UNIVERSITY of RWANDA

College of Medicine and Health Sciences

SCHOOL OF PUBLIC HEALTH

Department of Epidemiology and Biostatistics

MASTER IN SCIENCE OF EPIDEMIOLOGY

DISSERTATION

PREVALENCE AND FACTORS ASSOCIATED WITH TUBERCULOSIS AMONG TUBERCULOSIS SUSPECTS IN RULINDO DISTRICT

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DECLARATION

I do hereby declare that this dissertation titled “Prevalence and factors associated with tuberculosis among tuberculosis suspects in Rulindo District’’ for a Master in Science of Epidemiology degree at the Department of Epidemiology and Biostatistics, SCHOOL OF PUBLIC HEALTH, in the college of Medicine and Health Sciences at **UNIVERSITY OF RWANDA** is my original work and has not previously been submitted elsewhere. Also, I do declare that a complete list of references is provided indicating all the sources of the information cited.

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DEDICATION

I dedicate this work project

To the Almighty God who has guided me through this period of study, especially

To my Family, My Classmate for assistance, my working staff for their flexibility and friends who did not leave me alone and did not stop to pray for my success.

To other people that I could not enumerate on this page, their help is unforgettable to me.

May God bless them!

ACKNOWLEDGEMENT

For me to attain this goal, a number of people provided assistance. I want to start by expressing my gratitude to the Almighty God for giving me the fortitude, discernment, and guidance required to complete this study project. Second, I want to sincerely thank my supervisors, Prof. NYIRAZINYOYE Laetitia**(M.Sc., Ph.D.)** and my co-supervisor, Dr. NDAHINDWA Vedaste, who agreed to mentor me and support me in finishing this research project despite their busy schedules and heavy workload. I value their perseverance, encouragement, and suggestions. Finally, and most importantly, I want to express my gratitude to everyone who has helped me become the person I am today and to those who have helped make my dreams a reality. Thank you to everyone, and may God richly bless you!

ABSTRACT

BACKGROUND: Millions of people worldwide still lose their lives to tuberculosis each year, making it a serious global health issue. Despite the fact that all of the WHO's recommended tuberculosis control techniques have been put into place, there is still a significant gap in tuberculosis case detection and treatment, which has led to rapid case transmission in high burden countries including Rwanda. This study aimed to study prevalence and risk factors associated with TB among TB suspect in Rulindo District.

METHOD: From October 2022 to June 2023, a cross-sectional study was undertaken in the Rulindo District. Participants in the study were those who had been sent to healthcare facilities as TB suspects according to clinical symptoms. Data was gathered using a standardized questionnaire based on TB Book that included questions about potential risk factors, socioeconomic status, medical history, and demographic data. The questionnaire was formatted and created in an Excel sheet. Data Evaluation Demographic traits and prevalence rates were summarized using descriptive statistics. In order to analyze association between demographic data, Intermediate risk factors, and TB status, chi-square tests and logistic regression were used.

Results:

This study was inditified 4.8% as prevalence of TB in Rulindo District, that is 74 of the 1533 tuberculosis suspects included in the study were found to have active TB. There were 46.16% women and 53.84% men in the study population. The age varied from 0 to 60, with the [45-59] group showing the highest prevalence of TB.

About life style to TB: A logissitic regression analysis showed that sex, life style (smoking, Contact with TB Cases), and [history of Treated TB Before were significantly linked to a higher risk of TB among suspects with [AOR: 2.26 (1.33 - 3.83) P-value = 0.003], [AOR: 6.84 (2.22 - 21.08) p- value: 0.001], [AOR:2.19 (1.07 - 4.47) p-value 0.032)], and [AOR:6.40 (2.14 - 19.14) p<0.001] respctive results of the analysis.

CONCLUSION: This study provides a thorough understanding of tuberculosis prevalence and life style among tuberculosis suspects in Rulindo District. The need for targeted therapies and better case management is urgent given the high prevalence of TB and the existence of drug-resistant patients. A higher risk of TB was observed to be associated with characteristics like sex, Historical of Treated TB before, Contact with TB casesand Smoking, underscoring the necessity of comprehensive policies addressing these determinants. These findings add to the

body of knowledge that health authorities can use to adopt better TB control strategies, early detection, and appropriate treatment. To track patterns and improve measures in the battle against tuberculosis in Rulindo District and comparable settings, additional study and continued surveillance are crucial.

KEYWORDS:

Tuberculosis, Community, TB CASE and TB Suspect

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LIST OF ACRONYMS AND ABBREVIATIONS

AFRO: African Regional Organization

CHWs: Community Health Workers

CDT: Center of Diagnosis and Treatment

DH: District Hospital

DOT: Direct Observation Therapy

FY: Fiscal Year

GXP: Gene Expert

HIV: Human Immunodeficiency Virus

TB: Mycobacterium Tuberculosis

MDR: Multidrug Resistance

PH: Provincial Hospital

UR: University of Rwanda

UHC: Universal Health Coverage

UN: United Nation

WHO: World Health Organization

DEFINITION OF KEY TERMS

Tuberculosis: Tuberculosis (TB) is a bacterial infection caused by Koch's Bacillus, spreading through air when an infected individual coughs, sneezes, talks, releasing tiny droplets containing the bacteria into the environment, and inhaled by others person. It mainly affects the lungs, but it can affect any part of the body, including the tummy (abdomen), glands, bones and nervous system. (1)

TB CASE: A tuberculosis (TB) case is a person who has been diagnosed with tuberculosis, which is a contagious bacterial infection that predominantly affects the lungs but can also affect other regions of the body. Clinical evaluation, laboratory testing, and medical imaging techniques are used to determine a confirmed TB case.(3)

TB Suspect: A tuberculosis (TB) suspect is someone who has symptoms or clinical indicators that could be indicative of tuberculosis infection. Coughing, weight loss, night sweats, and fever are all common symptoms. Individuals who are TB suspects are being investigated for a probable TB infection and are awaiting further diagnostic tests and evaluation.(3)

TB Prevalence: The number of cases of tuberculosis (all forms) in a population at a given point in time (the middle of the calendar year), expressed as the rate per 100 000 population.

CHAPTER 1. INTRODUCTION

1.1.BACKGROUND

Tuberculosis (TB) continues to be a major global public health concern, particularly in low-resource settings. TB is a significant burden on individuals and communities in Rwanda, demanding dedicated research to better understand its prevalence and associated causes.(4) Rulindo District in Rwanda has a unique context due to socio-demographic and environmental factors that may influence tuberculosis transmission and illness prevalence. Exploring prevalence and risk factors for tuberculosis (TB) among people suspected of having the disease in Rulindo District might provide important insights into the local epidemiology and lead successful public health measures.

Tuberculosis (TB) is caused by an infection with Mycobacterium tuberculosis (MTB) that is transmitted through the air, and it was the leading killer infectious illness prior to the COVID-19 pandemic (5). An estimated 10.6 million people fell ill with tuberculosis (TB) worldwide, Six million men, 3.4 million women and 1.2 million children. (3) TB is present in all countries, in all race and in all age groups of people. TB is curable and preventable but we still have number of dying TB cases every day from preventable causes. A total of 1.6 million people died from TB in 2021 (including 187 000 people with HIV) (6). Worldwide, TB is the 13th leading cause of death and the second leading infectious killer after COVID-19(7), One-third of the world's population is thought to be infected with TB(8). Among these, 10 million individuals contracted tuberculosis in 2019, 1.4 million died from it, and 95% of TB cases and 98% of TB deaths occurred in poor countries(8). The majority of TB cases occurred in Asia and Africa at (44%) and (26%) respectively(9). In Rwanda, TB is one of the most serious health issues, TB incidence rates in Rwanda were predicted to be 86 per 100,000 people(10). In Rwanda, the first national TB prevalence survey, undertaken in 2012, indicated an estimated smear-positive TB prevalence of 74 per 100,000 individuals and an estimated bacteriologically confirmed TB prevalence of 74 per 100,000 adults (11) and At that time, TB associated deaths were 6% and 14.8% in bacteriologically diagnosed cases and clinically confirmed cases respectively(5). RDHs show the Prevalence of signs or symptoms to be suspected of TB are 12% of women and 8% of men age 15-49 and currently have at least one of the signs or symptoms suggestive of TB infection and those who have been suspected, 39% and 41%,

respectively, have sought help or care (12). And the Treatment with antibiotics for 4 or 6 months under the guidance and support of trained healthcare providers usually guarantees cure. Adherence to treatment is difficult without the direct supervision of healthcare worker, it was in that Rwanda country have straggled for eradicating TB as it was target of WHO in 2034 and is show by this trend of TB where TB cases declined since June 2011 from 7230 to 5763 TB cases in June 2016 due particularly to efforts done to increase detection. Every year, Community health workers contributed to 46% and 25% of TB presumptive referred to Health facilities and proportion of TB cases identified respectively. And 95% of TB cases followed by Community health workers were successfully treated.(13). And the other effort done by Rwanda in related to the screening of TB was reinforced among high risk groups especially contacts of TB cases, people infected with HIV and prisoners. However, no report that indicated the factors and prevalence associated with TB among TB suspect in Rulindo District as well as in Rwanda.

1.2 PROBLEM STATEMENT

The observed decrease in the reported incidence of newly diagnosed tuberculosis (TB) cases in the years 2020 and 2021 implies a potential rise in the population of individuals with undetected and untreated TB. Consequently, this has led to an initial upsurge in TB-related mortality rates and a subsequent increase in community transmission of the infection. Additionally, there is a delayed effect wherein a greater number of individuals are developing TB over time(14). The global incidence of tuberculosis (TB) mortality experienced an upward trend from 2019 to 2021, hence reversing a period of consistent decline observed from 2005 to 2019. In the year 2021, it was approximated that there were 1.4 million fatalities among individuals who tested negative for HIV, with a 95% uncertainty interval ranging from 1.3 to 1.5 million. Additionally, there were 187,000 deaths among individuals who tested positive for HIV, with a 95% uncertainty interval ranging from 158,000 to 218,000. Consequently, the overall number of deaths, when considering both HIV-negative and HIV-positive individuals, amounted to 1.6 million. This figure is an increase over the previously estimated 1.5 million in 2020 and 1.4 million in 2019, and has returned to the level observed in 2017(3). The net decrease observed between the years 2015 and 2021 amounted to a drop of 5.9%. This figure represents about one sixth of the progress required to reach the initial milestone outlined in the World Health Organization's End TB Strategy(7). In 2021, it is anticipated that around 10.6 million individuals (with a 95% uncertainty interval of 9.9-11 million) contracted tuberculosis (TB), representing a 4.5% rise from the 10.1 million cases (with a 95% uncertainty interval of 9.5-10.7 million) reported in 2020. The incidence rate of tuberculosis (TB), measured as the number of new cases per 100,000 population per year, had a 3.6% increase from 2020 to 2021. This growth marks a reversal of the declining trend observed over the past two decades, where the incidence rate had been decreasing by approximately 2% annually. The observed decrease in the time period between 2015 and 2021 amounted to a 10% decline, which is just half of the initial target set by the End TB Strategy, namely a 20% drop.(15). Globally, close to one in two TB-affected households face costs higher than 20% of their household income, according to latest national TB patient cost survey data. The world did not reach the milestone of 0% TB patients and their households facing catastrophic costs as a result of TB disease by 2020, this

failure will impact on CWHs performance directly or indirectly as the patterns in Health specifically in TB Reduction(7).

In Rwanda, 187,871 presumptive TB cases were discovered during the 2018-2019 fiscal year, with CHWs referring 56.9% of them. There were 5,949 TB cases among them, with 99.2% of them receiving treatment. The high risk category accounted for 53.4% (3174/5,949) of all TB cases, with CHWs accounting for 25.2 (1502/5949)(16). The proportion of TB cases under the age of 15 years among all TB cases in the country was 7.6%. More than 99% of TB presumptive and TB patients were tested for HIV, and the overall co-infection rate was 21%. The external quality control techniques were used in the lab, with results of 91% for microscopy and 93.3% for genexpert (16). Therefore, every year, the ministry of health in Rwanda hosts an event to mark World TB Day as it was in WHO regulation. This year, the event was held in Rulindo District- Murambi Sector, in the Northern Province of Rwanda. The purpose of the event was to raise public awareness of TB prevention, diagnosis and treatment, and ensure that those at risk of TB have access to necessary information and facilities(17). In spite of those progress this event drew to a close attention of all leaders and urged Rwandans to remember that TB is curable, and the importance of their active participation in the fight against TB by seeking early diagnosis and treatment, based on those information, it was an alert also that the TB is serious problem in the community as there is a scarcity of research in Rwanda that has explored the factors and prevalence associated with TB among TB suspect specifical focusing in Rulindo District and therefore I was conducting this study for adding more information on factors contributing on TB among TB suspect.

1.3. STUDY OBJECTIVES

1.3.1. Main objective:

The general objective of this research was to identify the Prevalence and Factors associated with of Tuberculosis among Suspect in Rulindo District.

1.3.2. Specific objectives

More specifically the research sought:

1. To Determine the pevalence of Tuberculosis among TB suspects in Rulindo District
2. To identify the factors associated with Tuberculosis among TB Suspects in Rulindo District.

1.4.RESEARCH QUESTION/ HYPOTHESIS TESTING

1. What are the positivity rate of Tuberculosis among TB suspects in Rulindo District?
2. What are the factors associated with Tuberculosis among TB Suspects in Rulindo District?

1.5. SIGNIFICANCE OF THE STUDY

Understanding risk factors and the situation of TB is crucial for the prevention of TB transmitted illnesses. Thesignifance of this study will mainly based on the findings of the present research which will help those who make decisions in Rwanda understand the increasing prevalence of TB and risk factors among suspected so that they can develop appropriate and effective measures to combat TB in this population. The findings of this study may also be used by health professionals to develop and execute adaptable health initiatives aimed at reducing TB-related morbidity and death. The study's findings will create the baseline data that other investigators could apply to perform further investigations on TB, This will be through:

1.5.1 **To the community**

The determination of the prevalence and Factors of Tuberculosis among TB suspects in Rulindo District, The benefit from the interventions resulting from the results of this research to close the identified gaps specifically in increasing number of screening for TB in early. Specifically, children who are under 12 years of age and older people more than 50 age are normally more vulnerable groups in the society for TB. Yet they are the future of the country while others are the experienced person for guiding the society; it is among them that are formed good authorities/ leaders, educators, and entrepreneurs, etc. However this is only possible when these categories are well maintained. Therefore, their life seemed important to the researcher who will provide the recommendations on identification of the prevalence and risk factors of Tuberculosis among TB, in rutrn will contributing to the improvement of their lives to ensure a future healthy Rwandan society.

1.5.2 **To Myself:**

The Researcher was feel confident of addressing the problem, giving my contribution on finding the prevalence and Factors of Tuberculosis among TB suspects, having my intellectual consideration elevated, making an input about the current community. This research of identification of the prevalence and Factors of Tuberculosis among TB suspects, it was chosen because the researcher sees the importance of rising awareness on the importance of TB screening by knowing the magnitude of TB positivity and factors which have potential in TB increases in Rwanda.

Therefore, as a student in Science of Epidemiology, this researcher was interested in Identification of the prevalence and Factors of Tuberculosis among TB suspects among people living in this area where there are many factors influencing TB, such as Mining activities, Smoking, older people, Many HIV Positive People, etc. As also finalist in Epidemiology from UR, this topic is interesting in the way that it seems applicable to me to give my contribution especially in combating TB as Communicable disease which could be neglected if nothing is done, and proposing the ways through which much more improvement should be applied for achieving desired target as it was sited in NST1, following SDGs.

1.5.3. Scientific and academic interests

In term of academic interest, this work was carried out to meet the requirement for students seeking academic Master's degree. This research prepares the grandaunts to fit in the environment where they were required to work. Furthermore, this research should be consulted and be supplemented by other researchers in the field of public health and epidemiology.

It will add also more to Rwanda university's reputation after its publication and it served as an example that the university can use to inspire other students to dare doing researches.

1.6.ORGANIZATION OF THE STUDY

The present study is structured into six distinct chapters, each fulfilling a specific role within the broader research framework. Chapter One initiates the research endeavour, concurrently establishing the study's significance and contextual background. Chapter 2 of the book offers a comprehensive examination of pertinent concepts, contemporary understanding, and empirical evidence. Chapter 3 provides a comprehensive account of the methodology employed in this work, encompassing the study design, data collection techniques, and analytical approaches utilised. The study findings are given in Chapter 4, where they are subsequently subjected to critical examination and analysis, facilitating a comprehensive and intellectually stimulating discourse. The synthesis of research findings is succinctly presented in Chapter Five. The concluding chapter, which is the sixth chapter, provides a comprehensive analysis of the implications, limitations, and recommendations for further research and practical application.

CHAPTER 2: LITERATURE REVIEW

2.1 THEORETICAL LITERATURE REVIEW

2.1.1. Worldwide

Tuberculosis is most prevalent in Africa, the Western Pacific, and Eastern Europe. These areas are afflicted by conditions that lead to the spread of tuberculosis (TB), such as a lack of resources, HIV infection, and multidrug-resistant (MDR) TB. As a result, while international public health initiatives have significantly slowed the rate of increase in TB, these regions are responsible for the continuous rise in global TB(18) also Tuberculosis (TB) is a communicable disease that is a major cause of illness and death around the world. TB was the leading cause of death from a single infectious agent until the coronavirus (COVID-19) pandemic, ranking ahead of HIV/AIDS. TB is caused by the bacillus Mycobacterium tuberculosis, which is spread when people who are sick with TB expel bacteria into the air (e.g. by coughing). A quarter of the global population is estimated to have been infected with tuberculosis (19), but the majority will not develop TB disease and some will clear the infection (20)(21). Approximately 90% of the annual incidence of tuberculosis (TB) is observed in the adult population, with a higher prevalence among males compared to females. The disease commonly manifests in the pulmonary system, known as pulmonary tuberculosis (TB), although it is also capable of affecting various other anatomical sites. In the absence of medical intervention, the mortality rate associated with tuberculosis (TB) is considerable, estimated to be approximately 50% (4). With the utilisation of presently endorsed therapeutic interventions, specifically a regimen of anti-tuberculosis medications lasting for a duration of 4 to 6 months, it is estimated that approximately 85% of individuals afflicted with tuberculosis can achieve a state of complete recovery. There are treatment options available for tuberculosis infection that typically span a duration of 1 to 6 months. Universal health coverage (UHC) is needed in order to guarantee equitable access to vital medical treatments for everyone afflicted with diseases or infections. The reduction of infection acquisition, disease development, and subsequent fatalities caused by tuberculosis (TB) can be achieved by implementing multi-sectoral interventions that target many drivers of TB, including poverty, undernourishment, HIV infection, smoking, and diabetes(22). Certain nations have successfully diminished the prevalence of tuberculosis (TB) to a level where the number of cases is below 10, and the mortality rate is less than one per

100,000 individuals annually. The global reduction of new cases each year, specifically in relation to tuberculosis incidence, necessitates the implementation of research advancements such as the development of novel vaccines. These innovations are crucial in order to attain the same levels of low disease burden already established in certain regions.

The achievement of global targets for reducing the burden of tuberculosis (TB) is contingent upon the provision of TB diagnostic, treatment, and prevention services within the framework of progress towards Universal Health Coverage (UHC). Additionally, it necessitates the implementation of multi-sectoral measures to address the wider determinants that influence TB epidemics and their socioeconomic consequences (7).

A study conducted In Ethiopian aiming on Assessment of Directly Observed Therapy following tuberculosis regimen adjustment in Addis Abeba found that it was difficult to administer due to the issues put on their TB patients. They describe most TB patients as impoverished and uneducated, with families to support, and that visiting daily has an impact on patients' work, income, and social lives (23).

2.1.1. In Rwanda

Rwanda has made tremendous efforts with political will to detect and diagnose TB in the framework of WHO strategies aiming to ending TB in 2035, Tuberculosis continues to be a significant public health issue in the country of Rwanda. Based on data provided by the World Health Organisation (WHO), there is a consistent downward trend in the incidence and mortality rates of tuberculosis (TB). This decline indicates a reduction in the transmission of the illness. The estimated treatment coverage stands at 84%, suggesting that a substantial proportion of prevalent tuberculosis patients go undetected (24)

The Government of Rwanda (GoR) has expressed its dedication to achieving the Sustainable Development Goals (SDGs) within the timeframe of 2030. The aforementioned objectives were created by the United Nations (UN) in the year 2015. One of the Sustainable Development Goals (SDGs) includes the aim of eliminating the tuberculosis (TB) epidemic by the previously indicated deadline. This target is fully consistent with the End TB Strategy of the World Health Organisation (WHO). Target 3C of the Sustainable Development Goals (SDGs) focuses on the eradication of epidemics such as AIDS, tuberculosis, malaria, and neglected tropical illnesses.

Additionally, this target attempts to tackle the issue of hepatitis, water-borne infections, and other communicable diseases (15).

In Rwanda, the incidence rate of tuberculosis - new cases and relapses - was projected to be 59 instances per 100,000 inhabitants in 2018, which was lower than the global average and the AFRO area, which were 96 and 231, respectively. Treatment coverage was estimated to be 80%. Since 2010, mortality has been steadily declining to the current level of 4.5 per 100,000 population. Among many Main program gaps highlighted by the MTR include the low detection of childhood TB, insufficient coverage of drug susceptibility testing especially among previously treated patients, absence of a pharmaco-vigilance system and lack of nutritional support for drug-susceptible TB patients, declining participation of Community Health Workers (CHWs) coupled with gaps in their TB knowledge. Those gaps will be addressed by introducing new proper strategic interventions, while maintaining and/or improving interventions that have been proven successful(24).

National TB program has been able to ensure continuity of service mainly based on the strengthening of community health workers and conduct active case finding specifically among prisoners. During this 2021-2022 FY, TB presumptive cases identified were 126,294 and community health workers referred 55.7% of them compared 63.7% in 2020-2021 FY(25). This decrease was due to the involvement of CHWs in the COVID-19 preventive measures especially vaccination campaign. The total number of all TB cases diagnosed was 5,538 including 39 RR/MDR-TB cases, children under 15 years was 271(5%) and male represented 72,6% and 27.6% were referred by CHWs with ratio male: female at 2.6. New and relapse were 5,455(98.5%), 4,505(81.3%) had pulmonary TB. The proportion of HRG was 50, 4 % compared to 53.4 % in 2020-2021 FY. Regarding drug susceptibility testing, 75, 8% of bacteriologically confirmed TB performed it versus 89.1% for the previously FY, This decrease was mainly due to the delay of gen-expert machines maintenance(25). By 2003, full national coverage was achieved again, and the DOT strategy was applied in all health facilities countrywide. Since 2003, the NTP has launched many programs, including Community DOT in 2005, where community health workers were trained to provide treatment of TB patients nearest their home with the aim of bringing TB service close to the community. During the

same period, HIV testing was offered to all TB patients and since 2009, all presumptive TB cases were routinely offered HIV counselling and testing(25).

2.2 CONCEPTUAL FRAMEWORK

The conceptual framework for tuberculosis (TB) prevalence and risk factors among suspects is a theoretical structure that defines the important aspects and linkages involved in understanding the incidence of TB among individuals who are designated TB suspects. This paradigm assists academics and healthcare practitioners in methodically analyzing and interpreting the complex interplay of factors that contribute to tuberculosis prevalence in this population.

The conceptual framework investigates the association between socio-demographic characteristics, intermediate factors, and tuberculosis (TB) prevalence among TB suspects. It seeks to understand how many factors interact to influence the chance of tuberculosis infection in those who are suspected of having the disease.

Researchers and Epidemiologist/public health practitioners can better grasp the intricate interactions between many factors and their combined influence on the prevalence of TB among TB suspects by researching this conceptual framework. This information can be used to inform targeted activities and policies aimed at reducing TB transmission and improving early diagnosis and treatment.

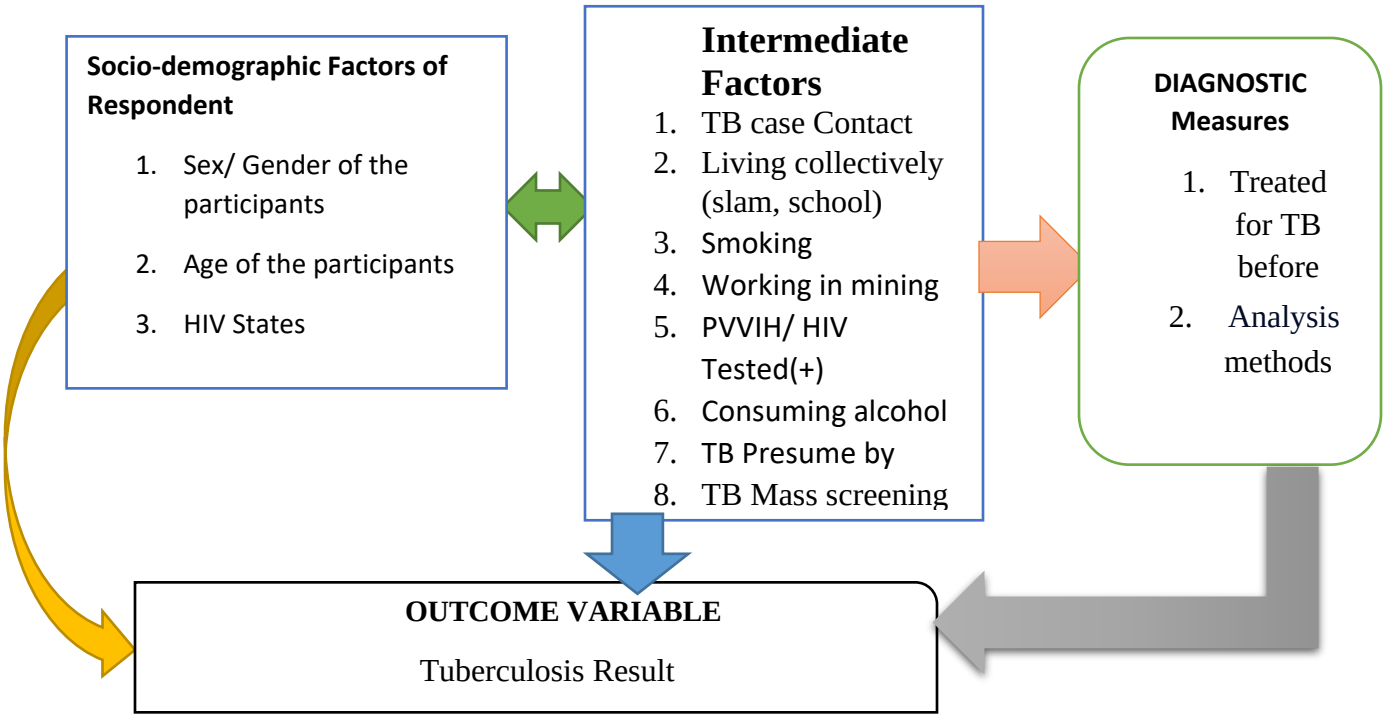

Figure 1: *Conceptual framework*

The framework's starting variables are socio-demographic parameters such as gender and age. Because of potential disparities in immune response, exposure, and healthcare-seeking behavior, these factors can influence an individual's susceptibility to tuberculosis.

The following intermediate components are important in this framework:

TB Case Contact: Individuals who have had intimate contact with proven TB cases are more likely to become infected due to exposure to the Mycobacterium tuberculosis bacteria.

Collective Living: Factors such as living in densely populated places such as slums or attending schools where close contact is common can enhance the risk of tuberculosis transmission.

Smoking: Tobacco use lowers the respiratory system's defenses, making it easier for tuberculosis bacteria to invade the lungs.

Working in Mining: Certain occupations, such as mining, can expose people to silica dust, which can harm the lungs and increase susceptibility to tuberculosis.

PVVIH/HIV Tested (+): HIV patients have weakened immune systems, rendering them more vulnerable to TB infection and progression.

Consuming Alcohol: Excessive alcohol use might suppress the immune system, making individuals more susceptible to infections like TB.

TB Presumed By: Individuals suspected of having tuberculosis by healthcare providers may exhibit symptoms or risk factors that raise concerns.

Treated TB Before: Individuals who have previously been treated for tuberculosis may be at risk of recurrence or reinfection.

TB Mass Screening: Participating in mass screening for TB programs can help detect latent infections and lead to early diagnosis and treatment.

These intermediary factors mediate the relationship between socio-
demographic parameters and the prevalence of tuberculosis among TB suspects.
The existence of one or more of these intermediary factors can increase the risk associated wi
th Socio-demographic parameters.
Finally, the prevalence of tuberculosis among TB suspects is an outcome variable.
This is due to the complicated interaction of socio-demographic and intermediary factors.
A higher prevalence indicates a stronger link between these factors and the chance of contract
ing tuberculosis.

CHAPTER 3. METHODOLOGY

3.1. INTRODUCTION

This chapter include the study design, population and area of the study or Study setting, source of data, method of data collection, data analysis, research instruments and techniques, validity and reliability of the instruments, and processing were used in conducting the research.

3.2 STUDY DESIGN AND DATA SOURCE

The study was a retrospective cross-sectional study aiming to conduct Prevalence and Factors associated with of Tuberculosis among TB suspect registered in TB registery form 4 health facilities chosen randomly from Kinihira PH and Rutongo DH (Rwanda) in period of October 2022 up to June 2023.

A cross-sectional design using quantitative approach was used . A cross-sectional study design was chosen because; the present study compared a single point in time variables. Quantitative method was selected because these methods allowed researcher assess more variables at the same time, I worked in CDT Health Centers as place where I had to fund an enough data. This research targeted all TB suspects that visited those four health facilities in Rulindo District Northern Province, Rwanda from October 2022 to June 2023.

3.3 STUDY SETTING

This study was conducted in catchment area of Kinihira provincial Hospital zone and Rutongo District Hospital with 337820 total populations. Those Two Hospitals are both located in Rulindo District in Northern Province and Serve 22 Health Centers with 7 CDT with 17 administrative Sectors. This District is open-door of Kigali Rwandan City Capital and has 567 km^2 surface and a population density of 596 per kilometers. This Area was selected because it has rural area as one of my preference in my research where there is many factors contributing in TB suspect like malnutrition in Children, older people, Smoking regulation are not respected, and mining place and many people with HIV and also this place is closer to my working place which makes it more accessible for me for data collection as mean of financial capacity.

3.4 STUDY POPULATION

This study was conducted among 1536 TB suspects reported in TB registery from October 2022 to June 2023 in the chosen four health facilities. The Participate which included in the study had been recorded in the registery found at Health Center at TB Service specifically and their information are available at the time of data collection and completed well, those with uncompleted information had been excluded from the study immediately in data collection process.

3.5 . SAMPLE SIZE

3.5.1. Sample size Calculation

The Cochran formula, also known as the Cochran sample size formula, is used to compute the sample size required to estimate a proportion in a limited population. In survey research, it is frequently used to calculate the minimum sample size required to attain a specific degree of confidence and margin of error. The following is the formula:

(1) $$n = \frac{\left(z_1^2\right) p(1-p)}{e^2} \text{ or } \quad n = \frac{\left(z_1^2\right) p(q)}{e^2}$$

Where:

n is the required sample size.

Z is the Z-score associated with the desired level of confidence (e.g., for a 95% confidence level, Z=1.96).

p is the estimated proportion of the population with the attribute of interest (often taken as 0.5 when there's no initial estimate), 1-p=q

Level of confidence is 1-α=95%, so we have 1- α = ±1.96 (equal the desired confident level)

$$n = \frac{(1.96)^2 \, x \left(1/2\right) x \left(1/2\right)}{(0.05)^2} = 384$$

So, the population of 384 was taken for each Health Center and as researcher worked in four health center the sample size were in total 1536 TB suspect enrolled in TB register to participate in this study.

3.5.2. Inclusion criteria

To participate in this study was TB suspect recorded in register and well completed all information as indicated in the TB register.

3.5.3. Exclusion criteria:

Researcher was excluded all TB suspect who miss one or more information as indicated in the book.

3.6 SAMPLING TECHNIQUE

In this study, the prevalence of tuberculosis (TB) and its risk factors were examined among TB suspects in the Rulindo District. To meet the study's aims, the following sample technique was used: Individuals in the Rulindo District who were thought to be TB suspects made up the population of interest. Within the Rulindo District, a list of health centres offering testing for TB suspects was compiled. From the gathered list of health facilities, from each of these hospitals, two health facilities were chosen, for a total of four chosen facilities.

To establish statistical significance, a sample size calculation was made. Each chosen healthcare facility was assigned a sample size of 384 TB suspects for each health center. This decision was made after taking into account practical limitations and the need for a sizeable sample.

Due to practical concerns, a convenient sampling method was chosen. Up until the targeted sample size of 384 was reached, TB suspect persons were conveniently sampled within each chosen health facility.

In each of the four chosen health facilities, 384 TB suspect persons had their information systematically recorded. Demographic information, medical history, socioeconomic background, and probable TB risk factors were all obtained and consided.

3.7 DATA COLLECTION METHOD

3.7.1 Data collection instrument

A reseacher was created excel data collection tool for data collection by extracting data from the registers, this tool was designed based on the information TB standardized book used in all health facilities in Rwanda which helped me to obtain needed information to achieve my Outcome. The Participate which were included in the study should be record in the register fund in Health Center Laboratory Specifically and all information are available at the time of data compilation, those with uncompleted information was excluded from the study immediately in data collection process.

3.7.2. Data collection procedure

Researcher received an introductory letter from the CMHS specifically from department of Epidemiology. The letter was addressed to the Mayor of Rulindo District explaining why researcher want to do this research in this area. researcher after receiving the agreement, and then the obtained permission was presented to both DG of Kinihira Provincial Hospital and Rutongo District Hospital as well as to the heads of Selected Health Centers in each hospital, the data collected by using machine through the designed excel format flowing indicators.

3.7.3. Data processing

Once the set of data was collected, it was entered into Computer specifically in Excel software and after cleaning them for better analysis, it was carefully prepared for tabulation in frequency table, proportion presentation and other statistical test for looking the association between different factors and Outcome variable. Data processing and analysis were employed in order to give clear research findings. The whole exercise included: editing and tabulation are extremely important.

3.8. STUDY VARIABLES

3.8.1 . Independent variables:

Independent Variable consisted of all variables regarding socio-demographic characteristics such as age, gender and Intermediate Variable as well as the Diagnostic method and they have been mentioned in Conceptual framework.

3.8.2. Dependent variable:

The outcome variable of interest in this study was Tuberculosis Result (Positve or Negative).

3.9. DATA ANALYSIS PROCEDURES

The data was analyzed using Stata software, the descriptive summary of socio-demographic and intermediate factors as figured on conceptual framework were presented in the same table with P- value. For Univariate analysis I used frequency distributions and Proportion to explain data. researcher performed bivariate data analysis using Chi-square test to test the association between indepedant variables and outcome variable (TB results). The independent variables which showed a p- value of 0.05 and less were brought into the final model of multivariate analysis to test for peristant association with the outcome variable (TB results) and I presented the results using Adjusted Odds ration (AOR) and p-value.

3.10. ETHICAL CONSIDERATIONS

The study protocol was presented to the CMHS IRB for approval and ethical clearance. To ensure client anonymity, data collecting systems use code rather than names for health centers to ensure that no one can track back the identity of participate. The data kept securely for 10 years by University of Rwanda before being destroyed, as per the UR Institutional Review Board (IRB) requirements. Files containing data was link-anonimized and strong password-protected. They were only be accessible using computer locked with password known only by researcher and supervisors who will only be able to access the data

3.11. LIMITATION OF THE STUDY

While conducting this research a number of limitations were encountered: the unavailability of completed data and missing necessary information needed by researcher like ubudehe Categories, level of education, working occupation for suspect that may affect my outcome, climate change, Limited time and insufficient budget.

The study acknowledged the disadvantage of utilising an easy sample method, which may have limited the generalizability of the results to a larger population. The sample, however, was meant to be as representative of the TB suspect population as possible within the chosen healthcare facilities.

CHAPTER 4: RESULTS

4.1. SOCIO - DEMOGRAPHIC CHARACTERISTICS

Table 1: *univarite analysis of socio- demographic.*

Variables	Frequency (1536)	Percent(%)
Age groups		
0-14	86	5.6
15-29	311	20.3
30-44	614	40.08
45-59	324	21.28
60+	195	12.73
Sex		
Male	827	53.84
Female	709	46.16

Table blow show that the study population displays an age distribution characterised by the following proportions:

In the age group of 0-14 years, there were a total of 86 cases, accounting for 5.6% of the overall population. In the age group of 15-29, there were a total of 311 cases, accounting for 20.2% of the overall cases. In the age group of 30-44, there were a total of 612 instances, accounting for 40.0% of the overall cases. In the age range of 45-59, there were a total of 326 instances, accounting for 21.3% of the overall sample. Among individuals aged 60 and over, there were a total of 195 instances, accounting for 12.7% of the overall population. Gender variable was distribution as this total number of cases, the male population accounted for 824 instances, or 53.7% of the whole sample. Among the total number of cases, 709 were identified as female, accounting for 46.3% of the whole sample.

4.2. LIFE STYLE FACTORS

Table 2:univarite analysis of life style factors.

Variables	Frequency (1536)	Percent(%)
Life style		
TB Mass Screening	561	36.52
Contact with TB Case	257	16.73
Habitant collectif (caserne, l'ecole)	229	14.91
Smoking	27	1.76
Travaille dans une Mine(mineur de fond)	293	19.08
PVVIH	36	2.34
Consume alcohol	133	8.66
Diagnosis methods		
Microscopy	967	63.08
GXP	569	36.92
HIV Statut		
Negative	1486	96.74
Positive	50	3.26
Traited for TB before		
Yes	22	1.43
No	1514	98.57
Presumed by		
CT(Center of Treatment)	164	12.82
CHW(Community Health Worhers)	1115	87.18

Table blow show that the study population exhibits varying distributions of risk factors, in which the mass screening process identified a total of 561 instances, accounting for 36.6% of the overall population. There were a total of 257 TB contact cases, accounting for 16.8% of the overall cases. Out of the total number of cases, 226 instances (14.8%) pertain to individuals residing in collective living arrangements. Among the total number of cases examined, smoking was found to be present in 27 instances, accounting for 1.8% of the sample. A total of 293 instances, accounting for 19.1% of the overall dataset, were observed in the mining sector.Among the total number of cases, 36 instances of PVVIH were identified, accounting for 2.4% of the overall population. The consumption of alcohol was observed in 133 cases, accounting for 8.7% of the overall sample. Among these cases, 96.2% were associated with bad outcomes, whereas 3.8% were associated with favourable outcomes.

By the methods of Diagnosis, The distribution of diagnostic methods throughout the research population is as follows, In the field of microscopy, a total of 967 instances were examined, accounting for 63.2% of the overall sample. The present investigation also reveals the distribution of HIV status within the studied population as follows: Out of the entire number of cases, 1483 instances were identified as negative, accounting for approximately 96.8% of the total, Out of the entire number of cases, 50 instances were identified as positive, accounting for 3.3% of the total. Regarding the Historical previously Treated for Tuberculosis, The distribution of prior tuberculosis treatment among individuals is presented as follows: There were a total of 22 cases, accounting for 1.4% of the overall sample. There were a total of 1511 cases, accounting for 98.6% of the overall sample. For case of presumed by the distribution of individuals who were assumed to have tuberculosis (TB) is as follows, In the treatment Center (CT) analysis, there were a total of 164 cases, accounting for 12.82% of the overall sample. The Community Health Worker (CHW) dataset consists of 1115 instances, accounting for 87.18% of the overall dataset.

4.3. BIVARIATE ANALYSIS OF PREVALENCE AND RISK FACTORS ASSOCIATED WITH TB RESULT

Table 3 :Bivariate analysis: Prevalence and Risk factors associated with TB result

	TB Results					
	Negative		**Positive**		**Total**	**p-value**
Variable	No.	%	No.	%	No.	
Age groups						
0-14	84	97.7	2	2.3	86	0.268
15-29	298	96.1	12	3.9	310	
30-44	580	94.8	32	5.2	612	
45-59	305	93.6	21	6.4	326	
60+	189	96.9	6	3.1	195	
Sex						
Male	771	93.6	53	6.4	824	0.002
Female	688	97	21	3	709	
Life Style						
TB Mass Screening	545	97.1	16	2.9	561	0.005
TB Case Contact	241	93.8	16	6.2	257	
Living Collectively (slam, school)	212	93.8	14	6.2	226	
Smoking	22	81.5	5	18.5	27	
Working in Mining	277	94.5	16	5.5	293	
PVVIH	34	94.4	2	5.6	36	
Consuming Alcohol	128	96.2	5	3.8	133	
Analysis methods						
Microscopy	920	95.1	47	4.9	967	0.937
GXP	539	95.2	27	4.8	566	
HIV Status						
Negative	1411	95.1	72	4.9	1483	0.781
Positive	48	96	2	4	50	
Treated for TB before						
Yes	17	77.3	5	22.7	22	0.0001
No	1442	95.4	69	4.6	1511	
Presumed by						
CT	153	93.3	11	6.7	164	0.314
CHW	1058	95.1	54	4.9	1112	

The above Table illustrates bivariateanalysis on prevalence of socio-demographic, intermediate and Diagnostic Factors of suspected for TB.

The statistical analysis reveals that the p-value for the assocition between age groups and TB findings is 0.268, this suggests that there is no significant statistical link between age groups and TB results. The statistical analysis reveals a significant link (p-value = 0.002) between sex and TB results, suggesting that there is a relationship between these two variables. There is a reported disparity in the prevalence of tuberculosis (TB) positive findings between males and females, with a larger proportion of males testing positive for TB compared to females.

The statistical analysis reveals a substantial correlation (p-value= 0.005) between risk variables and TB results, suggesting that risk factors are indeed influential in determining the outcomes of TB. Various risk factors seem to have different effects on the prevalence of tuberculosis (TB).

There is no noticeable correlation between mass screening and tuberculosis outcomes.

The data suggests a notable correlation between those who have been in contact with a tuberculosis (TB) case and the presence of positive TB test results (p = 6.2%).

Residential collectives: A statistically significant correlation exists between residing in collective settings and favourable tuberculosis outcomes, with a p-value of 6.2%.

The act of smoking has been found to be correlated with an increased likelihood of positive tuberculosis (TB) test results, with a statistically significant p-value of 18.5%.

The occupation of working in mines has been found to have a significant correlation with an increased likelihood of positive tuberculosis (TB) test results, with a statistically significant p-value of 5.5%.

The study findings indicate that there is no statistically significant correlation between individuals living with HIV (PVVIH) and the outcomes of tuberculosis (TB).

Alcohol use: There is no substantial correlation identified between the drinking of alcohol and the outcomes of tuberculosis.

Association between Analysis Methods and TB Results: The p-value obtained for the analysis of the association between diagnosis methods and TB results is 0.937, suggesting that there is no statistically significant association between the two variables.

The statistical analysis yielded a p-value of 0.781, suggesting that there is no statistically significant association between an individual's HIV status and their TB results.

The statistical analysis reveals a p-value of 0.000, showing a strong and statistically significant relationship between prior TB treatment and TB test results. There appears to be an increased probability of positive tuberculosis (TB) test findings among individuals with a history of prior TB treatment.

The presumptive diagnosis and tuberculosis test results:

The p-value of 0.314 suggests that there is no statistically significant correlation between the individuals believed to have TB and the actual TB test findings.

In conclusion, the findings of this bivariate analysis demonstrate statistically significant correlations between sex, particular risk variables (such as contact with a tuberculosis case, living in a collective habitat, smoking, and working in a mine), prior treatment for tuberculosis, and tuberculosis outcomes. There is no apparent significant association between tuberculosis (TB) results and several parameters such as age groups, diagnosis methods, HIV status, and those who are considered to have TB cases.

This Table Talks about the association between TB Result and proposed risks factors. The following variables were significantly associated with TB Result: Sex of respondent, Risk factors and Treated for TB before.

4.4. Multivariate logistic regression for risk factors associated with TB Result

Table 4: Multivariate logistic regression: Risk factors associated with TB result

	Bivariate			Multivariate		
	Unadjusted OR	**95% CI**	**p-value**	**Adjusted OR**	**95% CI**	**p-value**
Life style						
TB Mass Screening	1.00			1.00		
TB Case Contact	2.26	(1.11 - 4.59)	0.024	2.19	(1.07 - 4.47)	0.032
Living Collectively (Slam, School)	2.25	(1.08 - 4.69)	0.031	1.98	(0.94 - 4.16)	0.072
Smoking	7.74	(2.60 - 23.05)	0.000	6.84	(2.22 - 21.08)	0.001
Working in Mining	1.97	(0.97 - 3.99)	0.061	1.73	(0.85 - 3.53)	0.132
PVVIH	2.00	(0.44 - 9.07)	0.367	2.18	(0.47 - 10.06)	0.318
Consuming Alcohol	1.33	(0.48 - 3.70)	0.584	1.00	(0.35 - 2.89)	0.999
Sex						
Female	1.00			1.00		
Male	2.25	(1.34 - 3.77)	0.002	2.26	(1.33 - 3.83)	0.003
Treated for TB before						
No	1.00			1.00		
Yes	6.15	(2.20 - 17.15)	0.001	6.40	(2.14 - 19.14)	0.001

The multivariate logistic regression model was used to examine the connection between various independent risk variables which were significant in bivariate analysis and the outcome of tuberculosis tests. The goal is to understand how these risk factors interact to influence the chance of a positive or negative TB result Each risk factor is connected with a coefficient and an odds ratio (OR).

A positive correlation with a positive TB result is shown by an OR larger than one, and a negative association is indicated by an OR less than one.

The "p-value" column reflects the statistical significance of the coefficient of each risk factor. A low p-value (typically less than or equal to 0.05) indicates that the risk factor has a statistically significant impact on the outcome of tuberculosis. When the influence of other factors in the model is evaluated, adjusted ORs provide a more realistic portrayal of the risk factor's impact.

The logistic regression final model between the TB Contact and positive or negative TB test: Individuals who have had contact with TB cases are 2.19 times more likely to have a positive TB result after controlling for other characteristics, compared to those who have not had such contact.

The logistic regression final model between the Smoking and positive or negative TB test: After controlling for other variables, smoking is significant. smokers are 6.84 times more likely to obtain a positive TB test compared to non-smokers.

The logistic regression final model Result between the Sex and positive or negative TB test: Males are 2.26 times more likely than females to acquire a positive TB result after controlling for other factors. The findings imply that, in both the unadjusted and adjusted models, being male is associated with a considerably higher risk of getting a positive TB result than being female.

The logistic regression final model between the Treated for TB before and positive or negative TB test.

Individuals who have previously been treated for tuberculosis are 6.40 times more likely to receive a positive TB result than those who have never been treated for tuberculosis.

CHAPTER 5: DISCUSSION

This study have three variable out of Seven variable were significant to the TB result, those variable are Risk Factor in its categories of contact with TB cases ($p<0.032$) and smoking ($p < 0.001$), Sex of respondent variable categories ($p<0.003$) and finally treated for TB before variable ($p<0.001$), The data are shown in table 3, Individuals who have had contact with TB cases are 2.19 times more likely to have a positive TB result after adjusting for other factors than those who have not had such contact. This finding has been confirmed by literature from several countries like in the study conduct in India where Contact with known TB cases were 6.42 times more likelyto have positiveTB results than those who werenotin contact with TB cases (OR 6.42 [3.85,10.71])(26), other study conducted in Korea have also found significance among TB contact with contacts (0.4%) developed new active TB(27). This shows that close contact with tuberculosis patients increases the probability of testing positive for the disease. This is a major finding that emphasizes the significance of identifying and treating those who have had contact with TB cases in order to avoid further transmission.

Living collectively (in slums, schools, etc.) is not statistically significant in predicting a positive TB result after controlling for other variables. This suggests that, whereas living in crowded or communal environments is generally associated with greater disease transmission, it may not be a major predictor of TB in this study when other characteristics are taken into account.

After adjusting for other characteristics, smokers are 6.84 times more likely to have a positive TB test than none smokers. In the study from West Africa has demonstrated that smokers were more often sputum positive among smoker than none smokers (28), a cross-sectional study in central India (The adjusted prevalence odds ratio for mild, moderate and heavy tobacco smokers were 2.28, 2.51 and 2.74 respectively as compared to non-smokers)(29), also A Cross-Sectional Study in Gabon found that The prevalence of smoking among TB patients is high, and leading to aggravated disease as compared with controls (AOR = 3.18; 95% CI = 1.33–8.11)(30). This substantial link implies that smoking greatly increases the likelihood of testing positive for tuberculosis. Smoking damages the respiratory system and makes people more vulnerable to illnesses such as TB.

Working in a Mine: After adjusting for other variables, working in a mine is not statistically significant in predicting a positive TB result. This means that, when other factors are considered, working in a mine may not have a significant influence on the risk of testing positive for tuberculosis in this study. Having HIV does not appear to be statistically significant in predicting a positive TB result after adjusting for other factors. This shows that, when other variables are included, the presence of HIV infection may not be a substantial contributing factor to the risk of testing positive for TB in this study.

Alcohol usage: After adjusting for other variables, alcohol usage does not predict a positive TB result statistically. This suggests that, after controlling for other contributing factors, alcohol use may not have a substantial role in determining the risk of testing positive for tuberculosis in this study. In summary, our findings illustrate the complicated interplay of many factors in determining the likelihood of tuberculosis testing positive. While close contact with TB cases and smoking appear to have a strong correlation with a positive TB result, other characteristics such as living in a group, working in a mine, having HIV, and drinking alcohol may not be as significant in this study.

On the basis of the raw statistics, males are 2.25 times more likely than females to have a positive TB result. In other words, when simply the gender component is included, males have a considerably higher risk of testing positive for tuberculosis than females. After controlling for other variables such as age, smoking, and other characteristics, the data shows that males are 2.26 times more likely than females to have a positive TB test result. This suggests that even after controlling for other factors that potentially influence TB outcomes, the gender gap persists. This association is nevertheless statistically significant, demonstrating that the variation in TB outcomes between men and women is not purely coincidental. These findings point to a recurring pattern. Both the unadjusted and adjusted models show that being male is associated with a considerably higher probability of testing positive for tuberculosis than being female. This shows that, in addition to the influence of other variables addressed in the analysis, gender has a significant role in predicting TB outcomes.

This study emphasizes the possible significance of gender as a risk factor in TB outcomes. The fact that the gender difference remains significant even after controlling for other variables suggests that there may be fundamental gender traits that influence susceptibility to TB infection or disease progression. In conclusion, this study found a continuous and statistically significant link between being male and a higher probability of testing positive for tuberculosis when compared to females. This highlights the need of evaluating gender as a potential risk factor in TB outcomes, as well as the necessity for more research into the underlying causes of this gender-based disparity, in this study regarding the Effect of Gender on Clinical Presentation of Tuberculosis (TB) and Age-Specific Risk of TB, and TB-Human Immunodeficiency Virus Coinfection conducted in Zimbabwe has confirmed this significance (Males were at a 53% higher risk of TB compared to females)(31). Addition to that the study conducted in Koreas on Differential effects of sex on tuberculosis location and severity across the lifespan has confirm the significance of gender (male Compared to female patients' ratio of 1.49) (32). Another study conducted on Tuberculosis and gender -Factors influencing the risk of tuberculosis among men and women by age group has demonstrated higher association in men than in females "After the second decade of life, males had a considerably higher TB notification rate than females. Males had the highest notification rate of 52.2 per 100,000 inhabitants (95% CI 49.9---54.5) in the 40---49 age group, while females had the highest notification rate of 23.4 (95% CI 21.7---25.2) in the 20---29 age group"(33). A cross-sectional study in central India also confirm this significance (29) in the same study Males had a 2.35 (95% CI 1.66–3.32) times higher risk than females.

Individuals who have previously been treated for tuberculosis are 6.40 times more likely to have a positive TB test than those who have never been treated for tuberculosis, This shows that, without controlling for other factors, there is a significant connection between a history of tuberculosis treatment and the risk of testing positive for TB, This was confirmed also in the study carried out in all facilities in Rwanda for those who are treated TB by first line (AOR=2, 95% CI: 1.1–3.6) (34). Also in the study performed in China has shown the independently association among the those who have the previous history of TB(35).

After controlling for other factors that may influence TB outcomes, such as age, gender, and other relevant factors, the data shows that people who have previously been treated for

tuberculosis are 6.40 times more likely to have a positive TB result than people who have never been treated for tuberculosis. This relationship is still statistically significant, indicating that the impact of previous tuberculosis therapy on present TB outcomes persists even after controlling for these other characteristics.

These data consistently reveal that those who have previously been treated for tuberculosis have a significantly higher risk of testing positive for TB than people who have never been treated for tuberculosis. This relationship stays true in both the unadjusted and adjusted models, demonstrating the association's strength.

Previous TB Therapy and Current TB Outcomes: The findings imply that there may be a relationship between previous tuberculosis therapy and current TB outcomes. This means that those who have had TB treatment in the past may be more susceptible to infection or have a higher risk of reactivation or recurrence of the disease.

In conclusion, this study found a strong and consistent link between a history of tuberculosis treatment and an increased likelihood of testing positive for TB. Even when other affecting variables are taken into account, this relationship remains. These findings highlight the need for more research into the reasons for this association as well as the possible long-term implications of previous TB medication on present TB outcomes.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study provides valuable insights into the prevalence and risk factors for tuberculosis among tuberculosis suspects in Rulindo District. The need for targeted therapies and better case management is urgent given the high prevalence of TB and the existence of drug-resistant patients. It was discovered that factors such respondent's sex, prior history of TB treatment, contact with TB cases, and smoking were linked to an elevated risk of TB, highlighting the need for comprehensive policies that address these variables. These findings add to the body of knowledge that local health authorities can use to adopt better TB control strategies, early detection, and appropriate treatment. To track patterns and improve actions in the battle against TB in Rulindo District and beyond, additional study and continued surveillance are crucial.

6.2 Recommendations

Strengthen efforts to improve early case detection by putting community-based awareness initiatives into place, training healthcare professionals to recognize symptoms more accurately, and easing access to diagnostic services. Early treatment initiation and lower transmission rates can result from prompt identification of TB suspects.

Target High-Risk Groups: Create targeted interventions for high-risk populations found in the study, such as people in the [30+] age group, men, or people who smoking in the past and have undergone TB treatment, intensified screening, easier access to healthcare facilities, and specialized health education are among tailored strategies for these communities.

Enhance Diagnostic Facilities: Make investments in enhancing the diagnostic infrastructure in the Rulindo District, including increasing the accessibility of GeneXpert MTB/RIF testing in CDT center and other cutting-edge diagnostic tools. This will improve the speed and accuracy of TB diagnosis, especially for cases that are drug-resistant.

Boost Infection Control Procedures:To stop the spread of TB among patients, healthcare professionals, and visitors, improve infection control procedures in hospital settings. Implement proper ventilation, encourage symptomatic people to wear masks, and educate people about respiratory hygiene.

Promote Collaborative Care: To manage TB suspects cooperatively, set up multidisciplinary teams of healthcare professionals, public health officials, and community leaders. This strategy can provide a patient-centered, all-encompassing continuum of care, improving treatment compliance and follow-up.

Boost Public Awareness: Start extensive public education programs to dispel TB stigma and increase understanding of the disease's signs, how it spreads, and the services that are offered. Accurate information can be spread through using local media, influential members of the community, and educational institutions.

Establish a framework for ongoing monitoring and assessment of the interventions for TB control in the Rulindo District. Regular evaluations of program efficiency, therapeutic outcomes, and epidemiological trends will offer insightful information for future strategy adaptation.

Increase Drug Resistance monitoring: To enable the quick identification of drug-resistant TB cases, scale up drug resistance monitoring operations. This includes routinely checking identified patients for medication resistance and improving coordination with regional, national, and global health organizations.

Encourage research projects aimed at gaining insight into regional elements influencing TB transmission and treatment outcomes. To encourage innovation in TB control measures, encourage collaborations between regional scientists, academic institutions, and worldwide organizations.

By putting these suggestions into practice in Rulindo District, we can better address the help to improve the effectiveness of the response to the TB prevalence among tuberculosis suspects. The district can seek to lessen the burden of TB, enhance patient outcomes, and ultimately get closer to the objective of TB eradication by addressing both clinical and socioeconomic elements.

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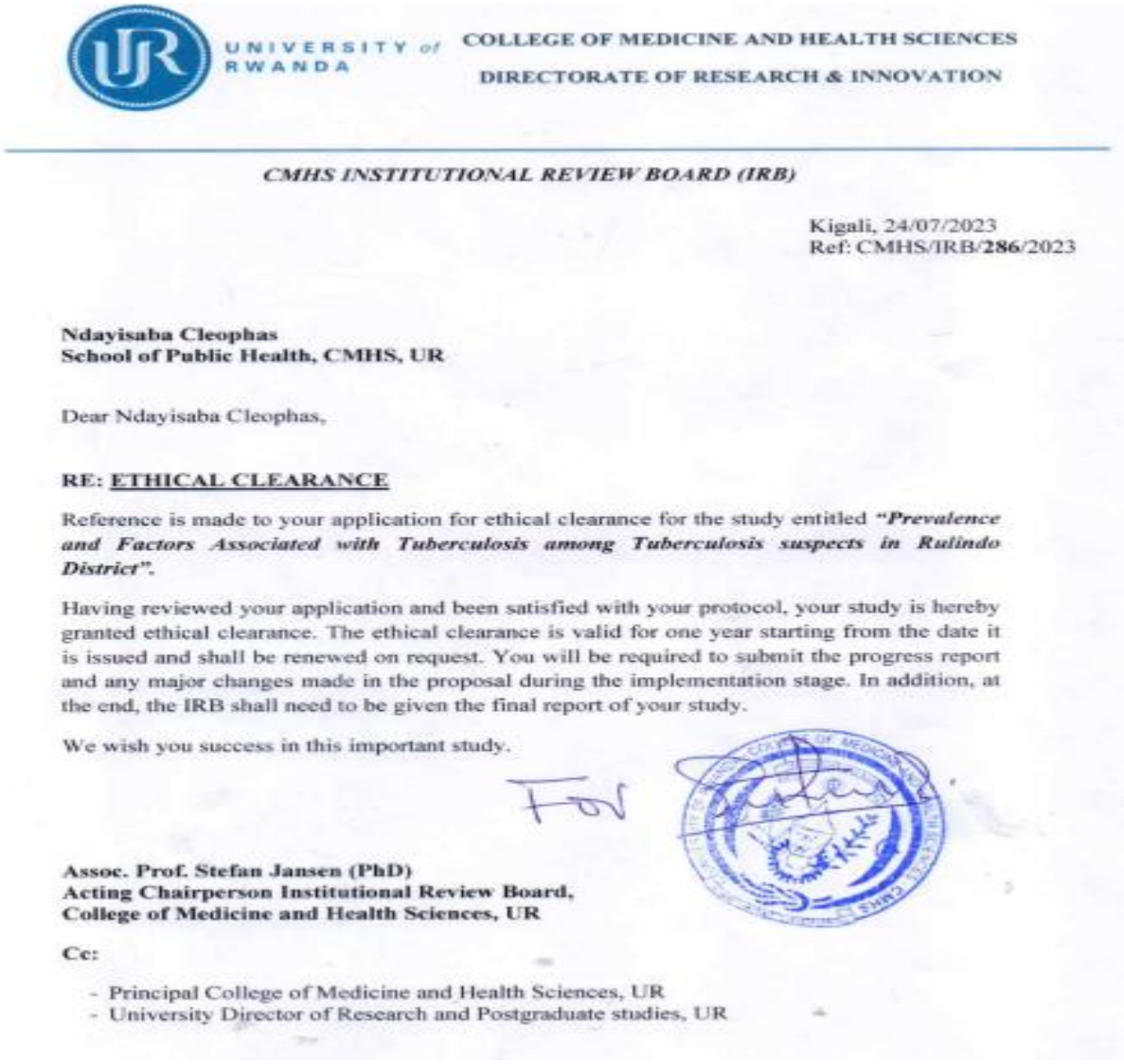
APPENDICES

Appendix 1: Ethical approval



UNIVERSITY of RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 24/07/2023
Ref: CMHS/IRB/**286**/2023

Ndayisaba Cleophas
School of Public Health, CMHS, UR

Dear Ndayisaba Cleophas,

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Prevalence and Factors Associated with Tuberculosis among Tuberculosis suspects in Rulindo District"***.

Having reviewed your application and been satisfied with your protocol, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Assoc. Prof. Stefan Jansen (PhD)
Acting Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:

- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

Appendix 2: Authorization letter

NDAYISABA CLEOPHAS
RULINDO DISTRICT
EPIDEMIOLOGIST CANDIDATE IN UR-CMHS
TEL: 0784141967/ 0785412739
Email: ndayisabacleo16@gmail.com

On: 15/06/2023

RULINDO DISTRICT
FOR RECEPTION
DATE: 16.06.2023
SIGNATURE: .....

To the mayor of Rulindo District

Re: Request To be recommended for collaboration with heath facilities in Rulindo District for my MSc in Epidemiology thesis Research.

Dear Madame,

As a part of my Master's Degree in UR, I am doing a project on "Prevalence and factors associated with tuberculosis among tuberculosis suspects in Rulindo District" the data will be collected in four health centers (MASORO, SHYORONGI, TUMBA and RUKOZO) which mean Two for each Hospital zone, In fact I need the information on patient suspected for TB registered in TB books from those mentioned Health centers.

I request you to link me with those institutions and the permission to collect those data needed in this study and I inform you that the recommendations from this study will be provided to you at the of this study and you find the attached document of ethical clearance provided by CMHS Institutional Review Board (IRB).

Thank you for your time and kind consideration of my request.

Yours Faithfully

NDAYISABA CLEOPHAS

Cc:

Principal College of Medicine and Health Science

University Director of Research and Postgraduate Studies, UR

Appendix 3: Data collection sheet

DATA COLLECTION FORM

No d' ordre	NOM &Prenon du Patient	No CI(Carte Identite)	Sexe	AGE	Adresse (District,Secteur, Cellule, Quartier)	Facteur de risque (ecrit le numero correspondant)	TB Presume par:	Traite pour TB Auparavant	Echantillon date/ Prelevemen t/ Result	GXP Date and Result	Statut HIV
						1. Contact avec un cas TB	1. CT	1. OUI			1. PVV deja connu(oui/non)
						2. Employe d' une FOSA	2.ASC	2. NON			2. VIH(Date/Resultat)
						3. Prisonnier actuellement	3. TP				
						4. antecendant de prisonnier les 5 dernieres annees					
						5. Employe d' un prison					
						6.refugie/ deplacecesvivant dans un camp					
						7. habitant collectif(caserne, l' ecole, etc)					
						8. Diabete non controle (>130mg/dl/)					
						9. fume le tabac					
						10. Travaille dans une Mine(mineur de fond)					
						11. PVVIH					
						12. Consumme l' alcool					
						13. index de bas(<18.5)					
						14. Autre precise					
Traite TB auparavan: Non: Suspicion d' un nouveau cas deTB											
OUI: SUSPICION DE RECHUTE OU REPRISE APRES ABONDON											
GXP: Genexpert											
CT: Centre de Traitment											
TP: Traditional practionnaires											
CDT: Centre de depistage et Traitment											