu K, Kebede A. Tuberculosis prevalence survey. First edition. Addis Ababa; 2011, 13-15.
- [3] Ashi Thompson's. Medical Microbiology. Seventh edition. Edenberg; 1030-1032.
- [4] World health organization. Global tuberculosis control. WHO; 2011.
- [5] Biadlegn F, Rodloff AC, Sack U. A. First Insight into High Prevalence of Undiagnosed Smear-Negative Pulmonary Tuberculosis in Northern Ethiopian Prisons: Implications for Greater Investment and Quality Control. *PLoS one*, 2014; 9 (9): e106869.
- [6] G/Beza M, Wuble M , Teferi M, Gethun Y, Moges S, Tefera S. Five years tuberculosis treatment Outcome at Kola Diba Health Center. *J infect Dis*, 2013; 1(1):1-5.
- [7] Central Statistical Authority. The 2007 Population and Housing Census of Ethiopia, Results for Amhara region. Addis Ababa; 2007.
- [8] Muvunyi C, Masaisa F, Bayingana C, Musemakwari A, Mutesa L, Hernandez T. Prevalence and diagnostic aspects of sputum smear positive tuberculosis cases at a tertiary care institution in Rwanda. *African Journal of Microbiology Research*; 2010; 4(1): 088-091.
- [9] Imam T, Oyeyi T. A retrospective study of pulmonary tuberculosis prevalence amongst patients attending infectious diseases hospital in kano, Nigeria. *Bayero Journal of Pure and Applied Sciences*, 2008;1(1):10-15.
- [10] Ali H, Zeynudin A, Mekonen A, Abera S, Ali S. Smear Positive Pulmonary Tuberculosis Prevalence Amongst Patients at Agaro Teaching Health Center, Southwest Ethiopia. *Ethiop J Health Sci*, 2012; 22(1): 71-76.
- [11] Shargie B, Yassin A, Lindtjörn B. Prevalence of smear-positive pulmonary tuberculosis in a rural district of Ethiopia. *Int J Tuberc Lung Dis*, 2006;10(1):87-92.
- [12] Alemayehu M, Birhan W, Belyhun Y, Sahle M, Tessema B. Prevalence of Smear Positive Tuberculosis, Intestinal Parasites and Their Co-Infection among Tuberculosis Suspects in Gondar University Hospital and Gondar Poly Clinic, Northwest Ethiopia. *J Microb Biochem Technol*; 2014; 6: 179-184.