PREVALENCE OF TUBERCULOSIS AND ITS ASSOCIATED RISK FACTORS AMONG PATIENTS VISITING DUKEM HEALTH CENTER, OROMIA REGIONAL STATE, CENTRAL ETHIOPIA

MSc. THESIS

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We hereby certify that we have read and evaluated this Thesis entitled: **The Prevalence of Tuberculosis and its Associated Risk Factors among Patients Visiting Dukem Health Center, Oromia Regional State, Central Ethiopia** prepared under our guidance by Feyissa Geremew. We recommended that it be submitted as fulfilling the thesis requirement.

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DEDICATION

This work is dedicated to my beloved wife, a son, mother, sisters and brothers.

STATEMENT OF THE AUTHOR

By my signature below, I declare and affirm that this thesis is my own work. I have followed all ethical principles of scholarship in the preparation, data collection, data analysis and completion of this thesis. All scholarly matter that is included in the thesis has been given recognition through citation.

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BIOGRAPHICAL SKETCH

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Since then,he has been teaching Biology in Dukem Secondary School, Dukem town. In 2015, he joined Haramaya University in Summer Program to pursue his postgraduate study in the field of Biology.

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ACRONYMS AND ABBREVIATIONS

AFB	Acid Fast Bacilli
AIDS	Acquired Immunodeficiency Syndrome
BCG	Bacillus Calmette-Guerin
CDC	Center for Disease Control and prevention
CXR	Chest X-ray
DNA	Deoxy ribo-Nucleic Acid
DOTS	Direct Observed Treatment Short –course
FMOH	Federal Ministry of Health
HIV	Human Immunodeficiency Virus
LTBI	Latent Tuberculosis Infection
MDR-TB	Multi Drug Resistant Tuberculosis
MNC	Manufacturing company
MTC	*Mycobacterium tuberculosis* Complex
NCCLS	National Committee for Clinical Laboratory Standard
OPD	Outpatient department
PCR	Polymerase Chain Reaction
PTB	Pulmonary tuberculosis
TB	Tuberculosis
USAID	United States Agency for International Development
WHO	World Health Organization
XMDR-TB	Extremely Multi Drug Resistant Tuberculosis

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ABSTRACT

Tuberculosis is a deadly infectious disease that affects millions of people worldwide. Ethiopia ranks seventh among the twenty two high tuberculosis burden countries. The aim of this study was to determine the prevalence of tuberculosis (TB), particularly pulmonary tuberculosis (PTB) and its associated risk factors among patients visiting Dukem Health Center, Oromiya Regional State. A cross-sectional survey on the prevalence of smear positive PTB was done among TB suspected patients visiting Dukem Health Center during December, 2017 to February, 2018. A total of 384 TB suspects were successively taken from the Out Patient Department of the Health Center to determine the current status of PTB. In addition, a longitudinal retrospective study was done to assess the TB cases during the past six years from year 2011-2016. From each TB suspect, sputum sample was collected and subsequently examined for acid fast bacilli using Ziehl-Neelsen staining technique. Pre-tested questionnaire was also used to determine the associated risk factors of TB infection among the study subjects. The data were entered and analyzed using SPSS version 20 software. Descriptive statistics and binary logistic regression analyses were employed to identify risk factors associated with pulmonary tuberculosis. The study revealed that the current prevalence of smear positive PTB was 7.8 %. The trend of all forms of TB started to decline starting from 2011 onwards in both sexes and all age groups. The current study also showed that age related, residence, and previous TB contact history, living in a confined place, alcohol consumption, educational status, monthly income and smoking cigarettes were significantly($p<0.05$)associated with prevalence of smear positive TB cases. Generally, in this study, the high prevalence of smear positive PTB in the area suggested the need for implementing strict screening of patients for TB and intensification of health education to prevent the spread of the disease and to create awareness on risk factors contributing to the infection. In addition, routine checkup of TB among TB suspects is important to minimize the burden of the disease and to control the transmission rate in the area.

Keywords: Acid fast bacilli, Smear positive PTB, Sputum Samples, Trend,TB suspect

1. INTRODUCTION

Despite the availability of highly efficacious treatment for decades, Tuberculosis (TB) remains a major global health problem. In 1993, the World Health Organization (WHO) declared TB a global emergency and subsequently launched the directly observed treatment short-course strategy (DOTS) to control TB (WHO, 2011andWHO, 2012).

Tuberculosis (TB) is a bacterial disease caused by *Mycobacterium tuberculosis* complex which includes most of the time *Mycobacterium tuberculosis* and occasionally *M. bovis*, *M. africannum* and *M. cannetti* (Demissie *et al.*, 2006). These organisms are also known as tubercle bacilli or acid-fast-bacilli (AFB). When examining a sputum containing tubercle bacilli processed by Ziehl-Neelson stain under the microscope, the bacilli are stained red. This is because they retain the primary dye even after washing with acid alcohol due to the waxy component of their cell wall (Cheesbrough, 2002).

Shockingly, 8.8 million new cases of TB were registered in 96 countries in (WHO, 2011). Globally, South East Asia and Sub-Saharan African (SSA) countries have the highest TB burden 35% and 30%, respectively. In addition, 1.1 million deaths were reported and the majorities were from Asia (50%) and Africa (26%) (WHO,2011).

The estimated incidence rate was 261 cases per 100,000 individuals and 29,000 deaths in 2010, with an estimated prevalence rate of 394 cases per 100,000 individuals (WHO, 2012). It still remains to be a major public health problem in the under developed world because of poverty, HIV pandemic, movement of displaced people and emergence of multi–drug resistant strains (Bone *et al.*, 2000). Drug-resistant tuberculosis (DR-TB) threatens global TB control and is the major public health concern in several countries. Globally in 2012, an estimated 450,000 people developed multi drug resistant tuberculosis (MDR-TB) and there were an estimated 170,000 deaths from MDR-TB. Internationally, 3.5% of new and 20.5% of previously treated TB cases had MDR-TB in 2013.

This translates into an estimated 480,000 people who have developed MDR-TB in 2013. On average, an estimated 9.0% of patients with MDR-TB had extensively drug resistant TB (XDR-TB) (WHO, 2014). There were an estimated 9.6 million new cases of TB in 2014. Out 2 which there were an estimated 480,000 new cases of MDR-TB and an estimated 190,000 people died of MDR-TB (WHO, 2015).

Tuberculosis is one of the ten leading causes of deaths in developing countries (WHO, 2005 & 2007). African countries, south of the Sahara including Ethiopia, are heavily affected by TB. The WHO global reports on TB showed that Ethiopia is among the ten top high burden countries in terms of prevalence of TB with an estimated incidence of 258/100,000 (WHO, 2009 & 2010). In other words, TB is amongst the major causes of morbidity and mortality in the horn of Africa with Ethiopia carrying heavy burden. Ethiopia is the second most populous country in Africa (World Bank, 2018).

Ethiopia is no exception; there is neither a reliable disease notification system nor any regular nationwide epidemiological survey of TB (FMOH, 2007). Of course, there are studies carried out about the prevalence of tuberculosis and its associated risk factors by different researchers in different parts of Ethiopia (Hussein *et al.*, 2012; Yohannes *et al*., 2012; Eyasu *et al*., 2013; Begna *et al.*, 2014). However, there is no reliable information on the prevalence of TB and its associated risk factors in the study area, Dukem. Therefore, this study was designed to determine the prevalence of TB and its associated risk factors among patients visiting Dukem Health Center, Oromia Regional State, South East Ethiopia. The study would provide information primarily for public health policy makers, managers and for the wider medical and public health community as support for strategic actions and program planning.

Objective

General Objective of the study was:

To determine the status of pulmonary tuberculosis and its associated risk factors in Dukem Health Center, Oromia Regional State, Central Ethiopia.

Specific objectives of the study were:

1. To determine the current prevalence of pulmonary tuberculosis in the study area
2. To assess the trend of TB prevalence in the study area for the past six years
3. To investigate the association between prevalence of TB and risk factors in the study area

2. LITERATURE REVIEW

2.1 Tuberculosis

Tuberculosis is a major public health problem worldwide. Although, TB deaths are declining the disease continues to pose as one of the world's most urgent health challenges. Nearly one-third of the world is currently infected with the TB bacterium (GHP, 20010).

Tuberculosis (TB) is a potentially fatal contagious disease that can affect almost any part of the body but is mainly an infection of the lungs (Beers *et al.,* 2004). It is caused by a bacterial microorganism, the tubercle bacillus or *Mycobacterium tuberculosis* complex (MTC).

Pulmonary tuberculosis is TB that affects the lungs. Although the lungs are the major site of damage caused by tuberculosis, many other organs and tissues in the body may be affected. The usual progression for the disease is to spread from the lungs to locations outside the lungs (extra pulmonary sites). In some cases, however, the first sign of disease appears outside the lungs. The tissues or organs that tuberculosis may affect include: bones, kidneys, female reproductive organs, abdominal cavity, skin, adrenal glands and blood vessels. All these parts of the body can be infected by *M. tuberculosis*. Infection of the wall of the body's main artery (the aorta), can cause it to rupture with catastrophic results (Beers *et al.,* 2004).

It is thought that the rates of new Tuberculosis infections and deaths per capita have probably been falling globally for several years now. However, the total number of new Tuberculosis cases is still rising. The majority of the morbidity and deaths occurred due to TB in the world is in Africa of which the share of Ethiopia is really quite big. However, recent evidence demonstrates that TB prevalence and TB death rates are globally decreasing after having reached a peak. Since 2005, the TB incidence rate is in decline in all six (FMOH, 2008).

2.2 Causative Agents of Tuberculosis

The *Mycobacterium tuberculosis* (MTC) comprises seven members which include: *Mycobacterium tuberculosis*, *M. africanum*, *M. bovis*, *M. caprae, M. pinnipedii*, *M. microti*, and *M. canetti*(Angela *et al.,* 2006). MTB is the etiologic agent of the majority of TB causes in humans; *M. africanuum and M. canettii are* primarily pathogenic in humans. *M. bovis* and

M. microti are the causative agents of TB in animals, and can be transmitted to humans (Palomino *et al*., 2007).

2.3 General Characteristics of *Mycobacterium tuberculosis*

Mycobacterium tuberculosis is a slow growing mycobacterium with a doubling time of 12–24 hours under optimal conditions. A major feature of MTB is the peculiar cell wall structure, that provides an exceptionally strong impermeable barrier to noxious compounds and drugs and that plays a fundamental role in virulence (Abdallah *et al*., 2007).

Mycobacterium tuberculosis possesses an outer membrane, functionally similar to what is seen in gram negative bacteria, consisting of an asymmetric lipid bi-layer made of long fatty acids in the inner leaflet (mycolic acids) and of glycolipids and waxy components on the outer layer. The outer and inner membrane form a periplasmic space, with the presence of a thin layer of peptidoglycan in the innermost side covalently linked to arabinogalactan and lipoarabinomannan which in turn are bound to my colic acids. Mycolic acid prevents attack by cationic proteins, Lysozyme, oxygen radicals and nutrient rich reservoir for MTB persistence. The waxy cuticle provides impermeability to dyes, resistance to many antibiotics, resistance to osmotic lyses, resistance to lethal oxidation and survival inside macrophages (Alderwick *et al*., 2007). Isoniazid and ethambutol are two of the most effective anti-TB drugs, target the synthesis of the mycolic acids and arabinogalactan respectively, highlighting the importance of the mycobacterial cell wall in MTB biology (Abdallah *et al*., 2007).

2.3.1 Taxonomy of *Mycobacterium tuberculosis*

Taxonomically, mycobacteria belong to the genus *Mycobacterium,* which is the single genus within the family of *Mycobactericidal,* in the order *Actinomycetes, Actinomycetes* include diverse micro-organisms, but mycobacteria and allied taxa are easily distinguished based on the ability to synthesize mycolic acids. The genus *Mycobacterium* contains a number of strict and opportunistic pathogens that afflict humans and animals alike (Table1).

Among the strict pathogens, the principal pathogens of humans include *Mycobacterium tuberculosis*, the causative agent of tuberculosis, and *M. liprae*, which causes leprosy. Mycobacterium species are traditionally differentiated on the basis of phenotypic characteristics. However, as the phenotypic characteristics do not allow precise identification of all species of mycobacteria, recent molecular taxonomical approaches for mycobacterial classification and phylogeny are also described (Rastoji *et al.,* 2001).

Table1. Taxonomic ranks of Mycobacterium tuberculosis

Domain	Eubacteria or true bacteria
Phylum	Actinobacteria
Class	Actinobacteria
Order	Actinomyetales
Family	Mycobacteriaceae
Genus	*Mycobacterium*
Species	*Tuberculosis*

Source: (George *et al*., 2004).

2.3.2 **Pathogenesis of *Mycobacterium tuberculosis***

Tuberculosis is one of the first and most studied infectious disease, as classically highlighted by the seminal work of R. Koch more than 100 years ago. But we have yet to answer many key questions on the mechanisms of pathogenesis and on the immunological correlates, if any, associated with protection from developing disease (Collins *et al*., 1998).

Mycobacterium tuberculosis infection occurs when few tubercle bacilli dispersed in the air from a patient with active pulmonary TB reach the alveoli of the host (Fig.1). Here, MTB is quickly phagocytized by professional alveolar macrophages that most often can kill the entering bacteria thanks to the innate immune response (Urdahl *et al.*, 2011).

If the bacilli can survive this first line of defense, it starts actively replicating in macrophages; diffuse to nearby cells including epithelial and endothelial cells, reaching in few weeks of exponential growth a high bacterial burden (Wolf, *et al*., 2008). During these early steps of infection can diffuse to other organs through the lymphatic and by hematogenous dissemination where it can infect other cells (Balasubramanian *et al.*, 1996). Thereafter, once the adaptive immune response kicks in, migration to the site of primary infection of neutrophils, lymphocytes and other immune cells form a cellular infiltrate that later assume the typical structure of a granuloma (Ottenhoff and Kaufmann, 2012).

Fibrotic components cover the granuloma that becomes calcified such that bacilli remain encapsulated inside and protected by the host immune response. This primary lesion, classically termed the Ghon complex, was thought to be the "sanctuary" of MTB during latent infection with bacilli persisting in a dormant, non-metabolically active state, for years, decades, or most often for lifetime. For unknown reasons, latent infection bacilli would start replicating inside this primary lesion, active disease would ensue (Bishai, 2009).

Musing normal lung tissues isolated at necropsy from patients who had died for causes other than TB in a TB endemic country, were able to detect by in situ polymerase chain reaction (PCR) MTB DNA in non-phagocytic cells, fibroblasts and endothelial cells, clearly suggesting that in latent TB subjects MTB bacilli can persist in tissues and cells not associated with the granuloma or the Ghon complex (George *et al*., 2004).

Using similar experimental settings, MTB was detected in the fat tissue surrounding several organs, residing intra cellular adipocytes, where it can survive protected from the host immune response. All these evidences suggest that during latent tuberculosis infection, MTB can reside in different organs, tissues and cell types, not associated with the site of primary infection and lacking any sign of the typical granulomatous lesions (Neyrolles *et al.*, 2006).

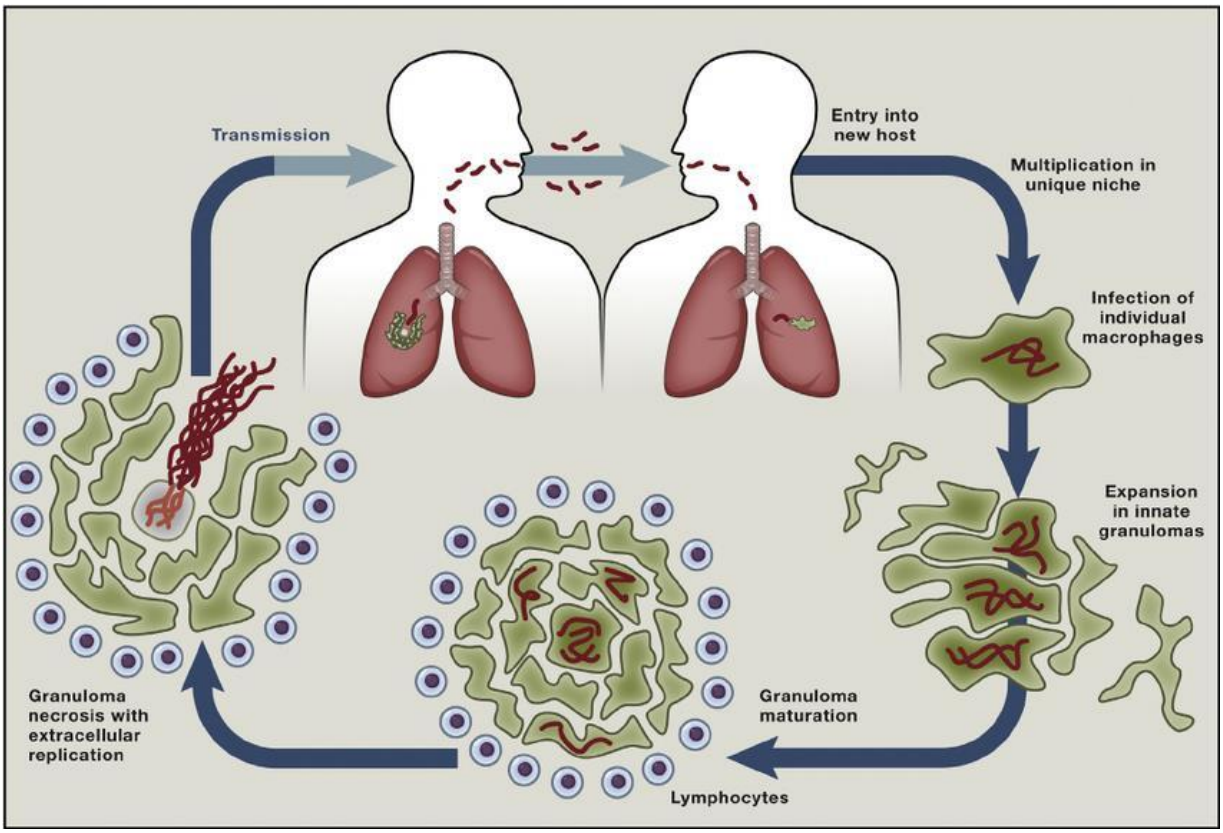

Figure 1 Life cycle of Mycobacterium tuberculosis

Source: (Camber and Stanley, 2014)

Based on the new understanding of biology of MTB, its different metabolic states, the dynamic host immune responses occurring during infection and on the spectrum of conditions are observed during infection. It has been proposed that during latent infection, most bacilli persist in a dormant state with fewer MTB found in an active state. Replicating bacilli, named "scouts" are processed and killed by the host immune defenses and as a result they are responsible for the induction of the larger number of effectors (memory T cells) directed against MTB antigens that are found in the peripheral blood. Latent TB dormant bacteria constantly replenish the bulk of activity replicating bacilli readily killed by the host when for any reason fail to control such as in the case of HIV infection, cancer patients and hematologic condition. These scouts, uncontrolled bacterial replication promotes diseases manifestations and active diagnosis ensues (Gengenbacher, 2012).

2.3.3 Signs and symptoms of tuberculosis

Signs and symptoms of pulmonary TB (PTB) are described into two types. The first types constitutional symptoms such as, fatigue, anorexia, weight loss, low-grade fever, night sweat, acute febrile illness, chills, flu like symptom and the second pulmonary signs and symptoms are cough progressing in frequency and producing mucoid or mucopurulent sputum, hemoptysis, chest pain and dyspnea (Nettina, 2006). Depending on the sort of patient population surveyed, as few as 20%, or as many as 75% of pulmonary tuberculosis cases may be without symptoms. Tuberculosis should be suspected when a pneumonia-like illness has persisted longer than three weeks, or when a respiratory illness in an otherwise healthy individual does not respond to regular antibiotics (Kumar *et al.*, 2007).

2.3.4 Diagnosis of tuberculosis

The diagnosis of pulmonary tuberculosis in adult is mainly done by collecting sputum sample. Due to the nature of the waxy coat of *Mycobacterium* cell wall, it retains an anilinedye (e.g.carbolfuchsin) even after decolorization with acid and alcohol; they are thus named Acid Fast Bacilli (AFB). This characteristic enables us to detect them by microscopy. Although this method has low sensitivity; it is widely applied and used globally, because it is simple, rapid and cost-effective. In resource limited settings, culture is used for a definitive diagnosis of TB. However, it is much more costly than microscopy, requiring a long incubation period and facilities for media preparation as well as skilled staff. The other diagnostic method is chest x-ray (CXR). It is less applicable in low resource countries such as in South East Asia and Sub-Saharan African countries (Dawit, 2009).

There are tests that can be used to help detect TB infection: a skin test or TB blood tests. The tuberculin skin test is performed by injecting a small amount of fluid (called tuberculin) into the skin in the lower part of the arm. A person given the tuberculin skin test must return within 48 to 72 hours to have a trained health care worker look for a reaction on the arm. The TB blood tests measures how the patient's immune system reacts to the germs that cause TB (CDC, 2011).

Another method is to detect MTB DNA using PCR for partial amplification of the genetic material present in a specimen. The newly developed Gene-Expert MTB/rifampicin assay offers

rapid automated and real-time detection of the gene and this method requires minimal training to perform and was endorsed by the WHO for fast diagnosis of TB, especially in people living with HIV and patients with suspected MDR-TB (WHO, 2011).The Gene-XpertMTB/rifampicin test has the advantages of being easy to perform and providing results in less than 2 hours. This technique also furnishes information about resistance to rifampicin, because it detects the most common resistance mutation (Lawn *et al.,* 2011). Although a risk of false positive reactions has been reported (Van Rie *et al.,* 2012). Furthermore, it should be noted that this assay is expensive, especially the cartridges that are used, and it requires an uninterrupted power supply, ambient temperature of C, and an environment without extreme humidity or dust. These features make Gene-Xpert MTB/rifampicin less appealing for deployment in peripheral low income settings (Wejise, 2013).

At the time of diagnosis, every TB patient will be registered under one of the following categories (Fujiwara *et al.,* 2005).

1. A patient who has never had treatment for TB or who has taken anti-tuberculosis drug for less than four weeks,
2. Relapsed case: a patient who has been declared cured of any form of TB in the past by a physician, after one full course of chemotherapy and has become sputum smear positive
3. Failure case: a patient who, while on treatment, remained or became again smear positive five months or later during treatment,
4. Treatment after default: a patient who interrupts treatment for two months or more and returns to treatments with smear positive sputum,
5. Transfer in: a patient who has been transferred from another TB register to continue treatment and, Other: all cases which do not fit the above definitions, for example a patient treated by a private agency, patient diagnosed with TB and relapsed with negative sputum smear.

2.4 Global Epidemiology of Tuberculosis

Tuberculosis is one of the major health, social and economic burden at a global level and primarily in low and middle-income countries (WHO, 2012). Although TB can be treated, cured, and can be prevented if persons at risk take certain drugs, scientists have never come close to wiping it out (Beers *et al.,* 2004*).*

The lack of an effective vaccine, the long and expensive drug regimens, the few diagnostic tools available in countries where TB is endemic and the dismantlement in several nations of the health systems and control measures that so effectively contributed to control TB throughout most of the 20th century, led to the reemergence of TB as a global pandemic. The last twenty years have seen a renewed interest on TB by health authorities and governments which resulted in halving TB deaths. However, it is widely accepted that only a better understanding of the pathogenic processes associated with infection and disease will lead to the development of effective tools capable of conquering this ancient scourge (Delogu *et al*., 2013).The epidemiology of TB varies substantially around the world. The highest rates (100/100,000 or higher) are observed in sub-Saharan Africa, India, China and the islands of Southeast Asia and Micronesia (Robert, 2012).

The TB incidence rate at a country level ranges substantially, with around 1000 or more cases per 100,000 people in South Africa and Swaziland and fewer than 10 per 100,000 population in parts of the Americas, Japan, Australia and New Zealand (WHO, 2013). An estimated half million cases of multi-drug resistant TB(MDR-TB) also occur annually in Africans; even higher rates of drug resistant disease occur in eastern Europe such as Armenia, Azerbaijan, Belarus, Estonia and Georgia (Robert, 2012).

Most TB cases and deaths occur among men, but TB remains among the top three killers of women worldwide. There were an estimated 410,000 TB deaths among women. Half of the HIV-positive people who died from TB in 2012 were women. Of the estimated 8.7 million new TB cases worldwide in 2012, 2.9 million were women (WHO, 2013). In 2013, an estimated 510,000 women died from TB, 330,000 among HIV negative women and 180,000 HIV negative children from TB (estimates for HIV-positive children are not yet available) (WHO, 2014).

There were an estimated 530,000 TB cases among children (under 15 years of age) and 74,000 TB deaths (among HIV-negative children) in 2012 (6% and 8%) of the global totals, respectively. In 2012, an estimated 450,000 cases of multi-drug resistant TB (MDR-TB) emerged globally, which corresponds to around 3.6% of all new cases and 20.2% of all previously treated cases of TB. Over 50% of the estimated MDR-TB cases that emerged in 2012 were in China, India and the Russian Federation. An estimated 170,000 deaths were caused by MDR-TB globally, in 2012 including patients with concomitant HIV infection (WHO, 2014c).

2.4.1 **Global prevalence of tuberculosis.**

Tuberculosis prevalence is the number of people in the population who are living with active TB. Prevalence is usually, but not always given as a percentage of the population. The TB incidence is the number of new cases of active TB disease in a population during a certain time period (usually a year) (WHO, 2014a). Tuberculosis has been on the rise since early 1980s with Sub-Saharan Africa and South East Asia majorly affected with an estimated 1.7 million deaths every year WHO report 2011 cited in (Tadesse, 2008).

The highest level of TB infection in the world may be found in eastern Asia, Oceania and in several areas in Africa (Table 2). In Africa more than 4 million people suffer from active tuberculosis and 650,000 deaths occurred every year (Kaufmann and Parida, 2008).

In 2003, 4 million new and relapse TB cases were reported to WHO,of which 1.9 million were sputum smear-positive pulmonary cases. However, it is estimated that nearly 9 million cases may have occurred worldwide. More than 95% of these cases occurred in developing countries (WHO, 2006).

In 2010, about 80% of reported TB cases occurred in 22 countries. Some countries are experiencing a major decline in cases, while cases are dropping very slowly in others. Brazil and China for example, are among the 22 countries that showed a sustained decline in TB cases over the past 20 years. China, in particular, has made dramatic progress in TB control. Between 1990 and 2010, the TB death rate in the country fell by almost 80% and the total number of people ill with TB dropped by half (WHO, 2010).

The largest increase in tuberculosis has occurred in locations and demographic groups with the highest HIV prevalence, which suggests that the epidemic of HIV is at least partially responsible for the increase of tuberculosis. In high HIV prevalence population, tuberculosis is a leading cause of morbidity and mortality, and the first presenting sign in the majority of acquired immune deficiency syndrome patients (FMOH, 2008). There are also studies reporting prevalence of childhood tuberculosis. The report indicated that there are very few cases among 0–14 year olds, even in areas of high transmission (10% of all new cases in Africa in 2004 (Dye, 2006).

Musing normal lung tissues isolated at necropsy from patients who had died for causes other than TB in a TB endemic country, were able to detect by in situ polymerase chain reaction (PCR) MTB DNA in non-phagocytic cells, fibroblasts and endothelial cells, clearly suggesting that in latent TB subjects MTB bacilli can persists in tissues and cells not associated with the granuloma or the Ghon complex. Using similar experimental settings, MTB was detected in the fat tissue surrounding several organs, residing intra cellularly in adipocytes, where it can survive protected from the host immune response. All these evidences suggest that during latent tuberculosis infection, MTB can reside in different organs, tissues and cell types, not associated with the site of primary infection and lacking any sign of the typical granulomatous lesions (Neyrolles *et al.*, 2006)

Table 2 .WHO regional TB statistics for 2014

Region	TB Mortality	Prevalence	Incidence	Population
Africa	450,000	3,200,000	2,700,000	963,361,000
Americas	17,000	350,000	280,000	981,613,000
Eastern Mediterranean	88,000	1,000,000	740,000	635,745,000
Europe	33,000	440,000	340,000	907,279,000
South-East Asia	460,000	5,400,000	4,000,000	1,906,087,000
W/ Pacific	88,000	2,100,000	1600,000	1,845,184,000
Global Total	1,1000,000	13,000,00 0	9600,000	7,239,269,000

Source. (WHO, 2015).

2.4.2 **Prevalence of tuberculosis in Ethiopia**

Tuberculosis has been recognized as major public health problem in Ethiopia more than half a Century. Ethiopia ranked seventh in the world for TB burden and third in Africa in 2008.

The estimated epidemiological burden of TB in Ethiopia indicates that TB is in 5 rank of among the ten top causes of deaths (CDC, 2010).

The incidence all forms of TB was261/100,000 per year and the prevalence of all forms of TB was 394/100,000 population per year (WHO, 2011), 163 new smear positive cases per 100,000 persons, and a prevalence of all forms of TB is 579 per 100,000 population (WHO, 2009). In the year 2009/10 Ethiopia registered 146,172 cases of TB. Among these, 139,261(95.3%) were new cases; 46,132 new smear-positive (33.1%); 49,037 new smear-negative (35.2%); 44,092 new extra-pulmonary TB (31.6%) (MOH, 2011).

According to the recent national TB drug resistance surveillance report, 2.3% of new TB cases and 17.8% of previously treated TB cases were estimated to have MDR-TB (WHO, 2014b).Tuberculosis is affecting all sexes and age groups. Among the total smear positive TB cases reported in 2009/10, 55.5%were males, 7.5% were children <14 years old, and 2% were above the age of 65. The 15 to 34 age group was found to be the one most affected with TB accounting for 62% of notified new smear positive TB cases (MOH, 2011).

It is reported that smear positive PTB is more common among men than women (Deribew *et al.*,2012).The federal ministry of health (FMOH) hospital statistics data showed that TB is the leading cause of morbidity, the third cause of hospital admission and the second cause of death (FMOH,2008).

Over one third of the population has been exposed to TB due to low health services coverage and poorly developed health information system in the country (WHO, 2005). A study conducted in Metehara Sugar Factory Hospital showed 14.2% prevalence of smear positive pulmonary tuberculosis (Yohannes *et al*., 2012).

Another study on smear positive TB conducted in Agaro Health Centre showed a prevalence of 10.9% (Hussein *et al*., 2012).A study conducted in Bale Robe Hospital showed that the

prevalence of smear positive tuberculosis was 9.2% (Begna *et al*., 2014) and other study conducted in Nekemte Hospital also showed 9.41% (Eyasu *et al*., 2013).

2.4.3 **Transmission, prevention and control of tuberculosis**

Tuberculosis can develop after inhaling droplets sprayed into the air from a cough or sneeze by someone infected with *Mycobacterium tuberculosis*. All cases of TB are passed to person to person via droplets. When someone with TB infection coughs, sneezes or talks, tiny droplets of saliva or mucus are expelled into the air, which can be inhaled by other person. The disease is characterized by the development of granulomas (granular tumors) in the infected tissues. The usual site of the disease is the lungs, but other organs may be involved. The primary stage of the infection is usually asymptomatic. Primary pulmonary TB develops in the minority of the people whose immune systems do not successfully contain the primary infection. In this case, the disease may occur within weeks after primary infection. TB maysince2005, the worldwide incidence rate has dropped slowly.

In 2011, an estimated 8.7 million cases occurred globally including 1.1 million cases among the HIV-infected population. The global incidence rate is 125 cases per 100 000 population. The 22 high-burden countries account for 82% of the global TB burden. These countries are all low-and-middle-income countries (LMIC) and the incidence rates in 14 of these countries are declining, six countries have stable rates and two countries have an increasing TB incidence rate.

The number of TB deaths was approximately 1.4 million in 2011. Globally the treatment success rate has reached 85% in 2009.1 Global trends in the incidence, prevalence and mortality rates are depicted and also lie dormant for years and reappear after the initial infection is contained (Ferrara and Meacci, 2005).

The lungs are primarily involved, but the infection can spread to other organs. Close prolonged contacts (people with prolonged, frequent or intense contact) are at the highest risk of becoming infected. Due to this, 22% infection rates are reported, and some reports show even up to 100%.person with untreated, active tuberculosis can infect estimated twenty other people per year. Others at risk include foreign-born from areas where TB is common,

immune compromised patients, residents and employees of high-risk congregate settings, health care workers who serve high-risk clients, medically underserved, low income populations, and children exposed to adults in high-risk categories (Ferrara and Meacci, 2005).

The chance of getting infected by the TB is highest for people that are in close contact with others who are infected. This includes: 1) Family and friends of a person with infectious TB. 2) Person who have migrated from areas of the world with high rates of TB. 3) People in groups with high rates of TB transmission, including the homeless persons, injection drug users, and people living with HIV infection and 4) People who work or reside in facilities or institutions that house people who are at high risk for TB such as hospitals, homeless shelters, nursing homes and residential homes for those with HIV (Alan, 1995).

Once infectious particles reach the alveoli, another cells called the macrophage, engulfs the TB bacteria. Then the bacteria are transmitted to the lymphatic system and bloodstream and spread to other organs occurs. The bacteria further multiply in organs that have high oxygen pressures, such as the upper lobes of the lungs, the kidneys, bone marrow and meninges, the membrane like the coverings of the brain and spinal cord. When the bacteria cause clinically detectable disease, one has TB. People who have inhaled the TB bacteria, but in whom the disease is controlled are referred to as infected. Their immune system has walled off. The organism in an inflammatory focus is known as a granuloma. Those that have no symptoms, frequently have a positive skin test for TB, yet cannot transmit the disease to others. This is referred to as latent tuberculosis infection or LTBI (Beers *et al.*, 2004).

Transmission can only occur from people with active TB disease. The probability of transmission depends on infectiousness of the person with TB (quantity expelled), environment of exposure, duration of exposure and virulence of the organism (Nettina, 2006).

General measures such as avoidance of overcrowded and unsanitary conditions are necessary aspects of prevention. Hospital emergency rooms and similar locations can be treated with ultraviolet light, which has an antibacterial effect. Vaccination is one major preventive measure against TB. A vaccine called BCG (Bacillus Calmette-Guérin, named after its

French developers) is made from a weakened mycobacterium that infects cattle. BCG is used more widely in many developing countries where TB is more common. Vaccination with BCG does not prevent infection by *M. tuberculosis* but it does strengthen the immune system of first-time TB patients. As a result, serious complications are less likely to develop. The effectiveness of vaccination is still being studied; it is not clear whether the vaccine's effectiveness depends on the population in which it is used or on variations in its formulation. It can also make TB skin test less accurate. Recent, evidences have shown that BCG is effective at reducing the incidence of TB in children by about half in populations with a high prevalence of active TB but it is much less effective in adults (American Lung Association, 2015).

People that have become infected with TB, but do not have active TB disease, may get preventive therapy. The most common preventive therapy is a daily dose of the medicine isoniazid for 6 to 9 months. This treatment kills germs that are not doing any damage during the treatment, but could so do in the future. If the infected person takes his/her medicine as instructed by the healthcare provider, it can keep him/herself from developing active TB disease. Standard anti-TB therapy typically continues for six months. For the first two months, patients receive three to four drug namely rifampin, isoniazed, pyrazinamide and in some cases ethambutol. During the final months, they continue with rifampin and isonized (American Lung Association, 2015).

Damage from TB continues to grow despite effective therapies from drug-susceptible TB that keeps the incidence of TB in western countries at record lows. The reasons for this shocking failure to control TB globally pivot on the difficulty of providing sustained, properly dosed, multi antibiotic therapy in developing countries. Worse this failure has led to development of drug resistant TB, including the recent recognition of extensively drug resistant tuberculosis (XDR-TB) in precisely those regions that are least equipped to deal with it. The result, though predictable, is no less disturbing: high rate of rapidly fatal TB with an estimated 1.7 million deaths world-wide annually, 9.2 million new cases of TB disease and more than 2 billion people infected with ''latent'' TB (Jain *et al*., 2008).

MDR-TB is defined as resistance in vitro to at least isoniazid and rifampicin, while extensively drug resistant tuberculosis (XDR-TB) is resistant to at least one flu quinolone and one inject able second line anti TB drug in addition to isoniazid and rifampicin (Migliori *et al.*, 2012; and Falzon *et al.*, 2013).

A study demonstrated that, in Germany the MDR-TB treatment related costs exceed €50000 and in Europe the average cost to treat a single XDR-TB case is over €160,000 (Diel *et al*., 2012). The largest Meta analytic study presently available revealed that MDR-TB treatment success is only 54% (with 15%death, 8 % failure or relapse and 23% default) (Falzon *et al*., 2013; Migliori*et al.*, 2013).

WHO has recently launched its innovative "End TB strategy" (WHO, 2014c) supporting the TB elimination strategy and the vision of TB free world with zero death, disease and suffering due to TB (Sotgiu and Miglori , 2014). The new strategy clearly supports universal access to high quality MDR-TB diagnosis and treatment. However, since the market launch of rifampicin in the early 1960s, no new anti TB drug has been specifically developed until recently, while significant progress has been achieved in the area of diagnosis (Esposito *et al*., 2014 and Codesca *et al*., 2015).

BCG,or Bacilli Chalmette Guerin, a vaccine for tuberculosis (TB) disease. Children BCG vaccination should only be considered who have a negative tuberculin skin test (TST) and who are continually exposed to TB disease (CDC, 2011).

3. MATERIALS AND METHODS

3.1 Description of the study Area

The study was carried out at Dukem Health Center. Dukem town was found south east of Addis Ababa. Dukem town is located at 37kms South East of Addis Ababa along the main road to Adama. Geographically, the study area is located at latitude 8°45'25"N-8°50'30"N and longitude 38°51'55"E - 38°56'5" E covering a total area of 35.96 km^2. It is located at an average altitude of 2100m above sea level. The town shares boundary with Bisboftu to south and Galan town to north, Ada'a Woreda at east and Akaki woreda at west. It is assumed that the town had received its name from Dukem River. The establishment is also related with the Ethio-Djibouti Railway company sites station for his workers, located around the center of the town (Figure2).

The economic activity of the town ranges from Large Manufacturing Company to formal and informal micro enterprises. Financial institution (commercial Bank and Microfinance institution) and, thirteen clinics and one private Hospital were found in the town. (Dukem Adm. Primary Data, 2014).

The town's land scope mainly more than 97% flat and 3% is mountain, its altitude range from 1920 to 2100 m above sea level. Average annual rain fall is between 800mm to 1200mm. The total population was 114,000 out of these, 56,400 were males and 57,600 females. More than 44,000 private workers were found in the town (Dukem AD, 2017).

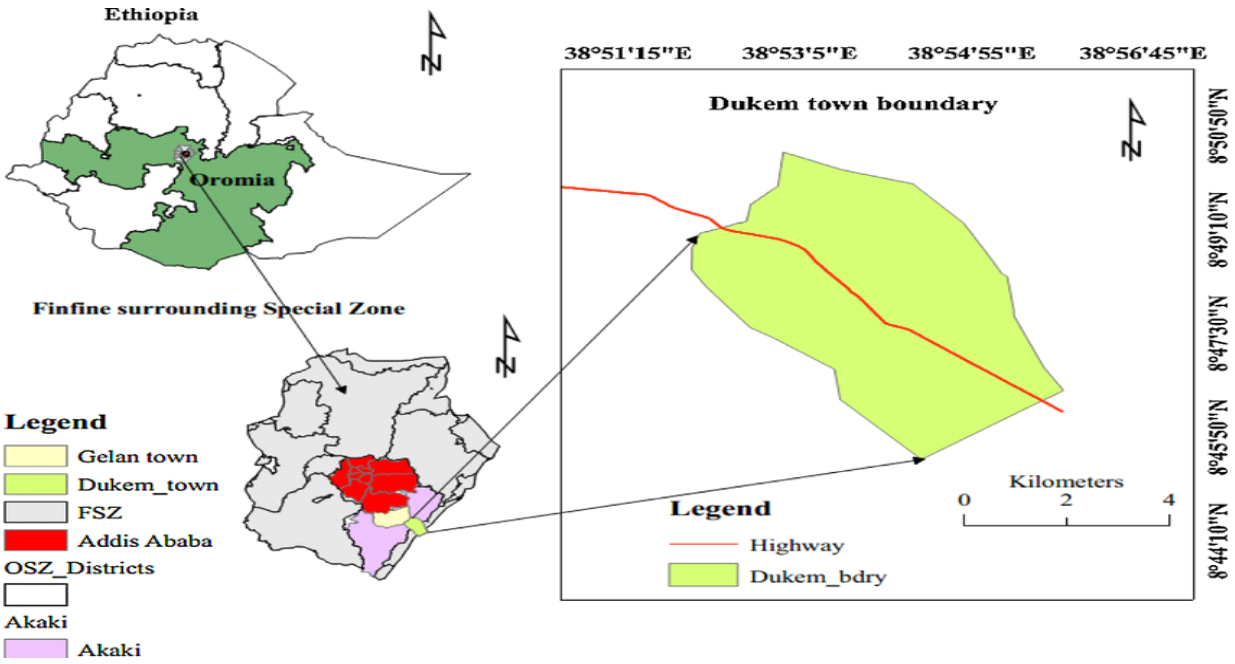

Figure 2. Map of the study Area (DAO, 2013)

3.2 **Study Design**

The study design was a cross sectional health center based survey of tuberculosis in Dukem Health Center, Dukem town to investigate the prevalence and trend of TB infection. The study was conducted from December 2017 – February 2018 at Dukem Health Center. The study had two main parts.

The first was involved in assessing the current TB prevalence among all TB patients who had tuberculosis (pulmonary TB) and the second part was a retrospective study to determine the trend of tuberculosis among patients visiting Dukem Health Center. The current study comprised of the medical records of TB patients by sex and age obtained from the registration book of TB clinic in Dukem Health Center from (December 2017 to February 2018) and the retrospective study data for taken the last six years (January 2011-Septamber 2016) were obtained from the record office as reference to estimate the trends in the study are. The main part of the study involved also a health institution based cross sectional study to rapidly determine the current prevalence of TB and to find out the associated risk factors of TB. For this, sputum samples were collected from 384 suspected TB patients who visited the Health Centers within the study period was collected and examined using acid fast technique.

The national TB control guideline was followed by physicians to diagnose TB patients. Smear positive TB was diagnosed when a patient had at least two initial smear positive sputum examinations for acid fast bacilli (AFB) and when AFB were detected in one of the initial smear examinations by direct microscopy.

Pretested questionnaire was used to collect personal data including socio-demographic data of TB suspects who were diagnosed by direct microscopy. The willingness of TB patients was asked orally and those who agreed to participate in the study were allowed in filling questionnaires.

The personal data of TB suspected was classified by gender, marital status, level of education, occupation, average income, residence, number of people living in the house and personal habits such as smoking history, alcohol consumption and diet to find out the risk factors associated with the prevalence of TB. The questionnaire was also used to gather clinical data that were classified as TB history, other critical illnesses such as HIV/AIDS, diabetes mellitus, cancer, etc.

3.3 Study Population and Sample Size Determination

All suspected patients who had more than two weeks of long lasting cough were diagnosed and included both sexes and all age groups $\geq$ 15 years to monitor their health status and voluntarily take part in this study. In addition, people who were referred from other health institutions for clinical and laboratory investigations to monitor their health status were also enrolled.

The sample size for the cross-sectional survey study were estimate by assuming the prevalence as 50% since there were no previously reported study in the area.

The sample size was determined using the formula employed by (Naing *et al.,* 2006).

$$n = \frac{Z^2 (P) (1-P)}{d^2}$$

Where**:**

n= required sample size

Z=standard deviation which is= 1.96

P=prevalence of the issue under study= 0.5

D= precision (0.05)

Therefore the calculated sample size for this study was 384.

3.4 Sampling Techniques

All patients visiting the Health Center with a cough of two weeks or more were considered as TB suspects and among 384 specified patients were successively be taken from the Out-Patient Department (OPD) of the Health centers until the sample size reaches.

3.5 Methods of Data Collection

The data for this study were obtained from retrospective TB health record analysis, AFB test and questionnaire survey.

3.5.1 Retrospective TB health record analysis

The medical records of all TB patients over the past six 6 years period (2011 to 2016) in Dukem Health TB center were reviewed. All forms of TB, sex and age patterns were assessed to collect necessary information to determine the trend of TB in the study area.

3.5.2 Sputum collection for PTB test

The samples were collected by using wide-mounted translucent cups by following standard procedure of the national tuberculosis and leprosy control program manual (FMOH, 2012). Accordingly, sputum sample collection for PTB suspected cases was represented as cough; so as to obtain sputum samples on two consecutive days from each PTB suspected patient.

Three sputum samples will collect in the early morning from each person-two spot. The patients were asked to cough forcibly several times from their lungs. They were then given a sputum container and asked to repeat the procedure on waking up the next morning (early morning sample). The second spot sample was produced when the early morning sample was brought to the sample collection unit.

3.5.3 Microscopic examination of sputum (AFB test)

The sputum samples were processed and stained using the direct Zeihel –Neelson staining technique and viewed under the microscope for acid fast bacilli (AFB) by an experienced laboratory technician at Dukem Health Center.

The diagnosis of smear positive PTB was based on the national guideline for microscopic examination of tuberculosis (FMOH, 2013). All positive and negative samples were checked and the results were recorded on laboratory data collection format. Results were recorded as positive when the sputum which was positive for acid fast bacilli and the rest results were as negative.

3.5.4 Questionnaire survey

A structured and pre-tested questionnaire was used to find out associated risk factors of TB among TB suspects during their Health Center visit from December 2017-March 2018. The questionnaire was translated into Amharic language and Afan Oromo languages and pretested using 10 suspected TB patients and 3 staff members from the Health Center. A translated questionnaire was translated back into the original language and checked by a different person who understands both languages to ensure that the meaning of the questions is properly understood.

The questionnaires were organized into the following sections: Socio-demographic characters, Morbidity history, Behavior of respondents, associated disease and TB history, and awareness towards tuberculosis of respondents. The questionnaire was filled in either by the participants themselves or by the researcher or laboratory technician for participants who cannot read and.

3.6 Data Analysis

All data were analyzed by using SPSS window version 20 and Microsoft Excel. Descriptive statistics was used for analysis of cross-sectional survey of questionnaire data and retrospective data analyses. Chi-square tests were used to compare differences between groups and $p < 0.05$ will be considered as statistically significant in this study. A binary logistic regression analysis was used and odds ratio was calculated to determine the strength of association between variables and life time of exposure to TB infection.

3.7 Data Quality Control

All laboratory procedures including collection of sample sputum and handling of sputum were carried out in accordance with standard protocols (FMOH, 2012). Necessary materials and sputum samples were kept in proper conditions and checked for contamination every time before handling. General safety rules and universal bio-safety precaution were strictly followed at all times (NCCLS, 2002). Collected samples were tested by well-trained laboratory technicians and a researcher in Dukem Health Center.

3.8 Ethical Consideration

The study was carried out after cooperation letter has been obtained from the School of Biological Sciences and Biotechnology, Haramaya University, to conduct the study. The permission letter was healed from Oromia Health Bureau of Health Research Ethical Review Committee to Dukem Health Bureau to conduct the research (Letterin appendices 4).

4. RESULTS AND DISCUSSION

4.1 Socio-demographic Characteristics and Description of Study Participants

The present study attempted to assess the prevalence of Tuberculosis and its Associated Risk Factors among Patients visiting Dukem Health Center.As summarized in (Table3), of the total 384 patents in the study who visited Dukem Health Center 235 (61.2%) were males and 149 (38.8%) were females .The study participants were divided into four age groups. The number and respective percentage of age groups included less than 0-14 years old6 (1.6%), 15-34 years old 252 (65.6%), 34-54 years old 89(23.2%) and greater than 55 years old 37 (9.6%) respectively(Table 3).

Concerning their educational status, 94 (24.5%) of the patients were illiterate, 115(29.9 %) were primary school, 100(26%) were secondary school and the remaining 75(19.5%) were Diploma and above.

In the case of marital status, the majority of the participants (196) were single and (158) were married whereas 20(5.2%) were divorced and 10(2.6%) were widowed. Occupation of patients revealed that 154(40.1%) were unemployed, 143(37.2%) were private worker, 31(8.1%) were civil servants, 37(9.6) were merchants 19(4.9%) were students. In case of monthly income, 231(60.1%) were earning below 600 Birr per month and 71(18.5%) of the participants were earning between 600-1500 and the rest[82 (21.4%)] of the patients were earning a monthly income of greater than 2500 Birr per month. Regarding their permanent residence, majority of the respondents 216(56.3%) were urban dwellers and 168(43.7%) were from rural area .According to their family size 257(69.9%) respondents had families ranging 1-2 and their family size3-4 for 87(22.7) and ≥5 for 40 (10.4%) respondents.

Table 3 Socio-demographic Characteristics of the Study Patients' Visiting Dukem Health Center.

Character	Categories	No (%)
Sex	Male	235(61.2)
	Female	149(38.8)
Age	0-14	6(1.6)
	15-34	252(65.6)
	35-54	89(23.2)
	>55	37(9.6)
Education	Illiterate	94(24.5)
	Primary	115(29.9)
	Secondary	100(26)
	Diploma and above	75(19.5)
Marital status	Single	196(51.)
	Married	158(41.1)
	Divorced	20(5.2)
	Partner died	10(2.6)
Occupation	Merchant	37(9.6)
	Government employee	31(8.1)
	Students	19(4.9)
	Daily lab our	143(37.2)
	Unemployed	154(40.1)
Awareness on TB	Good	318(83.1)
	Poor	66(17.2)
Cigarette Smoke	No	308(80.2)
	Yes	60(15.6)
	Some times	16(4.2)
Family Size	1-2	257(70)
	3-4	87(22.7)
	>5	5(10.4)
Residences	Rural	216(56.3)
	Urban	168(43.7)
Monthly income(Birr)	<600	231(60.1)
	600-1500	71(18.5)
	1500-2500	33(8.6%)
	>2500	82(21.4)

4.2. Different Types of TB during the Study Period (December 2017-February 2018).

The study showed that from the total 30(7.8%) of TB positive patients, the prevalence of smear negative pulmonary TB was the highest 26(6.7%) followed by smear positive 4(1.04%) whereas lowest 3(.78%) prevalence was observed in extra pulmonary TB type (Table 4).

The present study showed less in number as compared to previous study of Assefa (2011) who reported 32% smear positive PTB and 44.1% smear negative PTB of prevalence rates from the total examined patients. The study also in contradicts with report of Mohamed (2004) where smear negative PTB was 50% and PPTB was 31.2% in prevalence rates.

Table 4 Types of TB identified among the study participants in Dukem Health Center, Oromia Region during December 2017- February 2018

Age	Sex	No examined	SNPTB	SPPTB	PTB	EPTB
			No. (%)	No. (%)	No. (%)	No.(%)
<14	Male	5	2(40)	0.00	2(40)	0.00
	Female	1	0.00	0.00	0.00	0.00
15-34	Male	155	0.00	14(9.03)	14(9.03)	0.00
	Female	97	6(6.2)	2(2.1)	8(8.7)	2(2.1)
35-54	Male	63	0.00	2(3.2)	2(3.2)	1(3.22)
	Female	26	1(3.84)	0.00	11(3.84)	0.00
>55	Male	14	0.00	2(8.7)	0.00	0.00
	Female	23	1(4.34)	0.00	1(4.34)	2(8.7)
All age groups	Male	235	16(6.8)	2(.85)	18(7.7)	1(0.4)
	Female	149	10(6.7)	2(1.34)	12(8.1)	2(1.34)
	Total	384	26(6.7)	4(1.04)	30(7.8)	3(0.78)

SPPTB=Smear positive pulmonary tuberculosis

SNPTB=Smear negative pulmonary tuberculosis

EPTB=Extra pulmonary tuberculosis

4.3 Current Prevalence of Tuberculosis among the study population

In the present study a total of 384 patients were used as study participants and the overall prevalence of TB among the total examined patients was 30(7.8%) in numbers. The prevalence of TB among the Males was 18(7.6%) whereas the prevalence of TB in females was 12(8.01%).The results of the current prevalence of TB, particularly PTB are summarized and presented in Table 5. As in Table 5 the prevalence of PTB in age groups 0-14, 15-34, 35-54, 55.

The finding in this study coincides with the study conducted on prevalence of smear positive TB in hospitals and health centers of Ethiopia. For example Agaro Teaching Health Center (10.9%) (Hussein *et al*., 2012), Bale Robe hospital (9.2%) (Begna *et al.*, 2014), and Nekemte Hospital (9.41%) (Eyasu *et al.*, 2013).The study also showed less prevalence of smear positive PTB in the study area compared with other studies conducted in Metehara sugar factory Hospital (14.2%) (Yohannes *et al*., 2012). Similar studies conducted in Rwanda also reported (17.3%) (Muvunyi *et al*., 2010), and in Nigeria (14.7%) (Imam, 2008) which were relatively higher than the findings of this study.

There was significant difference in the prevalence of *Micro-bacterium tuberculosis* between males and females in all age groups i.e. (<15, 15-34, 35-54 and>55). When all TB infected patients (30) were observed and compared with their age references the frequencies of patients of age group >35 years old and 15-34 years old were the highest (i.e.4(4.5%) and 23(9.1%) respectively) and the rest of the age groups had no significant difference between each other.

This result is also consistent with the study that revealed that the majority of the study population was at age group 15-34 years old and this result is supported by Crompton, (1995) who reported that "Tuberculosis was considered a disease of middle aged and elderly people". Report of the other studies conducted in southern Ethiopia (Shargie and Lindtjorn, 2005), Nepal (Chandrashekhar *et al*., 2008) and national report of Federal Ministry of Health (FMOH, 2013). The sex and age difference shown in (Table 5) was in line with the report by

(Muvunyi *et al.,* 2010) and Chandrasekhar *et al*. (2008). Similarly, the sex distribution of TB patients recorded in the present study was also consistent with the report of other studies conducted in different part of the country such as in southern Ethiopia (Shargie and Lindtjorn, 2005; and north west Ethiopia (Kassu *et al*., 2007).

Tuberculosis was prevalent in male in all age group except age group below 15, which is consistent with the global pattern of TB where the number of male TB cases exceed that of female in all age groups except in children (WHO, 2008). The possible reason may be due to migration from place to place and working in crowded area. The review paper organized by Cegielski *et al*., (2004) showed that the risk of TB was higher in people with malnutrition and the effect was higher in severely malnourished group compared to the mild to moderately malnourished groups.

The mode of transmission of mycobacterium species from person to person is well established. The sources of infection are persons with tuberculosis of the lung who has coughing and reactions. Persons in the same household, or who were in frequent contact with TB patient has the greatest risk of being exposed to the bacilli (Murray and Lopez, 1996).

Table 5. Prevalence of Tuberculosis (Pulmonary Tuberculosis) among Study Participants (n=384) in Dukem Health Center

Age group	Male		Female		Both sex		X^2	p-value
	No. exam	No. +ve (%)	No. exam	No. +ve (%)	No. exam	No. +ve(%)		
0-14	5	2(40%)	1	0.00	6	2(33.3%)	0.065	0.004*
15-34	155	15(9.67%)	97	8(8.25%)	252	23(9.13%)	0.089	0.448
35-54	63	3(4.76%)	26	1(3.84%)	89	4(4.5%)	0.060	0.254
>55	12	0.00	25	1(4.34%)	37	1(2.7%)	0.048	0.015*
Total	235	18(7.6%)	149	12(8.0)	384	30(7.8%)		
X^2	3.139	.237	3.946	2.946	0.119	0.034		
p-v	0.157	0.056	0.277	0.453	0.821	0.033*		

M=Male, F=female, T=Total, No. exam=No. examined, No. +ve = No of positive, p-v=p-value

4.4 Trend of TB Patients in Dukem Health Center from 2011-2016

A total of 895 all forms of TB patients were registered during the last six years (2011 to 2016) in Dukem Health Centers. Out of 895 TB patients registered in the last six years, 505 (56.4%) were males and 390(43.6%) were females, respectively in (Table 6).
The finding from retrospective study indicated that the overall annual trends of all forms TB in the last six years (20011-2016) were observed to fall gradually, with a slight fluctuation in the number of cases of PTB+ and PTB- in 2015 and 2016.

The decline in prevalence of TB is similar to the national and global TB incidence according to the WHO report (WHO, 2008). In addition the results of this study coincide with WHO report that showed fall in the prevalence of all forms of TB in Ethiopia which was 394/100000, 152/100000, and 133/100000 population in the year 2014, 2015 and 2016 respectively.

This could be due to the effect of DOTS program being implemented in the TB clinic of Dukem Health Center and improvement of knowledge about TB and advancement of health facilities in the area. In current retrospective study the number of PTB patients was higher (59.1%) than EPTB (40.9%) from 2011-2016. This finding is consistent with studies in south

region of Ethiopia which indicated that PTB (67%) and EPTB (33%)(Shargie and Lindtjorn, 2005), and in northwestern Ethiopia which also indicated PTB(64.2%) and EPTB (35.8%), regardless of HIV status (Kassu *et al*., 2007).The data showed that the most commonly affected TB patients reside in age group of 15-34 (59.6%) followed by 35-54 was (23.9%);however the prevalence was less commonly observed in the age groups 0-14 (7.7%) and in the age group ≥55 (8.8%).

According to their sex, the highest number of TB patients was observed in males (103 and 100) and in female (73 and 72) in the year 2011 and 2012, respectively. Butin the year 2014 and 2015 low number of males (65 and 75) and females(61 and 50) TB patients were observed in 2015 and 2016.The recorded data revealed that the number of TB patients were decreasing among both sexes across the years from 2011-2016shown by line graph Figure(3)

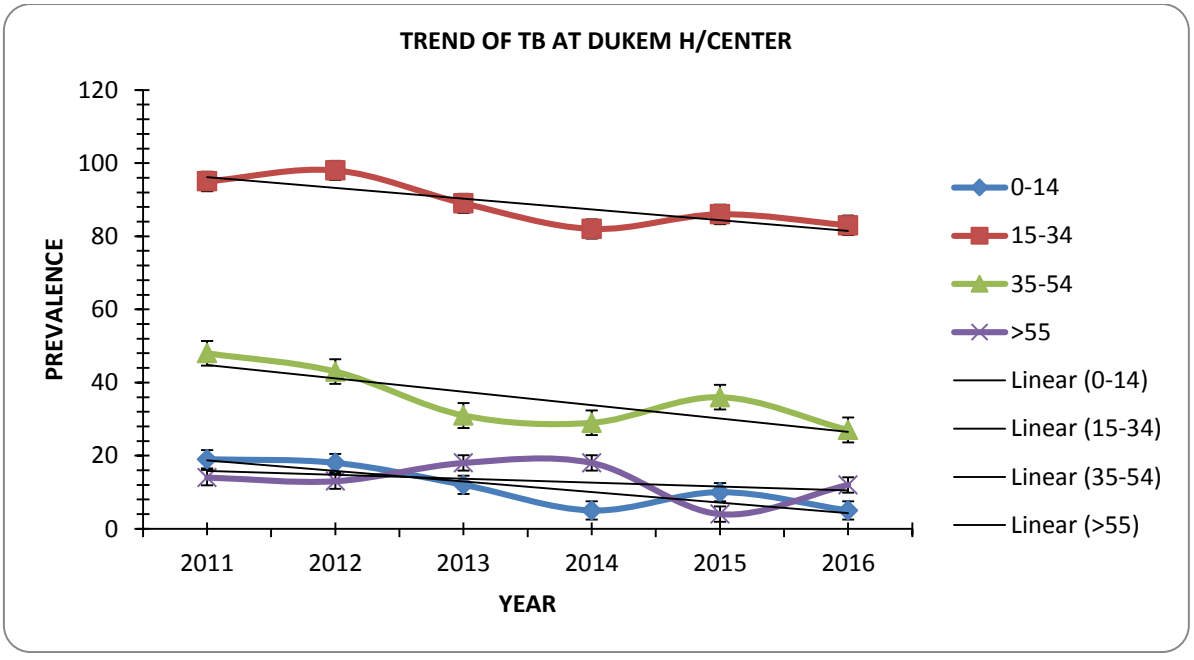

Figure 3.Trend of TB Patients for the last six year (2011-2016) in the Dukem Health Center

Based on the type of TB, the most frequent TB was PTB- (35.98%) followed by EPTB (34.86%) and PTB+ (29.16%) shown in (Table 6). The trend in the prevalence of all forms of TB showed that there was a considerable difference between years of attendance. The number of PTB (PTB+ and PTB-) and EPTB patients were higher in the year 2012 and later showed a considerable decline between years 2013-2016.

Table 6. Prevalence of PTB and EPTB TB among patients that attended Dukem Health Centre during the study period (2011-2016).

Year	Types of TB				
	PTB+	PTB-	PTB	EPTB	All TB Types
2011	50	62	112	64	176
2012	48	63	111	61	172
2013	44	56	100	50	150
2014	40	48	88	46	134
2015	41	49	90	46	136
2016	38	44	82	45	127
Total	261	322	583	312	895
Percentage	29.2%	36%	65.1%	34.9%	100%

4.5. Major Associated Risk Factors for Tuberculosis in The study Area

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 socio-economic status as a risk factor for the occurrence of active tuberculosis (Tulu *et al*., 2014) and the same study were showed in Malawi socio-economic status as a risk factor for the occurrence of active tuberculosis (Banerjee A *et al.,* 1999).

Most of the respondents 241 (62.8%) were not living in confined place. As far as the TB contact history is concerned, majority of the respondents 277 (72.1%) had no TB contact history with PTB patients. Majority of the study participants288 (75.0%) had no disease other than smear positive pulmonary TB. However, 29 (7.6%) of them have HIV infection and 33(8.6%) of them had other diseases. Socio-demographic characters showed that some

patients 72(18.8%) were adapted to smoking cigarette and the majority of the patients 312 (81.3%) were not smoking cigarette.

In the present study, 52(13.5%) of the patients were chewing chat and 51(13.3%) were chat chewing majority of the patients 281(73.2%) were no practice. Concerning patients knowledge and attitude about TB, 318(83.1%) had good knowledge and attitude and 66(17.2%) had poor knowledge and attitude about TB. As to patients residence 216(56.3%) were coming from urban area and the rest 168(43.7%) were from rural area.

With regard to alcohol consumption, majority of them 156 (40.6%) not use alcohol and 123 (32.0%) were taking alcohol and only 105(27.3%) were sometimes alcohol consumers. Alcohol consumption is one of the significant risk factors associated with TB in the study area (p=0.013). Similarly a study conducted in Kenya (Ndungu *et al*., 2013) that showed alcohol consumption is associated with TB saying that 39.5% of the patients being alcohol consumers.

The present finding is also analogous with systematic review of association between alcohol use and tuberculosis found those who consumed more alcohol per day and/or have an alcohol disorder have an elevated risk of active tuberculosis (Lonnorth *et al*., 2008). Moreover, this finding is consistent with the study conducted in Russia which has indicated that 62% of the patients were alcohol abusers and that alcohol abuse/ dependence is associated with an eight fold increase in drug resistance and relapse (Fleming *et al*., 2006).

A study in the Greater Vancouver regional district in Canada shows that smear positive patients had a history of alcohol abuse (Hernandez *et al*., 2004). Alcohol consumption leads to higher risk of infection or weakened immune system as a result of direct toxic effects of alcohol on the immune system leading higher risk of break down from infection to TB diseases (Zolnir *et al*., 2001).

Reasons for increased risk of developing PTB due to alcohol consumption include alteration in the immune system, specifically in altering the signaling molecules responsible for cytokine production (Szabo, 1997).

Regarding the environment in which the respondents lived, (37.2%) of the respondents were lived in a confounding environment. However, majority of the respondents (62.8%) were not living in a confounded environment.

As far as the TB contact history is concerned, majority of the respondents 277(72.1%) had no TB contact history with PTB patient (Table 8). However the present study also revealed that contact with TB patient was significantly associated (p=0.012) with pulmonary TB infection i.e. history of previous contact to PTB patients was one of hot related risk factor for PTB, which is consistent with the studies conducted in Ethiopia at Seka Health Center (Gebrie and Mimano, 2010), in Nekemte Hospital (Eyasu*et al.*, 2013) and in other developing countries like India (Rao *et .al*., 2011).

Living in confiding place was found to be associated with PTB+ in the study area (p=0.000). Report from other studies demonstrated that marginalized populations including prisoners have a higher chance of getting infected with TB because of crowded living conditions (Grady *et al*., 2011), prisons of Gamo Goffa Zone, south Ethiopia (Zerihun *et al*., 2014).

In line with this finding, studies from Pakistan, Gambia, and Thailand also reported similar findings which point out living in confounding or overcrowding condition as one of the risk factors for TB infection (Khurram *et al*., 2012, Hill *et al*., 2006, and Tornee *et al*., 2004).Transmission of *M.tuberculosis*is more likely if there is poor ventilation. Occupancy density, room volume and air change rate are all directly correlated with the number of new TB infections among persons who share air space. In adequate rates, negative air flow and recirculation of air have been identified as an occupational hazard in hospitals with respect to TB transmission (Menzies *et al*., 2000 and Beggs *et al*., 2003).

Smoking was also associated with the distribution of PTB+ (p= 0.000) and consistent with similar studies conducted in different countries (Bates *et al*., 2007; Shang *et al*., 2011 and Ndungu *et al*., 2013). In line with this finding, Bates and colleagues, in their meta-analysis of 24 studies on the effects of smoking on TB, proven that the relative risk of TB disease was high among smokers in comparison to non-smokers and that there was clear evidence that smoking causes remained a risk factor for TB infection and disease TB (Bates *et al*., 2007).

Moreover, the association between smoking and TB which supports the present finding has been studied in several systematic reviews (Maurya *et al.*, 2002, Arcavi *et al*., 2004, Yanbaeva *et al.*, 2007).

The reason for the increased risk of infection in smokers is unclear, but may be explained by the effects of smoking on pulmonary host defenses. Smoking has been shown to reduce natural killer cytotoxic activity, to suppress T cell function in both lung and blood, to impair mucociliary clearance of particles. The products of cigarette smoke may favors persistence and/or replication of ingested *Mycobacterium tuberculosis* by impairing the macrophage or dendritic cell function (Shang *et al*., 2011).

Smoking damages the lungs and impacts the body's immune system, making smokers more susceptible to TB infection. The occurrence of TB has been shown to be linked to altered immune response and multiple defects in immune cells such as macrophages, monocytes and CD4 lymphocytes (Altet *et al.,* 1996). Other mechanisms, such as mechanical disruption of cilia function and hormonal effects, could also appear secondarily to smoking (Buskin *et al.*, 1994).

Concerning with smoking habit only 72(18.8%) of the respondents were smokers and 57(14.8%) of the respondents were living with person smoking in their family, the rest were no smoker in their family.

Living in confiding place (p=0.000), and smoking cigarette (p=0.000), TB contact history (p=0.012) and alcohol consumption had had a statistically significant association with Pulmonary TB. ($P < 0.05$).

4.6 Assessment of study respondents level of awareness about the cause of TB

In the current study, 74% of the study respondents reported that they had access to health education through Radio/Television and 83.1% of the respondents respond that bacteria/germs as the cause of tuberculosis. Regarding awareness of other risk factors influencing TB, majority of the respondents (59.3%) reported that drug using life is related to TB (table 8).

Pertaining to the mode of transmission of PTB, 73.3% of respondents replied that droplet infection as a means of transmission, 43.3% through overcrowding. However, minority of respondents answered that 28.9% by sharing the same utensils, 25.0% by living in the same room, and 23% by sleeping together and 5.2% were answered we don't knowing.(Table 8).

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. Identified risk factors associated with tuberculosis in most developing countries including Ethiopia (Muniyandi *et al*., 2007; Lo¨nnroth *et al*., 2009 and Muvunyi *et al.,* 2010).

The finding of this study showed that age was associated with (p=0.033) smear positive pulmonary TB and this finding is in line with studies that were shown by developing countries like India (Rao *et al*., 2011).

In addition A systemic review performed by Morrison and colleagues in 17 countries (49% in Africa, 29% in Asia, and 22% in central and South America) to determine the yield of household contact investigation is in line with the result of this study as well (Morrison *et al*., 2008).

Table 7 Association between disease factors, personal behavior, and living conditions of respondents and prevalence of Smear Positive PTB in Dukem Health Centers December 2017 – February 2018(n=384)

Variable	Category	PTB			P value
		Positive (N %)	**Negative (N %)**	X^2	
TB contact history	Yes	15(3.9%)	89(23.2%)	0.841	.012*
	No	15(3.9%)	262(68.2)		
	No response	0	3(0.7%)		
Living in confined place	Yes	27(7.0%)	116(30.2)	0.747	.000*
	No	3(.7%)	238(61.9)		
Disease Factors	HIV positive	2 (6.9%)	27(7. %)	0.067	0.706
	Diabetes mellitus	0(0.0%)	7 (1.82%)		
	Lung cancer	0(0.00%)	23(5.98%)		
	Other	4 (1.04%)	29(7.6%)		
	No other disease	24(28.6%)	268(69.8)		
Alcohol consumption	No	10(2.6%)	140(36.5)	0.292	.013*
	Sometimes	7 (6.7%)	98(25.5%)		
	Frequently	13(8.3%)	116(30.2)		
Chat chewing	Yes	2 (.5%)	50(13%)	0.47	0.511
	Sometimes	4 (1.04%)	47(12.2%)		
	No	24(6.25%)	257(66.9)		
Smoking Cigarette	Yes	8 (2.0%)	64(16.7%)	0.668	0.00*
	No	19 (4.9%)	289(75.2)		
	No response	3(.78%)	1(.26%)		
Family Smoking	Yes	2(.5%)	55(14.3%)	0.553	0.362
	No	28 (8.6%)	296(77.%)		
	No response	0	3(.78%)		

Key: *=P<0.005 statistically significant

Binary logistic regression model is used to when the dependent variable has only two possible outcomes. Hence in this case: PTB = 0 if the respondent is positive and, PTB= 1 if the respondent is negative.

Thus the binary logistic was used to see the association between the prevalence of Smear positive pulmonary tuberculosis with explanatory variables (table 9). TB contact history were associated with the distribution of smear positive PTB among the study respondents (p=0.022). Those who had contact with active TB patient in their vicinity were about five times (OR = 5.42; 95% CI = 1.736 15.820) more likely to develop smear positive TB than those who had no contact with TB patients.

Living in confiding place was also found to be significant variable of smear positive TB (p=0.034).Those who lived in confounding place were 93 percent more likely to develop PTB+ than those who lived in non-confounding place (OR= 1.933; 95% CI =1.033 4.483). The age of respondents was also associated with the distribution of pulmonary tuberculosis among the study respondents. Those people whose age range is above 55 were about three times more likely to be affected by PTB compared to those whose age ranges 0-14 (OR=3.72; 95% CI=1.546 15.879). The smoking status had an independent association with the prevalence of pulmonary tuberculosis (p=0.002).Those who were smoking cigarette were 91 percent (OR = 1.915; 95% CI = 1.028 9.779) more likely to develop smear positive pulmonary TB than those who do not smoke. Finally monthly income of respondents was also another significant variable affecting pulmonary tuberculosis. Among the study respondents (p=0.000) those whose income is less than 600 birr were about six times (OR=6.245; 95%CI=.1.501 13.382) more likely to develop smear positive PTB compared to those who had monthly income greater than 2500 birr (Table 9)and some tables was found on the appendixes(Table A, B, C, and Table D) for farther references.

Table 9. Association between prevalence of PTB and Socio demographic characteristics of TB patients who attended Dukem Health Center from Dec. 2017-Feb.2018

Variable	No. exam	Odds ratio	[95%conf.interval]	P-Value
Age				
0-14	6(1.6%)	1		
15-34	252(61.2%)	1.14	[.155 - 8.33]	0.895
35-54	89(23.2%)	1.75	[.330 - 9.34]	0.508
≥55	37(9.6%)	3.762	[.546 15.879]	0.015*
Monthly income				
<600	198(51.6%)	6.245	[1.501 13.382]	0.000*
600-1500	71(18.5%)	2.24	[0.683-7.35]	0.183
1500-2500	33(8.6%)	Omitted		
>2500	82(21.4%)	0.923	[0.291-2.92]	0.892
		1		
TB history				
No	277(72.1%)	1		
Yes	104(27.1%)	5.422	[1.736 15.820]	0.022*
Live confined				
No	241(62.8%)	1		
Yes	143(37.2)	1.933	[1.033 4.483]	0.034*
Smoking cigarette				
No	308(80.2%)	1		
Yes	76(19.8%)	1.915	[1.028 9.779]	0.002*

Key: 1=Reference, p<0.05 statistically significant, OD=Odd ratio, 95%CI=95% confidence interval.

5 SUMMARY,CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Tuberculosis is one of the most challenging communicable diseases and infects one third of the world's population. It is caused by members of the species *Mycobacterium tuberculosis* complex. The overall objective of this study was to estimate the prevalence of TB and the associated risk factors for tuberculosis.

The data for this study was obtained by cross-sectional survey study was using AFB test and include questioner survey from (December 2017 to March 2018) and retrospective data from record office Dukem Health Center from (Jan 2011 to December 2016).

The finding of the cross sectional study carried from December 2017to 2018-March, also reveals that the current prevalence rate of smear positive PTB among TB suspects in Dukem Health Center is 7.8% by direct Ziehle-Nelson staining technique. The associated risk factors to smear positive pulmonary tuberculosis were found to be alcohol consumption, age, TB contact history, living in confounding place, TB contact history ,residence, monthly income, there educational status smoking cigarette and being passive smoker.

5.2 Conclusion

The overall prevalence of smear positive pulmonary tuberculosis among PTB suspected patients in Dukem Health Center was 7.8%. The major risk factors associated to this prevalence rate were age, low educational status, smoking cigarette, alcohol consumption, living in confiding place, TB contact history and average monthly income.

The result of the study showed TB were the major public health problems. TB represents a public health threat because its transmissions dependent on the way of life of the society. Accurate information about the extent and trends of TB infection is important for effective prevention & control programs.

There for, with high burden of tuberculosis infection, poor living condition, the risk of developing active tuberculosis will be much higher and eventually over load the health

services in the near future. Hence, controlling tuberculosis means detecting cases and ensuring that a person gets antibiotic treatment, he can be cured of his active tuberculosis as well as avoiding transmission to others and extends his survival.

5.3 Recommendations

- Adult education for those particularly, passed the stage of school age for raising their awareness is of high significance.
- Ways to avoid overcrowding in urban settings should be sought.
- Increase monthly income of the society.
- Improving the awareness of the community for the spread of disease and appropriate intervention mechanism such as environmental and personal hygiene and health education about transmission of TB.

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7 APPENDIX

Appendix Table 1 The age and sex distribution of the study participants in Dukem Health Center during December -March, 2018

Age group	Study population		
	Male	Female	Total
	No. (%)	No. (%)	No. (%)
< 15 years	5(1.3)	1(.3)	6(1.6)
15-34	155(40.4)	97(25.3)	252(65.6)
35-54	63(16.4)	26(6.8)	89(23.2)
>55	14(3.6)	23(6)	37(9.6)
Total	196(51.04)	188(48.95)	384(100)

Appendix Table 2 Awareness of study respondents about the cause of TB and factors influencing TB among study respondents in Dukem Health Centers from December 2017-March 2018 (n=384)

Characteristics	category	Frequency	percent
Access to Health Education	Yes	284	74
	No	100	26
Cause of TB	Bacteria/germ	319	83.1
	Aging	14	3.6
		26	6.8
	Genetic disorder	22	5.7
	I don't know	3	.8
	Other		
TB is influenced by			
	Yes	258	59.3
	No	156	40.6
Drug use	Yes	282	73.4
	No	102	26.6
Poor living	Yes	94	24.5
	No	290	75.5

Presence of other disease	Yes	85	22.1
	No	299	77.9
Working condition	Yes	85	22.1
	No	299	77.9

Appendix Table 3 Level of awareness about the mode of TB transmission among study respondents (n=384) in Dukem Health Centers December 2017-March 2018

Characteristics	Category	Frequency	Percent
Method 0f TB transmit ion			
	Yes	280	72.9
Through air droplet	No	104	27.1
Overcrowding	Yes	200	52.1
	No	184	47.9
Traveling in a crowded	Yes	180	46.9
Bus	No	204	53.1
Sexual intercourse	Yes	21	5.5
	No	363	94.5
Blood contact	Yes	5	1.3
	No	379	98.7
Sharing the same	Yes	111	28.9
Utensils with TB patient	No	273	71.1
Open window in	Yes	150	39.1
Public transport	No	234	60.9
Insect bite	Yes	5	1.3
	No	379	98.7
Living in the same room	Yes	96	25
Sleeping with the patient	No	288	75
	Yes	88	23
	No	296	77
Hand shaking	Yes	10	2.6
	No	374	97.4
I do not know	Yes	20	5.2

	No	364	94.8

Appendix Table 4 Level of awareness among Study respondents from December-March 2018.

Characteristics	Categories	Frequency	Percent
What are signs and symptoms of TB?			
Long last coughing	Yes	250	65.1
	No	134	34.9
Weight loss	Yes	160	41.7
	No	224	58.3
Persistent fever	Yes	121	31.5
	No	263	68.5
Night sweating	Yes	180	46.9
	No	204	53.1
Chest pain	Yes	236	61.5
	No	148	38.5
Loss of appetite	Yes	78	20.3
	No	306	79.3
I don’t know	Yes	28	7.3
	No	356	92.7
Is it possible	Yes	271	70.6
To prevent TB?	No	113	29.4
TB patients prevent the spread of TB to others by			
Not coughing in front	Yes	299	77.9
of	No	85	22.1
other people			
Spit in a container	Yes	224	58.3
with cup	No	160	41.7
Spit out in the open	Yes	32	8.3
everywhere	No	352	91.7

5. CONSENT FORM

VOLUNTEER AGREEMENT FORM

Title Prevalence of Tuberculosis and its Associated Risk Factors Among Patients Visiting Dukem Health Centers Oromia Regional state,South East Ethiopia

Principal Investigator: (Feyissa Geremew)

Address: Haramya University, Tel: 091109257

Email: Feyissageremew@gmail.com

General information about Research

This study will estimate the prevalence and evaluate the associated risk factors of tuberculosis in the study area.

Possible Benefits, Risks and Discomforts

There are no direct benefits to be gained from this study immediately, neither are there any risks associated with it. The only inconvenience might come from the time you will spend completing the questionnaire. The data from this study will be used only for the purpose of the study (Master Thesis)

Confidentiality Your identity and participation in this study will be treated strictly confidential. The information that we obtain from you will not be shared with anybody, except the study investigators. Your identity remains secret since your personal information will only be designated by a unique participant number. Your name will not appear in any reports or publications resulting from this study. After the study is completed, you may request information about the study results.

Voluntary Participation and Right to Leave the Research You participate entirely voluntarily in this study. You have the right to refuse to participate in the study. You also have the right to your participation in the study at any time, even after you have signed this informed consent form. The withdrawal of your consent will not cause any disadvantage or loss of advantages /privileges

The above document describing the benefits, risks and procedures for the research title (name of the research) has been read and explained to me .I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

Date: _____

Name of the volunteer_____

□□If volunteers cannot read the form themselves.

VOLUNTEER AGREEMENT

The above document describing the benefits, risks and procedures for the research title (name of the research) has been read and explained to me .I have been given an opportunity to have any questions about the research answered to my satisfaction. I agree to participate as a volunteer.

Date: _____

Name of the volunteer_____ If volunteers cannot read the form themselves, a witness must sign hereYou participate entirely voluntarily in this study. You have the right to refuse to participate in the study. You also have the right to your participation in the study at any time, even after you have signed this informed consent form. The withdrawal of your consent will not cause any disadvantage or loss of advantages /privileges

Contacts for Additional Information

Any questions or any further clarifications concerning the study can be directed to:

Contact of the promoter

Sewnet Mengistu (Dr.)/Sissay Menkir (Dr.)

College of Natural and Computational Sciences, Department of Biology

Tel: 00 32 9 264 9902, Fax: 00 32 9 225 5510

Email

Contact of the local researcher

Feyissa Geremew

Tel: 0911092857

Email: Feyissageremew@gmail.com

Ahaadii Wal-galtee

Gaaffillee qo'annoo warraa deebisan wajjin Ahaadii Wal-galtee

Qorannoo f iqo‟‟Tamsa‟‟ina dhukkuba Sombaa (TB) fi wantoota dhukkuba kana wajjin qunnamtii qaban dhukkubsattoota Dhaabbata Fayyaa Magaala Dukam Naannoo Oromiyaa Keessatti Wal‟‟ansa argatan kessaa

Maqaa nama qorannoo gaggeessu:Feyissa Geremew

Tessoo: Haroomayyaa Yunivarstii

Bilbilaa 0911092857 E.mail: Feyissageremew@gmail.com

Qaranno kun kan xiyyeeate

-Tamsa‟‟ina Dhukkuba Sambaa (TB) naannoo Qo‟‟onna Keessatti

Wantoofa (dhimmifa)dukkuba kana wajjin walitti dhufenya jiru qo"achuuf

Dabalaa deeme moo ykn hir‟‟achaa deema? .

Faayyidaa qoranno fi qo‟‟annoo,rakkoolee fi mijaawinaan kan hinqabnee Faayyidaa bu‟‟aa kaallattidhaa irraa argachuuf miti ,qo annichaa wajjinnis walqabatee yaaddoo fi balaa rakkoon dhufuu danda‟‟uu homa hin jiru ragaaleewwan gaaffilee kan sassabamu sagantaa digrii lammaffa ittin guutuu fi kaayyoo karoorfamee qofaaf kan oluudha.

Amanammumaan isaa

-Hirmaanan gaafatamaa ,maalummaa fi hirmaanan isa iccitiin isa kan eegameedha,ragaaleewwan gaaffiidhan argamaan abboo qo‟‟annoo gaggeessuun alaa hin ibsamu.

- Gaaffiilee irratti kan hirmaatuu koodii lakkoofsaan qofa ni qabama. Akkasumaas gabaasa qo,annoo irratti maqaa hirmaataa hin ibsamu.

- namaaa gaaffii irratti hirmaatu mirgaa inni qabu gaaffii dhaaf deebii kennu fi kennu dhisuu

- qaamni gaaffii deebisuu amantuma deebii kennuuf hirmachu qaba

- akkasumaas deebbi kennu dhisun mirgaa issaatii

-waligaltee ahaadii irratti ergaa mallatteesse booda gidduun dhisuu ni danda‟‟a

-ragaa dabalataaf teessoo arman gadiifii gaaachuun ni danda‟‟ama

- Waa‟‟ee gaaffii dhiyaateef gaaffii yoo qabataan gorsistoota qo‟‟anno fi qoranno namoota armaan gadii gaafachuu ni dandeessuu

1. Dr. Sawnet Mangistu
2. Dr. Sissay Mankir .

Lakk.Bilbilaa:00 32 9 264 9902 Email

Maqaa nama qoranno gaggeessu: Feyyissa Geremew

Bilbilaa: 0911 02857

E-mail:

Raggaalee armaan olitti ibsammaanii sirrumaan qo‟annichaa, rakkoolee fi mata duree qo‟annichaa haalaa sirrii ta‟een naf dubbisamee, akkasumaas naf ibsamee, dabalataanis waa‟ee qo‟annichaa aka gaafadhu carraan nakemame hundumtu naf ibsamee feedhidhan deebbi kennuuf walii galeera.Guyyaa_____

Kooda namaa deebii kennu_____

Gaaffii gaafatamaa dubisuu kan hin dandeenyee yoo ta‟ee bakka bu‟aan isaa mallatteessu danda‟a

Adeemsi gaaffiii deebii yeroo adeemsisamu fi gaaffilee feedhiin hirmachu isaa ilaaluu koo mallattoo kootiin mirkaneessa

Guyyaa_____

Mallattoo_____Yunivarsitii Haroomayaa

Appendix6. Questionnaire

A. Socio demographic characters of the study respondents

1. Age of respondent's 0-14 — 15-34 — 35-54 — 55 and Above_____

2. Sex of respondent's Male — Female —

3. Residence Urban — Rural —

4. The highest level of school completed. Illiterate (no formal education) — Primary — secondary — diploma and above —

5. Occupation, unemployed — civil servant — student — housewife —

Private worker — other specify _____

6. Marital statuses, single — currently married — divorced/separated — widowed —

7. Family size 1-2 — 3-4 — 5 &above — No family —

8. Total monthly income in Ethiopian birr. Less than 600 — 600-1500 —

1500-2500 — Above 2500 —

9. Housing (number of rooms) 1 — 2 — 3 & above — homeless —

10. Food habit, Vegetarian — non vegetarian — balanced — poor diet —

B Morbidity History and Status

11 Currently, what kind of symptoms(complaints) do you have?

—cough — chest pain — difficulty of breathing — Fever — weight loss — night sweating — loss of appetite —Malaise — Fatigue — others(specify)

C. Behavior of respondents

12. Do you consume or drink alcohol? No — Sometimes — Yes — 73

13. Do you chew chat? Yes — Sometimes — No —

14. Do you smoke cigarettes? Yes — No —

15. If your answer is „no" for question number 13, is there a family member at home that smoke Cigarettes?

Yes — No —

D. Other associated diseases and TB history of respondents

16. Other associated diseases of the respondents

HIV Sero-status — diabetes- mellitus — lung cancer — other — No —

17. Have you ever had long contact with TB patients?

Yes — No —

18. Have you ever lived in confiding environment such as military camp, prison or college dormitory? Yes — No —

E. Awareness of respondents to Tuberculosis.

19. Do you listen to health educations about TB through Radio or Television? Yes — Sometimes — No —

20. What is the cause of Tuberculosis? Bacteria or germ — Aging —

Genetic disorder — other, specify _____.

21. How is Tuberculosis transmitted? Through air droplet — through overcrowding — Through sexual inter course — Through blood contact — Traveling in crowded bus —

Sharing the same utensils such as cups in the house — open window in public transports —

Through insect bites — living in the same room — sleeping together —

I don't know — others, specify _____

22. What are the signs & symptoms of Tuberculosis? Long -lasting cough (2 weeks or greater)

Persistent fever — loss of weight — night sweating — chest pain —

Loss of appetite — I don't know — other specify _____.

23. Is it possible to prevent TB infections?

Yes — No — I don't know —

24. How could a person with Tuberculosis prevent the spread of TB to others?

Not coughing/sneezing in front of other people — spit in a container with cup or not —

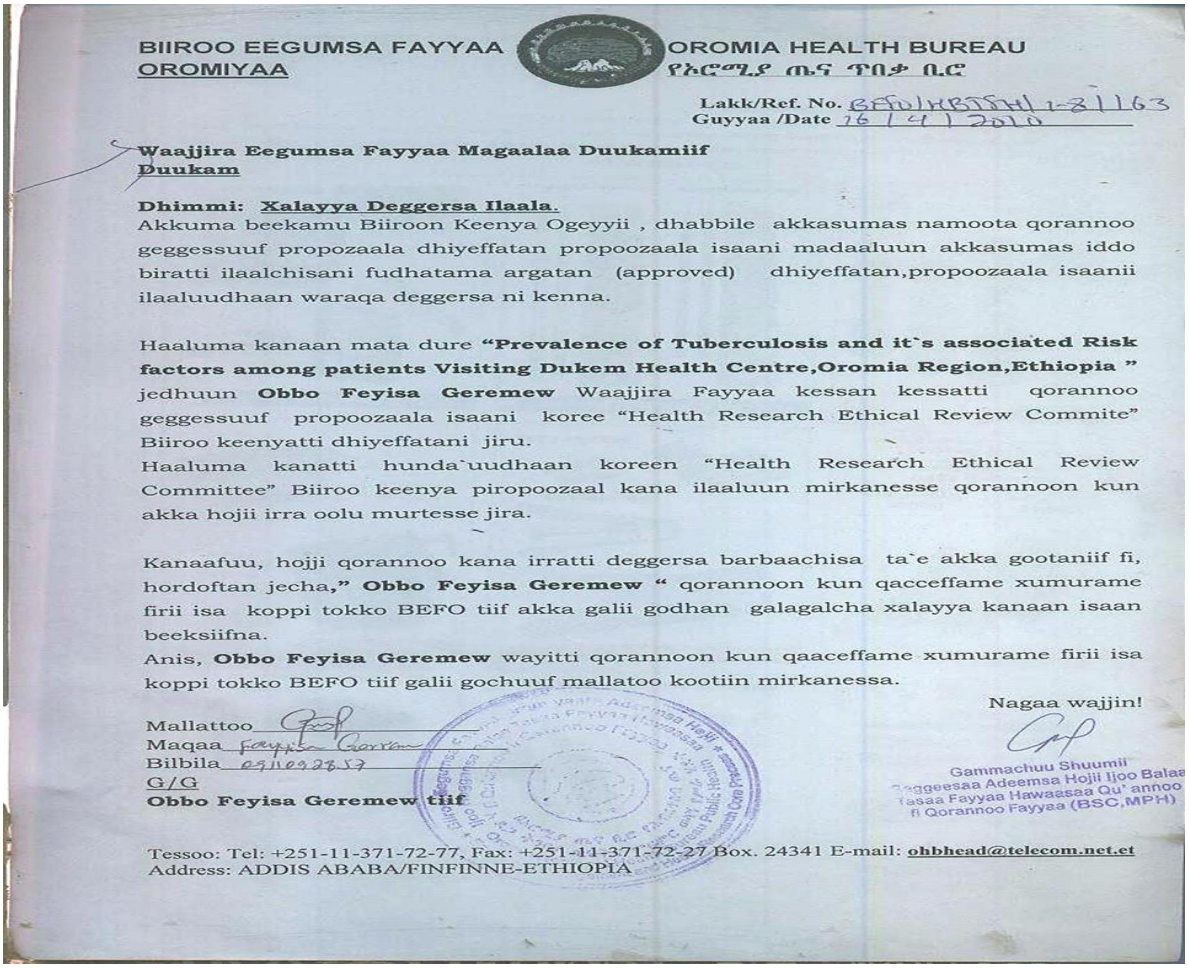
Spitting out in the open everywhere — ventilating the living room/open windows —

Avoiding shaking hands and blood contact — other specify _____

25. Tuberculosis is influenced by the factors such as drug use — poor living —

Working condition — the presence of other disease — I don't know —

Appendix 7. Ethical letter



BIIROO EEGUMSA FAYYAA OROMIYAA

OROMIA HEALTH BUREAU
የኦሮሚያ ጤና ጥበቃ ቢሮ

Lakk/Ref. No. BEFO/HRD/1-31163
Guyyaa /Date 16/4/2010

Waajjira Eegumsa Fayyaa Magaalaa Duukamiif
Duukam

Dhimmi: Xalayya Deggersa Ilaala.

Akkuma beekamu Biiroon Keenya Ogeyyii , dhabbile akkasumas namoota qorannoo geggessuuf propozaala dhiyeffatan propoozaala isaani madaaluun akkasumas iddo biratti ilaalchisani fudhatama argatan (approved) dhiyeffatan,propoozaala isaanii ilaaluudhaan waraqa deggersa ni kenna.

Haaluma kanaan mata dure **"Prevalence of Tuberculosis and it`s associated Risk factors among patients Visiting Dukem Health Centre,Oromia Region,Ethiopia "** jedhuun **Obbo Feyisa Geremew** Waajjira Fayyaa kessan kessatti qorannoo geggessuuf propoozaala isaani koree "Health Research Ethical Review Commite" Biiroo keenyatti dhiyeffatani jiru.

Haaluma kanatti hunda`uudhaan koreen "Health Research Ethical Review Committee" Biiroo keenya piropoozaal kana ilaaluun mirkanesse qorannoon kun akka hojii irra oolu murtesse jira.

Kanaafuu, hojji qorannoo kana irratti deggersa barbaachisa ta`e akka gootaniif fi, hordoftan jecha," **Obbo Feyisa Geremew** " qorannoon kun qacceffame xumurame firii isa koppi tokko BEFO tiif akka galii godhan galagalcha xalayya kanaan isaan beeksiifna.

Anis, **Obbo Feyisa Geremew** wayitti qorannoon kun qaaceffame xumurame firii isa koppi tokko BEFO tiif galii gochuuf mallatoo kootiin mirkanessa.

Nagaa wajjin!

Mallattoo _____
Maqaa Feyisa Geremew
Bilbila 0911692857
G/G
Obbo Feyisa Geremew tiif

Gammachuu Shuumii
Qaggeesaa Adeemsa Hojii Ijoo Balaa
Tajaaa Fayyaa Hawaasaa Qu' annoo
fi Qorannoo Fayyaa (BSC,MPH)

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