Current and Past 10-Year Trend of Pulmonary Tuberculosis and Intervention Practices in Amba-Giorgis Health Center, Northwest Ethiopia

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Acronyms

AFB	Acid Fast Bacilli
AHC	Ambagiorgis Health Center
AIDS	Aquired Immuno-Defficiency Syndrom
AOR	Adjusted Odds Ratio
ARHC	Amhara Regional Health Center
ARTI	Annual Risk of Tuberculosis Infection
ATS	American Thoracic Society
BCG	Bacilli Chalmette-Guerin
BDRHRLC	Bahir Dar Regional Health Research Laboratory Center
CDC	Center for Disease Control and Prevention
COR	Crude Odds Ratio
CSA	Central Statistical Agency
DOTS	Directly Observed Treatment Short-course
EPTB	Exra Pulmonary Tuberculosis
LED-FM	Light Emitting Diode Fluorescence Microscopy
HIV	Human Immunodeficiency Virus
KAP	Knowledge Attitude Practice
MDR-TB	Multi-Drug Resistance Tuberculosis
MLT	Medical Laboratory Technology
MTB	Mycobacterium Tuberculosis
NAAT	Nucleic Acid Amplification test
NIAID	National Institute of Allergy and Infectious Disease
PHC	Primary Health Care
PTB	Pulmonary Tuberculosis
SPSS	Statistical Package for Social Science
TB	Tuberculosis
WHO	World Health Organization
WWOARD	Wogera Woreda Office of Agriculture and Rural Development
WWOFED	Wogera Woreda Office of Finance and Economic Development
ZN	Ziehel-Neelsen

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Abstract

Human tuberculosis (TB) which is caused by *Mycobacterium tuberculosis* is the leading global health challenge. Regular surveys on the burden of this disease at a microenvironment level are vital to generate up-to-date information to effectively control TB in a locality. Thus, this study was designed to estimate the prevalence of pulmonary tuberculosis (PTB) and assess current intervention practices in *Ambagiorgis*, northwest Ethiopia. The study (January-May 2016) was a descriptive survey involving both primary and secondary data sources collected from *Ambagiorgis* health center (AHC). Ten-year (January 2006-December 2015) retrospective data containing PTB suspects and smear-confirmed cases were extracted from the health center registration logbook. For the current cross-sectional data, PTB suspects visiting the health center between January-May 2016 were included in the study. Pertinent information on socio-demography and participant knowledge, attitude and practices (KAP) was secured through a questionnaire and interview. Some selected AHC personnel were also used to generate data on current TB control practices and related activities within the health center. Data were organized and analyzed quantitatively using descriptive statistics, univariate and multivariate logistic regression models. In the past ten years, 4218 PTB suspected patients were registered on TB laboratory logbook. Of these, 252 (5.97%) were smear-positive, 127(6.53%) males and 125(5.2%) females. The highest PTB suspects were recorded in 2012 (16.2%) and the least in 2006, (3.2%). The highest number of smear-positives was in 2007 (17.4%) and lowest in 2011 (2.5%). All the health personnel (n=17) confirmed that the current control practice was adequate although there was budget inadequacy. There were 110 males and 90 females of which 9 (8.9%) and 7 (7.8) were PTB smear-positive, respectively, in the current cross-sectional survey. There was significant difference among study participants from rural and urban areas (p=0.023). There was also statistical significant differences between knowledge of patients about transmission of PTB and infection prevalence of PTB (p=0.027). Majority of the respondents had awareness about PTB and practiced the recommended TB preventive measures likely resulting in the observed lower prevalence for the study area. But further work is required to correct some misconceptions still circulating among certain community members about the public health importance of TB and maximize the choice of modern drugs. The control efforts must be further strengthened to sustainably control TB in the area.

Keywords:, *Mycobacterium tuberculosis,* Amba-giorgis,

1. Introduction

Tuberculosis (TB) is both human and animal disease. TB continues to be the most important cause of morbidity and mortality worldwide. Based on the World Health Organization (WHO) estimates, 8.8 million new cases of TB and 1.1 million deaths occurred globally in 2010 (WHO 2013).

Risk factors for infection by the tubercle bacilli include anything that puts someone in frequent, close contact with people who have active TB. These factors perhaps vary from place to place. Poverty and its consequences such as crowded living, and homelessness, lack of awareness, illiteracy, inadequacy of health facilities and stress are the most cited factors. In addition, prisoners, migrants, and health-care workers are high-risk groups.

The development of active TB is similarly a factor of anything that weakens a person's immune system. The immune system can be compromised because of genetic defects, age, malnutrition, pregnancy, human immunodeficiency virus (HIV) and possibly other infections, chronic noninfectious diseases and chronic steroid use thereof, patients on dialysis, and those who have had organ transplants and take drugs to prevent rejection, smokers and substance abusers (alcoholism). Sub-Saharan African countries including Ethiopia carry the highest TB burden for the above reasons.

TB is the first, fourth and second cause of morbidity, hospital admission and death in Ethiopia with average prevalence and mortality rates 623 and 42 per 82,950 respectively (FMoH 2015). Ethiopia ranks seventh among 22 high TB-burdened world countries and one of the top three in Africa pertaining to the number of TB patients (WHO 2013). Although the above sources show that over the third of the population has been exposed to TB, the actual magnitude of the TB epidemic has not been accurately determined, due to low health service coverage and poorly developed health information system in the country.

Regular surveys on the burden of this disease and the status of associated factors in various settings are vital to generate up-to-date information to effectively control TB in a locality and beyond. To this end, several attempts have been made in different parts of Ethiopia.

In southwest Ethiopia at Agaro health center, out of 2880 suspected patients for PTB, 314 (10.90%) were smear-positive with the majority of the smear-positive cases belonging to the age group 15-24 years (Ali et al. 2012). In Bale Goba, southeast Ethiopia the overall prevalence of smear-positive PTB was 9.20% (Tulu et al. 2014). In another study conducted in Metehara hospital, eastern Ethiopia, the prevalence of smear-positive PTB was 14.20% (Yohannes et al. 2012). In a rural district in southern Ethiopia, out of 436 symptomatic patients who submitted sputum samples 3.00% were positive for the acid-fast bacilli (AFB) (Shargie et al. 2006). Moreover, from Gondar University Hospital and Gondar Polyclinic the prevalence of smear-positive TB was 17.3% (Alemayehu et al. 2014).

But in Amba-Giorgis, Wogera (north Gondar), northwest Ethiopia, little organized scientific data is available to evaluate the trend of TB. Lack of knowledge about TB could affect the health-seeking behavior of patients and sustain the transmission of the disease within the community. Therefore, it is necessary to assess the knowledge, attitude and practice (KAP) of community members in TB control and the effectiveness of ongoing control activities. Thus, this study was designed to estimate the prevalence of PTB and assess the current intervention practices in Amba-Giorgis, the administrative center of Wogera woreda. The study produced important piece of information on TB contributing towards its better control in the study area and beyond.

2. Objectives

2.1 General objective

The general objective of this study was to assess the current and past 10-year trend of TB and its Intervention practices in Amba-Giorgis.

2.2 Specific objectives

The study had the following five specific objectives about TB. These were to assess/identify:

1. patient knowledge and perception,
2. the current and past prevalence,
3. age- and sex-based prevalence distribution

3. Literature review

3.1 Biology of mycobacteria

Tubercle mycobacteria belong to the species complex *Mycobacterium tuberculosis* complex (MTBC). The MTBC includes *M. tuberculosis* (MTB), *M. bovis*, *M. africanum, M. microtii, M. canetti, M. caprae, M. pinnipedii, M. suricattae and M. mungi* (Ryan and Ray 2004, https://en.wikipedia.org/wiki/*Mycobacterium tuberculosis*). Each of the closely related members of the MTBC can cause TB in humans; however, most worldwide cases are caused by MTB. The other primarily human pathogens, *M. africanum* and *M. canettii*, are seen less often and are more restricted to patients from sub-Saharan Africa (Van Soolingen et al. 1997).

Variants most closely associated with animal hosts but known to also infect humans are *M. bovis* (from cattle), *M. caprae* (from goats), and, in rare cases, *M. pinnipedii* (from seals) and *M. microtii* (from field voles) (Cousins et al. 2003*). M. bovis* bacillus Calmette-Guérin (BCG) strains, used as live vaccines or for the treatment of bladder cancer, can sometimes cause tuberculosis in immunocompromised patients. Tubercle mycobacteria are AFB which are strictly aerobic intracellular pathogens having a predilection for the lung tissues although they can infect any other organ-system (Jenkins 1998). TB of the lungs is pulmonary TB (PTB), and outside in any other organ it is termed extra-pulmonary TB (EPTB).

The name myco, fungus like, was derived from their occasional exhibition of filamentous growth. Many of the characteristics, such as acid-fast staining, drug resistance and pathogenicity are related to their distinctive cell wall, which is structurally similar to gram-negative bacteria. However, the outermost lipopolysaccharide layer in mycobacteria is replaced by mycolic acids, which form a waxy, water-resistant layer, makes the bacteria resistant to stresses such as drying. Also, few antimicrobial drugs are able to enter the cell. Nutrients enter the cell through this layer very slowly, which is a factor in the slow growth rate of mycobacteria; it sometimes takes weeks for visible colonies to appear (Tortora et al. 2010).

3.2 TB transmission and Disease

MTB is the most predominant cause of TB and other species are secondarily implicated. Personto-person TB transmission occurs via inhalation of droplet nuclei (airborne particles 1-5μm in diameter). Activities like coughing, singing, sneezing, talking or laughing facilitate formation of the aerosol droplet nuclei. The bacteria can remain suspended in the air for hours, potentially infecting anyone who breathes them in. M. bovis, which lives in animals and can be transmitted to children who drink unpasteurized milk from infected cows.

Once infectious particles reach the alveoli the macrophages (kupffer cells) engulf them in immunocompetent individuals (Ardeleanu et al. 2004). These and other immune cells immediately kill the bacteria. In most other people (over 90%) the immune system walls off the organism in an inflammatory focus known as granuloma and effectively controls them and the bacteria remain in a latent state. Such people, although frequently are TB skin test positive, have no symptoms and luckily cannot transmit the disease (CDC 2000). The condition is referred to as latent TB.

In immune compromised people the bacteria invade to the lymphatic system and bloodstream and spread to other organs. They further multiply in organs that have high oxygen pressures, such as the upper lobes of the lungs, the kidneys, bone marrow and meanings (NIAID 2009). Such individuals develop active TB and if untreated are highly contagious, particularly when cavitary disease is present or when the sputum is AFB smear-positive (CDC 2016).

Patients with sputum smear-negative, culture-positive PTB can also transmit infection. Among 844 secondary cases of TB in the Netherlands between 1996 and 2004, 13% were attributable to transmission from index patients who were smear negative (Alma et al. 2016). One study suggested that a short time to growth on culture (<9 days), as a potential marker of greater disease burden, was associated with a higher risk of transmission regardless of AFB smear results suggesting the importance of culture of cough aerosols for MTB for prediction of transmission (Edward et al. 2014).

3.3 TB prevention and control

Screening of health personnel for TB is being practiced in some high-income countries to control nosocomial transmission (CDC 2013). There are certain guidelines that require most employees to be screened for TB upon being hired and subsequently on a regular, often annual, basis. Some

residential institutions, such as nursing homes, also screen all new residents for TB. Screening for active TB is best accomplished by a chest x-ray. Some other steps toward preventing the spread of TB include improving the ventilation in indoor spaces so there are fewer bacteria in the air, using germicidal ultraviolet lamps to kill airborne bacteria in buildings where people at high risk of TB live or congregate, treating latent infection before it becomes active, using directly observed therapy (DOT) in people with diagnosed TB (latent or active) to raise the likelihood of the disease being cured, treatment to prevent active TB from developing in a person with a latent TB infection aims to kill walled-up germs that are doing no damage right now but could break out (activate) years from now.

3.3.1 TB diagnosis

3.3.1.1 Clinical diagnosis

Symptoms of PTB include coughing that continues for several days, coughing up blood, consistent low-grade fever, excessive sweating, chest pain, unexplained weight loss and fatigue (FMoH 2007). But these are signs of other diseases as well. Any symptoms of illness may not be noticed until the disease is quite advance (http://www.cdc.gov/parasites/naegleria/illness.html).The initial symptoms and signs characterize what is called primary PTB. Primary PTB frequently goes away by itself, but in more than half of the cases the disease can relapse (Ellner 2012).

Tuberculouspleuritis may occur in some people who have the PTB. The pleural disease occurs from the rupture of a diseased area into the pleural space, the space between the lung and the lining of the chest and abdominal cavities. These people have a nonproductive cough, chest pain, and fever. The disease may go away and then come back at a later date. In a minority of people with weakened immune systems, TB bacteria may spread through their blood to various parts of the body. This is called miliary TB and produces fever, weakness, loss of appetite, and weight loss. Cough and difficulty breathing are less common. Generally, return of dormant TB infection occurs in the upper lungs. Symptoms include common cough with a progressive increase in production of mucus (CDC 2000).

3.3.1.2 Laboratory diagnosis

3.3.1.2.1 Microscopy

Microscopy of AFB in stained smear of various clinical specimens is the most common diagnostic test PTB. This relies primarily on the identification of AFB in sputum smears using a conventional light microscope. The sputum specimens are smeared directly onto the slides (direct smears) and subjected to Ziehl-Neelsen (ZN) staining. Although all mycobacterial species are acid-fast, this assay is highly specific for MTB in countries where TB is endemic because of the high burdens of this disease. It is cheap, simple, rapid and specific. In spite of the high specificity, the sensitivity of the test has been reported to vary from 20 to 80% (Steingart 2007). And its usefulness is questionable for patients with reduced pulmonary cavity formation or reduced sputum bacillary load, such as children and HIV-coinfected patients. Recently light-emitting diodes (LEDs) fluorescence microscopy that generates both light and fluorescence wavelengths are found to be more sensitive compared to the ZN method. Especially, for HIV-positive patients, the sensitivity of LED microscopy reaches up to 100% (Steingart 2007). Because fluorochromestained smears can be examined at lower magnifications, it takes less time to examine these smears than to examine smears stained with ZN stain and still results in a higher sensitivity and a similar specificity.

3.3.1.2.2 TB culture

Culture is known to be more sensitive than both AFB smear and LED microscopy for MTB detection. In fact, culture of TB bacilli is gold standard testing with up to 89% sensitivity and over 98% specificity (WHO 2010). While microscopy requires approximately 5,000 to 10,000 AFB/ml of sputum for detection, culture can detect as few as 10-100 viable bacteria/ml (Pfyffer 2007). It is being critically important in detecting TB in HIV-positive individuals who often have low bacillary loads in sputum specimens (WHO 2013). Various kinds of solid (Lowenstien-Jensen (LJ) or Middle brook 7H11 media) and liquid media such as BACTEC 12B broth or MGIT broth are currently in use for mycobacterial culture. Solid media is the most widely used technique but liquid media are more sensitive and have higher bacteria isolation rates than a solid medium and may therefore increase the case yield by 10% and reduce turnaround time (Pardini et al. 2007).

But this method itself can miss lower bacterial loads and has a problem of longer turnaround time (Polesky et al. 2005). Most of the clinical specimens taken from unsterile sites such as sputum, blood, or pus may contain a variety of microorganisms commonly bacteria and fungi that easily overgrow the mycobacteria (Fenner et al. 2012). Therefore, chemical decontamination of sample is crucial in preventing contamination of a culture. However, it negatively influences the recovery of mycobacteria (Pardini et al. 2007).

3.3.1.2.3 Genetic methods

Direct nucleic acid amplification (NAA) testing of clinical specimens can reduce the overall turnaround time for the laboratory diagnosis of TB by at least 2-4 weeks than culture (Moore 2005). CDC guidelines (CDC 2009) recommend that NAA testing be performed on at least one respiratory specimen from each patient with signs and symptoms suggestive of PTB. Nucleic acid amplification tests can be performed in 6-8 hours (Noordhoek 2004). But, as for all laboratory work, these tests should be used only in laboratories that can ensure the competency of staff and provide sufficient reagents and controls to monitor the performance of the assays. Molecular testing, especially those assays that include the amplification of target DNA, is extremely susceptible to contamination from amplicons derived from positive specimens.

The introduction of the AccuProbe (Gen-Probe Inc., San Diego, CA) nucleic acid hybridization kits represented a quantum leap in the rapid identification of organisms of the MTBC (results within 2 hours, as soon as sufficient biomass is obtained following growth in culture. Because DNA/RNA probe assays do not include an amplification step, these tests are not sensitive enough to be used directly on clinical specimens (Metchock 1999). However, nucleic acid probes are usually capable of identifying MTB in contaminated liquid cultures, depending on the extent of the contamination, given that they have a sensitivity and a specificity of nearly 100% when at least 105 mycobacteria are present (Zheng 2001).

Apart from the above common TB detection methods, bacteriophages that specifically infect and replicate in mycobacteria have been used for the direct testing of processed clinical specimens to indicate the presence of viable bacterial cells (Kalantri 2005).

3.3.2 TB treatment and drug resistance

The first effective antibiotic for TB treatment was streptomycin, which is still in use but now considered a second-line drug. The current treatment for TB recommended by the WHO requires the patient to adhere to a minimum of 6 months of antibiotic therapy that includes three or four drugs (WHO 2010). That many patients fail to follow such a prolonged regimen faithfully increases the likelihood of resistance emergence. The two most powerful anti-TB drugs are isoniazid and rifampin (also known as rifampicin). Other standard first-line drugs include pyrazinamide, rifapentine, and ethambutol and in all about 10 drugs are for treatment of TB (http://www.tbfacts.org/tb-drugs/). However, the treatment of MDR-TB and extensively drugresistant TB (XDR-TB) is challenging because of the high toxicity of second-line drugs and the longer treatment duration required compared to drug-susceptible TB (WHO 2015). XDR-TB shows additional resistance to any fluoroquinolone and to at least one of three injectable drugs -capreomycin, kanamycin, or amikacin - used for TB intervention (WHO 2008).

The BCG vaccine may prevent the spread of TB and its meningitis in children, but the vaccine does not necessarily protect against PTB (Pelletier et al. 2002). It can, however, result in a falsepositive tuberculin skin test that in many cases can be differentiated by the use of the QuantiFERON-TB Gold test (CDC 2005).

4. Materials and Methods

4.1 Study area

The study was conducted in Amba-Giorgis, northwest Ethiopia. Amba-Giorgis town is the administrative capital of Wogera woreda with geographic coordinates of $12^0$16' north latitude and $37^0$31' east longitude. As part of the North Gondar Zone, it is bordered by Mirab Belessa in the south, Gondar Zuria in the southwest, Lay Armachiho in the west, Tach Armachiho in thenorthwest, Dabat in the north and Jan Amora in the east (fig. 1) and covering an area of 1862km2(CSA 2007).

The woreda is located at 40km from Gondar in the north east direction. It has 39 rural and 2 urban kebeles where 17 are found highlands, 8 in midland and 16 in lowland areas with agro-ecological coverage of 44,33 and 23% respectively. The elevation of the woreda is 1087-3096m above mean sea level and receives mean annual rainfall of 600-900mm. The onset of the rainy season starts in the second week of May and ends at the end of October and the mean annual temperature of the area ranges from 10-24°C (WWOARD 2013).

Wogera woreda has a total population of 268,833 (34008 households) of which 13705(51.0%) were males and 131,776(49.0%) females (CSA 2007). Of these, 42,758(15.91%) were inhabitants of the catchment area of the current study consisting of six kebeles namely, Ambagiorgis, Koseye, Sakdebir, Dibraso, Ambagiorgis Zuria and Sankatikim. Out of these, 20952(49.0%) were males and 21806(51.0%) females. The average number of family size is about 4.72, average population growth rate 2.6% per year and average population density 136 persons/km2, which is greater than the Zonal average (63.76 persons/km2).

The woreda has ten health centers each having a TB clinic where laboratory diagnosis of TB is done using the ZN smear microscopy technique. Smear-confirmed TB cases get treatment service in the directly observed treatment short-course (DOTS) scheme. Of these ten health centers in the woreda, AHC was purposely selected for logistic and other convenience reasons. In the health center there were a total of 50 health professionals - 17 males and 33 females - during the study. Three of the staffces were laboratory technicians, one TB focal person and one HIV focal person. The health center had organized outpatient department, TB laboratory using LED fluorescence microscopy (LED-FM), HIV counseling and testing

room, a pharmacy room, administrative and finance offices, childcare room, mothers pre- and postnatal care rooms and youth peer to peer advice room.

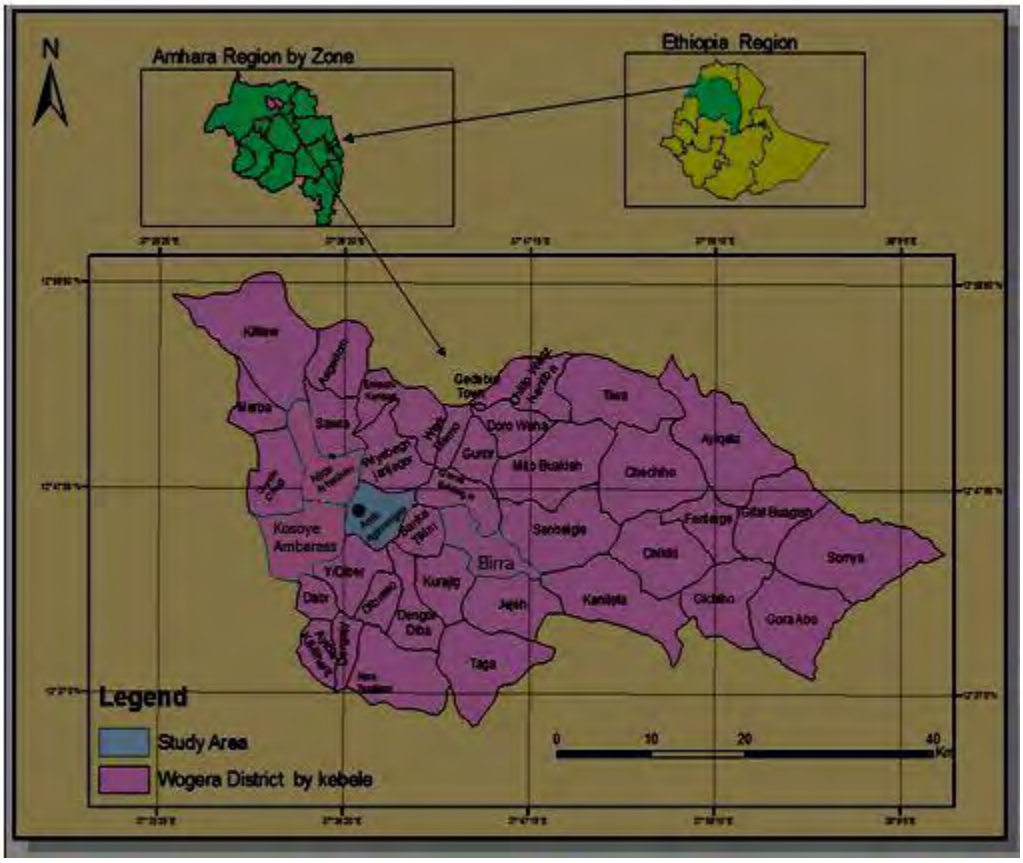

Figure 1 Map of the study area (Jemilu 2015)

4.2 Study design and population

The study included retrospective data extraction and current cross-sectional survey. Retrospective study included data from January 2006 to December 2015. Patient records that lacked age or sex or AFB results were excluded. Participant demographic variables, drug susceptibility test results of MTB were carefully collected from the laboratory registration book using a standardized check list (Appendix IX). Risk factors for drug resistance could not be evaluated as there was insufficient data in the charts.

For the cross-sectional sputum analysis (January-May 2016) patients under TB medication were excluded. Socio-demographic characteristics and knowledge, attitude and practice (KAP) of PTB suspects presented in the health centers were recorded using a semi-structured questionnaire

and face-to-face interview. The questionnaire was prepared in Amharic (in the participants' mother tongue) and then translated into English. Woreda TB focal persons were also interviewed. Some selected AHC personnel were also used to generate data on current TB control practices and related activities within the health center.

4.3 Sputum smear

In a well-illuminated room of TB clinic three sputum specimens (spot-morning-spot) were collected from each suspected patient through a standard sputum cup. One spot specimen when the patient came, an early morning specimen consisting of all sputum raised within 1 -2 from bed and another spot specimen collected at the time the early morning sample was brought to the laboratory and the examinations completed within 24 hours. About 3 -5ml containing solid, purulent or mucopurulent particles were obtained. Sputum smears were prepared, dried, fixed, and acid-fast stained with 0.1% auramine initially for about 20 minutes instead of carbol fuchsin which was for the ZN staining, following standard procedure (BDRHRLC and ARHC 2013).The preparations were examined using the LED-FM by the objective 20x for reading and 40x for confirmation .

4.4 Data quality control

To ensure the quality of data before analysis it was checked for completeness and consistency. The reagents used in the current cross-sectional study were purchased from well known manufactures or those certified by the Biological Stain Commission.

4.5 Data analysis

Data were analyzed using the SPSS version 19 statistical package (SPSS, IBM, Chicago, USA). Descriptive statistics was used to describe the prevalence of smear-positive TB cases. Univariate and multivariate logistic regression analysis models were used to test associations between sociodemographic and KAP variables with TB smear-positivity.

4.6 Ethical considerations

The study was reviewed and approved by the higher management of AHC. In Addition, official permission and approval letter was obtained from the Wogera woreda Health Office (ref.2/107/ት -3/35)(Appendix -X). The identity of the participants was kept confidential.

5. Results

5.1 Retrospective data

In the past ten years (January 2006-December 2015) 4218 PTB suspected patients registered on TB laboratory logbook of AHC. Of these, 252 (6.3%) patients were TB smear-positive, 127 (6.53%) males and 125(5.2%) females (Table 1). The highest PTB suspects was presented in 2012 (16.2%) and least in 2006, 3.2% (Table 1). Regarding smear-positives, the highest number was in 2007 (17.3%) and the lowest in 2011 (2.5%).

Table 1 Total PTB suspects examined and smear-positive cases in the past ten years at AHC, northwest Ethiopia, January 2006-December 2015

Year	Total examined no.(%)	Total positive no.(%)	Male		Female	
			Examined no.(%)	Positive no.(%)	Examined no.(%)	Positive no.(%)
2006	134	8(6.0)	78	4(5.1)	56	4(7.14)
2007	138	24(17.3)	79	14(17.7)	59	10(16.9)
2008	652	42(6.4)	295	15(5.1)	357	27(7.56)
2009	377	26(6.9)	178	13(7.3)	199	13(6.53)
2010	261	16(6.1)	117	7(6.0)	144	9(6.25)
2011	482	12(2.5)	209	7(3.3)	273	5(1.8)
2012	685	35(5.1)	269	17(6.3)	416	18(2.4)
2013	563	42(7.5)	259	22(8.5)	304	20(6.6)
2014	619	24(3.9)	280	14(5.0)	339	10(2.9)
2015	357	23(6.4)	180	14(7.8)	177	9(5.1)
Total	4218	252(6.3)	1944	127 (6.53)	2423	125 (5.2)

Regarding the age distribution of the participants <15, 15-24.9, 25-34.9, 35-44.9, 45-54.9 and >55 years were 0.19, 1.80, 1.30, 1.11, 0.76 and 0.81% respectively. The highest (76(1.8%)smear-positives cases belonged to age group 15-24.9 years old and the least (0.19%) among <15years (Table 2). But, the age-based difference was not statistically significant. Similarly, although the proportion of male TB smear-positives (50.39%) appears slightly higher than that of females (49.6%) the difference was not statistically significant (Tables 1). In case of residence, the prevalence of PTB was 4.57% in urban and 6.58% in rural areas.

Table 2 Total PTB suspects examined, smear-positives and History of patients in the past ten years at AHC, northwest Ethiopia, January 2006-December 2015 (N=4218).

Variables	Total PTB Suspected (n)	Smear Positive	
		(n)	(%)
Sex			
Male	1944	127	6.53
Female	2423	125	5.2
Age			
<15	379	8	0.19
15-24.9	839	76	1.80
25-34.9	853	55	1.30
35-44.9	862	47	1.11
45-54.9	631	32	0.76
>55	654	34	0.81
Residence			
Urban	1289	59	4.57
Rural	2929	193	6.58
Total	4218	252	5.97

5.2 Health personnel interview

A total of 17 health personnel at AHC including the three TB woreda focal persons participated in the study. Of these, 10 were males and 7 females. The number of participants in age-groups 15-24, 25-34, 35-44 and 45-55 years were 10, 2, 2 and 3 respectively. The participants reported that 5 had served for 1-5 years, 6 for 6-10 and the rest 6 for 11 years and above. Regarding their educational status, 1 had a certificate, 10 were diploma holders and the remaining 6 had a bachelor degree.

These health personnel strongly agreed or disagreed on 6 items raised concerning the current practice of TB control in their health center (Table 3). Six of the respondents replied that there was budget inadequacy in the health center. A total of 16 respondents of believed that routine health education to visitors exists in the health center. Moreover, most of the personnel (15) claimed that the current control practice was adequate.

Table 3 Health personnel response about current TB control practices in AHC, northwest Ethiopia, January-May 2016, (N=17)

Variable	Response					
	SA, no.	A, no.	U, no.	D, no.	SD, no.	Total
Current control practice is adequate.	7	8	1	1	-	17
Most professionals are fully confident.	1	6	5	4	1	17
Routine health education for visitors.	6	10	1	-	-	17
Routine discussion among professionals	9	5	2	1	-	17
Complete patients record exists.	11	3	3	-	-	17
NGO-sponsored budget is adequate.	7	7	2	1	-	17

AHC: Ambagiorgis health center, NGO: non-governmental organization, SA: strongly agree, A: agree, U: undecided, D: disagree, SD: strongly disagree

5.3 Current cross-sectional

There were 110 males and 90 females of which 9(8.9%) and 7(7.8%) were PTB smear-positive, respectively. The overall prevalence was 8.00%. Smear-positivity and its association with sociodemographic or KAP parameters is indicated in tables 4 and 5. The prevalence of PTB in the age groups <15, 15-24, 25-34, 35-44, ≥45 years was 2.7, 13.0, 9.8 and 5.3% respectively with no statistically significant difference. Similarly, sex had no significant association with PTB smearpositivity. However, participants from rural area had significantly higher (p=0.023) infected members (12.1%) compared to those from urban areas (3.9%).

Out of 111 respondents who knew about PTB only 3(2.7%) were found to be smear-positive. In the opposite category, however, 13(14.6%) individuals were smear-positive. The difference was statistically significant (p=0.006). Out of the respondents who claimed to have a specific knowledge about the cause of PB (n=154), 12(7.8%) were positive for the disease. On the other hand, there were 4(8.7%) positives among those who did not know the cause of TB (n=46). The prevalence estimate in the two categories was comparable. A total of 104 respondents knew about transmission TB, with only 2(1.9%) smear-positives.

But, among the 96 respondents who did not know about TB transmission, more individuals 14(14.6%) had the disease. The difference was statistically significant (p=0.005). Concerning the reasons why they could not know about TB transmission, 10(10.4%) participants reported that they were uneducated. However, 30(31.3%) had some education, but they did not give due emphasis for TB transmission.

Although coughing, breathing, and sharing cups with a patient were the most frequently mentioned routes of transmission others like sharing tooth brushes, cigarettes, or sexual intercourse were also cited. The participants also responded that PTB would be preventable mainly by avoiding sharing cups with a patient, using separate rooms, abstinence from sex, early treatment, avoidance of avoiding spiting everywhere, and personal hygiene.

Participants who did not know TB transmission mechanisms were at 7.9 times higher risk of infection than their counterparts (p=0.027). Out of 111 respondents who reported that they knew the symptom(s) of PTB, most mentioned persistent cough as a major symptom and 2(1.8%) were smear-positive among them. Contrastingly, among the 89 respondents who said that they did not know PTB symptom(s) 14(15.70%) were positive. There were 180 participants who responded that AHC was accessible to them the rest 20 responded the opposite. The number of smear positives in each group was 3(1.70%) and 13(65.00%) respectively.

Among 110 participants who responded that they seek modern drugs for PTB medication 2(1.80%) were smear-positive. The number of smear-positives out of the rest 90 participants who replied to use traditional treatments was 14(15.56%) and the difference was statistically significant (p=0.0001). Majority of the respondents (110) advised TB suspects to visit a nearby health center although the remaining 90 responded that they recommend traditional treatments. Most of the participants (178) believed that there is a TB vaccine and among these 14(7.90%) were smearpositive. Among the 22 who had no idea of a TB vaccine 2(9.10%) were positive.

The findings show that majority of the patients had awareness about PTB. However, most health professionals/officers responded that there were challenges in patient compliance concerning TB medication. The patients do not take the medicines as prescribed. However, all the 17(100%) of the respondents confirmed that early case detection, and prompt treatment is effectively practiced in the health center.

Table 4 Univariate logistic regression analysis result of the association between socio-demographic variables and TB smear-positivity at AHC, January-May 2016 (N=200)

Variable		N	Smear-positive no.(%)	COR	95% CI	p-value
Sex	Male	110	9(8.2)	0.946	0.338-2.650	0.917
	Female	90	7(7.8)			
Age (year)	<15	37	1(2.7)	0.500	0.030-8.464	0.310
	15-24.9	46	6(13.0)	2.700	0.303-24.980	0.374
	25-34.9	61	6(9.8)	1.960	0.221-17.421	0.545
	35-44.9	37	2(5.4)	1.020	0.087-12.120	0.982
	>45	19	1(5.3)	0.940		
Residence	Urban	101	4(3.9)			
	Rural	99	12(12.1)	0.290	0.093-0.961	0.043*
Education	Illiterate	78	13(16.7)	6.400	1.380-29.530	0.017
	primary school	56	1(1.8)	0.580	0.050-6.590	0.662
	≥high school	66	2(3.0)			
Income/month (Ethiopian Birr)	<250.00	45	12(26.7)	9.400	1.980-44.950	0.005
	250-500.00	86	1(1.2)	0.306	0.027-3.458	0.338
	500-750.00	15	1(6.7)	1.850	0.157-21.990	0.624
	750-1000.00	54	2(3.7)			
Know PTB	Yes	111	3(2.7)			
	No	89	13(14.6)	0.162	0.046-0.589	0.006
Know cause	Yes	154	12.(7.8)			
	No	46	4(8.7)	1.127	0.345-3.670	0.843
Know transmission	Yes	104	2(1.9)			
	No	96	14(14.6)	8.707	1.920-39.400	0.005*
Know symptoms	Yes	111	2(1.8)			
	No	89	14(15.7)	0.017	1.388-28.409	0.017
Accessibility	Yes	180	3(1.7)			
	No	20	13(65.0)	0.235	0.587-8.753	0.235
Treatment	Modern	110	2(1.88)			
	Traditional	90	14(15.5)	7.000	1.547-31.672	0.012*
Vaccines	Yes	178	14(7.9)			
	No	22	2(9.1)	1.170	0.248-5.534	0.842

*statistically significant, COR: crude odd ratio, AOR: adjusted odd ratio, CI: confidence interval

Table 5 Multivariate logistic regression analysis for assessment the relationship between socio-demographic variables and PTB smear-positivity at AHC, northwest Ethiopia, January-May 2016 (N=200)

Variable		N	Positive no.(%)	COR	AOR	95% CI	p-value
Residence							
	Urban	99	4(3.9)		1.000		
	rural	101	12(12.1)	0.290	6.990	1.300-37.730	0.023*
Education							
	illiterate	78	13(16.7)	6.400	5.340	0.66-43.080	0.116
	primary school	56	1(1.8)	0.580	0.590	0.40-8.570	0.698
	≥secondary school	66	2(3.0)				
Know TB							
	Yes	111	3(2.7)	1.000			
	No	89	13(14.6)	0.160	2.450	0.47-12.790	0.244
Know transmission							
	Yes	104	2(1.92)				
	No	96	14(14.6)	8.700	7.920	1.27-49.600	0.027*
Know symptoms							
	Yes	111	2(1.8)				
	No	89	14(15.7)	0.020	3.230	0.47-22.150	0.234
Treatment							
	Modern	110	2(1.80)	1.000			
	Traditional	90	14(15.56)	7.000	41.190	6.19-274.080	0.0001*

*statistically significant, COR: crude odd ratio, AOR: adjusted odd ratio, CI: confidence interval, n: number of people

6. Discussion

The past ten-year data showed PTB prevalence of 5.90%. The overall prevalence was low but in 2011 it was the lowest (2.77%). The data demonstrated a declining trend of TB prevalence in the past ten years compared to 2007. The possible reason for the higher prevalence in 2007, compared to 2006, might be the increased awareness of people about the disease through health information dissemination programs where health extension workers provide home to home instruction which was started in 2006 at woreda level. The efforts to encourage HIV screening and initiating antiretroviral therapy for TB/HIV co-infected patients could have played a role to the increased flow of patients to TB laboratory one year after the initiation of the program. This might have helped the people visit the health center which resulted in increased case detection.

In addition, the DOTS program which was started in 1991 in Ethiopia is a strategy of focusing on passive case finding and self-presentation of symptomatic patients. Therefore, the increase in the number of patients examined in the subsequent years could be the cumulative outcome of the various strategies.

In the current cross-sectional TB prevalence was 8.00%. These figures are apparently lower than other similar studies in Ethiopia as well as elsewhere in sub-Saharan Africa. For instance, at Agaro health center in Ethiopia 10.90% prevalence was reported (Ali et al. 2012). While a study from Rwanda recorded 17.30% prevalence estimate (Muvunyi et al. 2010), from Nigeria 9.57% was found (Imam and Oyeyi 2008). The reason for this disparity might be due to the ongoing control measures in Ambagiorgis. Another explanation might be related to the implementation of the established national TB control and prevention strategy including creating awareness about TB at household, health-facility and community levels using extensive extension health workers. Such activities are not practical in other African countries and may relatively differ in magnitude within Ethiopia itself.

On the other side, the current finding is slightly higher compared to a retrospective study from southern Ethiopia which revealed a prevalence of 3.00% (Shargie et al. 2006), from Gondar prison which revealed a prevalence of 2.03% (Zelalem et al. 2015). This difference

might be explained by the difference in criteria used for selection of the study participants and the type of diagnostic tool employed. In the current study, the fluorescence microscopy was used, which increases the possibility of case detection. In this study symptomatic patients were tested for early detection and treatment of TB. Community-based studies are likely to detect lower number of cases based on the sensitivity of the diagnostic tool in use and the bacterial load.

In both sets of data, the highest percent of smear-positives was observed among 15-24 years old patients. However, there was no age or sex-based significant difference in percentage distribution of TB. This result agrees as well as disagrees with various studies in Ethiopia and beyond. For instance, in a study from Bangladesh, the highest proportion was observed among persons aged ≥45 years but the lowest for 15-24 years old with smear-positivity significantly higher among males than females (Zaman et al. 2006).

Retrospective study was carried out in Rwanda in which among 364 TB suspected patients, the prevalence of smear-positive cases was 17.30% and most of the positive patients were 15-44 years old (Muvunyi et al. 2010). A similar retrospective study conducted in Kano, from 2006-2008 showed PTB prevalence of 14.70% out of 3679 subjects, with the highest prevalence in males (Imam and Oyeyi 2008).

Another retrospective study, conducted in Jos, Central Nigeria showed that out of the 303 sputum samples 29(9.57%) were positive and age group 36-45 years had the highest prevalence followed by age group 46-55 years old (Big et al. 2014).

Rural people had higher risk of having PTB than inhabitants of urban areas in this study. Several factors in the shelter environment can influence the likelihood of MTB transmission including crowding and the state of ventilation system. It appears that the absolute number and population density of persons sharing the same breathing space is important. If all other factors are constant, the size of the shelter population is directly proportional to the likelihood that someone with infectious TB will be present and that someone else will become infected

(CDC 2005). And that is why TB is more common in the homeless population than in the general population.

Most participants mentioned that extended coughing was the major symptom of PTB. This shows that the patients correctly recognized their disease by its symptom. Universally accepted symptoms of PTB include coughing that continues for several days, coughing up blood, fever, including low-grade, consistent fever, excessive sweating, chest pain, unexplained weight loss and fatigue (Ellner 2012, Pelletier et al.2002).

Although most of the patients knew that TB had modern treatment and preferred to visit local health centers, they confirmed that they do not follow treatment prescriptions. This problem was also understood by the local health personnel. The most common cause of treatment failures is patient failure to comply with the medical regimen. WHO reports (WHO 2014) show that adherence rates to TB medications even in high-income countries is only about 50% on average. To treat TB and prevent drug resistance, clinicians are urged to ensure that their patients follow the recommended course of treatment. However, this task proves difficult because patients are often unable or reluctant to take multiple medications for several months. Non-adherence to treatment is a major problem in TB control as inadequate treatment leads to treatment failure, relapse, ongoing transmission and development of drug resistance.

In conclusion, majority of the respondents had awareness about PTB and practiced the recommended TB preventive measures likely resulting in the observed lower prevalence. But further work is required to correct some misconceptions such as dependence on perceived traditional treatment options that were still circulating among certain community members about the public health importance of TB and maximize the choice of modern drugs. The control efforts must be further strengthened to sustainably control TB in the area.

For some retrospective cases socio-demographic data were not completely filled on the registration books. Lack of interest among respondents to fill out and return the questionnaire, after consenting and started participating, was noticed. Moreover, only sm ear-positive results were considered to estimate the prevalence of PTB in the retrospective investigation. The results were not culture- or other more sensitive methods-confirmed.

7. Conclusion

AHC attendants had basic awareness about TB although there were some people with wrong traditional beliefs and perceptions about the disease. The overall prevalence of sputum smear-positive PTB cases between 2006 to May 2016 was 6.1% with 15-24 years old adults carrying the highest burden. In the health center actions like early detection, isolation and prompt treatment of new cases are being well practiced to sustainably control TB.

8. Recommendations

Depending on the findings obtained and the conclusion drawn from the study, the following solutions are suggested. Early detection, isolation and provision of proper treatment of new cases must be scaled-up and sustained to effectively reduce the spread of the disease in the study area. Further increasing of the KAP of the community about various aspects of TB will help better counter the emergence and spread of drug-resistant strains and its control. Individuals aged 15-24 years need special attention in the fight against TB. Integration of government and nongovernment TB control efforts will help achieve more.

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10. Appendices

Appendix I Informed consent form

- Name of the investigator----------
- Study site----------
- Name of the participant ----------
- Serial number----------
- Card number----------

The researcher has well informed me that I might have developed pulmonary tuberculosis which is caused by bacteria known as Mycobacterium tuberculosis or Mycobacterium bovis. I have been appointed for an investigation that involves collection of the sputum smear specimens. The collected specimen will be processed in order to identify my disease problem.I have been also requested to agree the use of the specimen for research as to isolate, identify and type the etiological agents of the disease.I will be benefitted from the diagnosis and appropriate treatment to be provide for TB, In addition to this, I have been informed that laboratory results and all information to be written on the case record form be kept confidential and the nature of the record form is private. The researcher has also explained to me that participation in the study is on voluntary basis and I can withdraw my consent at any time without any prejudice to my case. I have been allowed to ask questions and have received clarification in a language I understand to my satisfaction. Finally, I confirm my agreement to participate in the study with my signature below.

Signature_____

Date _____

Appendix II Consent form for adults >18 years (Amharic version)

ለሳንባ ነቀርሳ በሽተኞች የተዘጋጀ የፈቃደኝነት መተማመኛ ቅጽ

1.1 የጤና ጣቢያው/የጤና ጥበቃው ስም ----------
1.2 የመለያ ኮድ(ሴሪ ቁጥር)----------
1.3 የ ካርድ ቁጥር ----------
1.4 ጾታ----------

የዚህ መጠየቅ ዋና ዓላማ በወገራ ወረዳ አምባ ጊወርጊስ ጤና ጣቢያ ባለፉት አስር አመተት እና በአሁኑ ሰአት የሳንባ ነቀርሳ በሽታ ስርጭትና የበሽታው ስርጭት ምን እንደሚመስል እንዲሁም ስርጭቱን ለመግታት በአሁኑ ሰዓት በጤና ጣቢያዉ እየተከናወኑ ያሉ ተግባራት ዳሰሳ በሚል ርዕስ በስነ -ህይወት ትምህርት ለ2ኛ ዲግሪ የሚያበቃ ጥናታዊ ጽሁፍ ለመስራት የሚፈለገውን

ጠቃሚ መረጃዎች ለመሰብሰብ ነው :: ስለሆነም የሚሰጡት ማንኛውም ዓይነት መረጃ ለዚህ ጥናት ብቻ የሚውልና ሚስጢራዊነቱም የተጠበቀ ነዉ በማለት የጥናቱ ባለቤት ከገለፀልኝ በኋላ ምናልባት እኔ የሳንባ ችቢ ይዞኝ ሊሆን እንደሚችልና ስለ በሽታው ያለኝን ግንዛቤ ጭምር ለማወቅ ይችሉ ዘንድ የአክታ ናሙና እና ተገቢዉን ምላሽ እንድሰጥ እና እንድሳተፍ ፈቃደኝነቴን ተጠይቂያለሁ እኔም የምርመራዉ ዉጤት ሚስጥራዊነቱ የተጠበቀና ለጥናቱ ፍጆታ ብቻ እንደሚጠቀመበት በጥናቱ ያለመሳተፍ እና ያለ መስማማት እንዲሁም የማቋረጥ መብቱ እንዳለኝ ካረጋገጡልኝ በኋላ ያለምንም አስገዳ ጅነት በጥናቱ ለመሳተፍ መስማማቴን በፊርማየ አረጋግጣለሁ::

የጥናቱ ተሳታፊ ስም ----------ፊርማ ----------ቀን ----------

የአጥኝዉ ስም ----------ፊርማ ---------- ቀን ----------

Appendix III Consent form Amharic version: for Cases below 17 years

ከ 17.99 አመት በታች ለሆኑ የሳንባ ነቀርሳ በሽታ ተጠርጣሪ ታዳጊዎች በወላጅ /አ ዳጊ የሚከናወን የፈቃደኝነት መተማመኛ ቅጽ

1.1 የ ጥናቱ ባለቤት ስም ----------የ ጤና ጣቢያው ስም ----------

1.2. የ ጥናቱ ስም ተሳታፊ ----------

1.3.የ መለያ ኮድ(ሴሪ ቁጥር)----------

1.4 የካርድ ቁጥር ---------- ጾታ----------

የዚህ መጠየቅ ዋና ዓላማ በወገራ ወረዳ አምባ ጊወርጊስ ጤና ጣቢያ ባለፉት አስር አመተት እና አሁኑ ሰአት የሳንባ ነቀርሳ በሽታ ስርጭትና የበሽታው ስርጭት ምን እንደሚመስ ል እንዲሁም ስርጭቱን ለመግታት በአሁኑ ሰዓት በጤና ጣቢያዉ እየተከ ናወኑ ያሉ ተግባራት ዳሰሳ በሚል ርዕስ በስነ -ህይወት ትምህርት ለ2ኛ ዲግሪ የሚያበቃ ጥናታዊ ጽሁፍ ለመስራት የሚፈለገውን ጠቃሚ መረጃዎች ለመሰብሰብ ነው :: ስሆነም የሚሰጡት ማንኛውም ዓይነት መረጃ ለዚህ ጥናት ብቻ የሚውልና ሚስጢራዊነቱም የተጠበቀ ነዉ በማለት የጥናቱ ባለቤት ከገለፀልኝ በኋላ ምናልባት ታካሚዉ (ታዳጊዉ) የሳንባ ትቢ ይዞት ሊሆን እንደሚችልና ስለ በሽታው ያለዉን ግንዛቤ ጭምር ለማወቅ ይችሉ ዘንድ የአክታ ናሙና እንዲሰጥና ምርምራ እንዲያደርግ በራሱ ለመወሰን ስለማይችል እኔን /ወላጁን ተገቢዉን ምላሽ እንዲሰጥ እና እንዲሳተፍ ፈቃደኝነቴን ተጠይቂያለሁ እኔም የምርመራዉ ዉጤት ሚስጥራዊነቱ የተጠበቀና ለጥናቱ ፍጆታ ብቻ እንደሚጠቀሙበት በጥናቱ ያለመሳተፍ እና ያለመስማማት እንዲሁም የማቋረጥ መብቱ እንዳለዉ ካረጋገጡልኝ በኋላ ታካሚዉ ያለምንም አስገዳጅ ሁኔታ የጥናቱ አካል እንዲሆን መስማማቴን በፊርማየ አረጋግጣለ ሁ።

ፊርማ ----------ቀን ----------

Appendix IV Questionnaire for patients

1. General information
Name of the health center----------Card No----------

1..Age (in years)----------

2. Sex:- A/Male ---------- B/Female----------

3.Adress 1.Urban----------2.Rural----------wereda/kebele----------house no----------4. Current educational status; 1. illitrate----------2.primary school----------3. secondary school and above 5. Family income/birr/month: A/<250 B/250-500 C/ 500-750 D/ 750-1000 E/>1000

PART TWO:- choose the one which you think is appropriate and encircle the letter of your choice

1. Do you know what pulmonary tuberculosis is? A/ Yes B/No

2. If your answer to the above question (No 1) is "A/Yes", then, what do you think the causative agent of PTB? A kind of:-A/ Virus B/Bacterium C/Protozoa C/ None

3. Do you know the mode of transmission of PTB? A/ Yes B/No

4. i. If your answer to question No:-3, is "A/Yes", then list down the means of transmission of PTB---------- ---------- ----------4.ii. If on the other hand, your answer to this same question is "B/No" then, what could be the reason for your not knowing the mode of transmission? It is because:-A/ I am un educated B/I am educated ,but I did not give due emphasis for the transmission of PTB

C/I am not interested in pathological aspects D/ None of the above

5.Do you know the symptom(s) of PTB? A/yes B/ No

6.If your answer for question no 5 Is "A/ yes" ,then ,list down the symptoms of PTB? ---------- ---------- ----------

7. What shall you do if the disease PTB happens in your area?----------

8. Is the health center is accessible to most PTB patients? A/ Yes B/No

9. If your answer to the above question is B/No ,why? ----------

10. Do you think that PTB is a curable disease? A/yes B/No

11.Is there a vaccine which is developed to control(prevent)PTB from spreading?

A/Yes B/No C/I don't know

12. What should be done by the different bodies to reduce the prevalence of PTB?----------

Appendix V Questionnaire for patients (Amharic version)

ክፍል 1 አጠቃላይ መረ ጃ

1.1 የጤና ጣቢያው / የጤና ጥበቃው ስም ----------

1.2 ግላዊ መረጃ :-1.2.1 ጾታ ሀ . ወን ድ ለ . ሴት

1.2.2 እድሜ ----------1.2.3 የት/ት ደረጃ ሀ . ሰርትፊኬት ለ . ዲፕሎማ

ሐ. የመጅመሪያ ዲግ ሪ መ . ሌላ ----------ክፍል 2 ትክክለኛ ነው ብለህ /ሽ / የምታስበ /ቢ/ ውን የምርጫ ፊደል ክበበ/ቢ/ው ክፍት ለሆኑት

ጥያቄዎች መልስህን /ሽ /ጻፍ/ፊ /።

1.ስለ ሳምባ ነቀርሳ በሽታ ምንነት ያውቃሉ ?

ሀ .አዎ ለ .የለም

2.በተራ ቁጥር 1 በተሰጠው ጥያቄ መልስዎ ሀ .አዎ ከ ሆነ የበሽታው አምጭ ተህዋስ ከየትኛ ው ይመደባል ?

ሀ .ቫይረስ ለ .ባክቴሪ ያ ሐ.ፕሪትዝዋ መ . የ ለ ም

3.የሳንባ ነቀርሳ በሽታ መተላለፊያ መንገዶችን ያውቃሉ ?

ሀ . አዎ ለ .የለም

4.1በ ተራ ቁጥር -3 ለቀረበው ጥያቄ መልስዎ ሀ .አዎ ከ ሆነ የ መተላለፊያ መንገዶችን ይዘርዝሩ ----------
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4.2 በተራ ቁጠር -3 ለቀረበው ጥያቄ መልስዎ ለ .የለም ከሆነ የመተላለ ፊያ መንገድን ላለማወቅ የሚጠቀሰው ምክንያት ምንድን ነው

ሀ .አለመማር ለ . የተማርኩ ቢሆንም ለሳንባ ነቀርሳ በሽታ መተላ ለፊ ብዙም ትኩረት

ያለመስጠት ሐ. ስለ ጤና ጉዳይ ግድ የለይም መ . መልስ የለም

5. ሳንባ ነቀርሳ በሽታ ምልክቶችን ያውቃሉ?

ሀ . አዎ ለ . የለም

6. ለ ጥያቄ ቁጥር -5 መልስዎ ሀ . አዎ ከ ሆነ ምልክቶችን ይዘርዝሩ ----------

7.በ አካባቢዎ የሳንባ ነቀርሳ በሽታ ሲከሰት ምን ያደርጋሉ?----------

-8. ጤና ጣቢያው ለአብዛ ኛ ው የሳንባ ነቀርሳ ህመምተኞች ተደራሽ ነው ?

ሀ . አዎ ለ . የለም

9.ለ ተራ ቁጥር -8 መልስዎ ለ . የለም ከሆነ ለምን ----------

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10. ሳንባ ነቀርሳ በሽታ ህክምና የሚድን በሽታ ነው ብለው ያምና ሉ?

ሀ . አዎ ለ . የለም

11. በጤና ጣቢያው የሳንባ ነቀር ሳ በሽታን ስርጭት ለመከላከል እና ለመቆጣጠር ክትባት መሰጠቱን ያውቃሉ?

ሀ . አዎ ለ . አላውቅም

12.የሳንባ ነቀርሳ በሽታን ስርጭት ለመግታት በየደረጃው የተለያዩ አካላት ምን ይጠበቃል /ምን መደረግ አለበት ይላሉ?----------
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አመሰግናለሁ!

Appendix -VI Questionnaire for health personnel including focal persons

Dear Health personnels& focal persons:-

The purpose of this questionnaire is to gather valuable data for the study entitled Current and Past 10-Year Trend of Pulmonary Tuberculosis and Intervention Practices in Ambagiorgis Health Center, *Leading to Msc degree in biology .Your contribution in providing genuine and frank information is indispensable for the success of this study .Therefore, I kindly request you to respond the questions jenuinely.All the information you provide will be used for the purpose of this study only,and it will be kept confidential.*

Thank you in advance for your cooperation!

Part One: General Information:-

1.1 Name of the health center----------
1.2 Personal information:-

1.2.1 Sex:- A/Male B/Female

1.2.2.Age----------

1.2.3.current educational status; A/ Certificate B/Diploma C/First degree D/ others----------

Part Two*:-To what extent are the variables in the "Item" columns considered in the current practice of the health center in the control of PTB. Put the (√)mark, in the column of your choice.*

Key:-NGO:non-governmetal organization, SA:strongly agree,A:agree,U:undisagree,

D:disagree, SD:strongly dis agree

Variable	**Response**				
	SA, no.(%)	**A, no.(%)**	**U, no.(%)**	**D, no.(%)**	**SD, no.(%)**
Current control practice is adequate.					
Most professionals are fully confident.					
Routine health education for visitors.					
Routine discussion among professionals					
Complete patients record exists.					
NGO-sponsored budget is adequate					

Thank you!

Appendix VII Interview prepared for wereda health officer and focal person

Dear Woreda health officers and focal persons,

The purpose of this interview is to gather valuable data for the study entitled Current and Past

10-Year Trend of Pulmonary Tuberculosis and Intervention Practices in Ambagiorgis Health Center, leading to MSc degree in biology.Your contribution in providing genuine and frank information is indispensable for the success of this study. Therefore, I kindly request you to respond to the questions genuinely. All the information you provide will be used for the purpose of this study only, and it will be kept confidential.

Thank you in advance for your cooperation!!

1.3 Personal information:-1.2.1 Sex:- A/Male B/Female

1.2.2.Age----------

1. Do you think that Ambagiorgis inhabitants have clear awareness about pulmonary tuberculosis

(PTB)? A/Yes B/No

2. What practices does Ambagiorgis health center employ in controlling of PTB? Do you believe that it is enough?

3. Which factor influences more of the prevalence of PTB in the health center?

4. Do you think that, there are good opportunities in the woreda to decrease the prevalence of PTB currently? Give example.

5. What should be done by the different bodies to reduce the prevalence of PTB?

Appendix -VIII Procedures of smear examination Staining with ZN and FM.

Smear examination stained with ZN	Smear Examination stained with FM
Place smear facing up wards on to stage	Keep stained smears in the dark (Box or Folder)until reading and read as soon as possible
Add one drop of oil at the ege of the smear	Place smear facing up wards on to stage
Use the low power objective lense to see the distribution and 100x for reading	Use the objective 20x for reading and 40x for confirmation
Scan the stained smear systematically at least one length has to be scanned before reporting a negative	Scan the stained smear systematically at least one length has to be scanned reporting a before negative
Quantitate the AFB	Quantitate the AFB
Recored and report results	Recored and report results
Store all smears	Store all smears

Positive and Negative Report

Negative Report: Negative AFB where no organisms observed in 100 HPF

Positive report: positive for acid-fast bacilli; provide AFB quantification to grade results.

WHO/IUATLD Quantification scale of ZN stained method.

Number of AFB	Number of fields* examined	What to report
No AFB in 100 fields	100 fields	No acid fast bacilli detected
1-9 AFB in 100 fields	100 fields	Record exact figure (1 to 9AFB per 100 fields)
10-99AFB in 100fields	100 fields	1+
1-10AFB in each field	50 fields	2+
More than 10 AFB in each field	20 fields	3+

*oil immersion fields

WHO/IUATLD Quantification scale of FM stained method

	FM Grading Scale using 20xobjective	FM Grading Scale using 40x objective
Reporting scale	AFB seen 200 magnification; one length =30 field=300 HPF in bright field microscope)	AFB seen 400 magnification; one length =40 field=200 HPF in bright field microscope)
Negative	No AFB in at least 30 fields	No AFB in at least 40 fields
Actual number	1-29 AFB per 30 fields	1-19 AFB per 40 fields
(1+)	30-299AFB per 30 fields	20-199AFB per 30 fields
(2+)	10-99AFB per field in at list 15 fields	5-49AFB per field in at list 20 fields
(3+)	More than 100 AFB per field in at list 6 fields	More than 50 AFB per field in at list 8 fields

ZN and FM Reagents and quality:Specifications

ZN Reagent name	FM Reagent name	Specification
Basic fuchsin	Auramine O	Purchased from well known manufactures or those certified by the Biological Stain commission
Phenol crystals	Phenol crystals	Near colorless-never black
Alcohol(Ethanol/Methanol)	Alcohol(Ethanol/Methanol)	Technical grade
Acid (0.5% HCl)	Acid (0.5% HCl)	Technical grade
Water	Water	Distilled or purified, not tap water
Methylen blue	Potasium per manganete	Purchased from well known manufactures

(Source:Bahir Dar Regional Health Research Laboratory Center and Amhara Regional Health Center ,manual for AFB smear microscopy on ZN/FM EQA Unpublished manual.jan.2013).

Appendix –IX Laboratory request form for microscopy

Name of Health center: Ambagiorgis Date_____
Name of patient_____Age _____Sex_____
Complete address_____
Patient register number_____
Source of specimen:

- Pulmonary__X__
- Extra pulmonary(site)_____

Reasons for examination

- Diagnosis____X_____
- Follow up of chemotherapy _____

Specimen identification number_____
Signature of person requesting examination_____
Microscopic results
Lab. Ser. No:- _____
Specimen 1. Negative_____ Positive_____
Specimen 2 Negative_____ Positive_____
Specimen 3. Negative_____ Positive_____

Date_____ Examined by (signature)_____

Appendix X Approval Letter

11. Declaration

I, the undersigned, declare that this is my original work and has never been presented for a degree before and all source materials are duly acknowledged.

Name Hamid Jemilu

Signature---------- Date----------

12. Statement of the supervisor(s)

This Thesis has been approved for submission to the Department of Zoological Sciences for public defense.

Name Hassen Mamo (PhD)

Signature_____Date_____