Research Article | *European Journal of Emergency Medicine & Critical Care*

Prevalence of Tuberculosis Among Adults Living with HIV at Arba-Minch General Hospital In 2023, South Region, Ethiopia

Bezawit Girma Gebre[1][*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma[6], Bethel Kassahun Seifu[5], Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1][*]

[1]Department of Medicine Arba Minch University College of Medicine and Health Sciences, Ethiopia.
[2]Department of Medicine Jimma University Oromia Region, Ethiopia
[3]MPH Candidate at the Harvard T.H. Chan School of Public Health in Boston, Massachusetts, USA.
[4]Medical Practitioner- Jordan Medical Council
[5]Department of Medicine University of Gondar College of Medicine and Health Science Ethiopia
[6]Department of Medicine, Addis Ababa University, College of Medicine and Health Science, Addis Ababa, Ethiopia
[7]Department of Medicine, Mekelle University, College of Health Science, Mekelle. Ethiopia

[*]**Corresponding author:** Email Address: bezagirma819@gmail.com (Bezawit Girma Gebre) or tedikas19@gmail.com (Tewodros Kassahun Tarekegn)

To cite this article: Bezawit Girma Gebre[1][*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma6Bethe[l], Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1][*]

Abstract

Introduction: *Tuberculosis is still the leading cause of morbidity and mortality of people living with HIV (PLWHIV). Many of these deaths occur in developing countries, like Sub-Saharan African countries. Ethiopia is one of the countries highly affected by TB/HIV co-infection epidemics. There are few studies done on the Prevalence of TB among PLWHIV.*

Objective: *The purpose of this study is to assess the prevalence of TB among People living with HIV who were on chronic HIV care services at Arba Minch General Hospital.*

Methods: *A one-year retrospective cross-sectional study was conducted among 212 adult patients who were enrolled in a chronic HIV care clinic from September 2022 to September 2023. All samples were taken from the above-selected enrollment period who fulfilled the inclusion criteria. The data has been analyzed by entering SPSS software version 26. The variables' frequency and distribution were worked out using a cross tab. Then, the data was analyzed using appropriate descriptive and inferential statistical tests. A binary logistic regression model will be used. Finally, relevant tables, graphs, and percentages are displayed. Descriptive results were summarized and presented with tables.*

Result: *A total of 212 Patient medical charts were selected for the study. Among these, 62.7% were females, and 37.3% were males. During one year, about 15 HIV patients had developed active TB infection, making the prevalence 7.1%.*

Conclusions: *The prevalence of tuberculosis infection in this study was 7.1 %. The infection rate was also highest in married females within the age range of 35 – 44 years who came from the city of Arba-Minch itself. Thus, we recommend tailoring the various therapeutic and preventive interventions to this group, such as Increasing public health awareness, Community mobilization, strengthening policies that support PMTCT, Early screening of TB, and Consolidation of TPT services.*

Keywords: *Pulmonary Tuberculosis, Prevalence, TB/HIV co-infection, public hospitals, South Region, Ethiopia.*

1. Introduction

1.1. Background

Tuberculosis, a preventable and curable communicable disease, is one of the leading causes of death from an infectious agent worldwide. It is also the foremost cause of death of people living with HIV and among the top contributors to disease and death from drug-resistant infections (1). Despite advancements in accessing antiretroviral therapy (ART), mortality remains high among individuals living with human immunodeficiency virus (PLHIV), primarily attributed to tuberculosis (TB) infection. In Sub-Saharan Africa, around 80% of HIV-related mortality cases are linked to TB (3).

The causative agent, Mycobacterium tuberculosis, spreads from person to person through the air. Latent TB infection results in only about 10% of infected individuals developing active TB at some point, typically through coughing. This disease predominantly affects the lungs (pulmonary TB) but can also manifest in other sites (extra-pulmonary TB) (5). HIV infection, caused by a retrovirus spread through body fluids, weakens the immune system, heightening susceptibility to opportunistic infections. Tuberculosis emerges as a significant opportunistic infection and a leading cause of death among individuals living with HIV/AIDS. The synergy between TB and HIV has been identified as a severe threat to human health (7).

To cite this article: Bezawit Girma Gebre[1*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma6Bethe[l], Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1*]

HIV-infected people with latent TB infection have an annual risk of developing active TB disease that may be as high as 5-10%, the risk being higher the more advanced the stage of immune deficiency. HIV-infected people are also at risk of progressive disease immediately after infection with M. tuberculosis and are vulnerable to reinfection. Finally, active TB may adversely affect the clinical course of HIV disease itself (6). The introduction of effective therapy for TB in the 1950s led to optimism about the prospects for global TB control. Still, some eight million cases of active TB and three million deaths continue to occur annually.

HIV infection significantly increases susceptibility to TB, and this has led to a tremendous increase in TB in areas where both diseases are prevalent. Around 15 million persons worldwide are infected with both HIV and tuberculosis, of whom over two-thirds reside in Sub-Saharan Africa. 1.5 million People died from TB in 2020 (including 214,000 people with HIV). Worldwide, TB is the 13th leading cause of death and the second leading infectious killer after COVID-19 (above HIV/AIDS). Several African countries have seen their TB caseload double or triple since the HIV/AIDS pandemic began (9).

1.2. Statement of The Problem
In 2020, an estimated 214,000 people living with HIV died from T.B. Every day, more than 4100 people die from tuberculosis (TB), and nearly 30,000 people fall ill with TB disease despite it being preventable and treatable. However, TB is the leading cause of death among people living with HIV, accounting for around one-third of AIDS-related deaths globally. The global target for reducing TB deaths among people living with HIV by 2020 was missed (62% vs 75%) (2).

Infection of TB enhances the replication of HIV, which leads to increased viral load and accelerates the progression of HIV infection to AIDS. TB increases the occurrence of other opportunistic infections. The management of TB/HIV co-infected individuals is challenging because of the pill burden. Thus, there are increased adverse effects, drug-to-drug interaction, immune reconstitution inflammatory syndrome (IRIS) and so on (17).

TB/HIV coinfection and drug-resistant TB aggravate the TB situation globally. According to national surveys, on average, 47% of tuberculosis patients and their households faced costs, including direct medical expenditures, direct non-medical payments such as transportation and lodging, and indirect costs such as lost income, which exceeded 20% of annual household income. In addition, TB/HIV coinfection contributes to the transition of mycobacterium tuberculosis at the community level and seriously affects the health and survival of HIV-negative individuals as well. A study conducted in Ethiopia also shows that co-infected individuals have a greater risk of common mental disorders, low quality of life, stigma & discrimination and poor physical health than HIV-infected individuals without active TB ART treatment has transformed the survival of HIV-infected individuals and has made it manageable. Although it reduces the TB incidence among individuals receiving HAART, TB risk remains elevated and unacceptably high (7).

The proportion of patients with impaired immune restoration was also significantly higher among patients who developed incident TB during ART follow-up (7).

1.3. Significance of The Proposed Study
In recent years, significant efforts have been made to integrate TB diagnosis and treatment into HIV care, which helps especially to prevent, diagnose, and treat TB among people with HIV and HIV among TB patients. This has created the chance for additional research to understand better the burden of TB and factors associated with the incidence of TB, which could help to increase service quality.

Therefore, studying the prevalence of TB among HIV-infected patients will be more critical for the healthcare system in making appropriate decisions to improve the survival and quality of life of people living with HIV. This figure is far from the target of the "End TB" Strategy, namely that no tuberculosis-affected households should face costs of this magnitude. The proportion is higher for patients with drug-resistant tuberculosis and their families (87% pooled average). Survey results show that the country still needs to meet the target.

The outcome of this study will provide information about risk factors or the most influential covariates that significantly impact the incidence of TB and identify the TB incidence rate under those significant factors at different times among HIV-infected patients during ART care. As a result, it can provide recommendations for researchers and government bodies to reduce the incidence of TB among HIV patients.

2. Literature Review
Even though it is preventable, treatable, and curable, TB is the leading cause of hospitalization and death of PLWHA. The global number of tuberculosis deaths (including deaths among people living with HIV) between 2019 and 2020 increased from 1.4 million to 1.5 million, reversing progress to the level of 2017. This is the first annual increase in the number of people dying from tuberculosis since 2005 and is attributed to the adverse impact of the COVID-19 pandemic. Overall, instead of the targeted milestone of a 35% reduction in the number of tuberculosis deaths between 2015 and 2020, there was a reduction of only 9.2%. However, 33 countries have achieved the milestone in reducing the number of tuberculosis deaths. WHO has updated its global list of countries with a high burden of tuberculosis. Cambodia, the Russian Federation, and Zimbabwe have transitioned out of the list of high-burden countries, while Gabon, Mongolia, and Uganda have joined (1).

The overall estimate of HIV prevalence in TB patients was 31.8%. There was substantial heterogeneity in the prevalence estimates in Southern, Central, Eastern, and Western sub-Saharan Africa regions (43.7, 41.3, 31.1 and 25.5%, respectively). An apparent reduction in the estimate was noted from 33.7% in the period before 2000 to 25.7% in the period after 2010. The Eastern and Southern sub-Saharan Africa regions had a higher prevalence [34.4% than the Western and Central regions [27.3%]. The prevalence of HIV in TB patients has declined over time in sub-Saharan Africa. We argue that this is due to strengthened HIV prevention and control response and enhanced TB/HIV collaborative activities. (2)

To cite this article: Bezawit Girma Gebre[1*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma[6], Bethel Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1*]

Ethiopia is in the top 30 TB and HIV coinfection countries in the world, with an estimated TB incidence rate of 140 per 100,000 TB and 112/100,000 TB cases among those with HIV. (2). According to the Federal HIV/AIDS Prevention and Control Office (HAPCO) estimates, 613,000 adults (0.9% of the adult population) were HIV-positive. However, this distribution was highly heterogeneous, with the lowest prevalence (0.1%) in Somalia and the highest in the Gambela Region (4.8%). The majority of PLWHA were from the Amhara (30%), Oromia (26%), and Addis Ababa (18%) regions. Jimma's study, published on December 6, 2021, showed the proportion of TB occurrence among HIV-1 infected patients was 17.3%. This finding is supported by the previous Ethiopian studies from Debre Markos (16.99%) and Hawassa (18.2%). (6)

Around 70% of people with untreated pulmonary TB die within ten years. Although the risk is reduced by being on effective antiretroviral therapy, among people living with HIV, untreated TB is rapidly fatal in almost all cases. TB is the top infectious killer worldwide, with three people dying of TB every minute. In 2017, there were around 1.6 million TB deaths, including 300,000 people living with HIV. There has been progress in reducing TB deaths among people living with HIV in recent years, which were reduced by 44% from 2010 to 2017. However, TB remains the leading cause of death among people living with HIV, accounting for one in three AIDS-related deaths. Different studies have documented the increased risk for TB among HIV-infected adults (4).

Many breakthroughs can be achieved by improving collaboration between HIV and TB programs and investing in diagnostics, vaccines, preventive medicine, and medicine to treat TB, including multidrug-resistant TB. However, more commitment, investment, and action are needed (4).

Filling the funding gaps, as well as investing in research and innovation, will not only save lives but yield significant returns (1). Countries with a high burden of HIV-associated TB need to integrate and scale up their TB/HIV services rapidly. Early and frequent TB screening and testing for people newly diagnosed with HIV is essential, and the delay between diagnosis and treatment must be drastically reduced. People diagnosed with active TB must be started on treatment, and people with no symptoms of active TB should immediately receive TB preventive treatment. Similarly, people newly diagnosed and treated for TB should be encouraged to test for HIV and, if HIV-positive, should be started on antiretroviral therapy as soon as possible (4).

3. Objectives
3.1. General Objective
➢ To assess the Prevalence of TB in HIV-positive patients.
3.2. Specific Objective
To determine the prevalence of tuberculosis among adult HIV-infected patients

4. Methods
4.1. Study Area
The study was conducted at Arbaminch General Hospital at Arba-Minch town, which is the capital of Gamo zone, South Ethiopia Region, Ethiopia, 500 km away from Addis Ababa (the capital city of Ethiopia), and approximately 245 kilometers from Wolayta Sodo, the capital of South Ethiopia Regional State. Its elevation is 2,133m above sea level. The town has two sub-cities, namely Secha and Sikela. The city has four public health facilities: Arba Minch General Hospital, Dil Fana Primary Hospital, Secha Health Center and Weze Health Center. The first three of these public health facilities provide ART services to HIV/AIDS patients. Arba Minch General Hospital serves as a critical healthcare facility in the town, making it an ideal setting for studying TB prevalence among people living with HIV. Understanding the dynamics of coinfection is essential for targeted interventions and improved healthcare.

4.2. Study Design and Period
A one-year institution-based retrospective cross-sectional study was conducted. The study used secondary data from medical charts of ART clinic patients who attended the clinic from September 11, 2022, to September 11, 2023. The data was collected from December 23, 2023, to December 28, 2023.

4.3. Source Population
The source population is those adults living with HIV who have been registered to chronic HIV care and support programs in AMGH, specifically the ART clinic.

4.4. Study Population
The study populations for this study were selected HIV patients who are on antiretroviral treatment and registered for follow-up at chronic HIV care.

4.5. Inclusion and Exclusion Criteria
4.5.1. Inclusion
Adult HIV patient Medical charts registered on ART clinic from September 11, 2022, to September 11, 2023, who are on antiretroviral treatment and registered for follow-up at chronic HIV care at Arba-Minch General Hospital, ART clinic.

4.5.2. Exclusion
Those patients' charts with missing or incomplete baseline and follow-up data will be excluded.

4.6. Sample Size and Sampling Procedure
From the early published study, 17% is taken as proportion/prevalence from Jimma's study published on December 6, 2021, which showed the proportion of TB occurrence among HIV-infected patients was 17%. This finding is supported by the previous Ethiopian studies from Debre Markos (16.99%) (6).

The Minimum sample size required will be determined using a single proportion formula.
Sample size=N
$$N = \frac{Z^2 \times \text{Expected proportion} \times (1 - \text{Expected proportion})}{(\text{Marginal Error})^2}$$
$$\frac{(1.96)^2 \times 0.17 \times (0.83)}{(0.05)^2}$$
N=216.82
The minimum sample size required was 217.
For the Incomplete data, 10% of the final sample size (23) was added, leading to the final sample size of 240.
Correction formula nf= n/(1+(n/N)= 240/(1+(240/1796) = 212

To cite this article: Bezawit Girma Gebre[1*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma[6], Bethel Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1*]

4.7. Sampling Procedure

A computer-generated simple random sampling technique was used to select the Patient's medical charts from the master register book as a sampling frame.

4.8. Variable of The Study

- The presence of active TB infection among HIV-infected patients
- **Sociodemographic characteristics**: Age, sex, residence, marital status, baseline weight in kg, substance use
- **Baseline clinical characteristics**: WHO clinical stage, initial regimen, initial regimen change, prior history of tuberculosis, functional status, Sites (Type) of TB

4.9. Operational Definitions

Prevalence TB case: The proportional numbers of TB cases during follow-up.

Adults: Patients above the age of 15 (As per the ART clinic in AMGH).

TB/HIV Coinfection: Occurrence of TB infection at the same time as an established HIV Infection.

4.10. Data Collection Procedures and Tools (Data Quality Control, Personnel and Instruments)

All available information on patient records was checked, and an appropriate data extraction format was prepared in English. Charts were retrieved using the Patient's registration number, which was found in the electronic system's database. Then, the data was extracted from patients' charts.

4.11. Data Quality Control

Data quality was maintained by giving the collectors an orientation for half a day. Before data collection, the data collectors were provided with information on the study's objective and how to extract data for this study's purpose using the data extraction format. The data extraction tool was pretested on 5% (11 patient charts) of the sample size for consistency in understanding the review tools and completeness of data as it is secondary data.

4.12. Data Processing and Analysis

Data was checked for consistency & completeness. Data was analyzed by entering SPSS software version 26. The variables' frequency and distribution were worked out using a cross tab. Then, the data was analyzed using appropriate descriptive statistical tests. Finally, relevant tables, graphs and percentages were displayed. Descriptive results have been summarized and presented with tables.

4.13. Ethical Considerations

The Department of Public Health officer of Arba Minch University wrote an official letter of cooperation to concerned bodies. Permission was obtained from the zonal health bureau of the Gamo Gofa zone. When conducting the research, the benefit outweighs the risk, and dignity and privacy will be prioritized.

4.14. Dissemination of Results

The final findings of this study will be submitted to Arba Minch University College of Medicine and Health Science, Department of Public Health and School of Medicine.

The research findings will also be disseminated to the zonal health bureau of Gamo Zone, Arba Minch General Hospital and other concerned bodies at different managerial levels to enable them to consider recommendations during their planning process.

5. Result

Sociodemographic characteristics of HIV patients

The medical charts of 212 HIV patients were included, and about 7.1% of HIV patients had developed tuberculosis (any type). Female HIV patients account for about 62.7% of the cases, and more than half (61.3%) were married. Regarding the current residence of patients, about 68.4% are living in Arba Minch town.

Clinical characteristics of HIV-infected patients

Based on WHO Clinical Stages, 28.3% of the HIV patients were Stage 1, 62.7% were Stage 2, 4.2% were Stage 3, and 4.8% were Stage 4. Eighty-eight (60.4%) of the patients had normal BMI, while 17.4% had a BMI less than 18.5 kg/m2.

Table 1: Sociodemographic characteristics of the HIV infected Patients at the ART clinic of AMGH.

Variables		Frequency	Percentage
Sex	F	133	62.7%
	M	79	37.3%
Age range, years,	15-24	23	10.8%
	25-34	46	21.7%
	35-44	72	34%
	45-54	38	18%
	>55+	33	15.5%
Marital status	Divorced	37	17.5%
	Married	130	61.3%
	Single	26	12.3%
	Widow	19	9%
Residence	AM	145	68.4%
	ArbaMinch Zuria	40	18.9%
	JINKA	9	4.2%
	Others	18	8.5%

To cite this article: Bezawit Girma Gebre[1*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma[6], Bethel Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1*]

Table 2 Clinical characteristics of HIV-infected patients at the ART clinic of AMGH.

Parameters		Frequency	Percentage
WHO staging	I	60	28.3%
	II	133	62.7%
	III	9	4.2%
	IV	10	4.8%
TB positive	Overall	15	7.1%
	WHO Stage III	9	4.2%
	WHO Stage IV	6	2.8%
TB negative	< 18.5	197	92.9%
BMI	18.5- 24.9	42	19.8%
	>25	147	69.3%
		23	10.8%

WHO- World Health Organization, BMI- Body Mass Index, TB- Tuberculosis

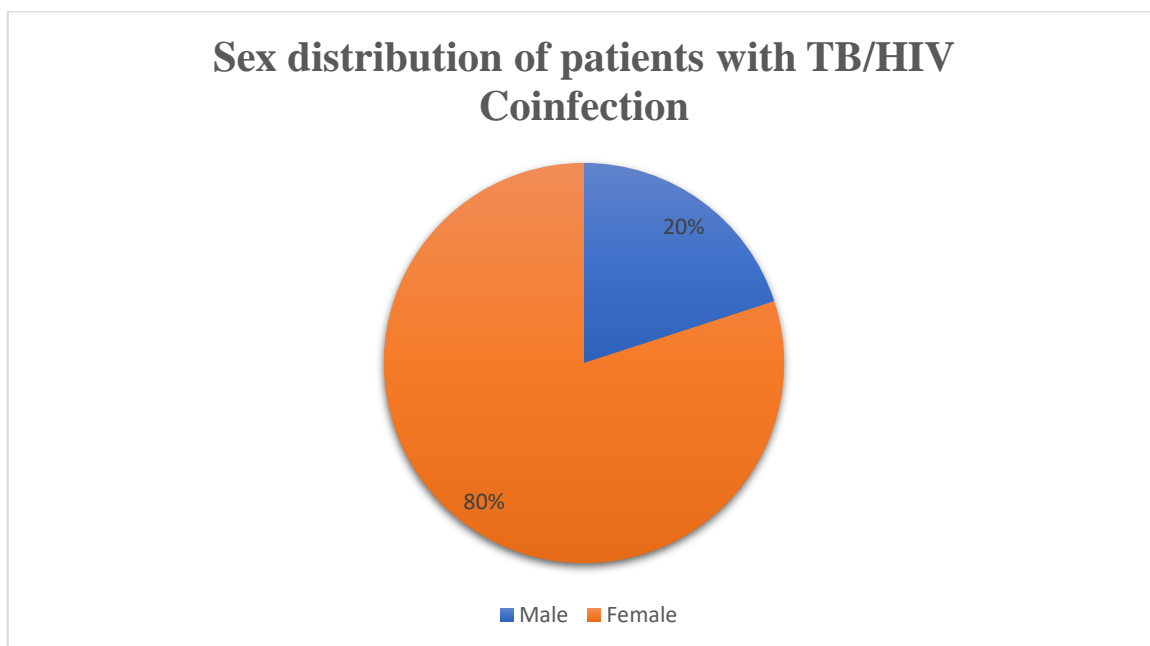**Figure 1:** Sex distribution of patients with TB/HIV Coinfection.

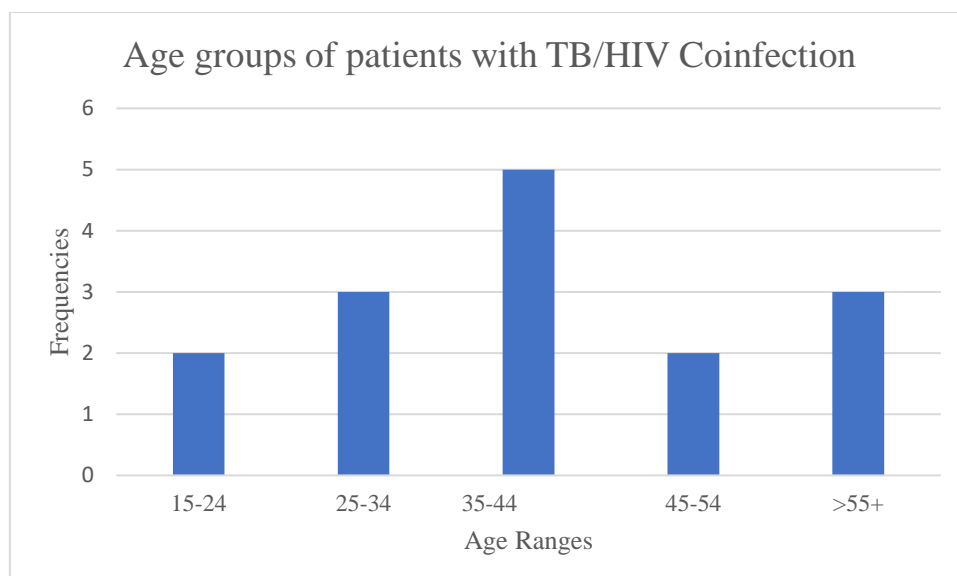

Figure 2: Age Groups of patients with TB/HIV Coinfection.

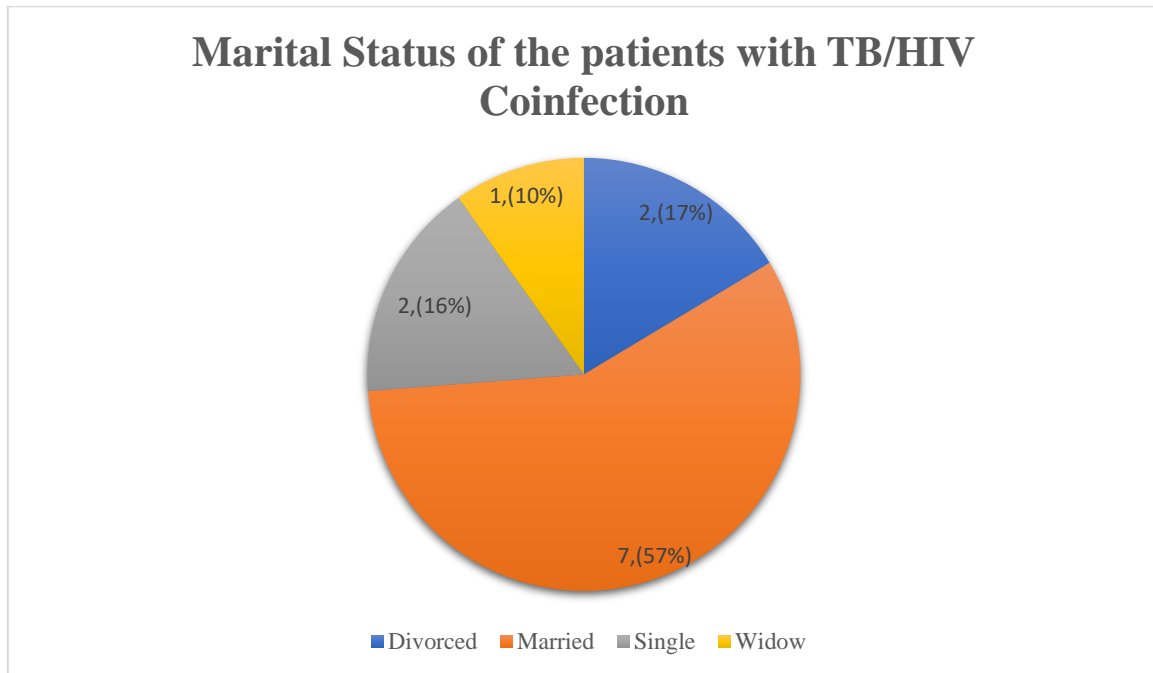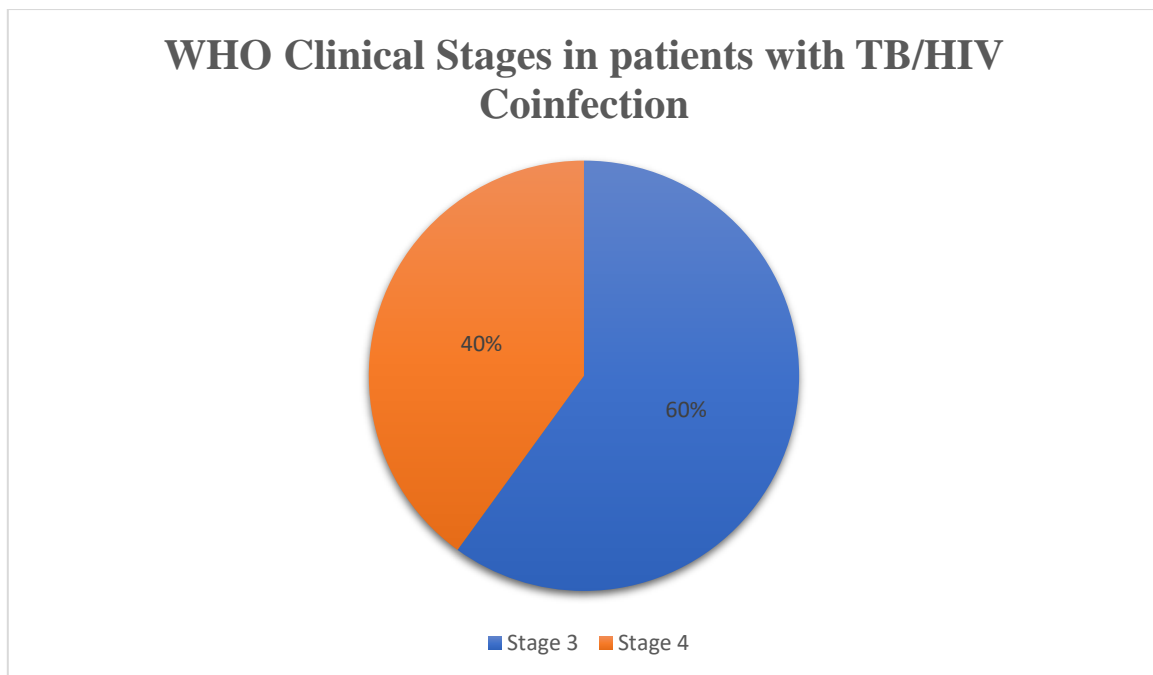**Figure 3:** Marital Status of the patients with TB/HIV Coinfection.

Figure 4: WHO Clinical Stages in Patients with TB/HIV Coinfection.

6. Discussion

In our research to assess the prevalence of TB in HIV-positive patients in AMGH in the year 2015 EC, we have found the prevalence to be 7.1%. This is compared to a study done in 2021 GC, whose concluded prevalence was 17%. This shows a marked decrease in the prevalence and can be attributed to the efficacy of the various interventions put in place by the hospital. These interventions include patient education, strict follow-up and provision of the appropriate ART regimen. This trend in prevalence has also been noticed in other previous studies, which were conducted in Hawassa (18.2%) (13), Debre Tabor (14), Debre Markos (6.19%) (15) and Gojjam (16).

In this study, the prevalence of TB in female patients far outweighs that of their male counterparts (80% vs. 20%). This finding is also supported in similar studies across the country: Jimma (54.7 vs. 45.3%) (6), Debre Markos (61.34 vs. 38.66%) (15), and Hawassa (63.7 vs. 36.1%) (13).

TB coinfection is most prevalent within the age range of 35 – 44 years (33.3%). These findings are supported by multiple studies across the country, like Hawassa (35 – 44 years) (15.8%) (13) and Debre Tabor (35 – 44) (40.3%). When analyzing the addresses of the respective patients, it was found to be most prevalent within the city of Arbaminch. The similarity in

To cite this article: Bezawit Girma Gebre[1*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma[6], Bethel Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1*]

findings could be due to the uniformity of several risk factors in patients due to the country's general socioeconomic conditions and the disease's pathogenesis.

The discrepancy in findings could be attributed to differences in the Study period, Sample size, Study design, the number of patients who have follow-up at the ART clinics and, by extension, the total population served by the hospitals in which the various studies were conducted.

7. Limitation and Strength of The Study
Since this study was based on secondary data, some essential predictors that had a significant association with TB occurrence, such as CD4 count and viral load, have yet to be consistently recorded. The absence of specific essential parameters during follow-up documentation may impact the generalizability of this study. However, this study could also yield a few insights on how to enhance the quality of care the hospital provides further.

8. Conclusion
The prevalence of tuberculosis infection in this study was 7.1 %. The infection rate was also highest in females within the age range of 35 – 44 years. It was found to be most prevalent in married women as opposed to Single, divorced women and also widows. The prevalence was found to be highest in patients who came from the city of Arbaminch itself.

9. Recommendations
- For the government
o Strengthening HIV preventative methods includes increasing public health awareness, mobilizing the community, and inducing behavioral change.
o Arranging various peer-to-peer support groups
o Strengthening policies that support PMTCT
o Tailoring the various therapeutic and preventive interventions to high-risk population groups
- For AMGH
o Ensure appropriate data collection and storage methods regarding the medical records of patients who have follow up at the ART clinic.
o Increasing the ease of follow-up to ensure adherence
o Early screening of TB and Consolidation of TPT services
- For Future Researchers
o Further research should utilize prospective cohort studies by incorporating essential variables that can be difficult to extract retrospectively, like the effect of viral load and socioeconomic variables, to give better insight into the distribution of the factors and their respective impact on the occurrence of TB in HIV-positive patients.

Abbreviations
AIDS: Acquired Immunodeficiency Syndrome
AMGH: Arba Minch General Hospital
ART: Antiretroviral Therapy
BMI: Body Mass Index
BSc: Bachelor of Science
CI: Confidence Interval
EPI-INFO: Epidemiological Information
EPTB: Extra-pulmonary TB

FMOH: Federal Ministry of Health
HAART: Highly Active Antiretroviral Therapy
HIV: Human Immune Deficiency Virus
IQR: Inter Quartile Range
IRIS: Immune Reconstitution Inflammatory Syndrome
OIs: Opportunistic Infections
PLWHA: People living with HIV/AIDS
PTB: Pulmonary TB
SNNPR: Southern Nation Nationality People Region
SPSS: Statistical Package for Social Science
TB: Tuberculosis
UNAIDS: United Nations Program of HIV/AIDS
WHO: World Health Organization

Reference

1. WHO, GLOBAL STRATEGY FOR TUBERCULOSIS RESEARCH AND INNOVATION, 2021; (1,4,7,8): 1 – 9
2. HIV PREVALENCE AMONG TUBERCULOSIS PATIENTS IN SUB-SAHARAN AFRICA
3. THE OPEN INFECTIOUS DISEASE JOURNAL 2011, RESEARCH PRIORITIES FOR HIV/M.TUBERCULOSIS COINFECTION
4. UNAIDS JOINT UNITED NATIONS PROGRAMME ON HIV/AIDS
5. PREVALENCE AND INCIDENCE RATE OF TB AMONG HIV-INFECTED PATIENTS ENROLLED IN HIV CARE TREATMENT AND SUPPORTIVE PROGRAM IN MAINLAND TANZANIA
6. ACTIVE TB INFECTION AND ITS ASSOCIATED FACTORS AMONG HIV-1 INFECTED PATIENTS AT JIMMA MEDICAL CENTER, SOUTHWEST ETHIOPIA, 2021; (4): 4 – 7
7. INCIDENCE AND PREDICTORS OF TB AMONG HIV-POSITIVE ADULTS AT DEBRE MARKOS REFERRAL HOSPITAL
8. TB AND HIV EPIDEMIOLOGY AND COLLABORATIVE SERVICE: EVIDENCE FROM ETHIOPIA, 2011–2015
9. WHO, GLOBAL TUBERCULOSIS REPORT EXECUTIVE SUMMARY 2020
10. INCIDENCE AND PREDICTORS OF TUBERCULOSIS AMONG ADULT PEOPLE LIVING WITH HIV AT PUBLIC HEALTH FACILITIES OF HAWASSA CITY, SOUTH ETHIOPIA. RETROSPECTIVE FOLLOW-UP STUDY
11. MAGNITUDE AND ASSOCIATED FACTORS OF PULMONARY TUBERCULOSIS AMONG HIV/AIDS PATIENTS ATTENDING ANTIRETROVIRAL THERAPY CLINIC AT DEBRE TABOR SPECIALIZED HOSPITAL, NORTHWEST ETHIOPIA, 2019
12. ORGANIZATION WH. SYSTEMATIC SCREENING FOR ACTIVE TUBERCULOSIS: AN OPERATIONAL GUIDE. GENEVA: WORLD HEALTH ORGANIZATION; 2015
13. PREVALENCE AND DETERMINANTS OF TUBERCULOSIS AMONG HIV INFECTED PATIENTS IN SOUTH ETHIOPIA. J INFECT DEV CTRIES. 2015;9(8):898–904.

To cite this article: Bezawit Girma Gebre[1*], Kirubel Tesfaye Hailu[2], Biruk Getachew Wakjira[7], Surafel Alemayehu Tsegaye[3], Ryan Riyad Haddad[4], Mohammed Ebrahim Musa[6], Yeabsera Mekonnen Duguma[6], Bethel Kassahun Seifu[5], Lidya Maregie Habtu[5], Kalkidan Gobeze Anbessie[5], Dagmawi Dereje Wale[1], Tewodros Kassahun Tarekegn[1*]

14. MAGNITUDE AND ASSOCIATED FACTORS OF PULMONARY TUBERCULOSIS AMONG HIV/AIDS PATIENTS ATTENDING ANTIRETROVIRAL THERAPY CLINIC AT DEBRE TABOR SPECIALIZED HOSPITAL, NORTHWEST ETHIOPIA, 2019. HIV/AIDS RES PALLIAT CARE. 2020; 12:849–58.
15. INCIDENCE AND PREDICTORS OF TUBERCULOSIS AMONG HIV-POSITIVE ADULTS ON ANTIRETROVIRAL THERAPY AT DEBRE MARKOS REFERRAL HOSPITAL, NORTHWEST ETHIOPIA: A RETROSPECTIVE RECORD REVIEW. BMC PUBLIC HEALTH. 2019; 19:1566.
16. PREDICTORS OF TUBERCULOSIS INFECTION AMONG ADULTS VISITING ANTIRETROVIRAL TREATMENT CENTER AT EAST AND WEST GOJJAM, NORTHWEST, ETHIOPIA, 2017. BMC INFEC T DIS. 2020;20(1):1–10.