MADDA WALABU UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

DEPARTMENT OF BIOLOGY

ASSESSMENT OF TREATMENT OUTCOME AND ASSOCIATED FACTORS AMONG TUBERCULOSIS PATIENTS IN ABOMSA GENERAL HOSPITAL AND SELECTED HEALTH CENTERS, MERTI WOREDA, OROMIA REGIONAL STATE, CENTERAL ETHIOPIA: A FIVE YEAR RETROSPECTIVE STUDY (2015 – 2019).

By: Sadem Jemal Tilmo

ID.NO. PGBSG/009/09

Advisor: Dr. Addisu Assefa (Associated Professor, PhD)

May, 2021

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APPROVAL SHEET

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As a member of the board examiners of the master's thesis open defense, we certify that we have read and evaluated the thesis prepared by the student under the title "Assessment of Treatment Outcome and Associated Factors Among Tuberculosis Patients in Abomsa Hospital General and Selected Health Centers, Oromia Regional, Central Ethiopia: a five year retrospective study (2015 – 2019)'' and recommended that it can be accepted as fulfilling the thesis requirements for the degree of master of Biology.

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Internal examiner 2	Sign	Date

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I hereby certify that all the corrections and recommendations suggested by board of examiners are incorporated into the final thesis

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DECLARATION

These research is my original work and has not been / presented for fulfillment of MSc in the same locality or elsewhere previous.

Principal investigator: Sadem Jemal Tilmo

ID. No: PGBSG/009/09

Signature: _____

Date: _____

I hereby the certify I have read, commented and made corrected the thesis entitled as "ASSESSMENT OF TREATMENT OUTCOME AND ASSOCIATED FACTORS AMONG TUBERCULOSIS PATIENTS IN ABOMSA GENERAL HOSPITAL AND SELECTED HEALTH CENTERS, MERTI WOREDA, OROMIA REGIONAL STATE, CENTERAL ETHIOPIA: A FIVE YEAR RETROSPECTIVE STUDY (2015 – 2019). " presented by Sadem Jemal

I recommend that it could be submitted as fulfilling the thesis requirement.

Advisor: _____

Signature: _____

Date: _____

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ABBREVATIONS AND ACRONYMS

AFB- Acid Fast Bacteria

AIDS- Acquired Immune Deficiency Syndrome

BCG - Bacillus Calmette-Guerin

CDC- Center for Disease Control and Prevention

DOTS- Direct Observed Treatment Short-course

DR-TB – Drug Resistance Tuberculosis

EPTB – Extrapulmonary Tuberculosis

FMOH- Federal Ministry of Health

HIV- Human Immunodeficiency Virus

RH - rifampicin (R), isoniazid (H)

IGRA- Interferon Gamma Release Treatment Assays

LTBI- Latent TB Infection

NIHCE –National Institute for the Health and Clinical Excellence

NGO – Non-Governmental Organization

NTLCP – National Tuberculosis and Leprosy Control Program

NTPs- National Tuberculosis Programs

RHZE - rifampicin (R), isoniazid (H), pyrazinamide (P), and ethambutol (E)

SDGs – Sustainable Development Goals

SNTB – Smear Negative Tuberculosis

SPSS – Statistical Package for Social Science

TB- Tuberculosis

USPSTF- United State Preventive Services Task Force

WHO- World Health Organization

ZN – Ziehl-Nielsen

SUMMARY

Tuberculosis could be an inveterate irresistible infection caused by different strains of mycobacterium, basically Mycobacterium Tuberculosis, ordinarily assaults the lung, but can moreover influence other parts of the body. The objective of this study was to evaluate the treatment outcomes of tuberculosis and associated factors in an Abomsa General Hospital and Selected Health Center, Merti Woreda, Oromia Regional State, Central Ethiopia. An institution based cross sectional study was carried out from January 1, 2015 to December 31st, 2019 at Abomsa General Hospital, Angeda Health Center and Bole Health Centers. Data were abstracted from patients' medical chart using data abstraction format. The predictors of treatment outcomes were analyzed through bivariate and multivariate logistic regression models, and were considered statistically significant a p-value < 0.05. A total of 758 patients with tuberculosis were included for the study with a median age of 30.44 years which ranged from 1 to 84 year. Most (28.6%) participants were in the age group of 15 to 24 years. The majority (45.4%) of patients had smear-negative pulmonary tuberculosis, 9.6% of them were HIV positive. Regarding treatment outcome, 442(58.3%) completed the treatment, 252(33.2%) were cured and the rest were 41(5.4%) died, 9(1.3%) defaulted and 14(1.8%) treatment failed. The total treatment success rate was 91.5%. In the multivariate logistic regression model, urban residence (AOR=3.07, 95% CI: 2.08-4.53); being farmer (AOR=0.337, 95% CI: 0.128-0.890); extra-pulmonary tuberculosis (AOR=2.1, 95% CI: 1.2-3.4); TB-HIV co-infected patients (AOR=3.071, 95% CI: 1.494-6.315) were identified as independent predictor factors for unsuccessful treatment outcomes in the current study. The present study showed higher successful tuberculosis treatment outcomes compared to World Health Organization and National Tuberculosis and Leprosy Control Program. To reduce PTB transmission people should be educated on TB prevention and consequences of risk behaviors. Further studies are also recommended to explore important factors which were not examined by current study.

Keywords: Associated factors, Merti district Central Ethiopia, Retrospective, Treatment outcomes, Tuberculosis,

1. INTRODUCTOIN

1.1. Background of the Research

Tuberculosis could be an inveterate irresistible infection caused by different strains of mycobacterium, basically *Mycobacterium Tuberculosis*, ordinarily assaults the lung, but can moreover influence other parts of the body (Smith 2003; WHO, 2014; WHO, 2016). Primary source of disease is untreated smear-positive aspiratory tuberculosis patients (FMOH, 2013; WHO, 2014; WHO, 2016). It remains as one of the best major open wellbeing issues around the world and driving cause of mortality among individuals living with HIV/AIDS. Based on the 2016 WHO report, there were 10.4 million unused TB cases all inclusive in 2015: 5.9 million (56%) men, 3.5 million (34%) ladies and 1.0 million (10%) children. India, Indonesia, China, Nigeria, Pakistan and South Africa accounted 60% of world's TB. So also, there were an evaluated 1.4 million TB passing's among HIV negative individuals and an extra 0.4 million passing's from individuals living with HIV/AIDS (WHO, 2016).

In spite of the fact that TB could be a World Health Organization concern, it is to a great extent influencing nations with poor financial conditions (Chadambuka *et al.,* 2011; Dangisso *et al.,* 2014; El-Sokkary *et al.,* 2015; Odo *et al.,* 2016; WHO, 2016; Basera *et al.,* 2017; Hamusse *et al.,* 2017). Developing world shared the global burden with highest rates; 56% of global cases in Asia and 28% in Africa (WHO, 2015). Top African countries with high TB burden were Nigeria (570, 000), South Africa (45000), Democratic Republic of Congo (240, 000), and Ethiopia (200000) TB cases (WHO, 2016). As proposed by literary works, the high TB burden in Africa is related to low community mindfulness, asset deficiency, destitute healthcare services/availability, comorbidities such as HIV/AIDS, jungle fever, Diabetes Mellitus, and geographic detachment (WHO, 2015; WHO, 2016); (Chadambuka *et al*., 2011; Dangisso *et al*., 2014; Odo *et al*., 2016; Basera *et al*., 2017; Hamusse *et al*., 2017).

In spite of a few intercessions counting giving TB discovery and treatment administrations in both open and private healthcare offices (FMOH, 2009; FMOH, 2013; FMOH, 2015), TB proceeds major open wellbeing concern in Ethiopia (WHO, 2017). Investigate discoveries from diverse parts of Ethiopia upheld the nearness of tall TB predominance among TB suspected patients: 7.3% in Arsi zone (Hamusse *et al*., 2017), 19.4% in Gamo Gofa (Zerdo *et al*., 2014),

14.2% in Metehara clinic (Yohanes *et al.,* 2012), 4.6% in Southern Ethiopia (Eliso *et al.,* 2015) and 9.2% from south East Ethiopia (Tulu *et al*., 2014). In outline, based on different ponders, TB predominance ranges from 1.8 in a remote place (Legesse *et al*., 2013), to 21% in Eastern Ethiopia (Mekonnen, 2014) from nation to nation, 83% has been detailed all inclusive (WHO, 2013). Studies conducted in different parts of Ethiopia detailed distinctive victory rates of the treatment and the related components. For occurrence, a study conducted within the Northern portion of the country reported 89.2% (Chadambuka *et al*., 2011), but another consider within the same locale detailed as it were 60.1% (Dangisso *et al*., 2014). Therefore, the aim of this study was evaluate TB treatment outcome and factors associated among TB patients in Abomsa General Hospital, Angeda Health Center and Bole Health Center, Merti Woreda Oromia Regional State, Ethiopia.

1.2. Statement of the problem

Tuberculosis (TB) remains the moment driving causes of dreariness and mortality from an irresistible infection, after human immunodeficiency infection (HIV) worldwide (Floyd *et al.,* 2018). In 2017, there were an assessed 10.4 million occurrence TB cases and 1.6 million passing, counting 0.3 million people living with HIV/AIDS (WHO, 2017). Approximately 87% of TB occurrence cases were happening in 30 high-TB burden nations. Ethiopia positioned 10th among these nations with an evaluated TB frequency of 172/100,000 population (WHO, 2018).

In spite of the fact that the usage of DOTS increments treatment victory and diminish transmission of safe tuberculosis TB murders 5000 individuals each day (Moonan *et al*., 2011). Worldwide TB rate is still developing at 1% a year due to the fast increment in Africa and particularly, influences the foremost helpless such as the poorest and the malnourished (WHO, 2005). The World Health Organization pronounced TB a worldwide open wellbeing crisis in 1993 and created the Specks technique, a five-component bundle. Inside a decade, nearly all nations had embraced the technique and there was significant advance towards worldwide targets built up for 2005: the location of 70% of the assessed number of smear positive pneumonic cases (the foremost irresistible cases) and the effective treatment of 85% of these cases. In 2005, the numbers of cases detailed by NTPs developed to over 5 million and treatment victory rates come to 85% (WHO, 2011).

Unsuccessful treatment result in TB persistent is related with numerous hazard variables that are likely change depending on the neighborhood settings and settings. A think about in Bulgaria appeared that sputum spread inspiration and weight misfortune were emphatically related with TB passing (Milanov *et al*., 2015). In Ethiopia, obscure HIV status and smear-negative TB patients begun on empiric TB treatment were moreover related with unsuccessful result (Tessema et al., 2009; Gebrezgabiher *et al*., 2016). Besides, in Somalia ponder uncovered that conjugal status, level of instruction, co-infection with HIV, treatment category, and information of consider patients on TB transmission were related with unsuccessful result (Ali *et al*., 2017).

In Ethiopia, TB has long been recognized as a common open wellbeing issue since the 1950s (FMOH, 2008) and the nation have been actualizing the World Health Organization (WHO) prescribed Direct Observed Treatment Short-Course (DOTS) methodology since 1992. In any case, still, there were an assessed 25,000 TB passing's with a rate of 24/100,000 populaces (WHO, 2018).

It isn't clear which components are major donors to destitute result of TB patients within the Abomsa Hospital. Therefore, it would be way better to explore for ways of foreseeing TB treatment outcome and recognizing variables that can offer assistance to anticipate poor treatment result which is able offer assistance to distinguish those patients that are at a better hazard of destitute treatment result whereas being treated with anti-TB drugs. With this data, clinicians might grant such patients uncommon consideration amid their follow-up in arranges to anticipate event of negative results taking after destitute treatment result. Routine monitoring of the extent of the outcome and its determinants is important, but studies that have focused on TB treatment outcome and associated factors are lacking in Centeral Part of Ethiopia. This study was to evaluate TB treatment outcome and the possible associated factors with treatment outcome among TB patients in Abomsa General Hospital and Selected Health Centers, Merti Woreda, Oromia Regional State, Ethiopia.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this study was to evaluate the treatment outcomes of tuberculosis and associated factors in an Abomsa General Hospital, Angeda Health Center and Bole Health Centers, Merti Woreda, Oromia Regional State, Ethiopia.

1.3.2. Specific Objectives

The specific objectives of this study were:-

- To determine the treatment outcomes of TB patients registered for anti-tuberculosis treatment
- To identify factors associated with treatment outcomes of tuberculosis.

1.4. Scope /Delimitation of the Study

The study was delimited conceptually, geographically as well as methodologically. Conceptually, this study only focused on the evaluation of treatment outcomes of tuberculosis and associated factors in an Abomsa General Hospital: a five year retrospective study (2015 to 2019). Geographically, scope of the study was delimited only within Abomsa, Angeda and Bole town, Oromia Region of Central Ethiopia. Methodologically, the research designs considered in the study will be retrospective and descriptive research designs where quantitative research approach was also employed. Additionally, the main source of this data was secondary data collected from medical record of patients.

1.5. Limitation of the study

Since the data were collected from document review retrospectively, there were some incomplete information and were unable to include other key important variables like substance abuse and adherence measures. Thus, the finding of the current study should be interpreted by taking the above limitation in to consideration.

1.6. Significance of the Study

The finding of the study will help to create awareness among government and NGO about the incidence of the disease. And also, future researchers might use the finding of this thesis as a bench mark for their further study on similar area.

1.7. Research Questions

This study sought to answer the following research questions:-

I. Which socio-demographic factors and clinical characteristics of patients show high frequency of the TB disease?
II. What did the treatment outcome look like?
III. What are predictor factors associated with unsuccessful treatment outcome of TB?

1.8. Operational definitions of key terms

According to the standard definitions of the National Tuberculosis and Leprosy Control Program (NTLCP) guideline adopted from WHO, the following clinical case and treatment outcome definitions were used (FMoH, 2013).

- **Smear Positive Pulmonary TB**

Refers to: a patient with at least two sputum specimens who were positive for acid-fast bacilli (AFB) by microscopy or a patient with only one sputum specimen who was positive for AFB by microscopy, as well as chest radiographic abnormalities consistent with active pulmonary TB.

- **Smear Negative Pulmonary TB**

Refers to: a patient with symptoms suggestive of TB with at least two sputum specimens which were negative for AFB by microscopy and with chest radiographic abnormalities consistent with active pulmonary TB (including interstitial or miliary abnormal images) or a patient with two sets of at least two sputum specimens taken at least two weeks apart and which were negative for AFB by microscopy and radiographic abnormalities consistent with pulmonary TB and lack of clinical response to one we8ek of broad spectrum antibiotic therapy.

- **Extrapulmonary TB (EPTB)**

This included tuberculosis of organs other than the lungs, such as lymph nodes, abdomen, genitourinary tract, skin, joints and bones, and meninges. Diagnosis of EPTB was based on fine needle aspiration cytology or biochemical analyses of cerebrospinal/pleural/ascitic fluid or histo-pathological examination or strong clinical evidence consistent with active extrapulmonary tuberculosis, followed by a decision of a clinician to treat with a full course of anti-tuberculosis chemotherapy. In all the cases of EPTB, sputum examinations and chest radiographs were used to investigate the involvement of lung parenchyma.

- **Case TB patient**

A case of TB is a patient in whom tuberculosis has been confirmed bacteriologically or diagnosed by a clinician. The following are case definitions:

- ✓ **New Case (N)** - A patient who never had treatment for TB or has been on previous anti-TB treatment for less than four weeks.
- ✓ **Re-treatment**: A patient who have received anti-TB drugs ≥1-month in the past [either as relapse (a patient declared cured or whose treatment was completed of any form of TB in the past but now found to be smear-positive or culture-positive) or treatment Failure (a patient who is smear-positive at the end of 5th months of treatment or later. Treatment failure can also apply for a patient who was initially sputum smear-negative but becomes smear-positive while on treatment) or return after default (a patient previously recorded as defaulted from treatment and returns to the health facility with smear-positive sputum)].
- ✓ **Transfer-in:** A patient who transferred into the center to finish the course of treatment.
- ✓ **Transfer-Out:** A patient who started treatment in one treatment unit and is transferred to another treatment unit to continue treatment.
- ✓ **Chronic:** A TB patient who remains smear positive after completing a retreatment regimen.
- ✓ **Others:** A patient who does not fit in any of the above-mentioned categories (e.g., a PTB smear negative patient who returns after treatment interruption).

- **Treatment Outcome**

The treatment outcome was divided into six categories according to NTLCP guideline. These categories were as follows:

- **Cured** - Finishing treatment with negative bacteriology result at the end of treatment.
- **Completed Treatment -** Finishing treatment but without bacteriology result at the end of treatment.
- **Failure** - Remaining smear positive at five months despite correct intake of medication.
- **Defaulted Treatment -** Patients who interrupted their treatment for two consecutive months or more after registration.
- **Died** - Patients who died from any cause during the course of treatment.
- **Transfer-Out -** Patients whose treatment results are unknown due to transfer to another health facility.

In line with WHO criteria, treatment outcomes were categorized into the following:

- **Successful Treatment Outcome -** If TB patients were cured (i.e., negative smear microscopy at the end of treatment and on at least one previous follow-up test) or completed treatment with resolution of symptoms.
- **Unsuccessful Treatment Outcome -** If treatment of TB patients resulted in treatment failure (i.e., remaining smear positive after 5 months of treatment), default (i.e., patients who interrupted their treatment for two consecutive months or more after registration), or death.

2. LITIRETURE REVIEW

2.1. Tuberculosis

2.1.1. Causative Agent

The most cause of TB is *Mycobacterium tuberculosis (M. TB)*, a little, oxygen consuming, non-motile bacillus (Dolin, 2010). The high lipid substance of this pathogen accounts for numerous of its one of kind clinical characteristics (Southwick, 2007). It partitions each 16 to 20 hours, which is greatly moderate rate compared with other microbes, which ordinarily separate in less than an hour (Jindal, 2011). Mycobacteria have an external film lipid bilayer (Niederweis *et al*., 2010). If a Gram recolor is performed, M. TB either stains exceptionally feebly "Gram-positive" or does not hold color as a result of the tall lipid and mycolic corrosive substance of its cell divider (Madison, 2001).

2.1.2. Epidemiology

Ethiopia venerated World TB Day on 24th March 2019 in Afar vicinity Samara town. The theme of World TB Day for 2019 is ‘It is time to quit TB’ that places the accent on the urgency to act on the commitments made by using international leaders to scale up access to prevention and treatment; to build accountability; to make sure adequate and sustainable financing which includes for research; to promote an end to stigma and discrimination, and promote an equitable, rights-based and people-centered TB response. TB is one of the top 10 motives of dying worldwide and the leading cause from a single infectious agent (above HIV/AIDS). Millions of human beings proceed to fall ailing with TB each year. In 2017, TB brought about an estimated 1.3 million deaths among HIV-negative human beings and there have been an extra 300,000 deaths from TB (WHO, 2019)

There has been a main decline on the incidence and TB related death charges in the country. The TB incidence charge (TB+HIV) has dropped from 369 in 1990 to 164/100,000 population in 2017. The TB related mortality rate (TB+HIV) has also declined from 89/100,000 in 1990 to 24/100,000 in 2017. However, Ethiopia is amongst 30 high TB, TB/HIV and DR-TB Burden

Countries. TB nevertheless predominates in the younger population. 70% of notified cases are within the age crew of 15-54 years. People living with HIV are more probable than others to emerge as sick with TB and global it is also one of the main reasons of death among human beings dwelling with HIV (WHO, 2019).

The authorities of Ethiopia in collaboration with improvement partners, bilateral and multilateral organizations, and neighborhood at massive is jointly working to fight this deadly disorder and gain the set sustainable development dreams (SDGs) through 2030 and END TB with the aid of 2035. The country is implementing the globally recommended TB control strategies and the offerings are furnished in public and quite countable numbers of private health services nationwide. Since the implementation of the strategies, more than a million TB instances have been identified and treated effectively and many greater lives were saved (WHO, 2019).

2.1.3. Sign and Symptoms

The most side effects of variants and stages of tuberculosis are given (Schiffman, 2009), with numerous indications covering with other variants, whereas others are more (but not totally) particular for certain variants. Different variants may be show simultaneously. Tuberculosis may taint any portion of the body, but most commonly happens within the lungs (known as respiratory tuberculosis). Additional aspiratory TB happens when tuberculosis creates exterior of the lungs, in spite of the fact that additional aspiratory TB may coexist with pneumonic TB. General signs and indications incorporate fever, chills, night sweats, misfortune of craving, weight misfortune, and weakness (Dolin, 2010). Critical nail clubbing may moreover happen (Gibson, 2005).

2.1.3.1. Pulmonary

If a tuberculosis contamination does end up dynamic, it most commonly includes the lungs (in almost 90% of cases) (Behera, 2010; Lawn and Zumla, 2010). Symptoms may incorporate chest torment and a drawn out hack creating sputum. Approximately 25% of individuals may not have any indications (i.e. they stay "asymptomatic") (Lawn and Zumla, 2011). Occasionally, individuals may hack up blood in little sums, and in exceptionally uncommon cases, the disease may disintegrate into the aspiratory supply route or a Rasmussen's aneurysm, coming about in enormous dying (Dolin, 2010; Halezeroğlu and Okur, 2014). Tuberculosis may get to be a

persistent sickness and cause broad scarring within the upper part of the lungs. The upper lung flaps are more as often as possible influenced by tuberculosis than the lower ones (Dolin, 2010). The reasons for this distinction aren't clear. It may be due to either superior discuss stream (Kumar et al., 2007), or destitute lymph waste inside the upper lungs (Dolin, 2010).

2.1.3.2. Extrapulmonary

In 15–20% of dynamic cases, the contamination spreads exterior the lungs, causing other sorts of TB (Jindal, 2011). These are collectively indicated as "extra pulmonary tuberculosis". Extra pulmonary TB happens more commonly in individuals with a debilitated resistant framework and youthful children. In those with HIV, this happens in more than 50% of cases (Golden and Vikram, 2005). Extrapulmonary contamination destinations incorporate the pleura (in tuberculous pleurisy), the central anxious framework (in tuberculous meningitis), the lymphatic framework (in scrofula of the neck), the genitourinary framework (in urogenital tuberculosis), and the bones and joints (in pot infection of the spine), among others. A possibly more genuine, broad frame of TB is called "spread tuberculosis", moreover known as miliary tuberculosis (Dolin, 2010). Miliary TB as of now makes up approximately 10% of extra pulmonary cases (Gosh, 2008).

2.1.4. Transmission

When individuals with dynamic aspiratory TB hack, sniffle, talk, sing or spit they remove irresistible airborne beads 0.5 to 5.0 μm in distance across. A single sniffle can discharge up to 40,000 beads (Cole and Cook, 1998). Each one of these beads may transmit the infection, since the irresistible measurements of tuberculosis is exceptionally little (the inward breath of less than 10 microscopic organisms may cause a disease) (Nicas *et al.*, 2005). People with drawn out, visit or near contact with individuals with TB are at especially high hazard of getting to be tainted, with an evaluated 22% disease rate (Ahmed and Hasnain, 2011). An individual with dynamic but untreated tuberculosis may taint 10–15 (or more) other individuals per year (WHO, 2010). Transmission ought to happen from as it were individuals with dynamic TB those with inactive contamination are not thought to be infectious (Kumar *et al.*, 2007)

The likelihood of transmission from one individual to another depends upon a few variables, counting the number of irresistible beads ousted by the carrier, the viability of ventilation, the

length of introduction, the harmfulness of the M. tuberculosis strain, the level of resistance within the uninfected individual, and others (CDC, 2011). The cascade of person-to-person spread can be circumvented by isolating those with dynamic ("obvious") TB and putting them on anti-TB sedate regimens. After almost two weeks of viable treatment, subjects with nonresistant active diseases for the most part don't stay infectious to others (Ahmed and Hasnain, 2011)

2.1.5. Pathogenesis

Approximately 90% of those tainted with *M. tuberculosis* have asymptomatic, latent TB infections (now and then called LTBI) (Skolnik and Richard, 2011), with as it were a 10% lifetime chance that the idle disease will advance to unmistakable, dynamic tuberculous infection (Ahmed and Hasnain, 2011). TB contamination starts when the mycobacteria reach the alveolar discuss sacs of the lungs, where they invade and reproduce inside endosomes of alveolar macrophages (Houben *et al.,* 2006; Kumar *et al.,* 2007; Queval *et al.,* 2017).

Macrophages distinguish the bacterium as outside and endeavor to dispense with it by phagocytosis. The phagosome at that point combines with a lysosome to make a phago-lysosome. Within the phago lysosome, the cell endeavors to utilize responsive oxygen species and acid to murder the bacterium. However, *M. tuberculosis* features a thick, waxy mycolic corrosive capsule that secures it from these harmful substances. Tuberculosis of the lungs may moreover happen through disease from the blood stream. Usually known as a Simon center and is regularly found within the beat of the lung (Khan, 2011). This hematogenous transmission can moreover spread disease to more removed locales, such as fringe lymph hubs, the kidneys, the brain, and the bones (Herrmann and Lagrange, 2005); (Kumar *et al*., 2007). All parts of the body can be influenced by the illness, in spite of the fact that for obscure reasons it seldom influences the heart, skeletal muscles, pancreas, or thyroid (Agarwal *et al*., 2005).

2.1.6. Diagnosis of TB

2.1.6.1. Active TB

Diagnosing dynamic tuberculosis based as it was on signs and a side effect is troublesome (Bento *et al.,* 2011), as is diagnosing the illness in those who have a debilitated resistant framework (Escalante, 2009). A conclusion of TB ought to, be that as it may, be considered in

those with signs of lung malady or sacred side effects enduring longer than two weeks. A chest X-ray and different sputum societies for acid-fast bacilli is regularly portion of the starting assessment (Escalante, 2009). Interferon-γ discharge measures and tuberculin skin tests are of small utilize within the creating world (Metcalfe *et al*., 2011; Sester *et al*., 2011)). Interferon gamma release assays (IGRA) have comparative restrictions in those with HIV (Chen *et al*., 2011; Sester *et al*., 2011).

An authoritative determination of TB is made by distinguishing *M. tuberculosis* in a clinical test (e.g., sputum, discharge, or a tissue biopsy). However, the troublesome culture handle for this slow-growing living being can take two to six weeks for blood or sputum culture (WHO, 2011). Nucleic acid amplification tests and adenosine deaminase testing may permit quick conclusion of TB (Bento *et al.,* 2011). These tests, in any case, are not routinely prescribed; as they seldom modify how an individual is treated (NIHCE, 2011). Blood tests to identify antibodies are not particular or touchy, so they are not suggested (Steingart *et al*., 2011).

2.1.6.2. Latent TB

The Mantoux tuberculin skin test is regularly utilized to screen individuals at high chance for TB. (Sester *et al,* 2011). Those who have been already immunized with the Bacille Calmette-Guerin immunization may have a false-positive test result (Rothel and Andersen, 2005). The test may be erroneously negative in those with sarcoidosis, Hodgkin's lymphoma, ailing health, and most outstandingly, dynamic tuberculosis (Kumar *et al*., 2007). Interferon gamma discharge measures, on a blood test, are suggested in those who are positive to the Mantoux test (NIHCE, 2011). These are not influenced by immunization or most natural mycobacteria, so they create less false-positive come about (Pai *et al.,* 2008). However, they are influenced by *M. szulgai, M. marinum, and M. kansasii* (Jindal, 2011). IGRAs may increment affectability when utilized in expansion to the skin test, but may be less touchy than the skin test when utilized alone (Amicosante *et al*., 2010).

The US Preventive Services Task Force (USPSTF) has prescribed screening individuals who are at tall hazard for idle tuberculosis with either tuberculin skin tests or interferon-gamma discharge tests (Bibbins-Domingo *et al*., 2016). While a few have prescribed testing of health care worker, prove of advantage for this is often destitute as of 2019 (Gill *et al*., 2019). The Centers for

Disease Control and Prevention (CDC) ceased prescribing annually testing of health care workers without known exposure in 2019 (Sosa,*et al.*, 2019)

2.1.7. Prevention

Tuberculosis avoidance and control endeavors depend fundamentally on the inoculation of newborn children and the location and suitable treatment of dynamic cases. The World Health Organization (WHO) has accomplished a few victories with moved forward treatment regimens, and a little diminishes in case numbers (Lawn and Zumla, 2011)

2.1.7.1. Vaccines

The only available vaccine as of 2011 is Bacillus Calmette-Guerin (BCG) (McShane, 2011). In children it diminishes the chance of getting the disease by 20% and the hazard of contamination turning into dynamic illness by about 60% (Roy *et al*., 2014). It is the foremost broadly utilized antibody around the world, with more than 90% of all children being inoculated (Lawn and Zumla, 2011).

2.1.7.2. Treatment

Treatment of TB employ anti-microbial to slaughter the microscopic organisms. Compelling TB treatment is troublesome, due to the unordinary structure and chemical composition of the mycobacterial cell divider, which ruins the section of drugs and makes numerous anti-microbials incapable. Latent TB is treated with either isoniazid alone or a combination of isoniazid with either rifampicin or rifapentine (WHO, 2018); (Borisov *et al.*, 2018). The treatment takes at slightest three months (CDC, 2011; WHO, 2018); (Njie *et al.*, 2018). People with idle diseases are treated to anticipate them from advancing to dynamic TB illness afterward in life (Arch and Mainous , 2010). Active TB malady is best treated with combinations of a few anti-microbial to decrease the hazard of the microbes creating anti-microbial resistance (Lawn and Zumla, 2010).

According to the WHO treatment guideline the essential anti-TB drugs are Isoniazid, Rifampicin, Pyrazinamide, Ethambutol, and Streptomycin. All anti-TB drugs should be quality assured, and management of anti-TB drugs should be incorporated into the management of other essential medicines by the ministry of health (WHO, 2009). First-line treatment of TB in Ethiopia is Rifampicin (R); Ethambutol (E); Isoniazid (H); Pyrazinamide (Z); and Streptomycin (S). The

drugs are available in fixed dose combination and available as single drugs (MOH, 2008). The treatment of TB has two phases: intensive (initial) and continuation phase. Intensive phase consists of three or more drugs for the first 8 weeks for new cases and 12 weeks for retreatment cases. Continuation phase requires at least two drugs, to be taken for 4–6 months. During the continuation phase, the drugs must be collected every month and self-administered by the patient, except for retreatment cases and for regimens containing Rifampicin (MOH, 2008).. A better understanding of the predictors and prognostic factors would allow closer follow-up and more targeted interventions to improve TB treatment outcome, thus reducing TB associated morbidity and mortality.

2.1.8. Medication Administration

Directly watched treatment, i.e., having a wellbeing care supplier observe the individual take their medication is prescribed by the World Health Organization (WHO) in an exertion to diminish the number of individuals not suitably taking anti-microbial (Arch and Mainous, 2010).

They prove to bolster this hone over individuals basically taking their medicines autonomously is of destitute quality. There is no solid prove showing that specifically watched treatment moves forward the number of individuals who were cured or the number of individuals who total their medication. Moderate qualities prove recommends that there's too no distinctions in case individuals are watched at domestic versus at a clinic, or by a family part versus a wellbeing care specialist (Karumbi and Garner, 2015). Methods to remind individuals of the significance of treatment and arrangements may result in a little but critical enhancement (Liu *et al*., 2014).

2.2. Risk Factors

A number of variables make individuals more helpless to TB contaminations. The foremost vital chance calculate all inclusive is HIV; 13% of all people with TB are tainted by the virus (WHO, 2011). This could be a specific issue in sub-Saharan Africa, where rates of HIV are high (WHO, 2006; Chaisson and Martinson, 2008). Tuberculosis is closely connected to both stuffing and ailing health, making it one of the foremost illnesses of destitution (Lawn and Zumla, 2011)

2.2.1. Gender

Over the past twenty a long time, tuberculosis (TB) case notices among men have surpassed those among ladies in most settings (WHO, 2011). In 2014, the male-to-female (M:F) proportion in smear-positive pneumonic TB case notice was 1.7 all inclusive and extended from 1.0 within the Eastern Mediterranean Region to 2.1 within the Western Pacific Locale (WHO, 2015). The overabundance of informed cases among men has frequently been clarified as a result of obstructions confronted by ladies in looking for care for and being analyzed with TB (Weiss et al., 2006). However, notification data alone are inadequately to decide whether usually genuine, or whether sex contrasts in case notices reflect an overabundance within the burden of malady among men and indeed an impediment among men in looking for and getting to TB care.

2.2.2. Socioeconomic

It is perceived that moo socio-economic foundation can contribute to the expanded chance of TB and troublesome TB treatment results (Wu and Dalal, 2012), (Prado *et al*., 2016; Di Gennaro *et al*., 2017). In sub-Saharan Africa, being single, low education, unemployment, moo salary, destitution, smoking, and liquor utilize were appeared to be related with TB (Saidu *et al.*, 2014); (Mitku *et al*., 2016). There is right now little information on the impacts of socio-economic hazard components for TB in HIV-infected patients in Asia. A Taiwanese consider detailed HIV-negative patients with lower pay levels were at noteworthy hazard of having repeat of TB (Hung *et al*., 2015). Besides, a Malaysian ponder found that one fifth of TB patients enrolled within the national registry in 2012 had ominous results. Lower instruction levels and HIV contamination were found to be noteworthy indicators of destitute treatment results (Liew *et al*., 2015).

2.2.3. Diabetes

The risk of tuberculosis in diabetics is 2-3 times higher than that of non-diabetics. Diabetes can worsen the clinical course of tuberculosis and tuberculosis can worsen blood sugar control in diabetic patients. Therefore, people with both of these conditions require careful clinical management. Strategies need to be developed to ensure that patients with these two diseases receive the best care. The prevalence of diabetes is increasing worldwide. The most dramatic increase has achieved a rapid economic, social and lifestyles. The increase in the number of TB cases related to diabetes is dangerous for progress in a global battle with TB. Therefore, the

prevention and acquisition of diabetes should be prioritized, as well as interested parties involved in the treatment and management of non-dynamic diseases, but also those that work in the attention and prevention of TB. This should be part of a broader behavior for risk factors and social decision factors (Restrepo, 2016).

2.2.4. Malnutrition

Malnutrition increases the risk of tuberculosis and tuberculosis causes malnutrition. Therefore, malnutrition is often very common among tuberculosis patients. Although proper tuberculosis treatment generally helps normalize nutritional status, many tuberculosis patients remain malnourished at the end of tuberculosis treatment. Therefore, nutritional assessment and counseling, as well as management of malnutrition based on nutritional status, are an important part of the treatment plan for tuberculosis. Malnutrition and possible food insecurity are one of the most important determinants of tuberculosis. Improving the nutritional status of the population is important for the prevention of tuberculosis. This should be part of a broader action on social determinants (Cegrielski and McMurrary, 2016).

2.2.5. Smoking

Smoking increases the risk of tuberculosis 2-3 times and is related to poor tuberculosis treatment. The smoking rate of tuberculosis patients is often high, and the prevalence of other smoking-related diseases is also high. People diagnosed with tuberculosis should be asked if they smoke and given advice on how to quit smoking. This is part of a practical approach to lung health. The high rate of smoking in the population is an important factor leading to the high burden of tuberculosis. Regulatory and public health efforts to reduce the prevalence of smoking can have a major impact on the incidence of tuberculosis. It is essential to link tuberculosis prevention efforts with efforts to reduce other smoking-related diseases in the population (Zhang *et al.*, 2017).

2.2.6. Alcohol

Harmful use of alcohol can triple the risk of tuberculosis and is a major risk factor for poor compliance with tuberculosis treatment. In countries with a high incidence of alcohol use disorders, especially in countries with low and medium incidence rates where tuberculosis is

highly concentrated in certain vulnerable groups, harmful use of alcohol may be an important risk factor for general tuberculosis. Patients with tuberculosis often have complications. As part of a comprehensive care package, it is important to identify problem drinkers, diagnose alcohol use disorders, and refer to appropriate alcohol interventions, especially in these countries (Soh *et al.*, 2017).

2.3. HIV and TB Co-infections

Human Immunodeficiency Virus (HIV) remained as the driving cause of mortality and dreariness; in 2016 for occurrence, 1.8 million individuals were recently tainted and 1 million AIDS-related passing's were enrolled (UNAIDS, 2017). HIV/AIDS and TB (Tuberculosis) are considered as the twofold burden illnesses of the world. Agreeing to the World Health organization (WHO) report, there were 1.5 million passing's credited to TB out of which 26% were due to HIV-associated TB (WHO, 2016). In creating nations, especially in sub-Saharan Africa, TB is expanding due to the burden of HIV (Nachega and RE, 2003). Consequently, the African landmass takes the more prominent share (74%) of the 1.2 million TB-HIV cases around the world (WHO, 2016). In Ethiopia, 4 in 100 individuals kick the bucket due to TB-HIV co-infection and the frequency of Multidrug-resistant Tuberculosis (MDR-TB) was evaluated to be 5.8 per 1000 individuals (WHO, 2017).

In common, individuals living with HIV are 20 times more hazardous to be tainted with TB as compared to HIV negative individuals (Melkamu *et al*., 2013), with case casualty rate of 16–35%, which is nearly 4 times higher than HIV free people (Mukadi *et al*., 2001). The rate of co-infection is decided by numerous variables counting smoking, family estimate, the clinical organize of HIV, utilize of antiretroviral treatment.

3. METHODOLOGY

3.1. Study Area

This study was conducted in selected study sites in Merti district of Arsi Zone, Central Ethiopia. The study sites were three TB treatment centers such as Abomsa General Hospital; Angeda Health Center and Bole Health Center located in Merti woreda. The woreda altitude varies from 900m-2850m. The administrative town of this woreda Abomsa located 192 Km from capital city Addis Ababa. The town has a latitude and longitude of 8°35′N 39°51′E and an altitude of 1438 meters. The 2007 national census reported a total population for this woreda of 90,408, of whom 46,759 were men and 43,649 were women; 14,655 or 16.21% of its population were urban dwellers (Population and Housing Census of Ethiopia, 2007). In the district, 19 health posts, 4 Health Centers and one district hospital are serving the community. The woreda has also a total of 110 health workers with different profession serving the peoples in the above mentioned health facilities. All kebeles have 2 health extension workers in the community at large (Woreda health office, 2015).

The health centers and Hospital were established by aiming to serve range of routine and preventive healthcare services, such as: laboratory testing, vaccinations, screening and treatment for conditions like blood pressure or diabetes, treatment for common illness like colds, the flu or urinary tract infections. Also in the hospital and health centers, there is one DOTS clinic which has been operating per National TB and Leprosy Control Program (NTBLCP) guidelines of Ethiopia since 2014 G.C.

3.2. Study Design and Period

A health institutional based retrospective document review was conducted to assess the treatment outcome of TB patients and the associated factors from TB patients' documents registered from

January 1, 2015 to December 31st, 2019 at Abomsa General Hospital, Angeda Health Center and Bole Health Center.

3.3. Study Population

All the TB patients who registered in the Abomsa General Hospital, Angeda Health Center and Bole Health Centers from 1st of January, 2015 to December 31st, 2019 were considered as study population.

3.4. Inclusion and Exclusion Criteria

The documents of all the registered TB patients at Abomsa General Hospital Angeda Health Center and Bole Health Centers were included in this study. However, registries in which treatment outcomes missing and patients transferred to other districts or hospitals (transferred out) will be excluded from the study.

3.5. Variables of Study

- Dependent Variables
  - ✓ Tuberculosis treatment outcomes (Cured, Defaulted, Completed, Died, Failure)
  - ✓ Treatment success (successful and unsuccessful)
- Independent Variables were as follows
  - ➢ Socio-demographic characteristics
    - Age
    - Distance from hospital
    - Educational status
    - Family size
    - Family income
    - Sex
    - Residence
    - Weight
  - ➢ Comorbidity
  - ➢ HIV/ TB Co-infections
  - ➢ Tuberculosis Type

- Smear negative pulmonary TB
- Smear positive pulmonary TB
- Extrapulmonary TB

- HIV Status
  - Positive
  - Negative
- Patient categories
  - New case
  - Relapsed
  - Failure
  - Defaulted
  - Transferred in

3.6. Data Collection and Data Quality

The data were collected from medical record reviews of patients using structured format. Socio-demographic data, clinical history and HIV status and other morbidities of each study participant were retrieved from patients' records in DOTs clinic of Abomsa General Hospital Angeda Health Center and Bole Health Centers from 1st of January, 2015 to December 31st, 201 9 using experienced nurses (Appendix 1).

3.7. Data Processing and Analysis

After checking completeness and accuracy, the collected data was entered and analyzed by using SPSS version 22. The collected data completeness and accuracy was checked by using data abstraction form from reconciling source data (both from TB treatment and follow-up log book and patient chart) till zero missed value is obtained. A descriptive statistics were performed and used to summarize socio-demographic data, clinical data and treatment outcome with respect to outcome category time of treatment. Chi-square test was performed to see status of TB with respect socio-demographic and clinical characteristics. Bivariate and multivariable logistic regression analysis was used to analyze factors associated with unsuccessful treatment outcome of TB patients. The independent variables were checked for the presence multi-collinearity using Variance Inflation Factor (VIF). The goodness of fit of the employed model was evaluated using

the Hosmer-Lemeshow test ($p > 0.05$). Marginal variables with $p < 0.05$ on bivariate analysis were included in multivariable logistic regression model in order to detect independent predictors associated with treatment success of TB patients.

3.8. Ethical Clearance

The study was approved by the Department of Biology, Madda Walabu University and Ethical clearance was obtained from College of Natural and Computational Science of Madda Walabu University. Permission to conduct the study was provided from Arsi Zone Health Office and from administration of Abomsa General Hospital, Angeda Health Center and Bole Health Centers before collection of data. Patient records were anonymized and identified prior to analysis to ensure confidentiality of individual patient information.

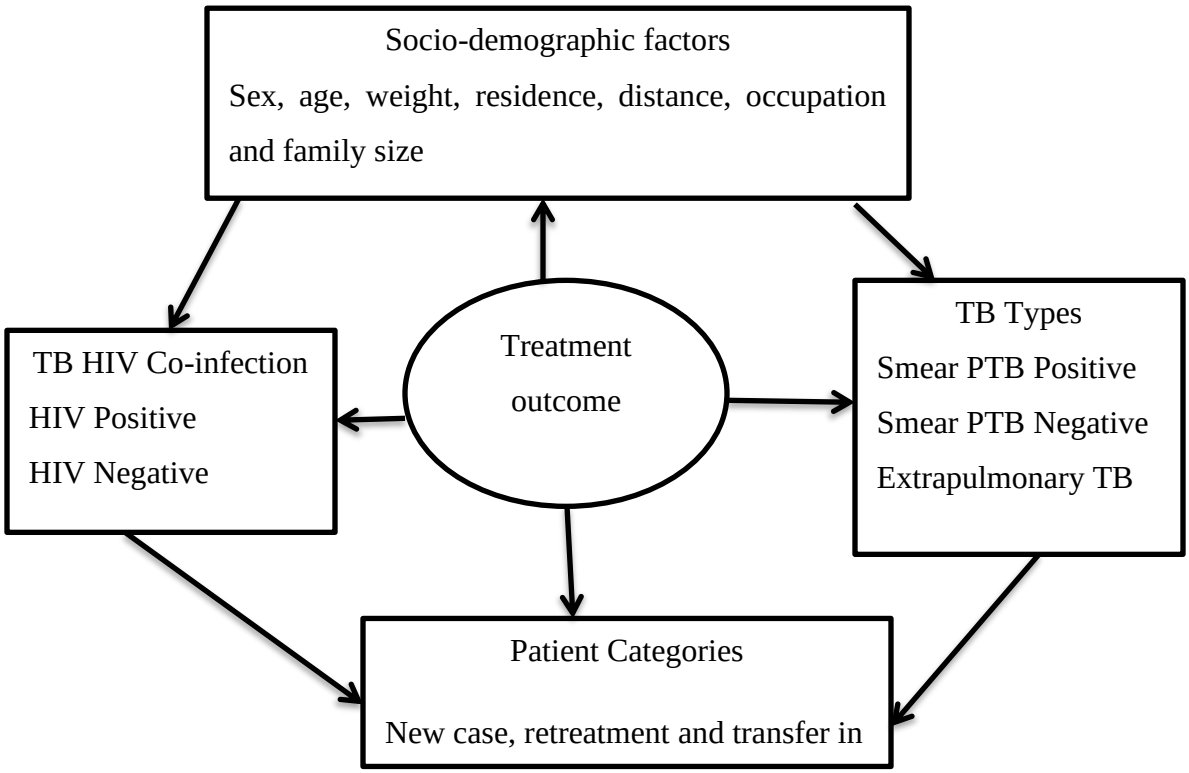

Figure 1: Conceptual frame work for determinants of treatment out comes among TB patients developed by reviewing different literatures

4. RESULTS

4.1.Socio-demographic characteristics of TB patients

A total of 758 patients were treated for TB one hospital and two health centers of which 387(51.4%) were from Abomsa General Hospital, 131(17.3%) from Angeda Health Center and 238(31.3%) from Bole Health Center. More than half 439(57.9%) of the patients were male. Their age ranged from 1 to 84 years, with a mean age of the participants were 30.44. About 217(28.6%) of the participants were in the age range of 15-24 years and 185(24.4%) of the patients were in the age group 25-34 years. The weight of the TB patients ranged from 6 to 85 Kg with mean (±SD) weight of 46.6 (±13.2) Kg. More than half (54.7%) weighed 40 – 55 Kg. The majority of the study participants 402(53%) were residents from rural areas, while the remaining ones were from urban area. About 73.2% of the cases were from patients living with the distance of greater than 5Km of the treatment center. Patients having more than 3 family members accompany by 73.5% of case. Occupationally, most of them were others (house wife, drivers, unemployed, school dropout, children under school age, maid and nanny) 203 (26.8%) (Table 1).

Table 1: Socio-demographic characteristics of participants in Abomsa General Hospital and Selected Health Center from 1st of January, 2015 to December 31st, 2019 (n=758)

Characteristics		Frequency	Percentage
Treatment center	Abomsa General Hospital	387	51.4
	Angeda Health Center	131	17.3
	Bole Health Center	238	31.3
sex	Male	439	57.9
	Female	319	41.9
Age	0-14	102	13.5
	15-24	217	28.6
	25-34	185	24.4
	35-44	117	15.4
	45-54	59	7.8
	≥ 55	78	10.3
Weight	≤20 Kg	48	6.4
	21-39 Kg	114	15.8
	40-55 Kg	415	54.7
	≥ 56 Kg	175	23.1
Residence	Urban	356	47
	Rural	402	53
Distance	<5 Km	555	73.8
	>5 Km	203	26.2
Occupation	Businessman	100	13
	Employed	114	15
	Farmer	162	21.6
	Student	179	23.6
	Other	203	26.8
Family size	1-3	201	26.5
	>3	557	73.5

Other includes: - children under school age, house wife, drivers, school dropout, unemployed, maid and nanny

4.2. Clinical characteristics of TB patients

The overall classification of TB Patients by the types of TB indicated that the largest proportion 344(45.4%) constituted by sputum smear-negative PTB, followed by sputum smear-positive PTB 267(35.2%) and extrapulmonary TB 147(19.4%) patients. Out of the total TB patients recorded during the 5 years, all TB patients had knewn HIV status result, among which, 73(9.6%) of the TB patients were co-infected with HIV. Most of the attendants 697(92%) were new cases. Based on the year of treatment, the number of cases was maximum 176(23.2%) and 171(22.6%) in the

year 2019 and 2016 respectively, during the 5-year study period. Comorbidity by TB/HIV infection accounts for 26(3.4%) only (Table 2).

Table 2: Clinical characteristics of participants in Abomsa General Hospital and Selected Health Center from 1st of January, 2015 to December 31st, 2019 (n=758)

Characteristics		Frequency	Percentage
TB status	Smear positive	267	35.2
	Smear negative	344	45.4
	Extra pulmonary	147	19.4
HIV status	HIV negative	685	90.4
	HIV positive	73	9.6
Patient case	New case	697	92
	Retreatment	49	6.5
	Transfer in	12	1.5
Year of treatment	2015	163	21.5
	2016	171	22.6
	2017	122	16.1
	2018	126	16.6
	2019	176	23.2
Treatment result	Cured	252	33.2
	Complete	442	58.3
	Defaulted	9	1.2
	Failure	14	1.8
	Died	41	5.4
Comorbidity	No	732	96.6
(TB/HIV and other)	yes	26	3.4

4.3.Treatment outcome among Tuberculosis patients

From the total 758 patients recorded 692(91.2%) were successfully treated (cured and completed their treatment), despite 66(8.8%) were not successfully treated (defaulted, failure and died). More specifically, the treatment outcome of most of the cases was promising, (58.3%) were completed anti-TB treatment and (33.2%) cured. Treatment defaulters, failure, and died were (1.3%), (1.8%) and (5.4%), respectively. Among 430(57.9%) male participants, 265(60.4%) and 137(31.5%) of them completed the treatment and cured respectively, while 2.5% and 5.01% of females failed and died during the course of treatment. Participants who completed their treatment were relatively evenly distributed in each age group. However, defaulters were mainly from age group 15-24 years and death from age group of 35-44. The rate of treatment outcome

(cure and complete) was higher among patients from rural settings (91.3%) than urban setting (90.3%). The evaluation of treatment outcome of smear-positive pulmonary TB showed that 204(76.4%) were cured and 44(16.5%) had completed their treatment. The rate of death reported in smear negative PTB and EPTB during the five years account for 7.5% and 4.8%, respectively. Of the total 41 patients who died, 8 patients had co-infected with HIV. The treatment outcome of all TB patients across the years is depicted in table 3. The cure rate of tuberculosis patients showed a steadily increase over the study period from 39(22.8%) in 2016 to 80(47%) in 2019. In contrast, the failure rate was increased over the study period from 2(1.2%) in 2015 to 4(3.2%) in 2018, albeit the slight decrease (1.8%) in 2019. The death rate was decreased from 5.5% in 2015 to 4.7% in 2016 then increased to 7.4% in 2017 and again decreased to 6.4% in 2018(Table 3).

Table 3: Treatment Outcome of all TB patients by socio-demographic and clinical characteristics of participants in Abomsa General Hospital and Selected Health Center from 1st of January2015 to December 31st, 2019 (n=758)

Characteristics		Treatment outcomes										Total
		cured		Completed		Defaulted		Failure		Died		
		No	%	No	%	No	%	No	%	No	%	
Sex	Male	137	31.2	265	60.4	6	1.2	6	1.2	25	6	439
	Female	115	36	177	55.5	3	0.94	8	2.5	16	5.01	319
Age	0-14	25	24.5	67	65.7	1	2.6	1	1	8	7.8	102
	15-24	70	32.2	130	60	4	1.8	6	2.8	7	3.2	217
	25-34	67	36.2	106	57.3	2	2.6	4	2.2	6	3.3	185
	35-44	40	34.2	65	55.5	-	-	1	0.85	11	9.4	117
	45-54	24	40.7	28	47.5	-	-	1	1.7	6	10.1	59
	≥ 55	66	33.3	46	59	2	2.6	1	1..3	3	3.8	78
Weight	≤20	9	18.7	34	70.8	1	2.2	-	-	4	8.3	48
	21-39	41	34.2	67	55.8	1	1.6	4	3.3	7	6.6	120
	40-55	139	33.5	238	58.8	7	1.7	7	1.7	24	5.7	415
	≥ 56	63	36	103	58.8	-	-	3	1.7	6	3.4	175
Residence	Urban	112	31.5	213	58.8	3	0.84	3	0.84	25	7.3	356
	Rural	140	34.8	229	56.5	6	1.7	11	2.7	16	4	402
Distance	<5 Km	182	32.9	324	58	8	1.6	8	1.8	33	6	555
	>5 Km	70	34.5	118	58.1	1	1	6	3	8	4.4	203
Occupation	Businessman	35	19.4	54	30	1	1	2	1	8	4.4	180
	Employed	24	16.6	73	64	-	-	1	0.87	6	6.1	114
	Farmer	52	31.5	102	60.6	1	0.6	3	1.8	4	2.4	165
	Student	59	33	106	59.2	1	0.6	4	2.2	9	5	179
	Other	72	35.4	107	52.7	6	3	4	2	14	7	203
Family size	1-3	64	31.8	123	61.2	3	1.5	3	1.5	8	6	201
	>3	188	34	319	57	6	1	11	2	33	2.6	557
TB status	Smear positive	204	76.4	44	16.5	4	1.5	8	3	7	7	267

	Smear negative	40	12	275	79	3	1	3	1	23	7.5	344
	Extra pulmonary	8	5.4	123	86.7	2	1.4	3	2	11	4.8	147
HIV status	HIV negative	237	34.6	397	57.7	5	0.7	13	2	33	1.2	685
	HIV positive	15	2.2	45	6.6	4	0.6	1	015	8	5.6	73
Patient case	New case	230	33	407	58	9	1.3	13	1.9	38	2	697
	Retreatment	19	39	26	53	-	-	1	2	1	17	49
	Transfer in	3	25	7	58	-	-	-	-	2	5.5	12
Year of treatment	2015	45	27.6	105	64.4	2	1.2	2	1.2	9	4.7	163
	2016	39	22.8	119	68.4	3	1.7	2	1.2	8	7.4	171
	2017	44	36	64	52.5	2	1.6	3	2.5	9	6.4	122
	2018	44	35	69	54.6	1	0.8	4	3.2	8	4.2	126
	2019	80	47	85	50	1	0.6	3	1.8	7	4	170

Other includes: - children under school age, house wife, drivers, school dropout, unemployed, maid and nanny

4.4.Association of TB types with socio-demographic and clinical characteristics

As all the variables (exposure characteristics) were qualitative in nature, chi-square test were used to determine the association between types of TB and both demographic and clinical of patients in the treatment center. As can be seen by frequencies cross tabulated table, there is a significant relationship between TB types and weight, residence, and year of treatment with p-value less than 0.05(Table 4).

Table 4: Association between TB type and socio-demographic and clinical characteristics of participants in Abomsa General Hospital and Selected Health Center from 1st of January2015 to December 31st, 2019 (n=758)

Characteristics		TB status						χ^2(p- value)
		Smear positive		Smear negative		Extra pulmonary		
		No	%	No	%	No	%	
Sex	Male	149	34	209	47.3	81	18.7	2.104(0.349)
	Female	118	37	135	42.3	66	20.7	
Age	0-14	28	27.5	48	47	26	25.5	
	15-24	81	37	92	42.4	44	20.6	
	25-34	74	40	75	40.5	36	19.5	13.230(0.211)
	35-44	39	33.3	61	52.2	17	14.5	
	45-54	24	40.7	26	44	9	15.3	
	≥ 55	21	27	42	53.8	15	19.2	
Weight	≤20	8	16.7	22	45.8	18	37.5	
	21-39	40	33.3	57	47.5	23	19.2	**17.982 (0.006)**
	40-55	164	39.5	181	43.6	70	16.9	
	≥ 56	55	31.4	84	48	36	20.6	
Residence	Urban	107	30	178	50	71	20	**8.348(0.015)**
	Rural	160	39.8	166	42.3	76	18.9	
Distance	<5 Km	192	34.8	255	46.2	108	20	0.383 (0.826)
	>5 Km	75	37	89	43	39	19	
Occupation	Businessman	43	43	40	40	17	17	
	Employed	37	32.5	59	51.8	18	15.7	
	Farmer	54	33.3	75	46.3	33	20.4	8.851(0.355)
	Student	60	34.7	71	41	42	24.3	
	Other	67	33	99	48.8	37	18.2	
Family size	1-3	71	35	97	48	33	16	1.748(0.417)
	>3	196	35	247	44	144	26	
HIV status	HIV negative	249	36.4	301	44	135	19.6	6.179(0.46)
	HIV positive	18	24.7	43	59	12	16.3	
Patient case	New case	248	35.6	313	45	136	19.4	
	Retreatment	16	32	28	56	6	12	8.653(0.194)
	Transfer in	3	27.2	4	36.4	4	36.4	
Year of treatment	2015	47	32.9	89	62.3	27	18.8	
	2016	46	27	97	56.7	28	16.3	
	2017	43	35.2	56	46	23	18.8	**36.918(0.000)**
	2018	45	38.8	48	41.2	23	20	
	2019	86	48.8	54	30.6	36	20.6	
Total		267	35.2	344	45.4	147	19.4	

Other includes: children under school age, house wife, drivers, school dropout, unemployed and nanny

Abbreviation: χ^2 = Pearson Chi-squared, Pearson Chi-squared and p-values indicated by bold numerals are statistically significant.

4.5. Bivariate logistic regression

In this study, bivariate logistic regression was used to identify factors that have association with unsuccessful treatment outcomes. Thus, residence, occupation, TB type and HIV Status have significant association with treatment outcome as it is indicated by P-value of <0.05 (Table 5).

Table 5: Bivariate logistic regression analysis and association with treatment success among study participants in Abomsa General Hospital and Selected Health Center from 1st of January2015 to December 31st, 2019 (n=758)

Characteristics		Treatment success		COR (95%Cl)	p-value
		Successful (%)	Unsuccessful (%)		
Sex	Male	400 (91.1)	39(8.9)	1	1
	Female	292(91.5)	27(8.5)	0.960(0.568,1.565)	0.840
Age	0-14	92(90.2)	10(9.8)	1	1
	15-24	200(92.2)	17(7.8)	0.782(0.345-1.774)	0.556
	25-34	173(93.5)	12(6.5)	0.638(0.266-1.533)	0.315
	35-44	104(88.9)	13(11.1)	1.150(0.481-2.147)	0.753
	45-54	51(86.4)	8(13.6)	1.443(0.536-3.886)	0.468
	≥ 55	72(92.3)	6(7.7)	0.767(0.266-2.209)	0.623
Weight	≤20	43(91)	5(9)	1	1
	21-39	108(91.5)	12(8.5)	0.956(0.318-2.875)	0.936
	40-55	376(89.6)	39(10.4)	0.892(0.314-2.304)	0.820
	≥ 56	165(9	10(10)	0.521(0.169-1.605)	0.256
Residence	Rural	368(94.3)	34(5.7)	1	1
	Urban	324(90.6)	32(9.4)	5.75(3.315-9.98)	**0.02***
Distance	<5 Km	504(90.8)	51(9.2)	1	1
	>5 Km	188(92.6)	15(7.4)	0.788(0.433-1.436)	0.437
Occupation	Businessman	88(88)	12(12)	1	1
	Employed	107(93.9)	7(6.1)	0.480(0.181-1.270)	0.139
	Farmer	154(95.1)	8(4.9)	0.381(0.150-0.968)	**0.042***
	Student	105(88.2)	14(11.8)	0.622(0.276-1.403)	0.253
	Other	178(87.7)	25(12.3)	1.030(0.494-2.146)	0.937
Family size	1-3	186(92.5)	15(7.5)	1	
	>3	506(90.8)	51(9.2)	1.250(0.686-2.277)	0.466
TB types	Smear positive	247(92.5)	20(7.5)	1	
	Smear negative	314(88.7)	40(11.3)	0.865(0.896-3.094)	0.107
	ETPB	131(89.1)	6(10.9)	2.051(1.004-4.193)	**0.049***
HIV status	HIV negative	632(92.3)	53(7.7)	1	1

	HIV positive	60(82.2)	13(17.8)	2.584(1.333-5.008)	**0.005***
Patient case	New case	635(91.1)	62(8.9)	1	
	Retreatment	47(95.9)	2(4.1)	0.436(0.103-1.837)	0.258
	Transfer in	10(83.3)	2(16.7)	2.276(0.481-10.768)	0.3
Year of treatment	2015	150(92)	13(8)	1	
	2016	158(92.4)	13(7.6)	0.949(0.426-2.114)	0.899
	2017	108(88.5)	14(11.5)	1.496(0.676-3.310)	0.321
	2018	111(88.1)	15(11.9)	1.559(0.713-3.409)	0.266
	2019	165(93.8)	11(6.2)	0.769(0.344-1.761)	0.537

Other includes: - children under school age, house wife, drivers, school dropout, unemployed and nanny
Abbreviation: ETPB- Extrapulmonary, HIV-Human Immunodeficiency Virus COR- Crude Odd Ratio, Cl-Confidence level
Using asterisk (∗) to indicate that P- value less than 0.05 is significant and indicated with bold

4.6. Multivariate logistic regression

In multivariate analysis, residence, occupation, TB types, and HIV status of the TB patients were found to be significantly associated with unsuccessful treatment outcome ($P < 0.05$). The risk of unsuccessful treatment outcome was 3 times higher (AOR= 3.07; 95% Cl; 2.08-4.53, *P*=0.016) among PTB patients living in an urban residence compared to rural dwellers. TB patients who were farmer experienced significantly lesser odd of unsuccessful treatment outcome (AOR= 0.337, 95% Cl; 0.128- 0.890, *P*=0.028) as compared the reference occupation types. EPTB patients were 2 times (AOR=2.1, 95% CI 1.2-3.4, *P*=0.013) more likely to develop poor treatment outcomes compared to patients with smear positive TB. Study participants who had an HIV- positive result were three times more likely to have unsuccessful treatment outcomes (AOR=3.071;95%Cl; 1.494-6.315, *P*=0.002) relative to HIV-negative patients

Table 6: Multivariate logistic regression analysis of factors that independently affect treatment outcome among tuberculosis patients in Abomsa General Hospital and Selected Health Center from 1st of January 2015 to December 31st, 2019

Characteristics		Treatment success		AOR (95%Cl)	P-value
		Successful (%)	Unsuccessful (%)		
Residence	Rural	368(94.3)	34(5.7)	1	1
	Urban	324(90.6)	32(9.4)	3.07(2.08-4.53)	**0.016**
Occupation	Businessman	88(88)	12(12)	1	1
	Employed	107(93.9)	7(6.1)	0.379(0.120-1.196)	0.098
	Farmer	154(95.1)	8(4.9)	0.337(0.128-0.890)	**0.028**
	Student	105(88.2)	14(11.8)	0.410(0.154-1.088)	0.073
	Other	178(87.7)	25(12.3)	0.859(0.396-1.998)	0.724
TB types	Smear positive	247(92.5)	20(7.5)	1	1
	Smear negative	314(88.7)	40(11.3)	1.496(0.747-3.019)	0.261
	ETPB	131(89.1)	6(10.9)	2.1(1.2-3.4)	**0.013**
HIV status	HIV negative	632(92.3)	53(7.7)	1	1
	HIV positive	60(82.2)	13(17.8)	3.071(1.494-6.315)	**0.002**

Abbreviation: ETPB- Extrapulmonary, HIV-Human Immunodeficiency Virus, AOR- Adjusted Odd Ratio, Cl- Confidence level

5. DISCUSSION, CONCLUSION and RECOMMENDATION

5.1. DISCUSSION

Tuberculosis remains a major public health problem through the world, developing countries shouldering much of the burden. TB outcome surveillance is important for two reasons. Firstly, it allows the measurement and comparison of the performance of TB services locally, regionally and nationally. The second important reason for TB treatment outcome surveillance is that, collection of information on outcomes depends on heavily on the collaboration of local TB departments (DOTs center) and they will do this better if the exercise is beneficial to them (WHO, 2018).

In this study, the successful treatment outcomes (completed and cured) of all TB types were 91.2 % which is higher than the NTLCP (85%) and WHO (90%), (FMOH, 2013). The high treatment success rate observed in this study was also in line with the previous studies of TB in other parts of Ethiopia and other countries, such as 94.3 % by Ahmad *et al.,* 2017, 93.6% by Adane *et al.,* 2018, and 90.1% by Belachew *et al.,* 2018. The treatment success of this study is higher than previous studies conducted in some parts of Ethiopia 85.6 %by Gebrezgebiher *et al.*, 2016, 74.1 % by Wondale *et al.*, 2017, and 68.1 % by Worku *et al.,* 2018. The difference may be due to the sample size used in the study, geographical difference, study period, study population and setting difference. Although, this variation might be due to difference in the quality of DOTS service.

The overall prevalence of smear-negative pulmonary tuberculosis in this study was 45.4% which indicates that smear negative PTB is higher in the study area. Similar findings were determined for the high incidence of smear negative PTB from South Africa, which is 46% (Claassens, 2015). The similarity may be due to the basis of clinical and radiological indicators. Furthermore, some suspected TB cases might be first diagnosed and transferred in from private health facilities; therefore, the clinicians might abuse the low sensitivity of smear microscope and might rush to diagnose presumptive TB cases as possible smear-negative PTB patients (Floyd *et al.*, 2018).

The relatively higher proportion TB in male (57.9%) in this retrospective data is in agreement with the study conducted in Gonder by Biruk *et al.,* 2016, which could be related to the

underutilization of health facility by female patients that could intern be due to various socioeconomic and cultural influences as suggested by Mohammed *et al.* (2017) or could also be due to the real biological differences between male and female in susceptibility to development of active disease (Abad-Franch and Guera, 2014).

During the study period, out of 758 patients with TB who were registered at the health centers for treatment; 58% completed their treatment, 33.2% cured, 1.3% defaulted, 1.8% failed and 5.5% died at the treatment regimen. From the point of view of the death rate, this was lower than the mortality rate among all TB patients of similar studies conducted in the northern part of Ethiopia (Gondar, 17.7%), by Biruk *et al.,* 2016. The difference in mortality rate seen could be due to variation of the year of study in which case the improvement of the healthcare system could be implicated, type of study population, variation of the sample size and possibly the variation in epidemiological entities associated with geographical locations. Besides, there might be difference in patient and professional interaction institution to institution that might affect adherence and ultimately their outcomes.

HIV infection of TB patients is considered a major public health problem, particularly in resource constrained settings like Ethiopia. Among those HIV screened patients; the proportion TB/HIV co-infection was 9.3% and it is lower as compared to with the prevalence at country level 15% (WHO, 2015) and previous studies conducted in different areas; Metema 20.1% by Tarekegne *et al.*, 2015, Arsi Negele 73% by Gebremariam *et al.,* 2016, Gimbi 23.5% by Garedew and Nemera, 2017,. However, the finding was higher than studies in Tigray region 8.6% by Berhe *et al.,* 2012. Also higher than from study in Addis Ababa by Getahuna *et al.,* 2013 which was 1.7%. This observed variation might be due to the difference in the quality of service in TB/HIV infection clinic, proper counseling and health education. Another possible explanation might be the inclusion of transferred out patients in the final analysis by some of the previous studies (Garedew and Nemera, 2017).

In multivariable logistic regression model, poor treatment outcome was significantly associated with patients from urban residence significantly associated with poor treatment outcome. This is due to underlying social and economic determinants of health that include not only poverty but also overcrowding, urban in migration, deficient social protection, stigma and discrimination, HIV infection (Carter *et al.,* 2018). Given these socioeconomic problems, it is not a surprise

that urban areas carry the highest burden of TB and notify more cases. Furthermore, the size of urban populations and socioeconomic problems are rapidly increasing in developing and high-TB-burden countries (Shete *et al.,* 2018), which will increase the number of people exposed to high risk environments for communicable diseases, including TB.

Data on TB transmission at the human-animal interface are important in designing a "one health" approach for the control of the disease, particularly, rural settings. Nevertheless, the awareness of farmers about zoonotic transmission of TB was low and thus was similar to the magnitude of awareness recorded by previous studies conducted in Ethiopia (Nuru, *et al.,* 2017) and in other countries including Zambia and Zimbabwe (Munyeme, *et al.,* 2010, Mosalagae *et al.,* 2011). The poor awareness of farmers on the transmission of zoonotic TB to them could pose risk of infection by zoonotic pathogens including *M. bovis,* suggesting a need for an awareness creation campaign about zoonotic TB in the study area.

In the current study, the type of tuberculosis was associated with poor treatment outcomes. Extrapulmonary TB was significantly associated with poor treatment outcomes compared to smear positive PTB patients (AOR=2.1, 95% CI: 1.2-3.4, p=0.013). The finding was in line with the study conducted in Hossana, South Ethiopia by Tigist *et al.,* 2016, but in contrary with the finding of study conducted in North West Ethiopia by Endris *et al.,* 2014. This could be due to the treatment outcome monitoring of smear positive pulmonary TB patients and by testing sputum result at 2^{nd}, 5^{th}, and 7^{th} months in addition to clinical progression of the patients but monitoring the treatment outcome of patients extrapulmonary TB is only clinical condition.

The data showed that HIV co-infection was associated with high likelihood of experiencing unsuccessful treatment outcomes (AOR=3.071, 95% CI: 1.494-6.315, p=0.002). This was in agreement with a number of previously published studies by Dangiso *et al.,* 2014 and Hamussa *et al.,* 2017. HIV infection in TB patients may result in negative sputum-smear and normal chest radiographs, thus challenging TB diagnosis (CDC, 2012 and Virenfel *et al.,* 2014). This might result in delayed case detection and initiation of TB treatment which, in turn, led to poor outcomes. Furthermore, TB/HIV co-infection often associates with poor response to TB-medications due to malabsorption of anti- tuberculosis drugs, overlap toxicity in ART patients and/or due to the risk of immune reconstitution inflammatory syndrome (Lazarus *et al.,* 2008).

This might be explained with HIV-negative tuberculosis patients were more immune competent than HIV-positive ones, HIV-positive patients might not take the drug as prescribed due to the fear of drug interaction and the side effects. Thus, this finding highlights the need for alternative approaches for effective diagnosis and coordinated treatments of TB and HIV to reduce morbidity and mortality resulting from these infections.

5.2. Conclusion

As five years retrospective study indicates the DOTS strategy improved TB treatment success in Abomsa General Hospital and Selected Health Centers. Successful treatment outcome rate 91.2% registered was high and more than more than the target success rate set by WHO (85%). Residence, Occupation, TB type and HIV status are the main predictors for unsuccessful treatment outcomes. There is a need to more closely monitor rural-dwelling patients accessing care in urban centres and to further decentralise TB care to rural areas including strengthening of community-based TB services in rural areas to improve access to early diagnosis and treatment.

5.3. Recommendation

- To the health centers: patients urban dwelling, extrapulmonary tuberculosis and HIV positive TB patients should be more closely followed as they at risk of unsuccessfully treated
- To the zonal and woreda health office: regular supervision and monitoring of the DOT strategy at health facilities are mandatory
- To the researchers: other study should be carried out by combining data from primary and secondary source to get more accurate results
- Also further studies that include private TB managing institutions, which use a longitudinal design to develop full knowledge and to identify common reasons for unsuccessful treatment outcomes in TB patients.

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APPENDIX-1

MADDA WALABU UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCE

DEPARTMENT OF BIOLOGY

Appendix 1. Structured format (to be filled by experienced physician/Nurse)

DEAR EXPERIENCED PHYSICIAN /NURSE

The primary purpose of this questionnaire is to gather primary information on the socio-demographic and clinical morbidities associated among all TB patients treated in Abomsa General Hospital and Selected Health Centers, Merti Woreda, Arsi zone, Oromia region, Centeral Ethiopia to the research work needed for the partial fulfillment of Degree of Masters of Science in Biology (MSC.) by Mr. Sadem Jemal. The success of this research depends on genuine data retrieved from TB patients' register in DOTS Clinic of Abomsa General Hospital. The result of this study will help to provide important recommendations on the treatment outcome and factors associated with treatment outcome in your respective Health institution. The researcher promises that the entire data gathered will only be used for academic purpose and be confidential.

Thank you in advance!!

QUESTIONNARIES

General direction: Dear Nurse/Health professional; you are requested to fill the socio-economic information and clinical history of all TB patients treated during January 2015 to December 2019 in your respective health institution.

NB:

- ✓ You don't need to write the name of the patients
- ✓ Please write the response briefly in the space provided.
- ✓ Study patients who do not have complete socio-demographic data, clinical history, and transferred out patients will be exempted from the study.

1. Socio demographic characteristics of patients

1.1. Sex: Male ☐ Female ☐

1.2. Age: ☐

1.3. Weight: ☐

1.4. Residence:

Urban ☐

Rural ☐

1.5. Distance from patients home to country TB drugs dispensary (DOTs clinic)

A. ≤ 5km B. >5 km

NB, you may use if the distance is too large A.<10KM B. ≥10KM

1.6. Occupational

A. Businessman B. Employed C. Farmer D. Student E. Unemployed

1.7. Family size A.1-3 B.> 3

NB. You may use also 1-5 and >5 if the family size is too large in the study area

1.8. Educational status

A. Illiterate B. Elementary C. High school D. Certificate/Diploma/Degree or above

1.9. Monthly income of family (if any)

A.<300 B.300-999 C.>1000

2. Clinical characteristics of patients and co-morbidities

2.1. TB types: PTB+ ☐

PTB- ☐

EPTB ☐

2.2. HIV status:

Negative ☐ Positive ☐

2.3. Patients category: New case ☐ Retreatment ☐ Transfer in ☐

Relapsed ☐ Failure ☐ defaulted ☐

Died ☐

2.4. Year of treatment: 2015: ☐

2016: ☐

2017: ☐

2018: ☐

2019: ☐

3. **Treatment outcome of TB Patients**

Cured: ☐ default ☐

Completed ☐ died ☐

Failure ☐

3.2. Treatment Success

3.1. Successful ☐

3.2. Unsuccessful ☐

4. **The presence of any Co morbidity**

Yes ☐

No ☐

4.2. If yes mention the co morbidity /presence of underlying diseases during period except HIV_____

_____

_____

APPENDEX-2

MADDA WALABU UNIVERSITY

SCHOOL OF GRADUATE STUDIES

ETHICAL APPROVAL APPLICATION FORM

Important note

Research involving participants who are in a dependent or unequal relationship with the researcher or research supervisor may be regarded as a vulnerable group. If your study involves such participants, it is essential to safeguard against possible adverse consequences of this situation. This can be achieved by ensuring that participants remain anonymous to the individuals concerned (e.g., no need to seek names of participants taking part in the study). If such safeguards are in place, or the research does not involve other potentially vulnerable groups or individuals unable to give informed consent, it is appropriate to check the NO box for question presented on number 4 and 6.

Researcher: Mr. Sadem Jamel Tilmo

School: Madda Walabu University School of Graduate Studies

College: College of Natural and Computational Sciences

Department: Department of Biology

Title of the Research: Assessment of treatment outcome and associated risk factors among tuberculosis patients in Abomsa General Hospital, and Selected Health Centers of Merti district, Oromia Regional State, Centeral Ethiopia.

Name of Supervisor _____

Type of Research: **Postgraduate**

1. APPLICATION FORM CHECK LIST

Please complete the ethics application form below and provide additional information as attachments.

My application includes the following documentation:	Included (mark as yes)	Not applicable(mark as N/A)
Participant information Leaflet	X	
Participant Informed Consent form	X	
Questionnaire/Survey	X	
Interview/Focus Group Questions		X

2. RESEARCH DETAILS

a) Lay description

Tuberculosis (TB) remains one of the deadliest infectious diseases responsible for millions of deaths annually across the world. While TB is present in every country majority of TB sufferers live in low income and middle income countries especially in regions such as Sub-Saharan Africa. In Ethiopia, tuberculosis is the leading cause of morbidity, the third cause of hospital admission, and the second cause of death in Ethiopia, after malaria. Routine monitoring of the extent of the treatment outcome and its determinants is important, but studies that have focused on evaluation of TB treatment outcome and associated factors that are lacking in Centeral Part of Ethiopia. This study aimed to evaluate TB treatment outcomes and associated factors between January 1, 2015 to December 31, 2019 under the DOTS clinic of Abomsa General Hospital and Selected Health Centers, Merti Woreda, Oromia Regional State, Centeral Ethiopia. A retrospective data of TB patients registered at those treatment centers between January 2015 to December 2019 will be obtained from hospital registry and used as source of data which will be collected from March 1 to April 8, 2020. Bivariate and multinomial logistic regression models will be used to analyze the association between treatment outcomes and potential predictor variables. At end of this study, the researcher will point out the treatment out comes and the factors that contribute to spread the disease.

Operational definitions of some terms:

Treatment outcome: study subjects who were cured, completed their treatment, new, relapsed defaulted, failure or transfer in during their treatment course in DOTs clinic in respective study area.

Treatment success: is defined as study subjects who were completely cured from the diseases and also completed their treatment. Unsuccessful treatment outcomes were study subjects who were new, relapse defaulted, failure or transfer in.

b) Research Objectives

The objective of this research is to assess Treatment outcome of Tuberculosis and Associated risk factors in selected health centers and Abomsa Hospital.

c) Research location and duration

Location	Abomsa town
Research start date	March
Research end date	April to May
Approximate duration	3 month

3. Participants

		Yes	No	N/A	Remark
1. Do participants fall into any of the following special groups?	Minors(under 18 years age)	X			
	People with learning or communication difficulties	X			If they attended their treatment at DOTs clinic
	Patients	X			
	People in custody	X			If they attended their treatment at DOTs clinic
	People engaged in illegal activities(e.g. drug taking)	X			If they attended their treatment at DOTs clinic
2. Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g., covert observation of people in non-public places)			X		

4. Sample details

Inclusion Criteria

The inclusion criteria will be pulmonary TB (smear positive, PTB and smear negative, PTB), and extra pulmonary forms (EPTB) of TB cases which were registered in the TB clinic of the Abomsa Hospital and selected Health centers will be included in the study.

Exclusion Criteria

Patients who transferred to other districts (transferred out), and patients with incomplete socio-demographic information (data) and with no clinical history will be excluded from the treatment outcome evaluation, as information on their treatment outcome was not available.

Justification for proposed sample size and for selecting a specific gender, age, or any other group if this is done in your research.

All registered TB patients with full socio-demographic information and clinical history that fulfilled the inclusion criteria during the study period will be sampled and included in the study.

5. Risk to participants

a) Please describe any risks to participants that may arise due to the research.

- ✓ The study will not cause any harm to the study participants as the research is a retrospective study that depend on the already registered socio-demographic and clinical history of the study participants.

	Yes	No	N/A
1. Will the study involve actively deceiving the participants? (e.g., will participants be deliberately falsely informed, will information be withheld from them or will they be misled in such a way that they are likely to object or show unease when debriefed about the study)		X	
2. Will the study involve discussion or collection of information on sensitive topics? (e.g., sexual activity, drug use, mental health)		X	
3. Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	X		
4. Will blood or tissue samples be obtained from participants		X	
5. Will the data be anonymous?	X		
6. Does the study risk causing psychological stress or anxiety or other harm or negative consequences beyond that normally encountered by the participants in their life outside research?		X	

a) Please outline your approach to ensuring the confidentiality of data.
In order to maintain confidentiality and anonymity, data collector will be recruited from nurses. There is no use of individual identifiers and the data that will obtain the records

will be only accessed by the investigator. During document review codes will be used and anonymity will be assured.

(b) There is an obligation on the lead researcher to bring to the attention of the College Ethics Committee any issues with ethical implications not clearly covered by this application form.

6. Declaration

I have read and understand the MWU guide lines for ethical practices in research and have read and understand the data protection guide lines.

	Name	Signature	Date
(Researcher):	_____	_____	_____
(Supervisor):	_____	_____	_____

Ethical Committee Name of the College

Head of College of Natural & Computational Science:

Name (Chairperson)	Signature	Date
_____	_____	_____
Department Head of Biology		
_____	_____	_____
Department Head of Chemistry		
_____	_____	_____
Department Head of Mathematics		
_____	_____	_____
Department Head of Environmental Science		
_____	_____	_____
Department Head of Physics		
_____	_____	_____

9. Statement of Ethical Approval

Chair of Ethics Committee (Chairperson of the College)

This Research has been considered by the Ethics Committee and approval is granted.

Signed: _____ Name: _____

Date: _____