TREATMENT OUTCOME AND ASSOCIATED FACTORS AMONG TUBERCULOSIS PATIENTS TREATED IN BEGI DISTRECT HEALTH FACILITIES, OROMIA REGION, ETHIOPIA.

MPH THESIS

MULUGETA GOBENA YADETA

NOVEMBER 2019

HARAMAYA UNIVERSITY, HARAR,

HARAMAYA UNIVERSITY

COLLEGE OF HEALTH AND MEDICAL SCIENCE

DIRECTORATE OF GRADUATE STUDIES

Treatment Outcome and Associated Factors among TB Patients Treated in Begi District Health Facilities, Oromia Region, Ethiopia

A Thesis submitted to directorate of Graduate Studies

HARAMAYA UNIVERSITY

In Partial Fulfillment of the Requirement for the Degree of **Masters of Public Health**

By: MULUGETA GOBENA YADETA

Major advisor: Mr.Melake Demena (MPH, Assistant professor)

Co -advisor: Habtamu Mitiku (MSc, Associated professor)

NOVEMBER 2019

HARAMAYA UNIVERSITY, HARAR**,**

APPROVAL SHEET

HARAMAYA UNIVERSITY

POSTGRADUATE PROGRAM DIRECTORATE

I hereby certify that I have read and evaluated this thesis '' **Treatment outcome and Associated Factors among TB patients Treated in Begi District Health Facilities, Oromiya, Ethiopia,** By Mulugeta Gobena and I recommended that it submitted as fulfilling the thesis requirement.

Major Advisor

Melake Damena (MPH, Assistant professor) _____ _____

Co-Advisor Signature Date

Habtamu Mitiku (MSc, Associated professor) _____ _____

Signature Date

As member of the Board of Examiner of the MPH thesis open defense examination, we certify that we have read and evaluated the thesis prepared by MULUGETA GOBENA and examined the candidate. We recommend that the thesis accepted as fulfilling the thesis requirements for the Master's degree of General Public Health.

_____ _____ _____

Chairperson Signature Date

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_____ _____ _____

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_____ _____ _____

Name of Chairman, CGS Signature Signature Date

DEDICATION

I dedicate this thesis to my wife Genet Misganu for her unconditional support during my study. I am honored to have you as my wife. Thank you for giving me a chance to provide and improve myself throughout all my works and life: Please do not ever change. I love you forever.

STATEMENT OF AUTHOR

By my signature below, I declare that this thesis is my own work and that all sources of materials used for this thesis have been fully acknowledged. I have followed all the ethical and technical principles of scholarship in the preparation, data collection, data analysis and compilation of the thesis. This thesis has been submitted in partial fulfillment of the requirement for MPH degree at HARAMAYA University and deposited at the University library to be made available to borrowers under the rule of library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award for any academic degree, diploma or certificate.

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Name: Mulugeta Gobena

Place: Haramaya University, Haramaya

School/Department: GENERAL PUBLIC HEALTH

Date of submission _____

BIOGRAPHICAL SKETCH

I was born on September 02, 19 81GC in Gimbi. I attended my elementary school and secondary education at Mareche Wodebo and Gimbi comprehensive secondary school in Gimbi respectively. I earned a BSc in Health Education and Promotion from Jimma University.

ACKNOWLEDGMENT

I would like to express my acknowledgment to Haramaya University College of health and medical science and public health department of the University for giving me this excellent opportunity to undertake this thesis research as fulfillment for masters of public health.

I would also like to express my deepest gratitude to my advisors Mr.Melake Damena and Mr. Habtamu Mitiku for their unreserved supports and guidance throughout the whole process of this research work. Colleagues working in my work site deserve acknowledgement for their cooperation in sharing workload while doing this thesis.

Last, but not least, I would like to thank my family without whose encouragements and moral supports this research would have not been finalized.

ACRONYMSAND ABBREVIATIONS

AIDS Acquired Immune Deficiency Syndrome

BMI Body Mass Index

CDC Center of Disease Control

CXR Chest X- ray

DOTS Directly Observed Treatment Short Course

EPTB Extensive Pulmonary Tuberculosis

FMOH Federal Ministry of Health

HIV Human Immune Virus

HRERC Health Research Ethics Review Committee

MDR TB Multi Drug-Resistance Tuberculosis

TB Tuberculosis

NPT National Program of Tuberculosis Control

OR Odds Ratio

SDGS Sustainable Development Goals

PHC Primary Health Care

PLWHIA People Living With HIV/AIDS

TB Tuberculosis

USAID United States Agency for International Development

WHO World Health Organization

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Abstract:

Introduction: Tuberculosis (TB) remains a major public health threat throughout the world, particularly in developing countries. Evaluating the treatment outcome of TB and identifying the associated factors should be an integral part of TB treatment.

Objectives: The aim of this study was to assess the treatment outcome of TB and its associated factors among TB patients in the TB clinics of Begi Public Health Facilities, Western Ethiopia.

Methods: A cross-sectional study was conducted in one public hospital and five public health centers of Begi district; a systematic random sampling technique was used to select the medical records of TB patients who registered in the health facilities from1 January 2011 to December 31, 2017.

Data were collected using a pre-tested structured data extraction format. SPSS Version 20 was used for data analysis. Binary logistic regression was employed to examine the associations between TB treatment outcome and factors associated variables at 95% confidence level. A sample of 204 male and 212 female tuberculosis patients was included in the study.

Results: The odds of favorable TB treatment outcome were about 3.6, 2.8 and 3.9 folds significantly higher among TB patients aged 11-20 years [AOR=3.609(1.183, 11.008)], aged 21-30 years [AOR= [2.817(1.033, 7.680)] and aged 31-40 years **[**AOR=3.952(1.273, 12.264))] compared to TB patients aged <11 years old, respectively. TB patients not with coinfection were four times likely to have favorable outcome compared to those TB patients with HIV infection and this was found to be statistically significant (AOR=3.952(1.273, 12.664).

Conclusion and recommendation. In the current study, the rate of successfultreatment outcome was acceptable and met the World Health Organization target. This rate shall be maintained and further improved by designing appropriate monitoring strategies.

Key words: Tuberculosis, treatment outcome, retrospective, Begi district

1. INTRODUCTION

1.1. Back ground

Tuberculosis (TB) is an infectious airborne disease caused by Mycobacterium tuberculosis. Occasionally, the disease can also cause by Mycobacterium africanum. The main source of infection is untreated smear-positive pulmonary tuberculosis (PTB) from a patient discharging the bacilli. It typically affects the lungs (pulmonary TB).The probability of developing tuberculosis is much higher among people with low immunity status (WHO, 2018).

TB remains a major public health problem, which affects all countries and all ages' groups. It is one of the top ten causes of death and the leading cause from a single infection agent and millions of people continue to fall sick with TB each year(FMOH, 2016).

Ethiopia has ranked as the eighth among the twenty-two high TB burden countries in the world and the third in Africa (FMOH, 2016).The incidence rate of all forms of TB is estimated at 164 per 100,000 population, leading to annual mortality rate of 27.5 per 100, 000 population(WHO,2018).

In Ethiopia, the proportion of tuberculosis patients with known HIV status was 43 percent and 15 percent of those with known HIV status are positive. Sixty nine percent of tuberculosis and HIV co-infected patients have started Cotrimoxazole prophylaxis, while 39percent are on ART. The WHO tuberculosis estimates for Ethiopia used at a time of survey protocol development extrapolated from an exercise undertaken in 1997, using an assumption of a 50percent case detection rate of 48percent. DOTS coverage and trends based on high HIV prevalence countries in the region (FMOH, 2015).

Ethiopia has adopted strategies to end tuberculosis with its revised plan aiming at 50percentTB incidence reduction and 75percent reduction in death by 2025. There is an increased coverage and decentralized tuberculosis and MDR TB diagnosis and treatment facility with donor helps including USAID, CDC, Global Fund and others (ibid).

1.2Statement of the problem

Latest status of the TB epidemic worldwide shows that it is one of the top 10 causes of death and the leading causes from a single infectious agent (above HIV/AIDS). Millions of people continue to fall sick with TB each year. In 2017 alone, TB caused an estimated 1.3 million deaths (range 1.2-1.4 million) among HIV negative people and there were an additional 300,000 deaths from TB (range 266000-335000) among HIV positive people (WHO, 2018).

Globally, the best estimate is that 10.0 million people (range 9.0-11.1 million) developed TB disease in 2017among whom 5.8 million were men, 3.2 million were women and 1.0 million were children. There were cases in all countries and age groups. Overall 90 percent were adults,(aged range ≥15 years),9 percent were people living with HIV(72 percent in Africa) and two thirds were in eight countries: India(27 percent),China (9 percent),Indonesia (8 percent),the Philippines (6 percent),Pakistan (5 percent),Nigeria (4 percent), and Bangladesh (8 percent) (WHO, 2018).

WHO reports that although people of all ages are at risk, TB mostly affects adults during ‘’their most productive years’’ posing significant challenges to the livelihoods of individuals in developing economies(WHO, 2018).People who suffer from other conditions that impair the immune system are at a higher risk of developing active TB (USAID, 2016*).*

In 2009, an estimated 9.7 million children were orphans because of parental death caused by TB.TB is the leading killer among HIV infected people with weakened immune system. Quarter of million TB deaths are HIV associated, with the most of them in Africa and 98 percent of TB deaths are in the developing world affecting mostly young adults in their most productive years.(WHO, 2016). Although the implementation of direct observed treatment short, course increases success and decrease transmission of resistance TB. TB kills 5000 people every day. Global incidence is still growing at 1 percent every year due to the rapid increase in Africa, and especially affects the most vulnerable (poorest and malnourished),(WHO, 2015).

The detection of 70 percent of the estimated number of smear positive pulmonary cases and the successful treatment of 85 percent of the cases. In all high burden tuberculosis, countries new cases account for 81 percent estimated in all forms. Among 22 high burden countries, Ethiopia ranks

seventh with an estimated incidence of all forms Tuberculosis around 378 per 100,000 new cases per year and 163 per 100,000 new smear positive cases. Now days (WHO, 2015).

According to WHO report, in collaboration with the stop TB partnership and the global Fund to Fight AIDS, Tuberculosis and Malaria launched an initiative called Find, Treat, All. The initiative had a target of detecting and treating 40 million people with TB in the period 2018-2022.The latest treatment outcome data for new cases show a global treatment success rate of 82 percent in 2016. This shows a reduction from 86 percent in 2013 and 83 percent in 2015. (WHO, 2018).

Tuberculosis (TB) has remained a global emergency ever since it was declared as such by the World Health Organization (WHO) in 1993, of the 9.6 million people who developed TB in 2014,28 percent were in the African Region, where the case rate was 281/100,000 population. An estimated 1.2 million (12 percent) TB cases were HIV positive and the Africa region accounts for 74percent of these cases. The global spreading of multidrug resistance TB (MDR-TB) is now a major public health challenge (WHO, 2018).

Ethiopian Federal Ministry of Health (FMOH) hospital statistics data has shown that tuberculosis is the leading causes of morbidity, the third causes of hospital admission and the causes of death in Ethiopia (FMOH, 2011).Ethiopia is also one of the countries in SSA that is hardest hit by the TB and HIV epidemics with an estimated national adult prevalence of 1.5%.The incidence of TB was 258 cases per 100, 000 populations (Solomon Ahmed Ali et al, 2016).

In contrast to the heavy burden posed by the widespread incidence of TB in Ethiopia. Studies conducted in the country on treatment outcome and associated factors of TB at institutional level were very limited. Particularly, there has been no study conducted in west Wollega, Begi district even though there is high proportion of TB cases. Therefore, it is necessary to identify the treatment outcome and factors, which contribute to poor treatment outcome TB at district level. Therefore, this study showed the overall treatment outcome of TB patients started the TB treatment in the district.

1.3. Significance of the Study

This study benefits Beghi District Health office for the control and prevention of Tuberculosis in general and for the successful treatment and quality of care of the Tuberculosis patients in particular'. Moreover, it expected to help the health care facilities in this District to focus action for the improvement of the program service. In addition, findings of this study will provide baseline information for similar future studies.

1.4. Objectives of the study

1.4.1. General objective:

- To assess the treatment outcome and its associated factors among tuberculosis patients treated in Begi District, Ethiopia in one hospital and five health centers, from September 15/2018 to November 20.2018.

1.4.2. Specific Objective:

- To determine the treatment outcome of tuberculosis patients treated in Begi District, Ethiopia.

- To identify factors associated with tuberculosis treatment outcome among tuberculosis patients treated in Begi District, Ethiopia.

2. Literature Review

2.1. Tuberculosis treatment outcome

A Study conducted in kyiv obiast Ukraire in 2017 showed that, over all, among TB patients treated in the study period 34.4 percent of them registered better cure rate whereas high treatment failure rate and death were found to be 12.9percent and 11.3percent respectively. The other treatment outcomes were 29.5percent treatment completed 9.9percent were defaulted (Omownmi A. et al, 2017).

According to cross-sectional study conducted in Addis Ababa, overall treatment outcome among TB patients treated low cure rate and high treatment completed were 18percent and 64.6percent respectively. On the other hand unsuccessful outcomes were registered in the forms of 3.7 percent death, 0.4percent treatment failure,5.1percent default and 5.4percent transfer out (Belete Getahun et al, 2016).

Similarly, a cross-sectional study conducted in Tigray Regional state in 2016 found that, among TB patients treated there were high death rate of 25.7percent. Other treatment outcomes such as treatment completed, cured, defaulted and failure were observed respectively for 58.2percent, 12.6percent, 2percentand 1.5percentof TB patients treated in the area during the indicated period (Kalayta Geday and Hailmariam Lemma, 2016). Another cross-sectional study conducted in the same region in 2012 found that, of TB treated patients there were high cured rate of 85.5 percent and high successful rate of 89 percent. In contrast ,unsuccessful treatment outcomes were only 10.8 percent and other treatment outcomes were 4.4 percent,3.7percent, 3.2 percent and 3.9 percent treatment completed, treatment failure, defaulted and died respectively(Gebretsadik Berhe et al,2012).

Another cross-sectional study conducted in Afar region in 2012found that among patients enrolled in TB treatment majority (61.3 percent) of them were diagnosed smear negative PTB (Mulugeta Belay, 2012).

Likewise, a study conducted on the treatment outcome of all cases of tuberculosis patients in Nekemnte town found that, under directly observed treatment short course in 175 TB patients between 2010 and 2015 were 14.5 percent cured and 56.3 percent treatment completed. Death,

treatment failure, defaulter and transferring to other health facility were recorded for 8.1 percent, 0.2 percent, 7.1 percent and 13.8 percent respectively (Eyasu E. et al, 2015).

According to a study conducted in Metema Hospital, the cure rate of the Tuberculosis during the study period showed in 2009 were 32.3% and decrease to 6.4 in 2011/12, in contrast the patients transfer out was increased 20.7% in 2009 to 40.6% 2011/2012 (Muhabaw J.et al, 2015).

According to a study done in Mekele Town, tuberculosis treatment success was assessed from the total cases based on the study, 44% those patients were cure from the disease and 49.6% were treatment complete, 3.5% were died, 3.1% defaulted, 5.8% transfer out to other health facility and 3.5% were unknown of their final treatment outcome (Misganaw D. and Abrham G.2016).

Another study undertaken in Gonder University Teaching Hospital found that, 29.5% of TB treatment cases were successes and 18.3% defaulted from the treatment. Others were 10.1% died, 0.2% treatment failure and 42.0% transferred to other Health facility but the death rate decreased during the study period (Bely T. 2009).

In another study done in Gonder University, the overall treatment outcome cured, treatment complete, defaulted treatment failed, died and transfer out were 19.9%, 50%, 5%, 1.7%, 0.6% and 22.7% respectively. Treatment cure rate 21.7%in 2007 the study showed success rate were decrease 6.5% in 2009 and dramatically increase in 2011 to 41.3 %(Beyene M.et al, 2015).

A five-year retrospective analysis conducted in Addis Ababa found that in the age one-year-old children poor treatment success rate compared to in the age group 5- 9 years old. Children who were HIV negative showed higher rate of treatment success compared to those HIV positive patients (AOR; 6.66) (3.07-14.47), p=0.000), (Genene Tilahun and Solomon Geberesilase, 2016).

According to a similar study conducted in Gonder University referral hospital in 2017, among those participants of TB/HIV patients 63.3% were their CD4 level were less than 200 cell/mm3, 88.9% of them on Cotrimoxazole prophylaxis, 61.0% were on ART treatment and 61.0% were stage four WHO staging. TB/HIV confection patients 77.3%) were success the treatment, 10.4% and 66.9% cured and treatment completed (Yenework Sinshaw. et al, 2017).

In a study conducted on the outcomes of tuberculosis treatment in Felege Hiwot /Referral Hospital, Northwest Ethiopia, among tuberculosis patients those success treatment outcome, negative tuberculosis bacteria result 26% were treatment completed, 2.5% were treatment defaulters, 5.8% were treatment failure. (Fantahun B.et al, 2013).

A cross-sectional study conducted in Debre Tabor in 2016 showed that high transfer out 10.6%, other treatment outcome 19.8% cured 58.1% treatment completed, 3.5% treatment failed, 2.4% defaulted and (Addisu Melese. et al, 2016).Another study done in west Gojjam Zone, 2016, showed that among TB treatment patients almost similar sex category male 50.7% and female 48.1%.A. Most of the patients were 90.6% newly diagnosed 51.2% extra pulmonary patients and 10.5% of the tuberculosis patients confection with HIV. Other TB treatment outcomes were 94.4% successfully treated, 1.5% defaulted, 3.7% died and 0.3 percent failure (Senedu B. et al, 2016).

According to study in Debre Tabor, Northwestern Ethiopia; study showed that based on TB treatment category classification 89.1% were new tuberculosis cases, 3.8% were treatment relapsed 0.6% were treatment failed and 5.3% were transferred in (Addisu Melese .et al, 2016).

Another study done in Azezo Health centers in North West Ethiopia,2013 found that, of the studied patients 19.3% were smear positive ,48.5% were smear negative tuberculosis patients and 32.2% patients were EPTB patients. From the total Tuberculosis patients were 62% of the patients treatment completed, 18.5% cured 8.5% died and 9.13% treatment failed. (Zelalem Addis .et al, 2013).

In other study done in Fenote selam District Hospital,2016, of the total patients included in study equal age of range 26.6% of the patient's age range between 15-24 years old and 26.6% of the patients the age range between 25-34 years. Unsuccessful Treatment outcome were 5.6% defaulters, 0.7% treatment failure, 8.3% died, 5.3% transfer out, and successful 15.8% cured and 63.3% treatment completed. (Desalegn Amare, 2016).

2.2. Factors Affecting TB treatment outcome

A retrospective cohort study done in north central Nigeria in 2016 found that of the total tuberculosis patients 52.0% were TB/HIV co-infection patients, 44.3% HIV negative patients and 3.6% of the patients were HIV not known. The male patients' higher new cases of tuberculosis 53.3% than the female patients 46.7%. Moreover, 72.5% of HIV negative patients had successful treatment compared to 62.7% of HIV positive patients. The proportion of transferred out patients were higher among HIV positive patients (5.6%) compared to HIV negative patients (3.9%).Failure rate among HIV negative patients was found to be relatively higher (1.9%) than the failure rate among HIV positive patients (0.6%).TB/HIV co-infection patients on Cotrimoxazole prophylaxis's than those who were not on Cotrimoxazole prophylaxis's (p; 0.44) (Abiodun H. et al, 2016).

In another study done in South Africa, TB patients on first line medication of drug side effect of total not developed 89% AOR=95%CI (4.6-56.8).The proportion of smear-positive among HIV negative patients was higher ($p<0.0001$).The death rate was higher among those patients that were HIV positive not on ART. Among HIV, positive TB patients being female lower defaulter rate was associated with treatment success rate adjusted odd ratio (0.57; 95% CI 0.35-0.91). Odd ratio for death rate treatment success high patient HIV positive not on ART Adjusted odd ratio (7.38; 95% CI 2.95-18.47) than those HIV positive on ART. Odd ratio defaulted relation to treatment success was found to be higher in HIV positive not on ART adjusted odd ratio 2.27, 95% CI 1.5 -4.47) than those HIV patient on ART (Mweete D.2015).

According to another study conducted on treatment outcomes after early initiation of antiretroviral therapy for human immunodeficiency virus associated tuberculosis in Hong Kong in 2013, among the HIV/AIDS patients the CD4 count and the viral load suppression at 12 and 24 months from TB DOTS. In other way older age and no initiation of ART medication with two months poor outcome of TB treatment. (Chan CK.et al, 2013).

A cross-sectional study conducted in Afar Region showed that majority of (75%) the study participants were who live within 10 km radius from the nearest health center of 3k.Regarding the forms of TB, the majority (61.3%) of the patients were smear negative PTB, the other form of TB 37.6% were EPTB, but few were 2.1% smear positive PTB (Mulugeta Belay et al, 2012).

According to a study conducted on factors associated with tuberculosis treatment outcome among tuberculosis patients attending tuberculosis treatment center in Mogadishu, Somalia, new tuberculosis treatment cases were more likely to have successful treatment outcome (OR 5.2,95% CI 2.9 to 9.2as compared to retreatment cases(Mariam Khalif et al,2017).

Another study conducted in Debre Tabor, north west Ethiopia on 303 patients with mean age of 34.9 years found that majority of the population were male patients 57.1% and 61% tuberculosis patients were urban residents(Addisu Melese and Bely Zeleke, 2018).

Another cross-sectional study done in Gambella Hospital, Southwest Ethiopia found that among the study participants, majority of the patients were (60.38%) male and 458 (39.62%) were female tuberculosis patients. (Getahun Asebe et. al, .2015

Another study done on Tuberculosis treatment outcome and associated factors among TB patients public Hospitals in Harar, Eastern Ethiopia reported that the rate of treatment success was higher among females (93.8%) than males (91.6%) and among patients from rural settings (94.4%) than urban setting 92.4%(Assefa Tola. et al, 2019).

A cross-sectional study conducted in Addis Ababa, Ethiopia which categorized patients based on disease site found that majority of the patients were Extra pulmonary tuberculosis (EPTB) 40.5% and the others category were pulmonary tuberculosis positive and pulmonary tuberculosis negative 25.6% and 33.9% respectively (Belete Getahun et al, 2016).

A cross-sectional study done in Mekele Town, Tigry Regional state, showed that patients who were rural residents were 18.6 times more likely to have unfavorable outcome than those from urban areas (Misganu D.and Abrham G., 2016).

According to study done in Hong Kong in 2013, among the HIV/AIDS patients the CD4 count and the viral load suppression at 12 and 24 months from TB DOTS. In other way older age and no initiation of ART medication with two months poor outcome of TB treatment. (Chan CK.et al, 2013).

According to a study done in Ibadan, Nigeria in 2009, males had a higher risk of a poor treatment outcome (AOR=1.8; 95% CI: 1.02-1.94) than females. In addition, patients with a poor knowledge of tuberculosis had higher risk of having a poor treatment outcome

(AOR=1.35:95%CI; 1.25-1.62) compared to those with good knowledge (Akinola A. et al, 2009).

Other study done at Dilla university referral hospital in southern Ethiopia in 2016showed that the risk of unsuccessful treatment were higher among patients who were living in rural area (AOR= 1.63, 95% CI: 1.21-2.20) compared to those who lived in urban area. In addition, unsuccessful treatment outcome was observed in PTB patients (AOR=1.77, 95%CI: 1.26-2.50) and EPTB (AOR=2.07, 95%CI 1.28-3.37) compared to the PTB+ patients (Gebremedhin G .et al, 2016).

A study conducted in Health centers of Mekele town, Tigray Regional State of Ethiopia in 2016 found that, of the study participants, more than half of patients (52.2%) were urban residents. Around 96.5%of the tuberculosis patients were not treated previously while extra pulmonary Tuberculosis accounted for about half of the proportion of patients by tuberculosis 50.9% cases. (Misganaw D. and Abrham G., 2016).

A cross-sectional study conducted in south western Ethiopia in 2016 found that of the total tuberculosis patients treated, HIV coinfection TB patients had more than two fold higher risk of unsuccessful outcomes compared to HIV negative TB patients (Abiyot Aseres et al, 2016).

2.3. Conceptual Framework

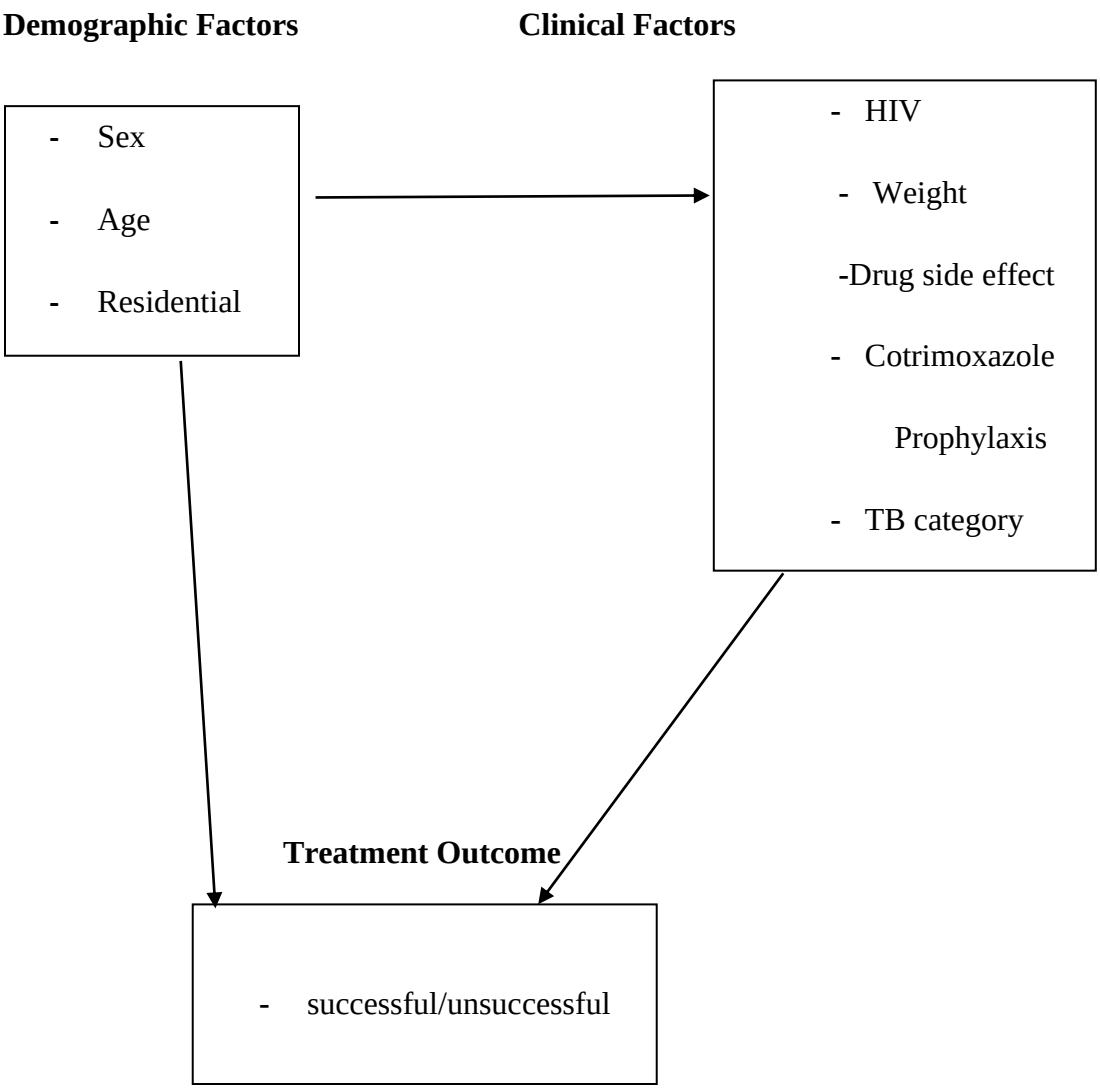

Figure 1: Conceptual framework modified from data used in Literature review

3. METHODS AND MATERIALS

3.1. Study Area and Period

Begi district is one of the districts found in western Wollega Zone at about 540 km away from the capital of Ethiopia, Addis Ababa and bordered with Benishangul Gumuz in West, Nedjo in East, Gidami in North and Mandi in South.

The district has one public hospital and five public health centers providing TB treatment services to their catchment population, and also four private clinics and thirteen-health posts. Between 1January2011 and 31December2017, 864 TB patients had started their treatment in Beghi hospital and the five health centers. There are 130 staffs working in the study facilities, of whom 52 were trained as TB care providers. This study carried out from September 15, 2018 to November 20, 2018.

3.2. Study design

Facility based cross-sectional study was conducted to assess treatment outcome of TB patients by reviewing medical records of TB patients from TB unit register in seven years of review period (between 1stJanuary, 2011 and 31stDecember, 2017).

3.3. Populations

3.3.1 Source population

All TB patients who were treated in public health facilities of Begi District.

3.3.2. Study population

All TB patients who had got treatment in the public health facilities of Begi District between 1 January, 2011 and 31,December, 2017.

3.4. Inclusion and exclusion criteria

3.4.1. Inclusion criteria

All patients who were on first line drugs treatment between1 January2011 and 31December2017

3.4.2. Exclusion criteria

Patient with incomplete medical records.

3.5. Sample size Determination

3.5.1. Sample size calculation for the first objective

For objective I: the sample size was determined by single population proportion formula assuming the prevalence of successful treatment outcome of 56.3%, marginal error of 5% at 95% confidence interval (CI) (Eyasu E et al, 2015).

$$n = \frac{(Z/2)^2 \times p(1-p)}{d^2}$$

Z= the standard normal deviation at 95% confidence level =1.96

P= 56.3% the proportion of successful treatment outcome

d= the desired precision (marginal error) 5%

$$= \frac{(1.96)2 \times 0.563(1-0.563)}{(0.05)^2} = 378 + (10\% * 378) = 416$$

3.5.2. Sample size calculation for the second objective

For the second objective, single population proportion formula was used considering different factors significantly associated with outcome variable with the following assumptions; 95% confidence level (CI), 5% margin of error and power of 80% using Epi Info version 7 software, and 10% adjustment (for non-response)was also considered.

Table 1: Sample size calculation for factors associated with treatment outcome of TB patients.

	Factors	Exposed with the outcome	Unexposed with the outcome	Initial sample size	Noon response (10%)	B	Final sample size	
1	Place of residence	Treatment completed (20.6%)	Treatment completed (36.0%)	320	52	80	372	Misganaw D. and Abraham G. 2016
2	HIV sero status	HIV+ (32.5%)	HIV- (40.8%)	38	4	80	42	Mweete D. et al ,2015

The sample size of the second objective was 372.Finally, the larger sample size was taken from first objective; i.e.416 patients were included in this study.

3.6. Sampling techniques and Procedures

In the first place, 864 records of TB patients who completed their treatment during the review period were identified from the six health facilities. Among them, 416 patients who were on treatment between January 1, 2011 and December 31, 2017 were included in the study using systematic random sampling technique. Then, using the list of medical records of patients who followed treatment for more than two months in each healthcare facility as a sampling frame, the calculated sample size was proportionally allocated.

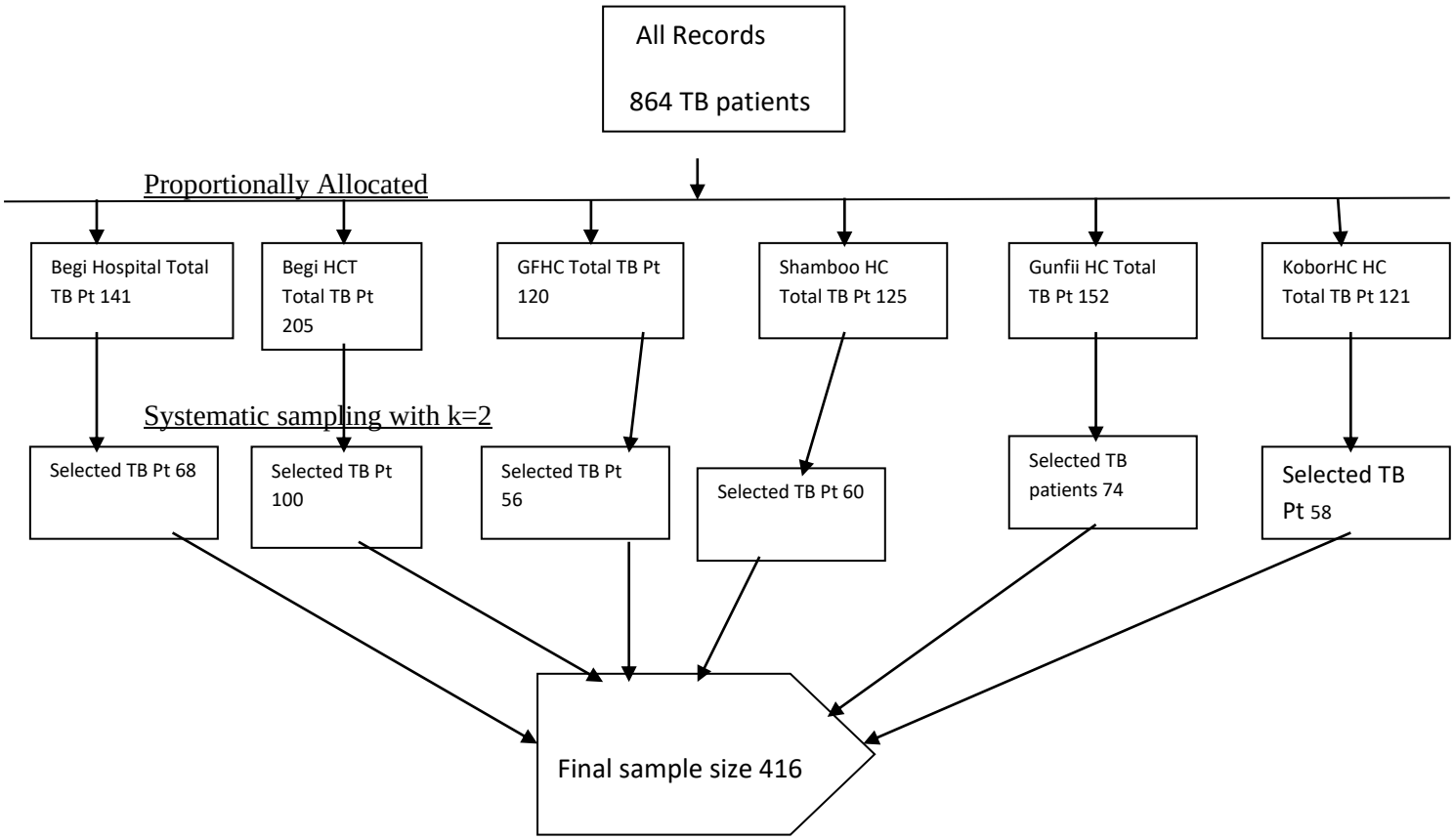

Figure 2:Schematic presentation of sampling technique for416 TB patient records in Begi public health facilities.

3.7. Data Collection Method

3.7.1. Data Collection Tool

Structured checklist was used to collected data on demographic, clinical information and TB treatment outcome from TB registration book with trained data collectors and adopted from national guideline.

3.7.2. Data Collectors

Six trained clinical Nurses who are diploma holders' were employed as data collectors.

3.7.3. Data Collection procedure

Data were collected from National TB registration book standard abstraction checklist. The standardized checklist used included all important socio-demographic data, clinical characteristics (sputum smear, type of TB, patient type, HIV status, and treatment outcomes), laboratory findings, and follow-up data. Six diploma nurses who have had training on comprehensive TB care and had an experience in data collection of such studies collected the data.

3.8. Study Variables

3.8.1. Dependent Variables

Treatment outcome (successful: completed and cured) and (unsuccessful: defaulter, transfer out, treatment failure, death and not evaluated)

3.8.2. Independent variables

- Socio demographic Factors (Sex, Age, Residence)
- Co morbidity (HIV)
- Clinical Factors (Weight, Drug side effect and Cotrimoxazole)
- TB category(New, Relapse, Return after Treatment failure, Return after Lost to follow up and other)
- TB classification (Smear positive pulmonary),(smear negative pulmonary),Extra pulmonary TB

3.9. Operational Definition

The following operational terms were used in accordance with the standard definitions of the National Tuberculosis and Leprosy control program guideline (NTLCP) adopted from WHO.

TB treatment outcome: The final known status of TB patients who started on anti TB treatment.

Cured: An initially smear positive patient who is sputum smear negative at, or 1 month prior to, the completion of TB treatment and on at least on previous occasion (usually at the end of the 2^{nd} or 5^{th} months.

Completed: Patient who completed anti-TB treatment without evidence of failure, but for whom sputum smear or culture results are not available in the last month of treatment and on at least one previous occasion

Cured: a patient who was initially sputum smear positive and who was sputum smear negative in the last month of treatment

Complete treatment: a patient who completed treatment for six or nine months but did not meet the criteria for cure or failure.

Smear positive pulmonary case of tuberculosis: Patient with one or more initial sputum smears positive tuberculosis patients.

Smear negative pulmonary cases of tuberculosis: A patient with pulmonary tuberculosis who does not meet the criteria for smear positive disease.

Extra pulmonary case of tuberculosis: a patient with tuberculosis organs other than the lungs

New case of TB: a patient who has never had treatment for tuberculosis or who has taken anti tuberculosis drugs for less than one month

Treatment after failure: Patients treated for tuberculosis and treatment failed.

Treatment after lost to follow-up: Patients treated for tuberculosis and declared loss to follow up at the end of their most recent course of treatment.

Relapse: Patients treated for tuberculosis were a patient declared cured or treatment completed at their most recent course of treatment and now diagnosed with recurrent episode of tuberculosis.

Transfer in: patients who are accepted to continue treatment in other reporting unit after starting treatment in another reporting unit.

Others: Patients who were treated previously for tuberculosis but whose outcome after their most recent course of treatment is unknown or undocumented and patients that do not fit into any of the category.

Treatment failure: for pulmonary confirmed tuberculosis patients whose follow-up smear result remain positive at or beyond fifth month into treatment.

Lost- to –follow- up: for tuberculosis patient who has discontinued tuberculosis treatment for eight or more consecutive week after initiated on Anti tuberculosis treatment.

Died: A patient who died from any cause during treatment.

Not evaluated; for patients whose final treatment outcome not known at time of evaluation/report, according to the standard definitions of the National Tuberculosis and Leprosy Control Program guidelines of (Ethiopia 2014).

3.10. Data quality control

Health professionals (nurses) extracted data from medical records of TB patients in the selected health facilities. Structured checklist was used for the data collection. The data were checked for their completeness and appropriate extraction every day by a trained supervisor and principal investigator.

3.11 Data Analysis

All incomplete data were identified and correction was made accordingly. Every data coding and entry was checked at the initial stage, mid-way and upon completion of data entry just before statistical analysis. Data quality control during data entry were done by double data entry to Epi-data version 3.1-computer software and then exported and analyzed using SPSS version 20. Descriptive statistics was used for computation of the frequency and percentage of predictor variables and outcome measures. Binary logistic regression analysis was done to show the association between independent and dependent variables. A p-value <0.05 was declared statistically significance at 95% CI.

3.12. Ethical consideration

Ethical clearance letter was secured from Haramaya University College of Health and Medical sciences, Institutional Health research Ethics Review Committee (IHRERC). Permission was obtained from respective administration. Informed, voluntary, written and signed consent was obtained from heads of each of the hospital and the health centers. This study was done under consideration of human right confidentiality. There was no harmful action imposed to patient files and photocopied or remove documents from the records. Anonymity of patients' record was maintained absolutely.

3.14. Information Dissemination

The report of the study was submitted and presented to Haramaya University, and then the copies of the report were given to Beghi district Health office.

4. RESULTS

4.1. Socio-demographic characteristics of patients

A total of 416 patients' records were reviewed and included in the study. One hundred seventeen (28.1%) of the patients were in the age group of 21-30 years. The majority (315, (75.7%)) and more than half (212, (51.0%) of them were rural residents and female patients, respectively (**Error! Reference source not found.**).

Table 2: Socio-demographic characteristics of tuberculosis patients treated in Begi district's health facilities, Oromia, West Ethiopia, January 01, 2011 to December 31, 2017 (n=416)

Characteristics		Frequency(No)	Percentage (%)
Age categories (in years)	<10	33	7.9
	11-20	88	21.2
	21-30	117	28.1
	31-40	84	20.2
	41-50	57	13.7
	>=51	37	8.9
Sex	Male	204	49
	Female	212	51
Residence area	Out of Begi town	315	75.7
	In Begi town	101	24.3

4.2. Clinical characteristics of patients

One-third (138, (33.2%)) of the TB patients were smear positive pulmonary TB cases. The majority (484, (92.3%)) and 16 (3.8%) of the sampled TB patients were new and relapse TB cases, respectively. Of the total TB patients sampled for this study, 15(3.6%) of them were co-infected with HIV and all of them started ART care (Table 2).

Table 3: Clinical characteristics of tuberculosis patients treated in Begi district's health facilities, West Ethiopia, January 01, 2011 to December 31, 2017 (n=416).

Clinical characteristics		**Frequency**	**Percentage**
Types of TB	Smear positive TB	138	33.2
	Smear negative TB	188	45.2
	Extra pulmonary TB	90	21.6
TB categories	New	384	92.3
	Return after treatment failure	3	0.7
	Return after loss to follow up	8	1.9
	Relapse	16	3.8
	Transfer in	1	0.2
	Others	4	1.0
HIV co-infection	Yes	15	3.6
	No	401	96.2
Cotrimoxazole prophylaxis	Yes	15	3.6
	No	401	96.2
TB drugs side effects	Yes	9	2.2
	No	407	97.8
Weight category of TB patients at during starting treatment (in KG)	≤10	10	2.4
	11-20	22	5.3
	21-30	15	3.6
	31-40	74	17.8
	41-50	179	43.0
	51-60	101	24.3
	≥61	15	3.6

4.3. Treatment outcome of TB patients

The overall TB treatment outcome was favorable (treatment success rate) for 365(87.7%) with 95%CI (84.4% to 90.9%) in the study area**Error! Reference source not found.**(Table 3).

Table 3: Treatment outcome of tuberculosis patients treated in Begi district's health facilities, Oromia, West Ethiopia, January 01, 2011 to December 31, 2017 (n=416)

Treatment outcome of TB patients	Treatment completed	248	59.6
	Cured	117	28.1
	Lost to follow up	9	2.2
	Death	14	3.4
	Transfer out	19	4.6
	Failure	6	1.4
	Not evaluated	3	0.7

4.4. Factors associated with Treatment outcome of TB patients

Results of bivariable analysis as summarized in Table 4 showed that TB treatment/drugs side effect was significantly associated with TB treatment outcome at P-value<0.001. Likewise, HIV infection and age category of 21-30 years were significantly associated with TB treatment outcome at P<0.05 while other predictors were not significantly associated with TB treatment outcome at P<0.05 but selected as candidate predictor for multivariate analysis at P<0.25. However, Sex was not a candidate predictor at P<0.25 (Table 4)

Table 4: Bivariable logistic regression of factors associated with Treatment outcome of TB patients treated in Begi district's health facilities, West Ethiopia, January 01, 2011 to December 31, 2017 (n=416)

Associated Factors		TB Treatment outcome		COR (95%CI)
		Favorable (%)	Unfavorable (%)	
Age category (in years)	<10	25(75.8)	8(24.2)	1
	11-20	81(92.0)	7(8.0)	0.69(0.27, 1.79)
	21-30	105(89.7)	12(10.3)	2.56(1.01,6.50)*
	31-40	77(91.7)	7(8.3)	1.93(0.87, 4.28)
	≥ 41	77(81.9)	17(18.1)	1.93(0.87, 4.28)
Sex	Male	181(88.7)	23(11.1)	2.43(0.95, 6.18)
	Female	184(86.8)	28(13.2)	1
Residence area	Urban	280(88.9)	35(11.1)	1.51(0.80, 2.85)
	Rural	85(84.2)	16(15.8)	1
HIV infection	No	355(88.5)	46(11.5)	3.86(1.26, 11.79)*
	Yes	10(66.7)	5(33.3)	1
Weight category at time of TB treatment (In KG)	≤20	25(78.1)	7(21.9)	1
	21-30	12(80.0)	3(20.0)	1.12(0.25, 5.12)
	31-40	66(89.2)	8(10.8)	2.31(0.76, 7.04)
	41-50	157(87.7)	22(11.3)	2.00(0.77, 5.16)
	≥51	105(90.5)	11(9.5)	2.67(0.94, 7.57)
Type of TB	PTB +VE	123(89.1)	15(10.9)	1.77(0.83, 3.80)
	PTB -VE	168(89.4)	20(10.6)	1.82(0.89, 3.70)
	EPTB	74(82.2)	16(17.8)	1
Category of TB	New	339(88.3)	45(11.7)	1.74(0.68, 4.45)
	All others	26(81.2)	6(18.8)	1

***=P<0.001=,**= P<0.01 and *= P<0.05; COR=Crude odds ratio and CI= Confidence Interval

During multivariable analysis, the odds of favorable TB treatment outcome were about 3.6 , 2.8 and 3.9 folds significantly higher among TB patients aged 11-20 years [AOR=3.609(1.183,11.008)], aged 21-30 years [AOR=[2.817(1.033, 7.680)] and aged 31-40 years **[AOR=3.952(1.273,12.264)**)] compared to TB patients in the aged <11 years old, respectively. Those TB patients who did not have HIV co-infection were four times more likely to have favorable TB treatment outcome compared to those TB patients who did have HIV infection and statistically significant [AOR=**3.952(1.273,12.264)]** (Table 5).

Table 5: Multivariable logistic regression of factors associated with Treatment outcome of TB patients treated in Begi district's health facilities, Western Ethiopia, January 01, 2011 to December 31, 2017 (n=416)

ssociated Factors		**TB Treatment outcome**		**AOR (95% CI)**
		Favorable (%)	**Unfavorable (%)**	
Age category (in years)	<10	25(75.8)	8(24.2)	1
	11-20	81(92.0)	7(8.0)	3.609(1.183,11.008)*
	21-30	105(89.7)	12(10.3)	2.817(1.033, 7.680)*
	31-40	77(91.7)	7(8.3)	3.952(1.273,12.264)*
	≥ 41	77(81.9)	17(18.1)	1.495(0.570, 3.917)
Residence area	Urban	280(88.9)	35(11.1)	1.370(0.704, 2.663)
	Rural	85(84.2)	16(15.8)	1
HIV infection	No	355(88.5)	46(11.5)	3.952(1.273,12.264)*
	Yes	10(66.7)	5(33.3)	1
Weight category at time of TB treatment (In KG)	≤20	25(78.1)	7(21.9)	1
	21-30	12(80.0)	3(20.0)	0.759(0.118, 4.894)
	31-40	66(89.2)	8(10.8)	1.228(0.130, 11.641)
	41-50	157(87.7)	22(12.3)	1.028(0.116, 9.078)
	≥51	105(90.5)	11(8.5)	1.368(0.147, 12.768)
Type of TB	PTB +VE	123(89.1)	15(10.9)	1.184(0.565, 2.479)
	PTB -VE	168(89.4)	20(10.6)	0.819(0.354, 1.895)
	EPTB	74(82.2)	16(17.8)	1
Category of TB	New	339(88.3)	45(11.7)	1.458(0.527, 4.031)
	All others	26(81.2)	6(18.8)	1

5. Discussion

In the current study, the overall rate of the treatment success was found to be 87.7 %. This is similar to the findings reported in Gonder Hospital (78.8%), Gonder University Referral Hospital (77.3%), Dabre Tabor (77.9%) and Dilla University Referral Hospitals (85.3%). This might be due to training and commitment of Begi district health workers (Tadesse. B et al., 2016; Yenework Sinshaw et al, 2017; Addisu Melese et al, .2016; Gebremedhin G et al, 2016).

The odds of favorable TB treatment outcome were 3.6, 2.8 and 3.9 folds significantly higher among TB patients in the age group 11-20, 21-30 and aged 31-40 years respectively compared to those in the age group <11 years. This finding is consistent with the study conducted in South Africa (Mweete D.2015). This might be due to close follow up by the health professionals, and TB patient in the mentioned age group might have enough information about the prevention of TB cases and advantage of TB medication.

In this study, the majority of tuberculosis cases were females (51%). This finding is consistent with previous studies conducted in different areas of Ethiopia, 43.9% and 39.62% (Addisu Melese and Belay Zeleke, 2018; Getahun Abebe et al., 2015). Higher TB cases rate among females than males might be because females are more likely to be exposed to the disease. The other possible reason could be less utilization of health services by females than males.

In the present study, 1.4% of the patients were treatment failures. Similar findings were reported in studies conducted in Gonder Hospital (0.2 %) (Belay T, 2009), Gonder University Hospital (0.5%) (Tadesse B, 2015), Felege Hiwot Hospital (5.8%) (Fantahun B.et al, 2016), Debre Tabor (3.5%) (Addisu M.et al, 2016) and Gojam Zone (0.3%) (Sendu B. et al, 2016).

This study revealed that one-third (33.2%) of TB patients were smear positive pulmonary TB cases. This result is comparable with the study conducted in Addis Ababa (25.6%) (Belete Getahun, et. al.2016). This might be due to presence of good laboratory services at each health services and presence of trained health professional who early detect TB based on TB sign and symptoms.

The study finding also showed that the magnitude of relapse from tuberculosis disease was 3.8%. This finding is in line with study done in northwestern Ethiopia (Addisu Melese et al. 2016). This might be due to the level of understanding for TB treatment and poor follow up of the medication.

The death rate in this study was 3.9%which is inconsistent with reports from Addis Ababa (3.7%) (Belete Getahun et al.2016), Tigray Region (3.9%) (Gebretsadik Berhe et.al.2012) and Mekele Town (3.5%) (Misganu D and Abrham G.2016).This variation in death rate might be related to differences in study population, living condition and the difference of knowledge about the disease and medication they follow.

Besides, the present study also found that those TB patients who did not have TB HIV co-infection were four times likely to have favorable outcome compared to those TB patients who have TB HIV co-infection. This result is comparable with a study conducted in Southwestern Ethiopia (Abyot Asres et al, 2015). This might be due to drug-drug interaction and poor adherence among TB HIV co-infected patents.

Generally, the findings of the present study pointed out that TB treatment outcome and associated factors are highly associated with not having coinfection with HIV TB case and a good success rate in Begi District among TB patients.

6. Limitation and Strength of the study

6.1. Limitation

Due to the nature of secondary data, there were not enough information on the patient registration and limited factors were assessed. Important variables like patient's income and patient's behavior could not be assessed.

6.2. Strength

It was conducted at Institutional level of Begi district: Where TB treatment outcome was not known before.

7. Conclusion and Recommendation

7.1. Conclusion

This study showed that the successful TB treatmentoutcome among TBpatients was high. Not having HIV coinfection and age were found to be the factors associated with successful TB treatment outcome in this study.

7.2. Recommendation

Based on the study's findings, the following recommendations have been forwarded.

District and Health Facilities

- Health facilities should have good follow up on TB-HIV coinfection
- Provide health education for new patient to complete their treatment for better TB treatment success rate

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9. APPENDICES

Annex 9.1: Information sheet and informed Voluntary consent form for head of Health institutions.

My name is Mulugeta Gobena am going to conduct a study on treatment outcome of TB patients in Begi Hospital and other Health centers for the fulfillment of my master's degree in public health. At Haramaya University, college of health and medical science I kindly request you to lend me your attention to explain you about the study and get permission to conduct the study.

The study title: Treatment outcome and associated factors among tuberculosis patients treated in Begi District, Oromiya, Ethiopia.

Purpose of the study: The finding of this study can have contribution for partial fulfillment of masters of Science in public Health and improvement of the quality of TB treatment and for further prevention and control of tuberculosis in Begi District Health office.

Procedures and Duration: Data were extracted from medical records of TB patients who were on treatment from January 1 2011 up to December 30 2017.In the Begi Hospital, five health centers Data were extracted using the structured checklist, and it will take two months.

Risk and Benefits: There is no direct contact with TB patients. Ingeneral, there is minimum harm imposed to the patients' records and files or to the corresponding patients indirectly .But the finding from this study may reveal important information for the prevention and control of tuberculosis

Confidentiality and anonymity: The data collected from patients records will be contained with absolute confidentiality. No any kind of extraction or Photocopy of the patients' data will be done at all. Moreover, no result referring individuals will be produced at the end. Data will be contained in a password locked computer as far as it is needed to keep raw.

Rights: The management unit of the _____have the right to decide on the document of its clients who have been treated in health facilities .So it is possible not to accept the study at all or to stop any time in between in the case any inconvenience occurs.

Annex 9.2:English Version Questionnaire

Data question check list

MRN PATIENTS

s.n	Question	Expected Response	Remark
Biographic data			
1o1	Age	<10 years	
		11-20 years	
		21-30 years	
		31-40 years	
		>+41 years	
102	Sex	Male	
		Female	
103	Residence	Out of Begi town	
		In Begi town	
104	Tuberculosis treatment outcome		
	Treatment completed		
	Cured		
	Lost to follow up		
	Died		
	Transfer out		
	Treatment failure		
	Not evaluated		
	Clinical Factors		
105	HIV infection	Yes	
		No	
106	Weight	<10 kg	
		11-20kg	
		21-30kg	

		31-40kg	
		41-50kg	
		>+50kg	
107	Drug side effect	Yes	
		No	
108	ART start	Yes	
		No	
109	Cotrimoxazole prophylaxis start	Yes	
110	TB category		
	New		
	Relapse		
	Return after treatment failure		
	Return after lost to follow up		
	Transfer in		
	Others		
111TB classification			
	Pulmonary positive TB Pulmonary negative TB		
	Pulmonary negative TB		
	Extra pulmonary TB		

Annex 9.3. Afan Oromo version

.Kaayyon Afaan oromotti jijjiruun barbaachiseef yeroo namoon gaaffii gafataman akka gaaffin gaafataman hubatanii deebii siirrii akka deebisaniif.

Lak	Gaafilee	Deebii	Yaada
101	Umurii	Waggaa 10 gadi	
		Waggaa 11-20	
		Waggaa 21-30	
		Waggaa 31-40	
		Waggaa 41-50	
		Waggaa 51 oli	
102	Saala	Dhiira	
		Dubartii	
103	Tessuma	Magaalaa Begii ala	
		Magaalaa Begii keessa	
104	**Bu'aa Dawwaa Dhukuba sonbaa**		
	Kan fayye		
	Kan Xumure		
	Kan du'e/duute		
	Kan addaan kute		
	Kan hin milkoofnne		
	Kan hin madalamne		
	Haala Fayyummaa		
105	HIV kan qabu	Eeyyee	
		Miti	

106	Ulfaatina Qaamaa	Kiilograama 10 gadi	
		Kiilograama 11-20	
		Kiilograama 20-30	
		Kiilograama 31-40	
		Kiilograama >+41	
107	Dhiibbaa Qorichaa	Eeyyee	
		Miti	
108	Qorich Farra HIV/AIDS kan jalqabe	Eeyyee	
		Miti	
109	Qorich ittisa dhukuboota ada adaa kan jalqabe	Eeyyee	
		Miti	
110	**Hamaloota Dhukuba sonbaa**		
	Haaraa		
	Dhufaatii Erga Qoricha Hin milkoofnee		
	Dhufaatii Erga Qoricha addan kutee		
	Kan itti deebi'ee		
	Kan iddoo biraatii dhufe		
	Kan biro		
111	**Gosoota dhukuba Sonbaa**		
	Dhukubni sonbaa kan irratti argame		
	Dhukubni sonbaa kan irratti hin argamne		
	Dhukaba sonbaan alaa		

Annex 9.3. Curriculum Vitae (C. V)

1. Personal Information

- Full Name: Mulugeta Gobena Yadeta
- Gender: Male
- Date of Birth: September 2 19 81 G.C
- Place of Birth: Gimbi
- Address: Gimbi Ethiopia
- Phone Number: 0932520027
- Email Adress:mulegobena12@gmail.com

2. Educational Background

- **Primary School:**
  - 1-3: Marechwodebo 19 80-1989 E.C
- **Secondary and Preparatory School**:
  - 9-12 Gimbi comprehensive High School 1990-1994 E.C
- **Higher Education:**

- Central Health College in clinical Nurse from 1996- 1998 E.C
- Jima University in Health Education from 20000-2005 E.C
- Undergraduate Research Title: Chronic malnutrition among below five

Children and its associated factors

- **Post Graduate**

- Haramaya University, collage of Health and Medical Science, School of Graduate Studies, General public Health.

3. Job description and Work experience

- Worked at, ART, TB/LEPROCY, Adult OPD, less than five OPD and community based health education and promotion.

4. Language skills

Language	**Speaking**	**Listening**	**Reading &writing**
- **Amharic**	Excellent	Excellent	Excellent
- **Afann Oromo**	Excellent	Excellent	Excellent
- **English**	V. good	V.good	V.good

5. Hobbies

- Reading
- Playing volleyball
- Care patients