

MAKERERE



UNIVERSITY

**COLLEGE OF VETERINARY MEDICINE, ANIMAL RESOURCES AND
BIOSECURITY**

**PREVALENCE OF TUBERCULOSIS AND FACTORS ASSOCIATED WITH TB
INFECTION AMONG THE NEW HIV PATIENTS ATTENDING
ANTIRETROVIRAL THERAPY AT KOMAMBOGA HEALTH CENTRE III**

BY

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**A DISSERTATION SUBMITTED TO THE COLLEGE OF VETERINARY
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DECLARATION AND APPROVAL

I **TWINE ROBERT**, declare that this research report is of my own and has never been submitted to any institution for academic award of any kind known to me.

I am responsible for the work presented in this report and is best of my knowledge.

Signature..........

Date.....04/08/25.....

This special research report has been prepared under the supervision and guidance of my supervisor

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Date.....04/08/2025.....

DEDICATION

This work is dedicated to my mother Mrs. NATUKUNDA MOUREEN, My Dad Mr. BWETUNGYE PETER and my brothers and sisters and all my well-wishers not forgetting Mr. ASABA JUSTUS for financial support up to this far and they have always prayed for me, stood with me at all levels of circumstances that have emerged may the Lord reward you all.

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TABLE OF CONTENTS

DECLARATION AND APPROVAL	I
DEDICATION	II
ACKNOWLEDGEMENT	III
TABLE OF CONTENTS	IV
LIST OF TABLES	VII
LIST OF FIGURES	VIII
LIST OF ABBREVIATIONS AND ACRONYMS	IX
ABSTRACT	X
CHAPTER ONE: INTRODUCTION	1
1.1 BACKGROUND OF THE STUDY	1
1.2 PROBLEM STATEMENT.	2
1.3 STUDY OBJECTIVES	3
1.3.1 GENERAL OBJECTIVE	3
1.3.2 SPECIFIC OBJECTIVES OF THE STUDY	3
1.4 RESEARCH QUESTIONS.....	3
1.5 JUSTIFICATION	3
1.6 SIGNIFICANCE	4
CHAPTER TWO: LITERATURE REVIEW	5
2.1 EPIDEMIOLOGY OF TUBERCULOSIS AND HIV	5
2.2 TUBERCULOSIS AND HIV BURDEN	5
2.3 ASSOCIATION BETWEEN TB AND HIV	6
2.4 BIOLOGICAL INTERACTIONS BETWEEN TB AND HIV CAUSING ORGANISMS	6
2.5 TB AND HIV TRANSMISSION	6
2.6 TB AND HIV PATHOPHYSIOLOGY	7
2.7 TB AND HIV DIAGNOSIS	8
2.8 RISK FACTORS ASSOCIATED WITH TB-HIV CO-INFECTION	9
CHAPTER THREE: MATERIALS AND METHODS	11
3.0 METHODOLOGY	ERROR! BOOKMARK NOT DEFINED.
3.1 STUDY SITE	11

3.2 STUDY DESIGN	11
3.3 STUDY POPULATION	11
3.4 SELECTION CRITERIA OF RESPONDENTS.....	11
3.4.1 INCLUSION CRITERIA	11
3.4.2 EXCLUSION CRITERIA	12
3.5 SAMPLE SIZE DETERMINATION	12
3.6 SAMPLING METHOD.....	12
3.7 SPUTUM COLLECTION AND HANDLING.....	12
3.7.1 DETECTION FOR MYCOBACTERIUM TUBERCULOSIS AMONG HIV PATIENTS GENEXPERT MTB.....	13
3.7.2 ZN-STAINING TECHNIQUE	13
3.7.3 Detection of HIV.....	14
3.8 DETERMINATION OF TB AMONG THE HIV PATIENTS	15
3.9 DATA MANAGEMENT AND ANALYSIS	15
3.11 ETHICAL CONSIDERATION	15
CHAPTER FOUR: RESULTS.....	16
4.1 PARTICIPANT CHARACTERISTICS	16
4.1.1 DEMOGRAPHIC PROFILE.....	16
4.1.2 CLINICAL AND NUTRITIONAL STATUS.....	16
4.1.3 BEHAVIORAL AND SOCIOECONOMIC CHARACTERISTICS	16
4.2 PREVALENCE OF ACTIVE TUBERCULOSIS AMONG THE NEW HIV-PATIENTS	18
4.3 RISK FACTORS ASSOCIATED WITH ACTIVE TB INFECTION AMONG NEW HIV-POSITIVE PATIENTS	18
4.3.1 SMOKING	18
CHAPTER FIVE: DISCUSSION, CONCLUSION, LIMITATIONS	22
5.1 DISCUSSION	22
5.2 CONCLUSION.....	24
5.3 RECOMMENDATIONS	24
5.4 LIMITATIONS.....	25
REFERENCES.....	26
APPENDICES	29

APPENDIX I: CONSENT FORM.....	29
APPENDIX II: DATA ACQUISITION TOOL	31
APPENDIX III: TB REQUEST FORM	32
NATIONAL TB AND LEPROSY PROGRAMME FORM 03	32
DATE:_____	32
APPENDIX III: KCCA APPROVAL LETTER.....	34

LIST OF TABLES

Table 1: Laboratory examination and reporting of results of sputum for AFBS Microscopy how they looked.....	13
Table 2: showing HIV patient`s results	15
Table 3: Summary of Participant Characteristics (N = 154).....	17
Table 4: Bivariate associations between participant characteristics and TB Status (N = 154)	19
Table 5: Multivariable logistic regression analysis of factors associated with TB infection ..	21

LIST OF FIGURES

Figure 1: Pie chart showing the prevalence of TB among the newly diagnosed HIV patients.....	18
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LIST OF ABBREVIATIONS AND ACRONYMS

AFB	Acid Fast Bacilli
AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
CDC	Center for Disease Control
Dr.	Doctor
EDTA	Ethylene Diamine Tetra-acetic Acid
HIV	Human Immunodeficiency Syndrome
IUAT	International Union against Tuberculosis
mL	Milliliters
PTB	Pulmonary Tuberculosis
RDTs	Rapid Diagnostic Tests
SPSS	Statistical Package for the Social Sciences
TB	Tuberculosis
WHO	World Health Organization
ZN	Ziehl-Neelsen

ABSTRACT

Tuberculosis (TB) is an infectious disease that most often affects the lungs and is caused by a type of bacteria "*Mycobacterium Tuberculosis*" MTB. Globally, about 2 million deaths due to tuberculosis occur annually throughout the world). According to World Health Organization (WHO), about 1/3 of the world population is infected by TB half of which are in sub – Sahara Africa. 5 -10% of these will show symptoms and they become sick or infectious at some point, more so if they are HIV positive.

The report presents a cross sectional and descriptive study carried out to determine the prevalence of TB among the new HIV patients attending antiretroviral therapy at Komamboga HCIII between 1st December, 2024 and 29th March, 2025. A purposive sampling technique was employed on HIV positive patients. Sputum samples were collected from only HIV patients, processed and examined both microscopically and by Gene-Xpert technology to diagnose TB, and determine the prevalence of TB among the newly diagnosed HIV patients at the study area. Data on age, sex, and diagnostic results for TB among others were collected. The data collected (outcome of the study) was entered into a Microsoft office Excel program 2016 and later exported to SPSS version 20 and analyzed with help of a biostatistician. The analyzed data was presented in table forms, and pie-charts graphs. A total of 154 respondents all known HIV patients aged 10 years and above who visited the Hospital at the time of the study were included in the study. Findings revealed that out of 154 respondents, 17 patients were diagnosed with TB that is 11.0% and 89.0% were diagnosed with TB negative (n=137), the number of females in this cohort was relatively bigger (n=106) compared to the male counterparts (n=48) Therefore the research was aiming at determining the prevalence of TB among the new diagnosed HIV patients attending ART clinic at Komamboga Health Center that was found to be 11.0%.

Further research of the same kind should be done to incorporate the persons below 10 years of age because this study was focused on those above that age. From the research, we recommend community awareness to increase knowledge on HIV and TB management. Patients diagnosed with TB should be given ant *Mycobacterium* drugs.

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Tuberculosis (TB) is an infectious disease that most often affects the lungs and is caused by a type of bacteria so called “Mycobacterium Tuberculosis” (MTB) (Wei et al., 2020). Globally, about 2 million deaths due to tuberculosis occur annually throughout the world (Daley, 2019). According to World Health Organization (WHO), about 1/3 of the world population is infected by TB half of which are in sub – Sahara Africa. 5 -10% of these will show symptoms and they become sick or infectious at some point, more so if they are HIV positive (Geresu & Mulu, 2016). Recent data estimates show that 3-7 million HIV patients develop TB per year and up to 5 million people develop acute pulmonary TB (Obeagu & Onuoha, 2023). Tuberculosis cases have doubled or trebled in the past 10 years in several African countries owing to the HIV epidemic and Tuberculosis is responsible for about 13 percent of all AIDS death worldwide (Obeagu & Onuoha, 2023).

Africa is facing the worst tuberculosis epidemic since the advent of the antibiotic era (Dixon & Tameris, 2018). Driven by a generalized human immune deficiency virus (HIV) epidemic and compounded by weak health care systems, inadequate diagnostic laboratories and conditions that promote transmission of infectious agents, the devastating situation has become exacerbated by the emergence of drug-resistant strains of mycobacterium tuberculosis (WorldHealthOrganization, 2017).

In Uganda, the HIV/AIDS epidemic has been accompanied by a severe epidemic of tuberculosis (Kagaayi & Serwadda, 2016). Available data suggests that this increase in TB infection rate is mainly as a result of the burden of HIV infection primarily because HIV induces immune suppression. HIV is the most patient risk factor for the progression of TB infection to acute disease. According to the World Health Organization estimation, about one third of the world’s population is infected with tuberculosis bacteria, about ten million cases of active disease are estimated to occur each year, and annually three million people die of tuberculosis (Sotgiu et al., 2017). The human immune deficiency virus (HIV)/AIDS has substantially altered the epidemiology of TB by increasing the risk of reactivating latent TB, increasing chance of TB infection once exposed to tubercle bacilli (re-infection) and by increasing the risk of rapid progression soon after infection from below 10% to about 25% in a spell of 10 years from 2012 to 2022 (Kagaayi & Serwadda, 2016; Sotgiu et al., 2017).

Several studies documented that the person infected with *Mycobacterium tuberculosis* (MTB) only has a 10% risk of developing TB during life time but for persons co- infected with both TB and HIV the annual risk of developing active TB disease exceeds 30%.(Obeagu & Onuoha, 2023).

HIV also causes difficulties in diagnosis and treatment of TB due to unusual clinical picture with increased smear negative Acid-Fast Bacilli (AFB) pulmonary TB, atypical finding on chest radiography and increased prevalence of extra pulmonary TB (Fenta et al., 2020; Obeagu & Onuoha, 2023).

One-third of the world's population has latent Tuberculosis (TB) infection, which increases the risk of becoming ill with TB. This infectious disease is a leading killer among people living with human immunodeficiency virus (HIV), and 26% of HIV deaths are attributable to TB (Getahun et al., 2010). Many of these deaths occur in resource-limited settings, (Obeagu & Onuoha, 2023). People living with HIV also have an estimated 20 to 30 times greater risk of developing active TB than people without HIV infection (Fenta et al., 2020).

The estimated total number of incident cases of tuberculosis worldwide rose to 9.4 million in 2009, more than at any other time in history (Yew et al., 2011). The worldwide tuberculosis incidence rates are estimated to have peaked in 2014 and since then decreased at a rate of less than 1% per year (WorldHealthOrganization, 2022).

Therefore, this research aimed at determining the prevalence of Tuberculosis (TB) among the newly diagnosed HIV patients attending antiretroviral therapy (ART) at Komamboga Health Center III and identified key risk factors for TB infection in this group of patients.

1.2 Problem Statement.

Despite advances in HIV treatment and TB control, the co-infection of TB and HIV remains a significant public health concern, particularly at Komamboga Health center III. The prevalence of TB among the New HIV-positive individuals attending antiretroviral therapy (ART) at this health facility is unknown, and factors associated with increased risk is poorly understood.

The World health organization end TB strategy targets 2035 (John, 2019) but still it remains a burden both globally, Africa, East Africa, and Uganda this is due to increased drug resistance

in Tuberculosis causative agent strain, immuno-compromised individuals due to infections and other associated chronic diseases that suppress the immunity of individual TB patients (WorldHealthOrganization, 2022).

Therefore, this research aimed at determining the prevalence of Tuberculosis (TB) among New HIV patients attending antiretroviral therapy (ART) at Komamboga Health Center III and identified key risk factors associated with TB infection in this group of patients.

1.3 Study objectives

1.3.1 General Objective

To determine the prevalence of Tuberculosis among the New HIV-positive patients attending antiretroviral therapy (ART) clinic at Komamboga health center III.

1.3.2 Specific Objectives of the study

1. To determine the prevalence of active TB among the New HIV-Positive patients attending ART clinic at Komamboga Health center III.
2. To identify factors associated with active TB infection among the New HIV-Positive patients attending ART clinic at Komamboga Health center III

1.4 Research Questions

1. What is the prevalence of active Tuberculosis among the New HIV patients attending ART clinic at Komamboga health center III?
2. What are the factors associated with active Tuberculosis and New HIV patients attending ART clinic at Komamboga health center III?

1.5 Justification

Accurate data on the prevalence of Tuberculosis (TB) at Komamboga Health Center III is inadequate that is hindering effective program, planning and resource allocation.

Further more research is needed to better understand the specific risk factors that increase the likelihood of TB infection in newly diagnosed HIV-positive patients at this facility enabling targeted interventions.

Therefore, this research was aiming at determining the clear picture of TB infection prevalence among the New HIV patients attending ART clinic at Komamboga Health Center III and aiming at providing broad information on how to live with the co-infection while on therapy and informing the public on the main risk factors associated with the HIV-TB co-infection improving awareness of how to go about with the risk factors associated with the co-infection.

1.6 Significance

The study provided clear statistics of the prevalence of Tuberculosis among the newly diagnosed HIV patients and thus a new strategy integrated TB control and management. This can be adopted to World Health Organization and National management of TB.

Early diagnosis of TB in HIV patients will largely improve clinical outcomes, public awareness and health strategies to optimize the use of current Limited resources thereby minimizing government expenditures.

The research was aiming at boosting knowledge and improvement of government policies towards the advocacy of TB strategic controls and treatment programs thereby improving health care to the communities.

The study clearly identified the main risk factors associated with HIV-TB co-infection thereby sensitizing the community on how to live with the co-infection while adhering to prevention of such risk factors for the better health.

CHAPTER TWO: LITERATURE REVIEW

2.1 Epidemiology of Tuberculosis and HIV

Tuberculosis (TB) is a bacterial infection caused by a bacteria called *Mycobacterium tuberculosis* (MTB). TB is categorized as latent TB and acute TB. Acute TB is manifested in immune compromised individuals while latent TB does not present with any symptoms. Millions of people worldwide are living with both TB and HIV (WorldHealthOrganization, 2020). The World Health Organization (WHO) estimates that around 10% of people living with HIV will develop TB in their lifetime, the new TB cases occur frequently among HIV-positive individuals particularly in regions with high prevalence (WorldHealthOrganization, 2022). TB is a major cause of depressed immunity leading to poor antibody response and increase susceptibility to other infections and *Mycobacterium tuberculosis* is one of the bacterial pathogens associated with defective immunity (Obeagu & Onuoha, 2023). The endemicity of Tuberculosis and HIV co-infection has been reported in many regions of the world (Huante et al., 2019). Tuberculosis and HIV Co-infection is the among the major cause of morbidity worldwide, each accounting for over one million deaths a year (Zhang et al., 2024). In 2023, 10.3 million of individuals were officially diagnosed with TB worldwide and it is estimated that 9.2 million per year are reported as new TB cases (WorldHealthOrganization, 2020).

2.2 Tuberculosis and HIV burden

About 6 million people die every year due to TB and HIV co-infection; (WorldHealthOrganization, 2017) and the 2 million die due to TB. The increasing global burden of Tuberculosis is linked to human immunodeficiency virus (HIV) infection (Zhang et al., 2024). And of which 1/3 of the infected with this co-infection die due to TB and the biggest percentage death occur in sub-Saharan Africa. Pregnant mothers, children under age of 5 and other immune compromised individuals are the most at risk because of their weak immune system (Obeagu & Onuoha, 2023). Africa is facing the worst tuberculosis epidemic since the advent of antibiotics era driven by a generalized by human immune deficiency virus (HIV) epidemic and inadequate diagnostic laboratories and conditions that promote transmission of infectious agents (Chinedu et al., 2017). In 2014, there was about 7.5 million new TB cases, and the disease caused 1.4 million deaths worldwide. Scientist note that as the world ages, higher number cases and deaths will occur. If left unchecked, within 20 years, TB will kill 35 million people.

2.3 Association between TB and HIV

TB and HIV are increasing and together kill about 6 million people each year (Tornheim & Dooley, 2017). Both diseases disproportionately affect the poor, and the greatest impact of Tuberculosis is among the immune compromised individuals, the young children and those living with chronic diseases (John, 2019). The association between Tuberculosis (TB) and HIV is a complex and concerning one, it is not by coincidence that these two diseases often co-occur, there is a strong interconnected relationship that makes each disease more dangerous when they exist together (Chinedu et al., 2017). HIV weakens the body's immune system by attacking CD4+ T cells, which are essential for fighting off infections and CD8+ that are necessary for anti-Mycobacterial response, and through a deregulation of the cytokine cascade. Moreover, the respiratory distress that is frequent during acute HIV infection both in children due to metabolic acidosis and in adults due to pulmonary edema and (acute respiratory Distress syndrome) can worsen the respiratory effort related to TB (Reshmi, 2017). A large proportion of people with latent Tuberculosis live in HIV-endemic areas, and thus the co-infection with these two organisms is likely to be common. In populations where both diseases are endemic, there may be implications for increased incidence of clinically detectable tuberculosis (Sailo et al., 2022).

2.4 Biological interactions between TB and HIV causing organisms

The biological interactions between TB and HIV are complex and contribute to the heightened vulnerability of HIV infected individuals to TB and the worsening of both diseases. TB is an opportunistic infection (OI). Opportunistic infections that occur more often or are more severe in people with weakened immune systems than in people with healthy immune systems. HIV weakens the immune system, increasing the risk of TB in people with HIV. People who have both HIV and TB should be treated for both diseases; however, when to start treatment and what medicines to take depends on a person's individual circumstances (Sailo et al., 2022).

2.5 TB and HIV Transmission

M. tuberculosis is spread by small air borne droplets nuclei, generated by the coughing, sneezing, talking, or singing of a person with pulmonary or laryngeal tuberculosis. These minuscule droplets can remain airborne for minutes to hours after expectoration. The number of bacilli in the droplets, the virulence of the bacilli, exposure of the bacilli to UV light, degree

of ventilation and occasions for aerosolization all influence transmission (Obeagu & Onuoha, 2023). Introduction Mycobacterium Tuberculosis into the lungs leads to infection of the respiratory system; however, the organisms can spread to other organs, such as the lymphatic, pleura, bones/joint, or meninges, and cause extra pulmonary tuberculosis. HIV is transmitted through the exchange of certain bodily fluids from a person with HIV to another person, through anal or vaginal sex without protection, sharing needles, syringes or other drug injection equipment, pregnancy, child birth or breastfeeding (Chinedu et al., 2017).

2.6 TB and HIV Pathophysiology

In TB pathophysiology, once in held, the infectious droplets settle throughout the air ways. The majority of the bacilli are trapped in the upper parts of the airways where the mucus secreting goblet cells exist (Long et al., 2022). The mucus produced catches foreign substances and the cilia on the surface of the cells constantly beat the mucus and its entrapped particles upward for removal. This system provides the body with an initial physical defense that prevents infection in most persons exposed to tuberculosis. The subsequent phagocytosis by macrophages initiates a cascade of events that results in either successful control of the infection, followed by latent tuberculosis, or progression to active disease, called primary progressive tuberculosis(Lampron, 2017).

The outcome is essentially determined by the quality of the host defenses and the balance that occurs between host defenses and invading mycobacteria. For the manifestation of HIV illness, HIV enters the body and attaches to CD4⁺ T cells (a type of white blood cell crucial for the immune system through a protein called *gp* 120 on the viral surface. Once inside the CD4⁺ T cell, HIV uses an enzyme called reverse transcriptase to convert its RNA genome into DNA(German Advisory Committee Blood 2016; Weber & Weiss, 1988). The viral DNA is integrated into the host cell`s DNA, becoming the permanent part of the cell`s genetic material. The integrated viral DNA directs the host cell to produce new HIV proteins and RNA, ultimately leading to the assembly of new HIV particles.

New HIV particles bud off from the infected cell, spreading the infection to other CD4⁺Tcells (Prabhu & van Wagoner, 2023). The continuous replication cycle of HIV leads to the destruction of CD4⁺Tcells, compromising the immune system. As CD4⁺ T cells count decline the body becomes increasingly vulnerable to opportunistic infections, which are illnesses that

wouldn't normally cause disease in people with healthy immune systems. As the immune system weakens further, the body becomes more susceptible to serious infections like TB and cancers. When the CD4+ T cell count drops below a certain threshold (typically below 200 cells per microliter of blood) and opportunistic infections develop, a person is diagnosed with AIDS (acquired immunodeficiency syndrome) (Obeagu & Onuoha, 2023).

2.7 TB and HIV Diagnosis

Advances in diagnosis have led to early and effective diagnosis in these diseases and consequently registering significant progress overtime in efforts to reduce on the burden caused by Tuberculosis and HIV. Definitive diagnosis of HIV must demonstrate the HIV virus or their components. HIV can also be diagnosed clinically, with first symptoms such as fever, night sweats, headaches, fatigue, flue-like illness, chills, muscle aches, sore throat, swollen lymph nodes, mouth ulcers, and diarrhea. These are not specific though as they can be found in other diseases such as flu, malaria and other viral infections.

Therefore, clinical signs are always confirmed by laboratory tests, for example immune assays for antigen-antibody detection techniques for example (RDTs) rapid diagnostic tests and they provide results in 2-15 minutes. This can also be done in different disciplines depending on policies, resources or the diagnosis objective. It can be through serology, molecular diagnosis (PCR), and antigen detection or drug resistance tests. For TB diagnosis also microscopic identification (golden standard) of the pathogen, serology and molecular diagnosis (PCR) and antigen detection or drug resistance tests. Polymerase chain reaction detection targets the pathogens nucleic acids.

This technique is, however, more expensive than microscopy and is therefore not recommended for routine use. This is however useful for confirming the species of the pathogens. There is no single test for TB in all circumstances. Some tests are cheap but not very accurate. Some can be used to test TB but can't be used to test drug resistance. Others such as TB culture test, the new GeneXpert TB test and the true Nat test can be used to diagnose TB and they can also test for some types of TB drug resistance. Molecular techniques have helped to register significant progress. The most routinely and primary test used is the sputum smear microscopy as test for TB. To do this, a very thin layer of the sample is placed on a glass slide, and this is called a smear. A series of special stains such as ZN are often applied to the

smear and the stained slide examined under a microscope for signs of the *Mycobacterium Tuberculosis*.

2.8 Risk Factors associated with TB-HIV co-infection

Several studies have cited various risk factors implicated in TB and spread of the disease in order to assist in proper utilization of public healthcare resources and prioritize targets for TB control. In this connection, the most significant independent risk factor in association with active pulmonary or extra-pulmonary TB is HIV infection contributing to ongoing transmission among individuals.

Gender

A study in Eastern Uganda, indicated that Gender had also been shown as a risk factor in increasing HIV/TB incidence (Aturinde et al., 2019); HIV positive women were found to be more susceptible to TB than HIV positive men probably due to the effect of female hormones or underreporting of TB cases.

Age

A cross-sectional community survey done in East Africa discovered that old age contributed 23,000 cases because of the deteriorating immunity among the elderly (Nyagaka, 2020). The study concluded that a person with HIV/AIDS who becomes infected with tuberculosis has 50% chances of developing active TB within 2 months.

Animal products

A study in the dairy producing central region of Botswana showed that, consumption of unpasteurized milk was observed in association with TB caused by *M. bovis* among HIV patients, 70% of all HIV patients who took un-boiled milk or half cooked milk developed a form of TB during a 10-year period spell (Chidumayo, 2021). In the same report an association between tuberculosis (TB) and body wasting was long recognized posure to TB patient

In research which was carried out in Pakistan by (Mukhtar & Butt, 2018) among HIV patients, it was found out that the highest risk of HIV patients becoming infected with TB was 3.5 times much more with people who live with people with infectious tuberculosis, these people include, friends, roommates, prisoners or than those staying with health individuals, it was found that

heavy drug users and HIV infection are the most predisposing factors that lead to high percentages of tuberculosis in patients with HIV.

Malnutrition

Malnutrition impairs host immunity and predisposes HIV patients to TB while TB itself can cause malnutrition (Chandrasekaran et al., 2017). Malnutrition or poor diet and food low in calories, puts a person at greater risk of TB and it may impair survival in TB patients. It is thought that chronic lack of appetite in HIV patients can be one of the causes of malnutrition which lowers immunity and therefore may be a potential independent risk factor for latent TB. Studies have shown that supplementation with vitamins and Zinc (mineral) during treatment of pulmonary TB may reduce mortality in those co-infected with HIV (Houtzager et al., 2010). Furthermore, malnutrition and intestinal parasites cause immune-suppression, which in turn may cause false-negative tuberculin skin tests (TST) and failure to identify TB infection (Abate, 2013).

Smoking

HIV and lifestyle usually go hand in hand; the association between HIV, smoking and TB has been investigated for several decades. At least 30% of HIV positive patients who are exposed to either passive or active exposure to tobacco smoke has shown to be associated with TB infection and with the transition from being infected to developing active TB disease (Altet et al., 2017). There may be several reasons for the association between HIV smoking patients and TB. Smoking in HIV patients compromise immune response and damage the protective effect of tiny hair –like structures called cilia in the airways, resulting in increased TB risk (Leung et al., 2010). It has been shown that HIV infected smokers are 25% more likely to have cough, dyspnea, chest radiograph appearances of upper zone involvement, cavity and miliary appearance, and positive sputum culture than non- HIV smokers (Ndiema, 2020). In HIV patients, Smoking has greatly been found to be associated with both relapse of TB and TB mortality. There appears to be enough evidence to conclude that HIV escalates the development of TB disease amongst the smokers. A meta-analysis study on HIV positive patients who were smokers as well reported a 73 percent likelihood to become infected with TB and more than twice as likely to develop active TB than in non-HIV patients, and Overall, HIV positive smokers were 40 to 60 percent more likely to develop active TB after being infected with TB bacteria than non-HIV patients (Straetemans et al., 2010).

CHAPTER THREE: MATERIALS AND METHODS

3.1 Study site

This study was carried out at Komamboga Health center III under health center facilities like TB ward, ART clinic, Pediatric clinic, Records department, outpatient department, and laboratories. This facility was selected due to its favorable distance from my residence and presence of the TB and HIV patients at the facility.

3.2 Study design

The study design was cross sectional descriptive study that was conducted on a population of newly diagnosed HIV patients aged 10 years and above including both sexes.

In this case a patient 'Questionnaire' methodology was employed to determine the other related risk factors influencing the prevalence of TB among the newly diagnosed HIV patients. The following parameters were assessed by asking respondents to have and rule out some factors and consider the potential associated factor for the cause of TB in HIV patients and it was determined per patient to also be able to identify the general associated factors that are contributing to the increased prevalence of TB in HIV patients. And these factors include; Gender, Age, Exposure to animal products, Exposure to TB patients, Smoking and Knowledge on clinical presentation of tuberculosis and its prevention

3.3 Study population

The study population included New HIV patients currently in the ART clinic at Komamboga Health Centre III as well as transferred HIV patients or those referred to the laboratory with signs and symptoms of HIV for diagnosis. The latter group was only evaluated after they have tested positive for HIV.

3.4 Selection criteria of respondents

3.4.1 Inclusion criteria

All newly diagnosed HIV patients that is (patients enrolled for ART for 6 months and below), aged ten years and above with or without signs and symptoms of TB admitted and those who switched from other facilities to the hospital for HIV treatment were included in the study. HIV suspects (those who would present signs and symptoms of HIV) who turned HIV positive on examination and with a consent from these patients were included in the study.

3.4.2 Exclusion criteria

The following groups were excluded from the study. Patients with signs and symptoms of TB but without HIV. Patients on antiretroviral therapy but above 6 months of treatment. Patients on antiretroviral therapy but negative on the last follow-up screening test. HIV suspected patients who would have tested negative. Patients who had attended antiretroviral therapy for more than 6 months were excluded in the study.

3.5 Sample size determination

The sample size was determined using the formula by Kiss and Lesly (1965)

$$N = \frac{Z^2 PQ}{D^2}$$

Where, N= sample size

Z= standard normal deviation usually set at 1.96

P= Prevalence of co-infection 11.4% (Baluku et al., 2020)

D= standard error allowed in the study will be at 5%

Q= the difference (1-P)

$$N = \frac{1.96^2 \times 0.114 \times (1 - 0.114)}{0.05^2}$$

$$N = 156$$

3.6 Sampling method

A simple random technique was used in the selection of the respondents. In this case, each individual was chosen entirely by chance and each member of the population was having the equal chances of getting selected for the study.

3.7 Sputum collection and handling

Two sputum samples were collected per patient as required by the National TB and Leprosy program guidelines (2017). Spot sputum specimen, this is the sample collected when the patient first attended to health facility for examination of TB. Early morning specimen, was be the sample collected when the patient wakes up in the morning before breakfast taken. The patient was asked to collect sputum samples in a wide mouthed, leak proof container with screw-cap. The patient was asked to make a deep breath and produce enough sputum sample (not saliva) approximately 3mls.

3.7.1 Detection for Mycobacterium Tuberculosis among HIV patients GeneXpert MTB

The Xpert MTB assay is a nucleic acid amplification test that uses a disposable cartridge with the GeneXpert instrument system. A sputum sample is collected from the patient with suspected TB. The sputum is mixed with the reagent that is provided with the assay, and a cartridge containing this mixture is placed in the GeneXpert machine. All processing from this point is fully automated and after a period of about two hours the GeneXpert device diagnosis system interprets the results and displays them as detected, not detected, or invalid/error. And from here, the results obtained as positives, negatives and invalid respectively were recorded in the laboratory or research record book.

3.7.2 ZN-staining technique

Clean, scratch-free new glass slides were labelled with laboratory number or research number and the sequence of the sputum samples (X and Y) for spot and early morning with a pencil respectively. The sputum was held at arm distance and opened carefully with or without biosafety cabinet, a purulent part of the sputum sample was picked using a wooden applicator stick. For each sample specimen, a new applicator stick was used to make a smear covering an area of about 2 x 3 cm on the slide. The smear was made too thin that a newsprint was read through it. The smears were air-dried in a safe area, and heat fixed.

The smear was covered with carbol-fuchsin dye and dry heated for about 2 minutes. The slide was then be rinsed with cool tap water and then the bottom of the slide was cleaned well. The smear was counter-stained with methylene blue stain for one minute, then rinsed with water and allowed to dry in air.

The slide was examined under a microscope using x100 oil immersion objective. Acid-fast Bacilli (AFB) will appear as red rods, and slightly curved against a blue background of methylene blue. The presence of AFBs shown a positiveness of *M. tuberculosis*, and their absence shown negativity. The results were recorded following the WHO (2006) guidelines as illustrated in the table 1 below.

Table 1: Laboratory examination and reporting of results of sputum for AFBS
Microscopy how they looked.

No. AFBs seen	Per hpf	Results	Rating
---------------	---------	---------	--------

0 AFBs seen	100 hpf	Negative	Report exact number of AFBs seen
1-9 AFBs	100 hpf	Positive	
10-99AFBs	100 hpf	Positive	1+
1-10 AFBs	50 hpf	Positive	2+
>10 AFBs	20 hpf	Positive	3+

3.7.3 Detection of HIV

The simple method used was ‘‘Lateral flow immune chromatography assay’’, specifically HIV rapid diagnostic test kits (RDT) which require blood samples.

The blood sample required was capillary blood. This was collected from the tip of the middle or ring finger of the participants. The participant was reassured and made to calm down as the procedure is being explained to them. Then, an alcohol swab was used to disinfect the site of blood collection. A lancet was used to prick the top side of the disinfected finger and the finger firmly squeezed to allow blood to flow out. A small capillary tube was then be used to collect the blood sample required for the RDT test. Pressure was applied to the collection site using cotton wool to arrest bleeding.

The collected blood specimen was then transferred to the laboratory for diagnosis. Depending on the RDT test kits procured the blood sample was applied on the sample pad of the test kit and an appropriate buffer also applied as it was in the manual and the assay was left to run for the predetermined time (usually 2-15 minutes) to detect antigen-antibody proteins responsible to manifestation in HIV infection that is HIV-p24 proteins and HIV-1/2 proteins for antigen and antibody respectively. The results were interpreted from the kit after the assay as 2 lines (positive) 1 line (Negative) NO line (invalid) Then the HIV positive and negative patients were recorded in the research record book and the table was drawn as below.

Table 2: showing HIV patient`s results

Result category from the kits	No. of patients
Positives	
Negatives	
Invalid	

3.8 Determination of TB among the HIV Patients

All the HIV cases that were known still on treatment and those that was screened positive for HIV and all later that tested positive for TB, were considered to have TB among the HIV Patients in this study. This later helped me to determine the prevalence of TB among HIV patients from the result findings.

3.9 Data Management and Analysis

The data was collected and recorded in the research data collection book including age, sex, and diagnostic results for both TB and HIV. The quantitative data collected was analyzed using SPSS software. Descriptive statistics were used to summarize the data, bivariate analyses including chi-square test were conducted to determine associations involving categorical predictors while independent samples t-test was used to determine associations involving continuous predictors. Multi-variate analyses were performed to develop a logistic regression model that adjusted for other variables in the associations.

3.11 Ethical consideration

The College of Veterinary Medicine Animal Resources and Biosecurity (COVAB) Makerere University allowed me to conduct research under the supervision of Mr. Angwe Martin Department of Biomolecular Resources and Bio-Lab Sciences. The permission was also sought from the Kampala Capital City Authority from the DIRECTOR PUBLIC HEALTH AND ENVIRONMENT office allowed me conduct my research at Komamboga Health Center III. Informed consent was obtained from the patients, with children aged 10-17 obtained their consent from their parents/guardians.

CHAPTER FOUR: RESULTS

4.1 Participant Characteristics

A total of 154 newly enrolled HIV-positive patients attending the ART clinic at Komamboga Health Centre III were included in the analysis. Their demographic, clinical/nutritional, and behavioral characteristics are summarized below in table 1.

4.1.1 Demographic Profile

Participants' ages ranged from 18 to 54 years, with a mean ($\pm$ SD) of 29.68 ± 7.75 years. The majority were female (68.8%, $n = 106$), while 31.2% ($n = 48$) were male. Most participants were married (76.6%, $n = 118$); the remaining 23.4% ($n = 36$) were single.

4.1.2 Clinical and Nutritional Status

Mid-Upper Arm Circumference (MUAC) values ranged from 22.0 cm to 77.0 cm, with a mean of 25.86 ± 4.85 cm, suggesting generally adequate nutritional status across the cohort. While all the participants had a CD4 count of >200 cells/mm³

4.1.3 Behavioral and Socioeconomic Characteristics

Just over half of participants reported consuming alcohol (51.3%, $n = 79$), whereas smoking was relatively uncommon (13.6%, $n = 21$). Nearly half had completed primary education (46.1%, $n = 71$); 24.7% ($n = 38$) had tertiary education, 18.8% ($n = 29$) secondary, and 10.4% ($n = 16$) had no formal education. A large proportion worked in the informal sector (76.6%, $n = 118$), with the remainder (23.4%, $n = 36$) employed formally. Most participants lived in urban settings (80.5%, $n = 124$); 19.5% ($n = 30$) resided in rural areas. Household size ranged from 1 to 13 individuals, with a mean of 4.88 ± 2.68 persons. The most common household sizes were three (26.0%, $n = 40$), five (14.3%, $n = 22$), and two persons (13.6%, $n = 21$). Nearly all participants reported regular milk consumption (92.9%, $n = 143$) and a high proportion consumed meat (85.1%, $n = 131$).

Table 3: Summary of Participant Characteristics (N = 154)

Characteristic	Category/Value	n (%) / Mean $\pm$ SD
Age (years)	Range: 18–54	29.68 $\pm$ 7.75
Sex	Male	48 (31.2%)
	Female	106 (68.8%)
Marital Status	Married	118 (76.6%)
	Single	36 (23.4%)
MUAC (cm)	Range: 22.0–77.0	25.86 $\pm$ 4.85
Alcohol Consumption	Yes	79 (51.3%)
	No	75 (48.7%)
Smoking	Yes	21 (13.6%)
	No	133 (86.4%)
Education Level	None	16 (10.4%)
	Primary	71 (46.1%)
	Secondary	29 (18.8%)
	Tertiary	38 (24.7%)
Occupation	Informal	118 (76.6%)
	Formal	36 (23.4%)
Residence	Urban	124 (80.5%)
	Rural	30 (19.5%)
Household Size	Range: 1–13	4.88 $\pm$ 2.68
Milk Consumption	Yes	143 (92.9%)
	No	11 (7.1%)
Meat Consumption	Yes	131 (85.1%)
	No	23 (14.9%)

4.2 Prevalence of active tuberculosis among the new HIV-patients

Among the 154 new HIV-positive patients enrolled at the ART clinic of Komamboga Health Centre III, 17 were diagnosed with active tuberculosis, corresponding to a prevalence of 11.0%. The remaining 137 patients (89.0%) tested negative for active TB (figure 1).

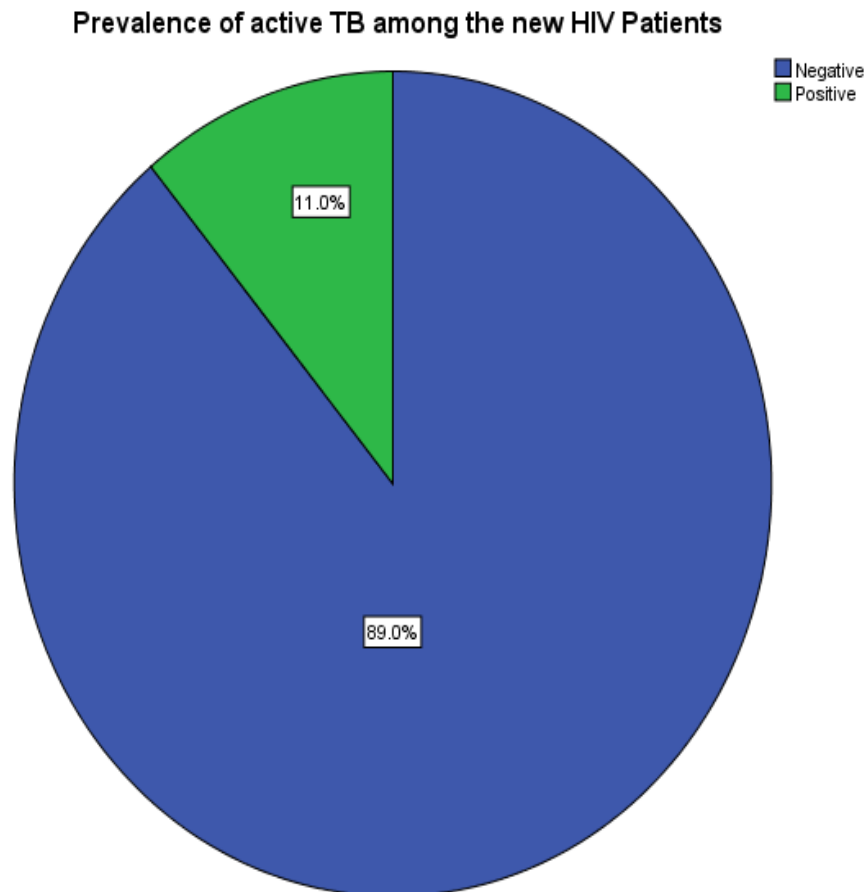


Figure 1: Pie chart showing the prevalence of TB among the newly diagnosed HIV patients

4.3 Risk Factors Associated with Active TB Infection among New HIV-Positive Patients

4.3.1 Smoking

Chi-square tests revealed that smoking status was significantly associated with TB infection ($\chi^2 (1) = 4.04, p = 0.044$), with a higher prevalence among smokers, suggesting it may be a risk factor. Other categorical variables: marital status, alcohol consumption, occupation, place of residence, milk and meat consumption, and education level did not show statistically

significant associations with TB status, though alcohol ($\chi^2 (1) = 2.85$, $p = 0.092$) and milk consumption ($\chi^2 (1) = 3.18$, $p = 0.075$) showed borderline significance.

Continuous Predictors

Independent-samples t-tests indicated that TB-positive patients were significantly older (mean 34.12 ± 9.59 years) than TB-negative patients (mean 29.12 ± 7.34 years), $t (152) = -2.55$, $p = 0.012$ highlighting age as a potential risk factor. There were no significant differences in mean mid-upper arm circumference (MUAC) or household size between TB-positive and TB-negative patients ($p > 0.60$ for both), indicating these variables were not associated with TB status at the bivariate level.

Table 4: Bivariate associations between participant characteristics and TB Status (N = 154)

Variable	Category	TB-Negative n (%) / Mean $\pm$ SD	TB-Positive n (%) / Mean $\pm$ SD	Test (df)	P- Value
Marital Status	Married	106 (89.8%)	12 (10.2%)	$\chi^2 (1) = 0.39$	0.533
	Single	31 (86.1%)	5 (13.9%)		
Alcohol Consumption	Yes	67 (84.8%)	12 (15.2%)	$\chi^2 (1) = 2.85$	0.092
	No	70 (93.3%)	5 (6.7%)		
Smoking Status	Yes	16 (76.2%)	5 (23.8%)	$\chi^2 (1) = 4.04$	0.044
	No	121 (91.0%)	12 (9.0%)		
Occupation	Informal	104 (88.1%)	14 (11.9%)	$\chi^2 (1) = 0.35$	0.554
	Formal	33 (91.7%)	3 (8.3%)		
Residence	Urban	110 (88.7%)	14 (11.3%)	$\chi^2 (1) = 0.04$	0.840
	Rural	27 (90.0%)	3 (10.0%)		
Milk Consumption	Yes	129 (90.2%)	14 (9.8%)	$\chi^2 (1) = 3.18$	0.075
	No	8 (72.7%)	3 (27.3%)		
Meat Consumption	Yes	117 (89.3%)	14 (10.7%)	$\chi^2 (1) = 0.11$	0.739
	No	20 (87.0%)	3 (13.0%)		
Education Level	None, Primary, Secondary, Tertiary	—	—	$\chi^2 (3) = 1.68$	0.642

Variable	Category	TB-Negative n (%) / Mean ± SD	TB-Positive n (%) / Mean ± SD	Test (df)	P- Value
Age (years)	—	29.12 ± 7.34	34.12 ± 9.59	t (152) = -2.55	0.012
MUAC (cm)	—	25.93 ± 5.09	25.29 ± 2.17	t (152) = 0.51	0.609
Household Size	—	4.89 ± 2.77	4.82 ± 1.85	t (152) = 0.10	0.923

Bold p-values indicate statistical significance at $\alpha = 0.05$.

4.4 Multivariable Analysis of the risk factors

A multivariable logistic regression was performed to identify independent predictors of TB infection among newly diagnosed HIV patients. The full model included age, gender, marital status, MUAC, alcohol consumption, smoking status, education level, occupation type, place of residence, household size, milk consumption, and meat consumption.

The model was statistically non-significant overall ($\chi^2 (14) = 20.62, p = 0.112$), indicating that, collectively, the predictors did not reliably distinguish between TB-positive and TB-negative patients. However, several individual variables demonstrated significant Age was a significant predictor ($p = 0.016$), with each additional year of age associated with a 12.1% increase in the odds of TB infection (AOR = 1.121, 95% CI: 1.022–1.231). Marital status also remained significant in the adjusted model ($p = 0.029$), with single individuals having significantly higher odds of TB compared to married participants (AOR = 0.168, 95% CI: 0.034–0.831). Milk consumption was independently associated with TB status ($p = 0.046$), where those who did not consume milk had significantly higher odds of TB infection (AOR = 5.360, 95% CI: 1.034–27.799).

Other variables such as gender, alcohol use, smoking, MUAC, education level, occupation, residence, household size, and meat consumption were not statistically significant predictors in the adjusted model ($p > 0.05$ for all).

Table 5: Multivariable logistic regression analysis of factors associated with TB infection

Predictor Variable	B	SE	AOR	95% CI for AOR	p-value
Age (years)	0.115	0.048	1.121	1.022 – 1.231	0.016
Gender (Male vs Female)	−0.241	0.657	0.786	0.217 – 2.846	0.713
Marital Status (Single)	−1.782	0.814	0.168	0.034 – 0.831	0.029
MUAC (cm)	−0.173	0.136	0.841	0.645 – 1.097	0.202
Alcohol Consumption (Yes)	−1.284	0.664	0.277	0.075 – 1.017	0.053
Smoking (Yes)	−0.960	0.867	0.383	0.070 – 2.092	0.268
Education Level					0.769
- None (reference)	—	—	—	—	—
- Primary	0.024	1.440	1.024	0.061 – 17.214	0.987
- Secondary	−0.823	1.348	0.439	0.031 – 6.169	0.542
- Tertiary	−0.284	1.330	0.753	0.056 – 10.192	0.831
Occupation (Informal)	0.350	1.231	1.419	0.127 – 15.834	0.776
Residence (Urban)	−0.330	0.776	0.719	0.157 – 3.294	0.671
Household Size	0.050	0.115	1.051	0.840 – 1.316	0.664
Milk Consumption (Yes)	1.679	0.840	5.360	1.034 – 27.799	0.046
Meat Consumption (Yes)	0.655	0.787	1.925	0.412 – 8.996	0.405

CHAPTER FIVE: DISCUSSION, CONCLUSION, LIMITATIONS

5.1 Discussion

This study aimed to determine the prevalence of active Tuberculosis among new HIV-positive patients attending the ART clinic at Komamboga Health Centre III and to identify associated factors. The findings would contribute to understanding the dual burden of HIV and TB in this specific population and other related populations. The study found a prevalence of active tuberculosis at 11.0% among the 154 new HIV-positive patients attending the ART clinic at Komamboga Health Centre III. This figure highlights the significant public health challenge of TB/HIV co-infection, even among newly diagnosed HIV patients who might not yet be severely immune compromised (all participants had CD4 counts >200 cells/mm³).

This prevalence is comparable to or slightly lower than some estimates from similar settings in sub-Saharan Africa, where TB prevalence among HIV-positive individuals can range widely. For instance, a systematic review in East Africa reported pooled TB prevalence among HIV-positive individuals from 8.8% to 20% in various studies (Tchokontio et al., 2021). The World Health Organization (WHO) consistently reports high rates of TB among people living with HIV, noting that HIV is the strongest risk factor for developing active TB disease (WHO, 2023a). The observed prevalence highlights the necessity for routine and robust TB screening protocols at the point of HIV diagnosis and ART initiation. Early diagnosis is crucial for preventing disease progression, reducing transmission, and improving patient outcomes (Yayan et al., 2024).

The bivariate analysis identified smoking status and age as significantly associated with TB infection. However, the multivariable logistic regression, which accounted for all variables, provided a more refined understanding of independent predictors. The overall multivariable model was not statistically significant ($p = 0.112$), suggesting that while some individual predictors were significant, the combination of factors included did not *collectively* explain a substantial proportion of the variance in TB status among these patients, implying that other unmeasured factors or complex interactions might be at play. Despite this, several individual variables did show significant independent associations. Age in the multivariate model was consistent with the bivariate findings and emerged as a significant independent predictor of active TB, with each additional year of age associated with a 12.1% increase in the odds of TB infection. This aligns with global epidemiological patterns where older age is often linked to a

higher risk of TB (Lönnroth et al., 2010). This could be due to longer cumulative exposure to *Mycobacterium tuberculosis* over a lifetime, declining immune function with age, or increased comorbidity burden that predisposes individuals to active disease, even in the context of relatively stable HIV infection ($CD4 > 200$). Older HIV patients had more advanced but undiagnosed latent TB infection. Surprisingly, single individuals had significantly *lower* odds of active TB compared to married participants (AOR = 0.168). This finding is somehow contradicting other literatures that suggests that single or divorced individuals might be at higher risk for various health conditions due to social isolation or lack of support (Schoenborn & Heymann, 2013). However, in the context of an infectious disease like TB, this could potentially be explained by increased household contact and transmission among married individuals living in closer proximity to potential sources of infection (e.g., an undiagnosed TB case within the household or extended family). Married individuals might also have larger household sizes or more frequent social interactions that increase exposure opportunities compared to single individuals. The study also found that not consuming milk was independently associated with significantly higher odds of TB infection (AOR = 5.360). This finding contrasts with some literature that has linked the consumption of *unpasteurized* milk to an increased risk of TB, particularly *Mycobacterium bovis* infection (Huante et al., 2019). The present study, however, only captured general milk consumption without specifying pasteurization status. The result suggests that regular milk consumption, possibly indicative of better dietary habits and nutritional status, might be protective. Milk is a source of essential nutrients, and good nutrition is known to bolster the immune system, making individuals more resilient against infections like TB (Obeagu & Onuoha, 2023). Therefore, "not consuming milk" might be a proxy for poorer nutritional status or dietary deficiencies, which are well-established risk factors for TB (Obeagu & Onuoha, 2023). While smoking was significantly associated with TB in the bivariate analysis, it lost its statistical significance in the multivariable model. This suggests that the apparent association of smoking with TB in the unadjusted analysis might have been confounded by other variables included in the multivariable model (e.g., age or other lifestyle factors not fully captured). It is also possible that the relatively low prevalence of smoking in this cohort (13.6%) may have limited the statistical power to detect an independent effect in the adjusted analysis.

Gender, MUAC, alcohol consumption, education level, occupation, residence, household size, and meat consumption were not statistically significant predictors in the adjusted model. The

lack of significance for MUAC, despite malnutrition being a known risk factor, could be attributed to the relatively adequate nutritional status across the cohort (mean MUAC 25.86 cm) and the fact that all participants had CD4 counts above 200 cells/mm³. This suggests that among new HIV patients attending ART with relatively preserved immunity, overt malnutrition might not be the primary driver of active TB, or that MUAC alone was not sensitive enough to capture sufficient data on nutritional deficiencies.

5.2 Conclusion

This study found that active tuberculosis remains a significant comorbidity among new HIV-positive patients attending ART at Komamboga Health Centre III, with a prevalence of 11.0%.

Key independent factors associated with active TB infection in this cohort were older age, being married (compared to single), and not consuming milk.

While smoking was significant in bivariate analysis, its effect was not independently observed after controlling for other variables in the multivariable model, possibly due to confounding or low prevalence in the study population.

These findings underscore the importance of targeted interventions and ongoing screening for TB in this vulnerable population.

5.3 Recommendations

Based on the study findings, the following recommendations were proposed.

Strengthen systematic TB screening and early diagnosis for all new HIV Patients

Tailored TB Prevention and Screening Strategies for High-Risk Groups like older and married patients.

Further research of the same kind should be done to incorporate the persons below 10 years of age because this study was focused on those above 10 years.

From the research, we recommend community awareness to increase knowledge on HIV and TB management.

Patients diagnosed with TB should be given anti-Mycobacterium drugs.

5.4 Limitations

Some respondents were not willing to participate in the study, saying that they had no signs and symptoms of TB.

The study was targeting 156 patients as the sample size but due to lack of necessary requirements and time to meet the targeted sample size only 154 patients were considered for this research study.

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APPENDICES

APPENDIX I: Consent Form

I am Twine Robert, a final year student at Makerere University pursuing a Bachelor's Degree in Biomedical Laboratory Technology. I am carrying out research on **prevalence of tuberculosis and factors associated with infection among HIV patients**. I will provide a verbal explanation of the study, highlighting its importance, and the information and samples needed.

You will be asked to;

- Provide a sputum sample for TB diagnosis.
- Provide a blood sample for HIV diagnosis.
- Answer a few questions within a focused questionnaire based on the parameters/factors being evaluated within the study.

Participation is voluntary, meaning you can decide whether to take part in the study or not.

Please note that you are free to refuse to participate in the study if you do not feel comfortable with any or all of the following;

- Providing a sputum sample for TB diagnosis.
- Providing a blood sample for HIV diagnosis.
- Answering highly sensitive questions such as HIV status.

Participation is free, and no costs will be incurred by you during the study. There are also no rewards for participation, other than the important information that will be generated by this study to help future generations combat TB and HIV.

Confidentiality

All the information that you provide for this study will be considered confidential. Participant ID numbers will be attached to collected samples to avoid the use of patient names in the data analysis. No mention of your name will be made in publications of the results of this study, and only local staff overseeing your care will be able to link your name or other personal information to the Participant ID number used.

Declaration of the Participant

I,....., have understood the explanation provided to me by the researcher, the purpose of the study, and my benefits from it. I have accepted to participate in the study without being forced and have done it on my own will.

Participant signature: Date:

Research assistant: Date:

Submitted by: **Twine Robert**

2200703923

BBLT (MAK – COVAB)

Supervised by; **Mr. Angwe Martin Kamilo**

Submitted on; 12th July 2025

APPENDIX II: Data Acquisition Tool

[illegible]

APPENDIX III: TB Request Form

FOR ANY INQUIRIES;
CALL NTRL TOLL FREE
LINE. 0800111133

National TB and Leprosy Programme FORM 03
CULTURE AND DST REQUEST FORM

TSRS

IDENTIFICATION
NUMBER

DATE: _____

1.0 PATIENT IDENTIFICATION

TC

Name:.....Sex.....Age (years).....

Patient ID.....Patient unit TB No:..... Contact Tel No:.....

LC1/Village:.....Parish/ward.....District of Residence:.....

Next of Kin name..... Next of Kin Contact:.....

2.0 HEALTHY FACILITY DETAILS:

Name.....District.....TB Zone:

.....

3.0 CLINICAL INFORMATION:

3.1 PATIENT CATEGORY

Failure ☐ Defaulter ☐ Relapse ☐ Chronic Case ☐ MDR TB Case ☐ MDR Contact ☐

Other (Specify) ☐

3.2 ANTI-TUBERCULOSIS DRUGS EVER BEEN USED:

Isoniazid ☐ Rifampicin ☐ Streptomycin ☐ Ethambutol ☐ Pyrazinamide ☐

Kanamycin ☐ Amikacin ☐ Capreomycin ☐ Levloxacin ☐ ☐ Other specify.....

4.0 REASONS FOR REQUEST

☐
☐
☐
☐
☐
☐
☐

Diagnosis

Smear positive at ----- month(s) of treatment

Culture and Initial DST

Follow Up DST at Months of TB treatment

Xpert MTB Rifampicin resistant

Month..... of MDR Treatment follow-up

Other reason (specify).....

5.0 SPECIMEN INFORMATION

5.1. Type of Specimen:..... Date collected:.....Time:.....

5.2. Specimen collected at (Follow-up visit);

0 months ☐ 2 months ☐ 5 months ☐ 8 months ☐ ☐ Other specify.....

5.3 Peripheral Results:

Sample collected by: Phone number: Signature:.....

6.0 EXAMINATION REQUESTED

☐
☐
☐

MICROSCOPY:

CULTURE:

DRUG SUSCEPTIBILITY TEST:

Requested by:

Name.....Sign.....Phone
number:.....

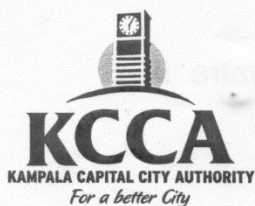
For National TB Reference Laboratory Use:

Date Received: _____ Time: _____

Appearance: _____ Volume: _____ Received by
(Name): _____

Laboratory Number: _____

APPENDIX III: KCCA Approval Letter



DIRECTOR PUBLIC HEALTH AND ENVIRONMENT

REF: DPHE/KCCA/1302/01

28th January, 2025

Twine Robert
Makerere University
+256(0) 756077574
Kampala, Uganda

ADMINISTRATIVE CLEARANCE

Reference is made to your letter dated 14th January, 2025 on the above subject matter.

This is to inform you that permission has been granted to you to conduct an impact and process evaluation entitled **“PREVALENCE OF TUBERCULOSIS AND FACTORS ASSOCIATED WITH TB INFECTION AMONG THE HIV PATIENTS ATTENDING ANTIRETROVIRAL TEHRAPY AT KOMAMBOGA HEALTH CENTER III”** for a period of one (01) month from 28th January, 2025 to 28th February, 2025.

The above permission is granted to you on the following conditions:

1. Participation in your study is voluntary and the informed consent process should be observed at all times.
2. You will provide a report to the office of the Director Public Health and Environment of your findings.
3. You will strictly adhere to the study protocol and make no changes without informing the Director Public Health and Environment.

P. O. Box 7010 Kampala – Uganda
Plot 1 – 3 Apollo Kaggwa Road
Toll free line: 0800299000
Email: info@kcca.go.ug
f x i @KCCAUG
WWW.KCCA.GO.UG

By copy of this letter, the Komamboga Health Centre III is requested to render you all the necessary support.

Dr. Sarah K. Zalwango
AG. DIRECTOR PUBLIC HEALTH AND ENVIRONMENT

DIRECTORATE OF PUBLIC HEALTH AND ENVIRONMENT
KAMPALA CAPITAL CITY AUTHORITY
28 JAN 2025
P. O. BOX 100
KAMPALA

Copy: Komamboga Health Centre III