

**DETERMINANTS OF PATIENTS DELAY IN PULMONARY TUBERCULOSIS DIAGNOSIS IN PUBLIC HEALTH CENTERS OF JIMMA ZONE, OROMIA REGION SOUTH WEST ETHIOPIA, 2024: UNMATCHED CASE CONTROL STUDY**



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**A research thesis to be submitted to Jimma University, Institute of Health, and Faculty of Public Health, Department of Epidemiology in partial fulfillment of the requirements of a master of public health in Epidemiology.**

**Mar 2024,**

**Jimma, Ethiopia**

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## Abstracts

**Introduction:** Tuberculosis remains the top infectious killer in the world claiming close to 4000 lives a day. Ethiopia is among the 30 high-burden TB and TB /HIV countries globally with an estimated tuberculosis incident rate. Delayed presentation is a major problem contributing to the burden and transmission of tuberculosis in most developing countries: Ethiopia has identified less than half of the planned sputum -smear positive cases of tuberculosis. Despite the significant expansion of Tuberculosis services and availability of free diagnosis at health facilities, in Ethiopia delay in Pulmonary tuberculosis patients' detection and early treatment is a major health problem.

**Objective:** To identify determinants of patient delay in Pulmonary tuberculosis diagnosis at public health centers in Jimma zone, Oromia region south west Ethiopia, 2024.

**Methods:** Unmatched case control study were conducted in randomly selected public health centers implementing direct observations treatment services of Jimma zone Oromia region Ethiopia; from December 2023 to March 2024. **Cases** were Pulmonary tuberculosis patients who have diagnostic delay following the onset of pulmonary symptoms related to tuberculosis. **Controls** were patients with similar inclusion criteria as a case except those who sought timely care within 3 weeks onset of symptoms related to pulmonary tuberculosis. Cases 129 with 129 controls were interviewed face to face using a pre-tested questionnaire. Data were checked, entered and cleaned in to Epi data 3.1 version software, then exported to SPSS version 23 versions. Binary logistic regression was used to fit the data to identify factors associated with patient delay in pulmonary tuberculosis diagnosis. All explanatory variables that are associated with the outcome variable in bivariate analysis with p-value of 0.25 or less were included in the initial logistic regression models of multivariable analysis. Adjusted odds ratios with their corresponding 95% confidence interval were computed. A P-value < 0.05 was considered to declare a result as statistically significance.

**Results:** The study included 124 cases and 128 controls with 98% response rate. After multivariate analysis, sex [AOR=2.46, 95% CI: 1.31-4.63], and place of residence [AOR=2.34, 95% CI: 1.07-5.09], educational status [AOR=6.40, 95% CI: 1.64-14.98 and distance from residency to health facility [AOR=6.77, 95% CI: 2.04-22.5] were identified as the determinants of patient delay of pulmonary tuberculosis diagnosis at a 5% level of significance.

**Conclusion and Recommendation:** The patient delay were the main contributors delay in TB diagnosis. Specific and effective health education programs that focus on the symptoms, prevention and treatment of tuberculosis, the importance of seeking early care and the availability and location of free diagnostic services should carried in the community.

**Key Words:** Patient delay; determinant; tuberculosis; Jimma Zone.

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## **Abbreviations**

AIDS:	Acquired immune deficiency syndrome
DOT:	Direct observation treatment
HBC:	High burden countries
HIV:	Human immune deficiency virus
IUATLDS:	International Union against Tuberculosis and Lung Disease
MDR-TB:	Multi-drug resistance tuberculosis
PTB:	Pulmonary tuberculosis
TB:	Tuberculosis
WHO:	World health organization



## **CHAPTER ONE**

### **1. INTRODUCTION**

#### **1.1.1. BACKGROUND**

Tuberculosis is an airborne communicable disease caused by bacteria from the mycobacterium tuberculosis complex, mainly composed of Tuberculosis and other closely related species like *M.bovis* and *M. africanum*. The diseases spread when people who are sick with tuberculosis exhale bacteria into the air (by coughing). Tuberculosis is most often affects the lungs, although other organs are involved in up to one-third of the cases (1).

Despite the tremendous efforts and encouraging progresses obtained towards the control of TB epidemic since 1991, TB remains the major cause of ill health and one of the leading causes of death, ranking 13<sup>th</sup> leading cause of death worldwide in 2019. Until the corona virus (COVID-19) pandemic, TB was the leading cause of death from single infectious agent, ranking above HIV /AIDS worldwide. In 2020 and 2021 ,TB ranks as the second leading cause of death from a single infectious agent ,after COVID-19 (2).

In 2021, an estimated 10.6 million people fell ill with TB. Most people who developed TB were in the South-East Asia (45%), Africa (23%) and the Western Pacific (18%), with smaller proportions in the Eastern Mediterranean (8.1%), the Americas (2.9%) and Europe (2.2%). The 30 high TB burden countries accounted for 87% of all estimated incident cases worldwide. There were an estimated 1.6 million deaths from Tuberculosis in 2021. Africa and South-East Asia regions accounted for 82% of the total TB deaths. (3).

Delay in start of tuberculosis (TB) treatment has an impact at both the individual level. Around 3.6 million people with active TB disease continue to be not detected by health systems across the world every year. Nearly half of TB patients delayed for more than one month and about 40% of patients were diagnosed only after the second or the third visit. There was still a large gap (2.9 million) between the numbers of people newly diagnosed and estimated to have TB in 2019. This is due TB patients do not diagnosed even when they access health care(4).

### **1.1.2. Statement of Problems**

Delays in tuberculosis (TB) diagnosis is the main barrier to the effective management of the disease(5). A major factor in the continuing threat of TB world is the fact that many cases remain undiagnosed. In Africa ,40 percent of TB cases are underdiagnosed or under-reported(6).Ethiopia accounts for 3% of the annually 3 million missed people with TB by the global health system, which was estimated to be 35%(56,164) of incident TB cases missed in 2016(7). Delayed presentation is a major problem contributing to the high burden and transmission of tuberculosis in most developing countries: Ethiopia, where the estimate of sputum-smear positive cases of pulmonary tuberculosis is less than half of those undiagnosed TB cases(8). In Ethiopia evidence indicates that the proportion of tuberculosis patients who had delayed diagnosis was 59.9%(9).

World Health Organization had made different efforts to narrow gaps in TB detection and treatment, in 2018 through an initiative called to find to achieve estimates that at least 30 million people will be eligible for TB preventive treatment between 2018 and 2022(10). Ethiopia could not achieve an on-time diagnosis. The problem is contributed from different factors like inadequacy of resources for TB case finding such as a shortage of healthcare providers, inadequate basic infrastructure, and inadequate diagnostic equipment and supplies(6, 11).

Early diagnosis and prompt effective therapy form the key elements of the tuberculosis control programmer. Delay in diagnosis results in increased infectivity in the community and it is estimated that an untreated smear-positive patient can infect, on average, 10 contacts annually and over 20 during the natural history of the disease until death(12). Delay in start of tuberculosis (TB) treatment has an impact at both the individual level, by increasing the risk of morbidity and mortality, and at the community level, by increasing the risk of not only transmission but also development of Drug resistance TB.

Delay in tuberculosis diagnosis may also lead to a more advanced disease state at presentation, which contributes to late sequel and overall mortality. The major factor for the continued threat of TB in the world lies with the fact that many cases remain undiagnosed and patients delaying seeking healthcare or failure of the health care systems to diagnose patients in a timely manner(13).

The most important component of TB control is prompt detection and treatment of patients with active TB(14).Prolonged delay of such patients to treatment leads to extensive disease(15).Complications, higher mortality, increased period of infectivity in the community(16)and spread of the disease to domestic contacts(17).It is estimated that untreated smear-positive patient can infect, on average, 10 contacts annually and over 20 during the natural history of the disease until death(18). Numerous studies have found association between patient delay and knowledge, stigma, external constraints, and gender differences. When healthcare services fail to detect TB cases, case finding depends on voluntary presentation motivated by symptom recognition, as well as cultural and social influences. For instance patient delay from TB treatment seeking in northern part of Ethiopia were due to living in rural areas, being illiterate, lack of awareness/misperceptions of causes of pulmonary TB, informal treatment related factors such as prior treatment with holy water ,treatment by private practitioners and treatment by drug vendors(19).

Long delay of TB patients in diagnosis pose a terrifying challenge to TB control in Ethiopia; this has been attributed to a number of factors, mainly long distance to health facilities, limited awareness of TB disease and prevalent use of traditional healers(20, 21).

Despite availability of free diagnosis of TB at health facilities in Ethiopia, delay in TB patients detection and early treatment is a problem. Ethiopia contributes 3.5% of undiagnosed TB on the world. Nearly half of TB patients delayed for more than one month and about 40% of patients were diagnosed only after the second or the third visit.

In spite the fact; there are only few studies that specifically address the issue of determinants patient delay in PTB diagnosis in rural areas. Thus, this study is intended to identify determinants of patient delay in pulmonary tuberculosis diagnosis in public health centers of jimma Zone.

### **1.1.3 Significance of the study**

The study findings will help directly and indirectly health care professionals and community at large by exploring determinants of patient delay in diagnosis of pulmonary tuberculosis towards prevention and control of Tuberculosis. It will also assist policy makers in developing context specific and relevant policies capable of improving the prevention and control of the disease in general. Furthermore, it is hoped that, this study can contribute an effort to implement an effective and efficient strategies that may lead to improve, awareness, appropriate knowledge and understanding the independent risk factors of patient delay in TB diagnosis at all levels. Therefore, this study revealed information's which will serve as baseline for planning and intervention strategies in Tuberculosis prevention and control by identifying the determinants of delayed PTB diagnosis and it will help in early diagnosis and treatment in Jimma zone. The recommendations from this study will furthermore be helpful for local health planners, local health department and those organizations working on TB to consider during their planning.

## **CHAPTER TWO**

### **2. LITERATURE REVIEW**

#### **2.1. Determinants of Patients Delay in PTB diagnosis**

TB control strategies involve two components- case finding and case holding. Currently, passive case finding is more widely used than the active one. Owing to the fact that the majority of TB diagnosis is passive-case finding of patients with respiratory symptoms using direct microscopy, the patient's sought timely care on time following onset of symptoms related to PTB is the key issue as well as the quality of TB health services.

Patient's delays in diagnosis of pulmonary tuberculosis related to the socio-demographic factors of people such as, age, gender, marital status, income, education, occupation, address, are indirect determinants that influence the decisions to use health service(5, 22).

A matched case control study done in somali pastoralist setting of Ethiopia revealed that patient delay was attributed to a set of determinants pertaining to the individual patient, disease condition or health system characteristics. Individual factors influenced the patients' intent to seek healthcare or limited their access to health facilities/services. These include pastoral lifestyle, rural residence, poor knowledge, and considering symptoms as less severe. Disease-related factors were severity and multiplicity of symptoms that patients manifested upon disease onset; whereas, the health system elements comprise long distance to access health facilities and visits to traditional healers (23).

The single-centered retrospective review of delayed diagnosis of PTB in western Melbourne showed a delay between the onset of symptoms and treatment initiatives largely caused by patients delay in presenting for a care the patients delay in diagnosing TB problems is a major drawback. Delay in symptoms onset and treatment initiative's largely caused by patients delay in presenting of (24).

##### **2.1.2. Socio Demographic factors**

Determinants of diagnostic delay are more complex than merely socio-demographic characteristics, such as personal perception. Delays in the diagnosis of tuberculosis may also exacerbate the disease and increase TB transmission in the community. Patient Delay in the diagnosis of tuberculosis is related to the socio-demographic factors of people such as, age, gender, marital status, income, education, occupation, address, are indirect Determinants that influence the decisions to use health service(22).

The study done on determinants of delay in tuberculosis diagnosis in Hamadan province, 2014 stated that, Gender is a determining use of health service. Female's use of health services is considered have low risk delay of diagnosis in tuberculosis compared to males. (25).

The study done on delay in tuberculosis diagnosis in provinces of Argentina showed age is one variable with determinants which plays a role in diagnosis. The influence of age in relation to seeking care or using health services is different because of different age groups is different from the distribution of illness or suffering. Patient delays occurred most frequently in patients aged >50 years, in those who need transportation to a nearby destination on public health services (26).

Different studies observed that advanced age is one of the predictors of patient delay(27).However, in the study done at seru district individuals in the 45-50 year old age range sought care earlier than those 15-24. Unemployed, rural residence, low income, and long travel time/distance is the variables determine with patient delay in diagnosis of tuberculosis(5).

An institutional based cross-sectional study was conducted by Chang CT and Esterman, A. in Sarawak, Malaysia on Diagnostic delay among pulmonary tuberculosis patients showed that out of 316 new smear-positive adult PTB patients recruited for study 61.1 % were males and 38.9% females; the mean age was 44.2 years, the median patient interval was 30 days with the longer delay of one year and the median diagnostic delay was 22 days and the reasons for patient delay were , treated themselves with over-the-counter drugs15.5%, sought treatment from traditional healers7% and the remaining respondents claimed that they treated themselves as well as using traditional healer(28).

In Ethiopia, a Study conducted by Mengiste M et, al on Delays and care seeking behavior on 237 tuberculosis patients in Tigray of northern Ethiopia showed that 55.3% were married, 56.1% were rural residents, 92 (38.8%) had formal schooling and 44.7% depended on farming for a livelihood, median age 34.4 years; the median patient, health service and total delays were 60, 9, 99 days, respectively. Factors associated with patient delay were residence (rural/urban), education (no formal schooling/formal schooling), age (>35/15-34 years), tuberculosis diagnosis, whether a patient suspected tuberculosis before his/her first visit at a health institution, action taken before first consultation (treated by private or traditional practitioner/did nothing), and

Illness perceived as not serious (44).However, the study does not address the determinants of patient delay in TB diagnosis therefore; this study will address this gap.

### **2.1.3. Enabling Factors**

A study in Patient's delay in TB center treatment among Myanmar migrants, stated that, There are certain barriers in the access of health service including physical barrier (distance, time travel, mean to transport), Economic barrier (travel cost, medical cost) a social and cultural barrier that exist in any community. In general, as distance to facility increase, utilization of health service decreases. This is an important barrier toward seeking health care. The effect of distance is greater when it is combined with lack of transportations and complex directions. Availability and Accessibility to health services factors identified as influencing delay in diagnosis (29).

According to WHO TB diagnosis delay report 2016, Accessibility is a number or proportion of the given populations that can be expected to use a specified facility service. In general, as increase, utilization of health service decreases. This is an important barrier towards patient delay in diagnosis.

### **2.1.4. Individual Factors**

The role of knowledge about their disease is an important role in Diagnosis because it refers to the patient's ability to recall or know about the etiology of disease, chain of disease process, symptoms, preventions and treatment. The delay was mainly the presence of the patients in Iraq, Somali Syrian Arab republic and Yemen, delays inpatient were due with insufficient knowledge (18).

Delays in the diagnosis of TB have been studied in both high and low income c countries and vary significantly from 8.1 weeks in New York to 12 weeks in Botswana and 26 weeks in Tanzania. Individual's perception of the disease, the severity of the disease, factors identified as influencing delay in diagnosis.

The study done on Patient delay and associated factors among tuberculosis patients in Gamo zone public health facilities stated, The cultural issues, low socioeconomic standing, low knowledge and awareness of the disease are all possible explanations for the difference in delay. Furthermore the long delay of patients to be related to their failure to recognize symptoms in

early onset of symptoms A positive perception on TB illness plays an important role in the early detection of infectious cases (30).

The study done in jimma zone confirms that there is considerable delay between the onsets of initiation of treatment among all categories of TB patients in the jimma zone. According to the study findings most of the delay was attributable to late patient's health seeking care facilities(31).

## **2.6. Conceptual framework**

The conceptual frame works for this study is developed by extracting ideas from factors leading to delay in PTB diagnosis from different literature reviews, based on the assumption Socio demographic Factors (such as; age, sex, place of residency), Individual factors (perception, knowledge about Tb) and enabling factors (Availability, Acceptability to TB center and treatment (from Date of onset symptoms to sought care for PTB cases will may be determinant of patient delay in PTB diagnosis (32).

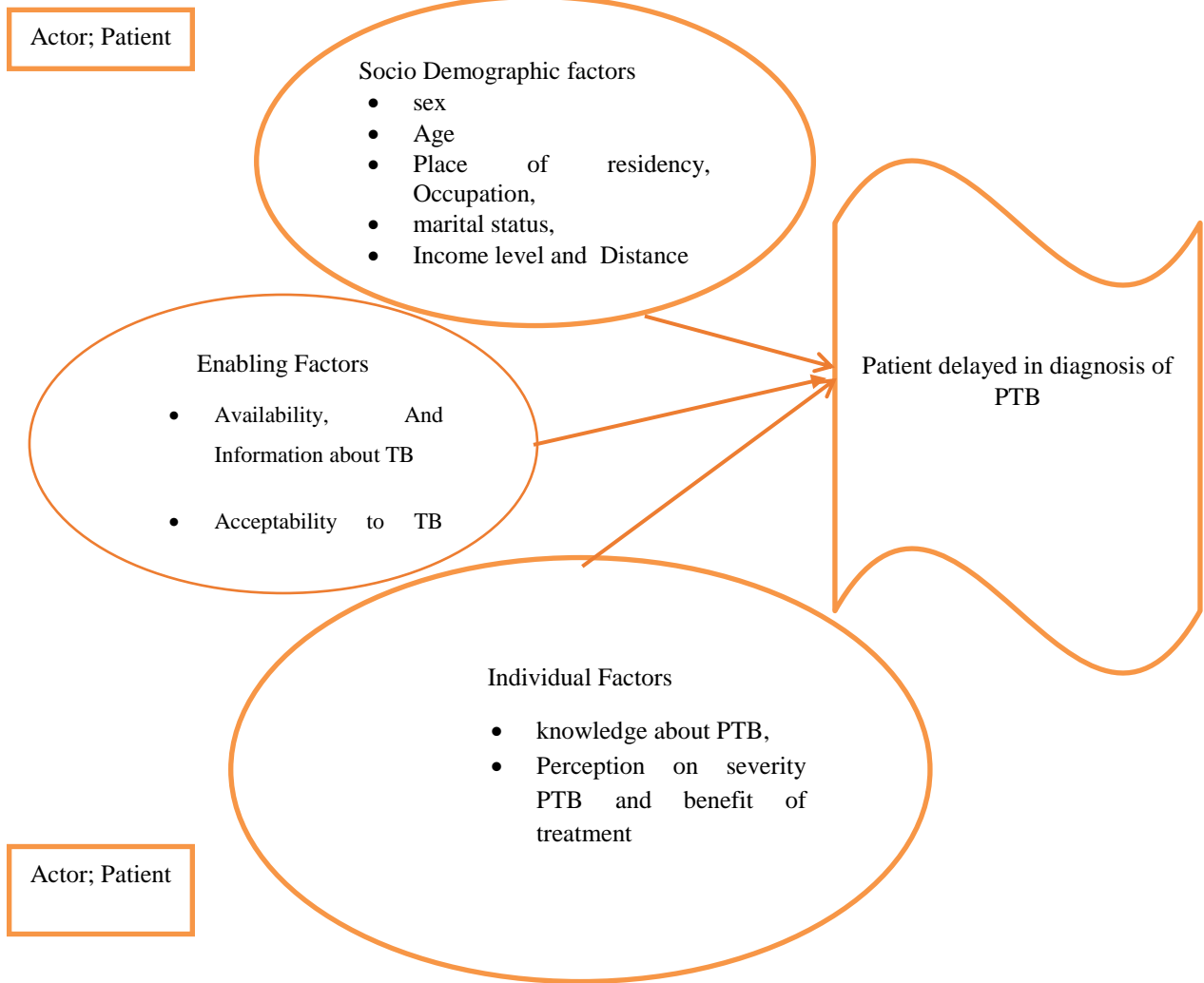


Figure1 Conceptual framework for study determinants of patients delay in tuberculosis diagnosis services in public health centers in Jimma zone, Oromia region Ethiopia 2024.

## **CHAPTER THREE**

### **3.1 Objectives**

- ❖ To identify determinants of patient delay of pulmonary tuberculosis diagnosis at public health centers in Jimma Zone 2024.

### **3.2 Hypothesis**

- ❖ Patients living in rural areas and distant from residency to health center more substantial delay to diagnosis of pulmonary tuberculosis.

## **CHAPTER FOUR**

### **4 Methods**

#### **4.1. Study Area and Period**

The study was conducted in Jimma zone from December 2023 to March 2024. Jimma Zone is one of the zones in Oromia National Regional state located at 336 km away from Addis Ababa in south west. According to 2022P rojection, the total population of the zone is 2,692,740. The majority of the population lives in the rural area and is engaged in farming The zone has 20 Woreda and 31 urban towns, The zone has eight governmental Hospitals,two private hospitals ,120 health centers 390 health posts 76 private clinics79 drug venders. In the zone in general there are 2643 health professional working at different levels. In 2022 at the beginning of third quarter there were 20 DOTS centers in the zone with around 1507 patient attending treatments (33).

#### **4.4.2. Study Design**

- ❖ Unmatched Case Control study was conducted to identify determinants of patient delay in pulmonary tuberculosis diagnosis in Jimma Zone 2024.

### **4.3. Population**

#### **4.3.1. source population**

Confirmed PTB patients aged > 15 years who are on the DOT in selected public health centers of Jimma Zone.

#### **4.3.2. Study Population**

The study population was PTB patients who are on the DOT at selected public health centers in Jimma zone.

Cases were PTB patients who had diagnostic delays following the onset of pulmonary symptoms related to TB.

Controls were patients with similar inclusion criteria as a case except those who sought timely care within 3 weeks of onset the symptoms related to PTB.

## **Inclusion Criteria**

- Self-presented and confirmed PTB patients aged > 15 years who delayed more than 3 weeks who didn't seek timely care of TB from health care facility following the onset symptoms of PTB those who are on the treatment (Case).
- Self presented and confirmed PTB patients aged > 15 years who sought timely care within 3 weeks onset of symptoms related to PTB(Control).

## **Exclusion Criteria**

- Those who have impaired hearing and psychiatric problems
- Those with previous history of PTB treatment were excluded from the study
- Patients identified using active case-finding efforts are excluded, which include human immunodeficiency virus (HIV) co-infected patients identified during follow-up screening
- Those identified by health extension workers (HEWs) during home visits.

## **4.4. Sample size and Sampling procedures**

The sample size was calculated by using OpenEpi7.2.5.0 software for using the double population proportion formula for case-control studies. Assumptions considered included 95% confidence interval (CI), power of 80%, AOR of 2.1 cases to control ratio of 1:1, and 45.6% proportion of control exposed. Hoped illness go away gradually in Ethiopia(34). 5% precision and 10% non-response rate. The final sample size is 129 cases and 129 controls (Total = 258).

### **4.4.1 .Sampling procedure**

Health centers implementing DOTS service were identified based on the information from Jimma zonal health departments. There were 21 health centers that implemented the DOTS service (32). Thirty percent of the Implementing DOTS Health centers were selected as study sites using lottery methods due to the possible economic constraint and time limitation to cover the entire health center with Functional DOTS services. Based on PTB patients who are on DOTS from each selected Health center were proportionally allocated to cases 129 and 129 controls. The required number of individuals was randomly from the sampling frame of PTB patients who are on the DOTS at the health centers.

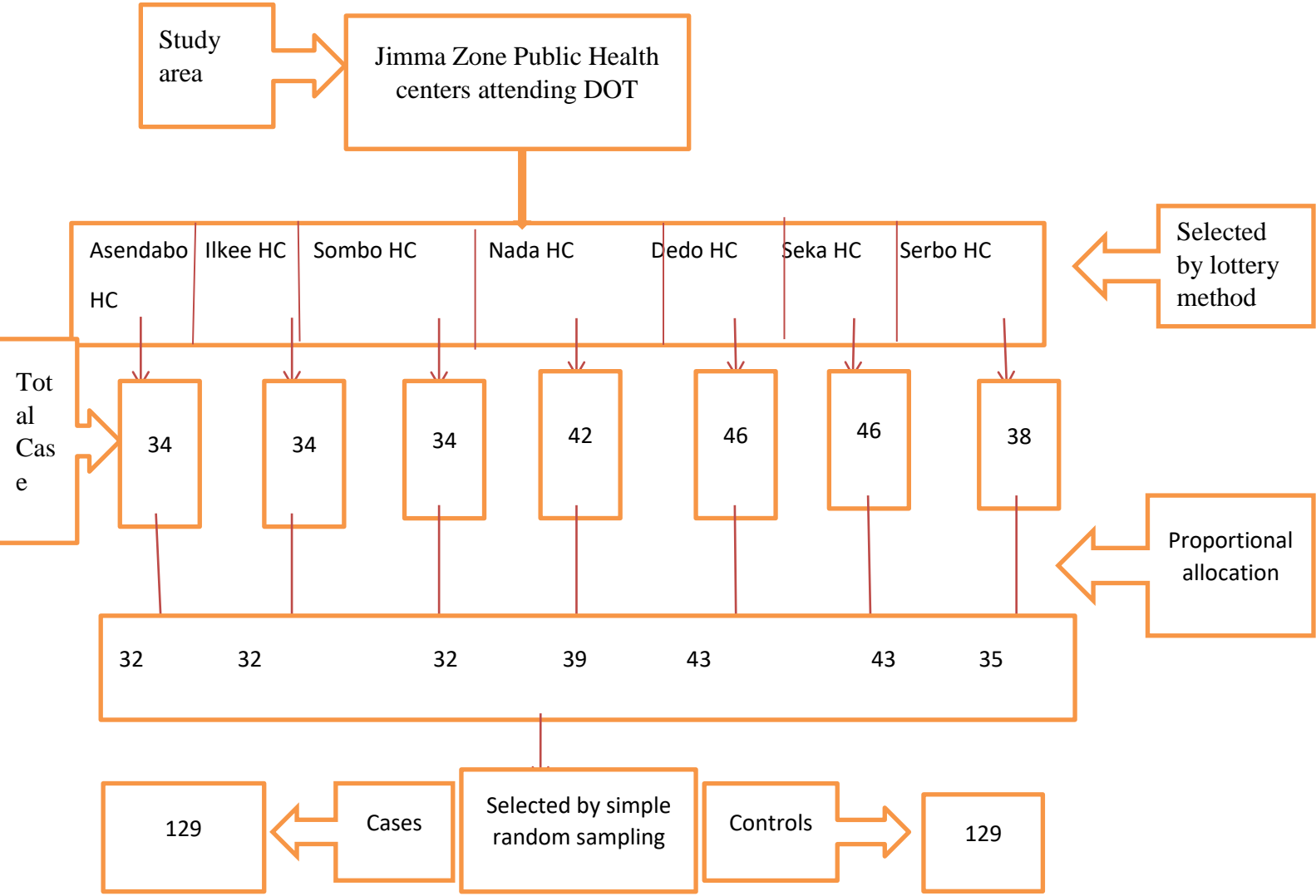


Figure 2: The scheme of Sampling Procedure for study determinants of patients delay in tuberculosis diagnosis services in public health centers in Jimma Zone, Oromia Region Ethiopia

## **4.5. Data collection procedures (Instrument, personnel, data collection technique)**

### **4.5.1. Instrument**

The questions were adapted from similar studies in Eastern Mediterranean WHO region (18). The questionnaire were adapted initially in English and translated to Afaan Oromo and it again translated back to English by experts to check the consistency of the instrument. Finally, the Afaan Oromo version was used for the actual interview. Data on socio-demographic, individual Factors, Enabling factors, were collected from patient through patient interview using pre-tested and structured questionnaire. (23, 35, 36).

### **4.5.2. Data collection Technique personnel**

Data was collected by six trained experienced diploma nurses recruited from the health centers through face -to -face interview of the study population using pre –tested structured questionnaire. For one questionnaire on average takes 25 minutes per person. The period of data collection was one month at TB clinic in the health institutions. The investigator expected to receive the total calculated cases of subjects and each data was checked for the completeness .

six nurses in the respective DOTs clinics conducted interviews using the questionnaire that was translated into local oromic languages by language experts. The durations of delay were calculated afterwards (time span from onset of symptoms to first consultation). Cough or another main symptom constitutional symptoms (fever, night sweats, weight loss, and loss of appetite) that compelled the patients to seek care (in the absence of cough) was used as a benchmark of symptom onset and information was taken from record review.

## **4.6. Study variables**

### **4.6.1. Dependent Variables**

- Patient delays in Pulmonary tuberculosis diagnosis

### **4.6.2 Independent Variables**

- **(Socio -demographic factors)**

- ❖ Sex
- ❖ Age
- ❖ Marital status
- ❖ Occupational
- ❖ Place of residency
- ❖ History of smoking
- ❖ Distance from Health facility time
- ❖ Educational level
- ❖ Family income
- ❖ HIV status and co-morbidities.

- **Enabling Factors**

- ❖ Availability,
- ❖ Acceptability to TB center and treatment

- **Individual Factors**

- ❖ Perception on severity PTB and benefit of treatment.
- ❖ Knowledge, perceived barriers to care (myths/perceptions)

## **Measurement of the variables**

**Perception:** The respondents were asked about their opinion on PTB disease and treatment. A total of 11 questions is prepared based on 3 level likert's scales. The respondent's score on the answer to each questions was score lowest "1" to highest "3" depending on either question is positive or negative (37). For the positive perception question, the scoring was given as follows Agree = 3 score Not sure = 2 score Disagree= 1 score For the negative perception question' the scoring was reversed The level of perception was classified in in to positive and negative perception.

**Knowledge:** The respondents were interviewed about their knowledge on PTB on cause,transmission and treatment. For knowledge assessment; the entire item was converted to scores. Each correct answer was given one score. Knowledge level was classified into high level, moderate, and low level of knowledge based on Bloom's cut off points for knowledge, in which cut off point was determined by 60% of full mark.

## 4.7. Operational definitions

**Patient Delay:** Is defined as the period between the onset of illness and patient first attendance of health care facility because of this illness, patient delay is considered when He/She is delay in more than three weeks before seeking treatment from health care facilities(38).

The date of onset of for the main symptoms was taken as the date of onset for the illness. For PTB patients, cough was taken as the main symptom or constitutional symptoms (fever, night sweats, weight loss, and loss of appetite) were taken as the onset of the illness which ever came first(39).

Pulmonary Tuberculosis (PTB): is a patient with lung TB and confirmed by microbiological (AFB/culture/GeneXpert) (40).

**Self-presented patient:** is a PTB patient who sought initial care for his/her pulmonary illness without being referred by healthcare providers (excluding patients identified by active case finding).

**New case:** is a patient who has never had treatment for TB before or has not yet initiated anti-TB treatment. **Retreatment patient:** is a patient who was treated for any form of TB before but has developed the disease again (relapse, default or therapy failure of the first regimen).

**Availability:** Refers to the available condition for TB patients to get TB services.

**Accessibility:** Refers to whether the service site is ease of getting or convenient for TB patient's obtaining anti TB treatment. i.e. within 2hr on foot or less than 10Km from the patient home to the health institutions on one way travel

#### **4.8. Data analysis procedures**

Data were checked, entered and cleaned in to Epi data 3.1 version software, then exported to SPSS version 23 versions. The results of the descriptive statistics were expressed as percentage and frequency. Logistic regression was used to fit the data to identify factors associated with patient delay in PTB diagnosis. All explanatory variables that were associated with the outcome variable in bivariate analysis with p-value of 0.25 or less was included in the initial logistic models of multivariable analysis. Adjusted odds ratios together with their corresponding 95% confidence intervals was computed. A P-value < 0.05 were considered to declare a result as statistically significant. Model fitness was checked by Hosmer and Lemeshow test. All the independent variables selected for multivariable analysis variables were fitted and the multicollinearity effect was checked.

#### **4.9. Data quality management**

Pretested was done on 10% of the sample size at Jimma town in three of health centers. The quality of the data was assured by using validate questionnaire, translation, retranslation and pre-tested of the questionnaire. The questionnaire was translated from English to Afaan Oromo by expert translator and back to English by second other translator to compare the consistency. Prior to the actual data collection, pre-tested was done on 10% of the total study subjects PTB patients attending Jimma town health center who were not part of the study and based on findings necessary amendments were made. Data collectors and supervisors were trained for three days on the study instrument and data collection procedure. There were regular supervision of the data collectors by trained supervisors and each day collected data were counterchecked for completeness and corrective measures were taken accordingly. To minimize misclassification due to recall bias, the first dates of illness onset from the record reviewed by the Investigator and data collectors were blinded in selection of case and Controls.

#### **4.10. Ethical consideration**

Ethical clearance for the study was obtained from the Ethical Review Board of Jimma University Institute of Health. After approval from Jimma University Institute of Health Research and Postgraduate IRB granted supportive letter was written from the Epidemiology department to the the selected health office and Districts. In addition all of the study participants were informed about the purpose of the study and finally their oral consent was obtained before interview and it was also ensured during each activity of data collection. The respondents were notified that they have the right to refuse or terminate at any point of the interview. The information provided by each respondent was kept confidential.

#### **4.11. Dissemination plan**

The final report of this study will be presented and a comprehensive report will be submitted to Jimma University, Epidemiology department as partial fulfillment for the requirement of research methodology course. It will also be given for the woreda health offices. It will be ready for users at the health science library of Jimma University. Lastly, efforts will be made to publish the paper in an international journal.

## Chapter 5: Results

### 5.1 Socio-demographic characteristics of PTB patients

In this study, a total of 124 cases and 128 controls were included. Over all of the total cases, 52(41.9%) were male and controls 75(58.5%) were male with 98% response rate. Majority of the ages of the respondents 46(37.09%), 53 (41.4%) were between 24 and 30 years old among cases and controls respectively. The majority of cases 104(83.8) were from rural setting compared to 100(78.1) of controls. More than four fifth 101 (81.4%), 106 (82.8%) of respondents have monthly income of greater than 801among cases and controls respectively. Regarding occupational status of the total cases farmers, Students, Unemployed and Other's(Government employee, house wife and daily labor) were 80(64.5%), 21(16.9%), 15(12.09) and 8(6.4) respectively compared to 77(60.15%), 21(16.4%), 15(11.7%) and 15(11.7%) controls, respectively. The majority of cases and controls were primary school and live with support from other. Out of 124 cases and 128 controls interviewed, about 3.22% cases and 17.10 of controls can easily reach the health center TB clinic within the distance of 6km and more than half 90 .3% and 77.34% of cases and controls had to travel more than 10km to get TB center. (**Table 1**).

Table 1 socio-demographic characteristic of PTB patients at public health centers of Jimma zone, Oromia region south west Ethiopia, 2024 (Cases=124, Controls=128).

Variables	Category	Cases, N (%)	Controls, N (%)
Sex	Male	52(41.9)	75(58.6)
	Female	72(58.1)	53(41.4)
Age cat	15-23	26(20.95)	46(35.9)
	24-30	46(37.09)	53(41.4)
	31-50	35(28.26)	25(19.5)
	>50	17(13.7)	4(3.12)
Place of residence	Urban	20(16.2)	28(21.8)

	Rural	104(83.8)	100(78.2)
Marital status	Married	96(77.41)	75(58.59)
	Unmarried	20(16.12)	43(33.59)
	Divorced/widowed	8(6.45)	10(6.25)
Occupational status	Farmer	80(64.51)	77(60.66)
	Student	21(16.94)	21(16.41)
	Unemployed	15(12.1)	15(11.72)
	Others	8(6.45)	15(11.72)
Educational status	Illiterate	61(49.1)	37(28.9)
	Read and write only	10(8.06)	16(12.5)
	Primary school (1-8)	48(38.7)	63(49.3)
	High school (9-12) and above	5(4.03)	12(7.8)
Monthly Income	<400	5(4.03)	5(3.9)
	401-801	18(14.5)	17(13.2)
	>801	101(81.4)	106(82.8)
Distance from residency to HF in KM	0-6	4(14.8)	23(17.10)
	6.1-10	8(57.1)	6(4.68)
	10	112(53.1)	99(77.34)

## 5.2. Individual Factors

### 5.2.1 Knowledge about TB and its prevention

There were 18 questions used to test the level of knowledge of the respondents on TB and its treatment with each correct answer given one score. From the total of 124 case and 128 controls of respondents about 34.6% cases and 48.4% of controls knew that causal agent is infectious TB germs, 90.3% cases and 91.4% of controls knew TB could give group of symptoms, 53.2% cases and 64.6% controls knew respiratory tract is the route of entry, 64.5% cases and 71.1% controls knew one infected family member is the risk for other, 39.6% cases and 46.1% controls knew TB occurs as OI in TB patients, 45.2% cases and 51.6% controls knew BCG vaccination as preventive measure of TB, 76.6% cases and controls knew Preventive methods of TB covering mouth and nose, and 75% cases and 8.% controls knew Six month therapy can cure TB.

From the total score of knowledge; Lower level, moderate level, and higher knowledge level were classified according the Bloom's cut of point in table 3. Total scores more than 60% were considered as good knowledge, total score of 60% were considered as moderate and total score less than 60% were considered as lower knowledge. Accordingly more than half (55.6%) of cases had lower knowledge level compared to controls 5.9% respectively and about 29.8% of cases and 32.8% of controls had moderate knowledge level (**Table 2**).

Table 2 Knowledge level of pulmonary TB patients about TB and its prevention and treatment of Jimma zone, Oromia region south west Ethiopia, 2024 (Cases=124, Controls=128).

		Frequency (%)	
		Cases	Controls
Knowledge	Lower level	69(55.6)	46(5.9)
	Moderate level	37(29.8)	42(42.8)
	Higher level	18(22.5)	40(31.25)
Total		124	128

### 5.3 Enabling Factors

#### 5.3.1. Availability of TB center and information about TB and its treatment

Regarding to the availability of TB center service provided at TB center; out 124 cases and 124 controls respondents 32.2%, 22.5%, 43.5%, 37.09% and 33.07% of cases knew that Anti TB drugs, consultation, physical examination, sputum examination and x-ray services were given at TB center compared to controls 44.5%, 28.2%, 53.1%, 49.2% and 48.2% respectively. (Table 3).

Table 4 : Types of services known by Pulmonary TB patients at public health centers of Jimma zone, Oromia region south west Ethiopia, 2023

Table 3 : Types of services known by Pulmonary TB patients at public health centers of Jimma zone, Oromia region south west Ethiopia, 2024

Availability statement	Frequency (%)	
	Controls(n=128)	Cases(n=124)
<b>Consultation services</b>	No 91(71.1)	96(77.4)
	Yes 37(28.9)	28(22.6)
<b>Physical Examination services</b>	No 70(54.7)	72(58.1)
	Yes 58(45.3)	52(41.9)
<b>Sputum Examination services</b>	No 65(50.8)	78(62.9)
	Yes 63(49.2)	46(37.1)
<b>X-ray services</b>	No 66(51.6)	83(66.9)
	Yes 62(48.4)	41(33.1)
<b>Anti TB drug services</b>	No 71(55.4)	84(67.7)
	Yes 57(44.6)	40(32.3)

Regarding main source of advice to visit TB center of 124 cases and 128, about 67(54.03%) cases and 46(35.9%) controls of patients were self-initiated, 23(18.6%) cases and 23(17.10) advised by family members, 22(17.74%) cases and 49(8.2%) advised by private health workers and 12(9.7%) of cases and 10(7.8%) of controls advised by others (HDA, Previous TB patients and friends at work).Concerning Source of information about TB and its treatment, about 17.7% ,20.16%, 45.16%, 9.6%, 6.4% and 0.8%, of Cases got information from hospital staffs, Friends, Private health workers, Television, radio and others, where as compared to controls 17.18% ,21.8%, 41.4%, 8.5%, 7.0% and 3.9% respectively. (**Table 4**).

Table 4 Source of information of TB patients about TB and its treatment in Jimma zone, Oromia region south west Ethiopia, 2024 (Cases=124, Controls=128).

		Frequency (%)	
		Cases(n=124)	Controls(n=128)
Source of information about TB	Health care providers	78(62.9)	75(58.5)
	Friend	25(20.16)	28(21.8)
	Television	12(9.6)	11(8.5)
	Radio	8(6.4)	9(7.0)
	Other	1(0.8.9)	5(3.9)
Total	124	128	

Regarding the first action up on recognized illness, as initial points of care 68(54.8%) of cases and 81(63.2%) controls were visited at Hospital/HC, while 27(21.77%) of cases and 26(20.31) controls visited at traditional remedy/religious as well as 29(23.38%) of cases and 21 (16.40%) were visited at lower level of health facility respectively.

## 5.4. Individual Factors

### 5.4.1 Perception on Severity of getting PTB

Out of the total cases 44(35.4%), controls 51(9.8%) of the respondents perceived that having TB doesn't discriminate from society and about 40(32.25%), 21(16.04%) of respondents perceived that TB is not permanently cured by drug alone, among cases and controls respectively.

However; majority of cases 80(64.5%) and controls 95(74.25%) perceived that TB is a deadly infectious disease, about 59(47.5%) cases and 84(65.6%) of respondents perceived that suffering with TB could partly lose income, on the other hand more than one third of the cases 83(66.9%) had perception on early treatments speed up recovery and 71 (57.2%) had perception that timely treatment of TB can prevent TB complications, Compared to controls 99(77.3) and 88(68.75%) among cases and controls respectively.

From the total score of perception; Positive and Negative level were classified .About 62.9% of cases had Negative perception, but 37.1% and 68.75% of the cases and controls had Positive perception level on severity of TB and benefit of TB treatment respectively (**Table 5**).

Table 5: Distribution of TB patients in Jimma zone health centers by perception level on severity of getting TB and benefit of treatment of tuberculosis 2024

	Frequency (%)
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		Cases	Controls
Perception	Negative	78(62.9)	40(31.25)
	Positive	46(37.1)	88(68.75)
Total		124	128

### 5.5 Determinants of patient delay of pulmonary tuberculosis diagnosis

To identify determinants of patient delay of pulmonary tuberculosis diagnosis in Jimma Zone, bivariate and multivariate binary logistic regression analyses were used. In the bivariate analysis, factors that had p-value < 0.25 were selected as candidate variables for the multivariable analysis. Sex, place of residence, age, marital status, educational status, first action upon recognized illness, overall financial support, distance from residency to HF, knowledge about TB and perception on severity PTB were selected as a candidate variable for multivariate logistic regression model (Appendix A: Table 6). Then these variables were entered into multivariate logistic regression analysis and backward variable selection method was used to determine patient delay of pulmonary tuberculosis diagnosis in Jimma Zone.

Table 6 \*indicates candidate variables selected for multivariate analysis (P-value<0.25), COR: Crude odd ratio, AOR: Adjusted odd ratio, 1: reference categories, CI: Confidence interval

<b>Variables</b>	<b>Category</b>	<b>Case</b>	<b>Control</b>	<b>COR(95%CI)</b>	<b>p-value</b>
Sex	Male	52(40.9)	75(59.1)	1	.008*
	Female	72(57.6)	53(42.4)	1.96(1.19,3.23)	
Place of residence	Urban	20(41.7)	28(58.3)	1	.247*
	Rural	104(51.0)	100(49.0)	1.46(.771, 2.75)	
Marital status	Married	96(56.1)	75(43.9)	1	.011*
	Unmarried	20(31.7)	43(68.3)	.363(.197, .669)	
	Divorced/widowed	8(44.4)	10(55.6)	.625(.235, 1.66)	
Educational status	Illiterate	61(62.2)	37(37.8)	3.96(1.29, 12.13)	.002*
	Read and write only	10(38.5)	16(61.5)	1.50(.405, 5.552)	
	Primary school (1-8)	48(43.2)	63(56.8)	1.83(.603, 5.542)	
	High school (9-12) and above	5(29.4)	12(70.6)	1	
First action upon recognized illness	Visit HC/Hospital	68(45.6)	81(54.4)	1	.126*
	Visit traditional remedy /religious	27(50.9)	26(49.1)	1.24(.660, 2.317)	
	Visit low level HF	29(58.0)	21(42.0)	1.65(.861, 3.143)	
Advises to come to TB center?	Family members	23(50.0)	23(50.0)	1	.110*
	Self-initiatives	67(59.3)	46(40.7)	1.46(.731, 2.901)	
	Private health workers	22(31.0)	49(69.0)	.449(.209, .966)	
	Others(Neighbors, HDA, Previous TB, Friends at work)	12(54.5)	10(45.5)	1.20(.433, 3.324)	
Financial support to go to TB center?	Self	16(34.8)	30(65.2)		.015*
	Family	87(50.6)	85(49.4)	1.92(.976, 3.77)	
	Friends	14(58.3)	10(41.7)	2.63(.953, 7.23)	
	Others	7(70.0)	3(30.0)	4.37(.994, 19.26)	
Age	15-23	26(36.1)	46(63.9)		.001*
	24-30	46(46.5)	53(53.5)	1.54(.824, 2.86)	
	31-50	35(58.3)	25(41.7)	2.47(1.226, 5.05)	
	>50	17(81.0)	4(19.0)	7.52(2.28, 24.73)	
Distance from residency to HF in KM	0-6	4(14.8)	23(85.2)		.001*
	6.1-10	8(57.1)	6(42.9)	7.67(1.71, 14.35)	
	10	112(53.1)	99(46.9)	6.51(2.17, 19.46)	
Knowledge	Lower level	69(60.0)	46(40.0)	3.33(1.71, 6.51)	.000*
	Moderate level	37(46.8)	42(53.2)	1.96(.962, 3.984)	
	Higher level	18(31.0)	40(69.0)		
Perception	Negative	78(66.1)	40(33.9)	3.73(2.21, 6.28)	.000*
	Positive	46(34.3)	88(65.7)		

Model fitness was checked by Hosmer and Lemeshow test and the p-value was 0.585, shows that the p-value is greater than 0.05, then fails to reject the null hypothesis, and it is stated that the logistic model is good for the data set. All the independent variables selected for multivariable analysis were fitted and the multicollinearity effect was checked. Then, the VIF for all the independent variables is less than 10 (Appendix B). Finally, Sex, place of residence, educational status, knowledge about PTB, perception on severity PTB, and distance from residency to HF was identified as the determinants of patient delay of pulmonary tuberculosis diagnosis at 5% level of significance.

The odds of patient delay to diagnosis PTB was 2.87 times higher in female as compared to their respective counterparts [AOR=2.46, 95% CI: 1.31-4.63]. Similarly the odds of patients delay >21 days was 2.34 times higher for patients living in rural area as compared to urban [AOR=2.34, 95% CI: 1.07-5.09].

Illiterate patients were 6.40 times more likely to delay in diagnosis of PTB as compared to patients who had an educational level of higher school and above [AOR=6.40, 95% CI: 1.64-14.98]. Patients who walked over 10KM were 6.77 time more likely delay to diagnosis PTB as compared to patients who came from short distance (Less than 6KM) [AOR=6.77, 95% CI: 2.04-22.5].

Patients who had lower knowledge of TB patients were 3.69 times more likely delay to diagnosis PTB as compared to patients who had higher knowledge [AOR=3.64, 95% CI: 1.56-8.75]. Similarly, patients who had negative perception towards TB patients were 3 times more likely to delay longer than 12 days as compared to patients who positive [AOR=3.05, 95% CI: 1.65-5.65]. Patients advised to come to TB center by private health workers were 74.4% less likely to delay longer than 12 days as compared to patients advised to come to TB center by self-initiatives [AOR=.256, 95% CI: .098-.669] (**Table 7**).

**Table 7:** Determinants of patient delay in pulmonary tuberculosis diagnosis in Jimma Zone from December 2023 to March 2024 (Case=124, Control=128).

Variables	Category	Case (>21 day)	Control (≤ 21 day)	COR(95%CI)	AOR(95%CI)	p-value
Sex	Male	52(41.9)	75(58.6)		1	
	Female	72(58.1)	53(41.4)	1.96(1.19,3.23)	2.46(1.31,4.63)*	.005
Place of residence	Urban	20(16.2)	28(21.8)		1	
	Rural	104(83.8)	100(78.2)	1.46(.771, 2.75)	2.34(1.07,5.09)*	.032
Educational status	Illiterate	61(49.1)	37(28.9)	3.96(1.29, 12.13)	6.40(1.64,14.98)*	.007
	Read and write only	10(8.06)	16(12.5)	1.50(.405, 5.552)	4.31(.873,21.29)	.008
	Primary school (1-8)	48(38.7)	63(49.3)	1.83(.603, 5.542)	2.35(.619,8.91)	.073

	High school (9-12) and above	5(4.03)	12(7.8)		1	
Advises to come to TB center	Family members	23(18.55)	23(17.97)		1	
	Self-initiatives	67(54.03)	46(35.10)	1.46(.731, 2.901)	1.01(.424,2.40)	.984
	Private health workers	22(17.74)	49(38.28)	.449(.209, .966)	.256(.098,.669)*	.005
	Others	12(9.68)	10(7.81)	1.20(.433, 3.324)	.862(.250,2.97)	.814
Distance from residency to HF in KM	0-6	4(3.22)	23(17.10)		1	
	6.1-10	8(6.45)	6(4.69)	7.67(1.71, 14.35)	3.77(.705,20.1)	.121
	>10	112(90.3)	99(77.34)	6.51(2.17, 19.46)	6.77(2.04, 22.5)*	.002
Knowledge	Lower level	69(55.6)	46(35.9)	3.33(1.71, 6.51)	3.69(1.56,8.75)*	.003
	Moderate level	37(29.8)	42(32.8)	1.96(.962, 3.984)	2.29(.979,5.35)	.056
	Higher level	18(22.5)	40(31.25)		1	
Perception	Negative perception	78(62.9)	40(31.25)	3.73(2.21, 6.28)	3.05(1.65,5.65)*	.000
	Positive perception	46(37.1)	88(68.75)		1	

*\*indicates significance at 5% level, COR: Crude odd ratio, AOR: Adjusted odd ratio, 1: reference categories, CI: Confidence interval*

## Chapter 6: Discussion

Tuberculosis is the major cause of ill health and death in developing countries. It remains an important public health problem in Ethiopia since the number of TB cases have not declined throughout the past years. The prevention and control of tuberculosis in Ethiopia will require increased case detection and effective treatment. Therefore; the public should know that tuberculosis has treatment; there is cure for TB, the importance of early seeking treatment and compliance with anti-TB treatment regimen. In this case control study an effort has been made to identify determinants of patient delay of pulmonary tuberculosis diagnosis in Jimma Zone 2023. This study identified unacceptably long duration delay between onsets of symptoms until the

diagnosis of pulmonary tuberculosis diagnosis and days during which the TB cases were transmitting infection in the community.

The finding revealed that patient delay was attributed to a set of determinants pertaining to the socio demographic factors, Enabling factors and individual patient. In this study gender, place of residence, knowledge and perception of patients were significantly associated with patient's delays in diagnosis of pulmonary tuberculosis diagnosis. Individual factors influenced the patients' intent to seek healthcare or limited their access to health facilities/services. These includes rural residency, poor knowledge and negative perception towards TB patients.

This study indicates that Females were more likely delay to diagnosis of pulmonary tuberculosis compared to males and rural patients were more likely to delay more than a three weeks to medical attention. The reason might be related to long distance to diagnostic services in rural settings. Patients who walked over 10KM were more likely to delay longer than 21 days as compared to patients who came from short distance (Less than 6KM) The study is in agreement with the study conducted in Somali pastoralist setting of Ethiopia found that rural resident were more likely to delay in diagnosis of pulmonary tuberculosis than urban dwellers (23). Illiterate patients were more likely to delay longer than 21 days as compared to patients who had an educational level of higher school and above. The finding of this study in line with similar study conducted in Aday et al. WHO eastern Mediterranean office, Mengiste et al which revealed illiterate patients significantly associated to delay in diagnosis of pulmonary tuberculosis (8). Patient delays in diagnosis of pulmonary diagnosis, although this data showed that the effect changes with ages:, delay increases age >50 years as compared to age group of between 15 to 23 years. A study from provinces of Argentina supports this finding, in that age >50 years were delays in pulmonary tuberculosis diagnosis (41).

However opposite to this concept, even though considerable number of TB patients delayed from TB diagnosis and missed their medication during study period; detailed analysis of the various determinants interplaying to predict the delay in TB showed no significant association between the level of delay and non-delay with age, gender, residency and educational level of respondents.

Low level of knowledge about TB and its treatment, Negative perception level on severity of getting TB and benefit of TB treatment, and when patient advised from non-health care provider

significantly contributed this long delay. Reason adduce by some of the respondents and informants who had prolonged delay in seeking care in the spent study; temporary treatment and getting improved initially , symptoms were minimal and gradually arise , health facility too far , financial problems , low level of knowledge, and use of traditional medicine. This finding is similar to studies by WHO regional office for eastern Mediterranean (29), Fatiregun, and Ejeckam(46), and Mengiste (44) which reported longer distance from health care facility, educational level of the patients and action taken before the first consultation ( treated by traditional practitioner) are the main reason for delay. These findings were not mentioned in other previous studies. In general, Thus, these findings shows that visiting drug store or pharmacy and buy drug/medicine may mask and/or delay the progression of disease process, non-health care professionals may provide inaccurate information about TB and its treatment and having low knowledge about TB and its treatment and low perception on severity of TB contributes for long duration of overall delay. So that patients may stay long duration being unconfirmed as having TB.

This study might be Recall and selection bias negatively affected the study result, Use of case control study design could not establish temporal relationship, Case control study can only identify association, could not proof causation and since this study conducted on a facility level generalization to community is unreal.

## **Chapter 7: Conclusion and Recommendation**

### **7.1 Conclusion**

This study has found statistical significant association between various determinants of patients delay in pulmonary tuberculosis diagnosis. Accordingly, Female patients, patients living in rural area, Illiterate patients, Patients who walked over 10KM, Patients who had lower knowledge of

TB and negative perception on Severity of getting PTB were significantly associated with patients delays on pulmonary tuberculosis diagnosis.

## **7.2 Recommendations**

Based on the conclusion the following recommendations are forwarded to the responsible bodies:

1. From the findings of the study high proportion of pulmonary TB patients taking actions such self-care methods and going to other places prior to TB clinics or health centers in the zone. Therefore; Jimma zonal health department, Woreda health office and respective health centers should increase community awareness through more specific and effective health education programs that focus about the symptoms, prevention and treatment of tuberculosis and the importance of early treatment seeking behaviors and the availability and location of free diagnostic services should be carried out at community level there by it is possible to minimize duration of TB patients delay and its consequence.
2. All TB coordinators of the health care facilities in the zone should orient pulmonary TB patients about TB.
3. Further prospective studies on large scales are recommended on Determinants of patient delay, health system delay, total delays and compliance with treatments.

### **ASSURANCE OF PRINCIPAL INVESTIGATOR**

The undersigned agrees to accept responsibility for the scientific ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Faculty of Public Health in effect at the time of grant is forwarded as the

result of this application.

Name of the student: Daniel Gobena Gemechu

Date. April, 15, 2023      Signature \_\_\_\_\_

### **APPROVAL OF THE FIRST ADVISOR**

Name of the first advisor: \_\_\_\_\_

Date. \_\_\_\_\_      Signature \_\_\_\_\_

### **APPROVAL OF THE SECOND ADVISOR**

Name of the first advisor: \_\_\_\_\_

Date. \_\_\_\_\_      Signature \_\_\_\_\_

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**JIMMA UNIVERSITY FACULTY OF PUBLIC HEALTH DEPARTMENT  
EPIDEMIOLOGY**

**ANNEX: I ENGLISH VERSION QUESTIONNAIRE**

## 1.1 Subject information sheet

You are invited to participate in research study to be conducted by MPH student at Jimma university faculty of public health department epidemiology. Please be patient while the interviewer read the following statement to you and ask any unclear question before you agree to participate.

1) Topic. Determinants of patients delay in pulmonary tuberculosis diagnosis in public health facilities of jimma zone, Oromia region south west Ethiopia, 2023: a case control

2) Objectives of This Study: To identify determinants of patient delay in Pulmonary tuberculosis diagnosis in Jimma zone, Oromia region south west Ethiopia, 2023.

The information you provide will be crucial in determining determinants of patients delay in pulmonary tuberculosis diagnosis. The questions are simple and ask you about background information, Socio demographic factors, Enabling factors, Individual Factors.

3) Participation Procedures and Guidelines

a. The information you provide will be keep completely anonymous, that is, your name will not be on any of the form

b. your information will be kept confidentially

c. The interview will take about 20-30 minutes to complete, however, if you don't want to participate in the study you have full right.

4) Participation Benefits and Risks.

a. Your participation in this study does not involve risks. But you might feel some mild discomfort and exhaustion during responding on the questionnaires. However, the risk of discomfort might not be greater than your contribution to the study.

b. You also might experience some benefit from participating in this project .These benefits might be positive feeling from helping with an important research study and your response will assist in development of appropriate prevention strategies for TB control.

c. Participating in this study will also give you opportunity to learn about Determinants of patient delay in diagnosis of PTB.

d. No incentive will be given for participants in the study

5) Rights to Refuse or withdraw your participation is voluntary and there is no penalty for you not wanting to participate. This means that you are free to stop at any point or to choose not to answer any particular question or all the questions.

6) Rights as participant. You have a right to raise any question about this research project.

7) Agree to participate. Yes \_\_\_\_\_ Date \_\_\_\_\_

Annex II: consent form Jimma university faculty of public health department epidemiology.

### 1.2 English consent form

A Questionnaire prepared to collect data on Determinants of patients delay in pulmonary tuberculosis diagnosis in public health centers of jimma zone, Oromia region south west Ethiopia, 2023: a case control .

Questionnaire number \_\_\_\_\_

Hello: Good morning /evening?

My name is \_\_\_\_\_. I'm Masters of public health in Epidemiology student from jimma university faculty of public health department of epidemiology. I am conducting a study on determinants of patients delay in pulmonary tuberculosis diagnosis in public health centers of Jimma zone, Oromia region south west Ethiopia, 2023: a case control.

The result that will come out of this study will be used by the districts to base their rational decision to develop appropriate strategies to combat this problem. The research is intended to benefit the community including the people that will be participating in this research and will be introduced no risk to the participant. Your participation is entirely voluntarily, and you can quit from the study any time you want. You will have no penalty if you fail to show desire to participate. I, however, do hope that you will participate in the study since the information that will come from you will be very important. Your name and other personal identity will not be used, and hence the information we will collect from you will completely be kept confidential and will not be disclosed to any third person other than the people participating in this study. You may choose to stop the interview at any time. May, you will agree on the interview? If yes,

continue but if no, stop. May I remind you that the research will not be interpret the data if at least one question is missing? I would like to thank you very much for your kind cooperation in this study.

Name and sign of the consenting interviewer\_\_\_\_\_

Result of the interview:

1. Completed
2. Partially completed
3. The interviewee refused
4. Others\_\_\_\_\_

Supervisions name \_\_\_\_\_Sign\_\_\_\_\_

Time interview started\_\_\_\_\_ time interview finished\_\_\_\_\_

Name of institution data collected \_\_\_\_\_

**INSTRUCTION: Circle on the responses from the given alternatives and fill blank space**

<b>Part: 1. Back ground information</b>		
S. No	Question	Answer
101	Code of the health facility	<b>Encircle the code</b>

		1. Asendabo HC 2. Ilkee HC 3. Nada HC 4. Serbo HC 5. Saka HC 6. Sombo HC 7. Dedo HC
102	Date of onset of symptoms	_____
103	Date of diagnosis	_____
104	Date of the interview	_____
<b>PART:2</b>		
<b>2.1 Socio-demographic Characteristics</b>		
201	Sex of the respondent	1. Male 2. Female
202	Age of the respondent(enter by number)	_____
203	Place of residence	0. Urban 1. Rural
204	Ethnic group:	1. Oromo 2. Amhara 3. Other (specify _____)
205	What is your present marital status?	1. Single 2. Married 3. Divorce 4. Widowed
206	Occupational status?	1. Governmental employee 4. Non-employed

		2. Daily labor 3. Private employee	5. Retired /Pensioned 6.Other (Specify
207	What is your current average family monthly?	_____ Birr	
208	What is your highest educational attainment?	1. can't read and write 2. primary school (1-8) 3. Secondary school(9-12) 4. 12+	
209	History of smoking	1.Never 2.Current smoker 3.Quitted smoking	
210	If smoker specify amount of daily consumption (number of cigarettes/day):	_____	
211	Duration of smoking:	1 Months 2 Years_____	
212	Other chronic diseases	1HIV/AIDS, 2 Diabetes, 3 COPD, 4 Disability,	
<b>2.2 Knowledge and misconception about PTB and treatment.</b>		0 .NO	<b>1. Yes</b>
213	TB is caused by infectious TB germs( mycobacterium TBC)	0	1
214	Is PTB hereditary?	0	1
215	Is PTB contagious? Is TB contagious?	0	1
216	Is PTB curable?	0	1

217	PTB can bring about group of symptoms such as recurrent cough for more than three weeks, evening fever and weight loss	0	1
218	If un treated PTB patients cough up TB germs float in the air, then TB spread out	0	1
219	Respiratory tract is the route of PTB enter to human body	0	1
220	One family member infected with PTB is a risk for other to be infected with it	0	1
220	When the work place is poorly ventilated PTB can spread	0	1
221	Weak immunity due to smoking may prone to get	0	1
223	PTB may prone to get as an infection in AIDS patients	0	1
224	Sun light effectively kill airborne germs	0	1
225	BCG vaccination is an active measure for children to prevent TB	0	1
226	For prevention of PTB spread, whenever cough or sneeze, always use cloth or both hands to cover mouth and nose	0	1
227	The accurate way to detect PTB is sputum microscope and X-ray	0	1
228	After three weeks of treatment patient will no longer transmit infection to other	0	1
229	Complete course of 8 month	0	1

	multiple drug therapy can cure PTB		
230	Hoped illness go away gradually	0	1
231	First action upon recognized illness	1 visit HC/Hospital 2 Visit low level HF 3 Visit traditional remedy/religious	
<b>Part 3:Enabling factors</b>			
<b>3.1Availability of TB center and information about disease and treatment</b>			
300	Who advises you to come to this TB center?	.Private health workers 2.Neighbors 3.Self initiative 4.Family members 5.Health extension worker 6.Previous TB patients 7.Friends at work 8. Other specify_____	
301	Where did you get information about TB treatment regimen and TB center services?	.Hospital staffs 2.Friends 3.Private clinic health .workers 4.Health extension workers 5.Previous TB patients 6.Television 7.Family members 8.Radio 9.Other (Specify	
302	Did you know the following types of services that you can get from this TB center?	0.Yes	1.No

303	Consultation	0	1
304	Physical examination	0	1
305	Sputum examination	0	1
306	X-Ray	0	1
307	Anti TB drug	0	1
308	Accessibility to TB center		
309	How far is your residence from this TB center?	Approximately _____Km	
310	How long your residence takes on foot from TB center?	_____min _____hours	
312	Do you think the time you specified above is convenient?	0.Yes 1.No	
313	How do you travel from your home to TB center?	On foot 2.By animal 3.Bus 4.Motor cycle/ bicycle 5.Other specify_____	
314	How long have you have waited to see the doctor/ other health worker for examination?	_____min _____hours	
315	Who is your overall financial support to go to TB center?	.Self 2.Family 3.Friends 4.Other specify_____	
316	For each visit to this health center, how much over all money do have spent?	On average _____Birr	
317	Do you have any language barrier when you got to TB center?	0.Yes 1.No	
318	If yes to QC317 in which language you want to be served?	Specify_____	
	<b>Part:4 Individual Factor</b>	1.Disagree	2.Not 3.Agree

	For perception on severity of PTB and benefit of PTB treatment: Ask your interviewee that “Do you “agree” or “disagree” with the following statement.		sure	
	<b>4.1 Perception on Severity of getting PTB</b>	1	2	3
400	TB is deadly infectious disease	1	2	3
401	TB can spread to other parts of the body	1	2	3
402	Having TB may discriminate you from society	1	2	3
403	Suffering with TB could partly lose your income	1	2	3
404	TB is not permanently cured with drug alone	1	2	3
405	Causes of Delay in go to health facility?	0 No delay 1 Fear of what would be found on diagnosis 2. Hoped their symptoms would go away on their own (denial and concealment) 3. Fear of social isolation 4. Economic constraints 7. Others (mention)		
<b>Perception on benefit of PTB treatment</b>		1	2	3
405	Early PTB treatment can speed up recovery from PTB	1	2	3
406	Timely treatment of PTB can prevent PTB complication	1	2	3
407	Irregular taking of PTB drugs during course will lead to drug resistant	1	2	3
408	Delayed PTB treatment may lead to spread of PTB	1	2	3
409	The sooner you start treating PTB, the lesser you spend your expense	1	2	3

Thank you very much for your kind cooperation in answering this questioning; wishing you soon well...

## **Gaggesitootaa**

Geggeessituu: 1

1.1 Kutaa Odeeffannoo Dhimma Qorannichaa Yuunivarsiitii Jimmaa Kolleejjii Fayyaa Hawaasaa Kutaa Barnoota Epidemilogy

Yuunivarsiitii Jimmaatti Kolleejjii Fayyaa Hawaasaa, Kutaa Barnoota Epidemiologyitti Qorannoo barataa Digrii lamaffaasaaynsii Faayyaa Hawasatiin tiin geggeeffamu irratti hirmaachuuf

afeeramtee jirta. Maaloo gaaffilee namicha sigaafatu irraa siif dhiyaatu obsaan deebisi. Yaada ifa siif hintaane deebisuu fi ykn irratti waliigaluu keen dura gaaffadhuu adda baafadhu.

1. Mata-duree Qo'annoo:- Dhabelle Faayya Ummataa Kibba Dhiha Itiyoophiyaa, Godina Jimmaatti, Naannoo oromiyaa bara, 2023 Mallattoolee harkifannaa Dhibee TB Ilaalchisee Dhukubsattoota Giddu kan jiru murtessitootaa Qaacceessuu ta;aa.

2. Kaayyolee Qorannichaa:- Murtesitota harkifannaa Dhukkubsatootaa Dhibee TB somba Ilaalchisee Dhukubsattoota Buufataalee Fayyaa Godina Jimmaa keessatti hordofan irratti mul'atu adda baasudha. Odeeffannoon sirraa argamu murtesitota Boodatti harkifannaa fi Dhibee TB irratti mul'atu adda baasuuf baay'ee murteessaadha. Gaaffileen dhiyaatan saalphaa fi dhimmoota kanneen akka: odeeffannoo ka'umsaa, haalota ittisa dhibichaa duraan jiran, halota dandeessisan, haalota fedhii-gidduu galeeffatan, TB ilaalchisee odeeffannoo jiran sigaafatu.

3. Adeemsa Hirmaannaa fi Qajeelfamoota a. Odeeffannoon ati kennitu abbumaadhaan qabama. Kanaafis, maqaankee guca kamirrattiyuu tasa hin katabamu. b. Odeeffannoon ati laattu iccitiidhaan eegamu. c. Aff-gaaficha xumuruuf daqiiqaa 20-30 fudhachuu danda'a. Garuu, qo'anicha keessatti hirmaachuuf yoo fedha hinqabaanne dhiisuuf mirga guutuu qabda.

4. Bu'aa fi Balaa Hirmaannaa

a. Hirmaannaa ati qorannoo kana keessatti gootu balaa tokkoyyuu hinqabu. Hata'u malee, gaaffilee dhiyaataniif deebii kennuu keessatti nuffuu fi dadhabuu dandeessa. Sitti toluu dhabuu irraan miidhaan simudachuu malu garuu, hirmaannaa ati qorannoo kanaaf gootu hincaalu.

b. Qorannoo kana keessatti hirmaachuu keef bu'aan ati buufattu jiraachu mala. Bu'aawwan kanneenis, qorannoo barbaachisaa kana keessatti hamilee gaariin hirmaachuu fi to'annaa dhibee TBf godhamu keessatti gahee barbaadamu ba'uu keedha.

c. Bu'aan qorannoo kana irraa argattu kan biroon immoo, murtessitota boodatti-harkifannaa PTB ilaalchisee jiru beekuuf carraa siif kenna.

d. Hirmaattoota qorannoo kanaaf faayidaaleen addaa taasifamu hinjiru.

5. Mirga Diddaa ykn Addaan Kutuu Hirmaannaan kee fedhii irratti kan hundaa'e hanga ta'ee jirutti hirmaachuu dhiisuu keef ykn addaan kutuu keef adabbiin sirra ga'u tokkooyyuu hinjiru. Kana jechuun, yeroo barbaaddetti addaan kutuu dandeessa ykn, gaaffii hinbarbanne deebisuu dhiisuu dandeessa.

6. Mirga Akka hirmaataatti Qabdu Qorannoo kana ilaalchisee gaaffilee deebisteef wanta shakkitu yoo qabaatte, qaama dhimmisaa ilaalu gaafachuuf mirga qabda\*

7. Fedhii Hirmaannaa Hirmaachuuf waliigalteettaa?

Eeyyee \_\_\_\_\_ Guyyaa \_\_\_\_\_

**Odeeffannoo ka'umsaa**

Maaqa nama Raga Sassabuu \_\_\_\_\_

Koodii buufata fayyichaa\*

itti marii

1 Asendabo HC

2 Ilkee HC

3 Nada HC

4 Serbo HC

5Saka HC

6Sombo HC

7 Dedo HC

Medical record number of the patients (MRN)\_\_\_\_\_

Guyyaa Mallattoon dhukkubaa egalee\_\_\_\_\_

guyyaa isaa baressii

dd -mm-yyyy

Guyyaa gaaffii fi deebii\*

Guuyyaa isaa baressi\_\_\_\_\_

dd-mm-yy

**Part 1:Waanttota Haaldureen Nama Saxileessu**

Saala\*

1Dhiira

2Dhalaa

Umurii\*

Lakkofsan baressi

Bakka jireenya\*

guuti

1Magaalaa

2Badiyyaaa

Sablamiii\*

1Oromoo

2 Amaara

3.Kan biroo (Addeessi)\_\_\_\_\_

Haalli gaa'elaa kee yeroo ammaa maali\*

1Qophaa

2.Fuudheera/ Heerumeera

3.Walhiikneera

4Narradu'eera

Dalagni kee maalii?\*

1Hojjetaa moottummaa

2.Hojii dhabeessa

3Qotee bulaa

4.Hojjetaa guyyaa

5.Kan biro(Addressi)\_\_\_\_\_

Galiin maatiikee giddu-galeessan Ji'att meeqaa?\*

Qarshiin \_\_\_\_\_

Sadarkaa barumsaa ati irra geese hangam?\*

1Hinbaranne

2Dubbisuu fi barreessuu nan danda'a

3Sadarkaa tokkoffaa(1-8)

4.Sadarkaa lammaffaa(9-12)

5 12+

Seenaa tamboo xuuxuu\*

1Xuuxee hin beeku

2Reefuun eegale

3Xuuxuu dhaabeera

yoo hin xuuxaa taa'ee guyyaatti hangam\_\_\_\_\_

yoo hin xuuxaa ta'e wagga ykn ji'aa meeqaaf\_\_\_\_\_

lakkofsaa guuti

Dhukkubotaa daddarboo yoo qabatee\*

1HIV/AIDS

2Diabetes,

3COPD

4 Hin Qabu

**Part:2Hubannoo Waa'ee TB fi Yaalii isaa**

Dukkubii TB jarmii TB (maayikoo baaktireemii TBC) jedhamuun dhufaa

1Eeyyee

2Lakki

TBn dhalootaan namaa namatti daddarbaa ?\*

1Eeyyee

2Lakki

TBn darbarbaadhaa?\*

1Eeyyee

2Lakki

TBn fayyuu danda'aa?\*

1Eeyyee

2Lakki

TBn mallattoolee adda addaa kanneen akka qufaa ammaa ammaa torbee sadii oliif, gubaa qaamaa halkanii fi hirrina ulfina qaamaa qabaa?\*

1Eeyyee

2Lakki

Dhukkubsataan TB hin yaalamin jiru tokko yoo qufa'e jarmootni TB qilleensa keessa faca'u. kanaafis, TBn nitamsa'aa\*

1Eeyyee

2Lakki

.Hujummoon qillensaa daandii Jermiin TB gara qaama keenyaa ittin seensuudha.\*

1Eeyyee

2Lakki

Miseensi matii TBn qabame tokko warren kaan TB qabsiisuuf balaadha\*

1Eeyyee

2Lakki

.Bakka hojii qillensi ga'aan hinjirreetti TBn daddarbuu danda'a.\*

1Eeyyee

2Lakki

Sababa xuuxuu irraan kan ka'e madiinummaa(anti-body) yaraa qabaachuun TBf nama saaxila\*

1Eeyyee

2Lakki

Namni dhibee AIDS qabu tokko TBn saaxilamuu niidanda'a\*

1Eeyyee

2Lakki

. Ifni aduu jarmoota qilleensaan dardarban ga'umsaan ajjeesa\*

1Eeyyee

2Lakki

Talaalliin BCG daa'imman TB irraa baraaruuif murtoo sirridha\*

1Eeyyee

2Lakki

Tatamsa'ina TB harmbisuuf, qufaas ta'e haxxinfuu, yeroo mara huccuu ykn harka lamaaniin afaanii fi funyaan cuqqaaluudha\*

1Eeyyee

2Lakki

TB adaan baasuuf karaa sirriin maayikiroskoppiin akkee ilaaluudha.\*

1Eeyyee

2Lakki

Yaalii torbee sadii booda dhukkubsataan dhibee gara nama kan birootti dabarsuu hindanda'u\*

1Eeyyee

2Lakki

Ji'a 8 guutuuf qoricha osoo walirraa hinkutin fudhachuun TB nifayisa\*

1 Eyyee

2 Lakki

Mallattoon isaa sutumaa ni dhisaan jechuun barfachuu yalidhaaf ni fidaa

1 Eyyee

2 Lakki

Mallattooo dhukubaa TB akka argiteenn maal gootee

1 Hospitaala /HCdeemaa

2, Mana yaala aadaa/amaantaadeemee

3 Mana yaala dhunfaa deemaa

Part 3:Haalota Dandeessisan

Gara wiirtuu TB kana aka dhufu eenyutu sigorsee?

1Hojjetoota Fayyaa dhuunfaa

2Ollaa

3.Kaka'uumsa dhuunfaa koo

4.Miseensa maatii koo

Dhukkubsataa TB kanaan duraa

7.Kanbiraa addeessi

. Odeeffannoo waa'ee gosa yaalii TB fi tajaajila wiirtuu TB eessaa argate? Maaloo Odeeffannoo kee hunda natti him

1 Hojjetoota fayyaa/ miseensota Hospitaalaa

2 Hiriyoota

3Hojjetoota fayyaa kilinika dhuunfaa

4 Televiziyoonaa

5 Raadiyoonii

6 Kan biro ( Addeessi) \_\_\_\_\_

Tajaajila gorsa akka wiirtuu TB tti kennamu ni beekta?\*

1 Eyyee

2 Lakki

Sakatta'iinsa Qaamaa akka wiirtuu TB tti kennamu ni beekta?\*

1 Eyyee

2 Lakki

Sakatta'insa tufaatii qufaa akka wiirtuu TB tti kennamu ni beekta?\*

1 Eyyee

2 Lakki

Tajaajila Raajii (x- Ray) akka wiirtuu TB tti kennamu ni beekta?

1 Eyyee

2 Lakki

Qoricha TB Ittisu akka wiirtuu TB tti kennamu ni beekta?

1 Eyyee

2Lakki

Yeroon deemsaa miillaa dimshaashatti mana keeraa hanga wiirtuu TBtti hagam fudhataa?\*

Daqiiqaa ykn sa'atidhaan kahi

Yeeroon ati armaan olitti addeessite mijataadha jettee yaaddaa?\*

1 Eyyee

2 Lakki

Mana jireenyaa kee irraa kaastee hanga wiirtuu TBtti maaliin deemta?\*

1Miillaan

2Beeyilladaan

3Baasiin(Geejjibaan)

4 Mootoraan /saayikiliin/

5. Kan biro (addeessi

Gara wiirtuu TB deemuuf gargaarsa mallaqaa waliigaltti kan siif taasisu eenyu?

1Dhuunfaan

2Maatiin

3 Hiriyootaan

4. Kan biro (addeessi) \_\_

Gara buufata fayya kanatti deddeebitee yaalamuuf waliigalatti maallaqa hangam baafte?

Qarshiidhaan kahi

Gara wuiirtuu TB yeroo deemtutti rakkoo dubbii (Afaan) niqabdaa?

1 Eyyee

2 Lakki

Gaaffii oli irratt deebiinkee Eeyyee yoo ta'ee Afaan maaliin tajaajlamuu barbaaddaa?

Addessi

Part 5 Ilaalcha waa'ee hammeenya dhibee TBn qabamuu

TBn dhibee dardarbaa nama ajeessuudha

1Hindeggeru

2Adda hinbafanne

3Nan deggera

TB qabaachuun hawaasa keessaa siqoqqobuu danda'a

1Hindeggeru

2Adda hinbafanne

3Nan deggera

TBn qabamuun galii kee hanga tokko miidhuu danda'a

1Hindeggeru

2Adda hinbafanne

3Nan deggera

TBn qoricha qofaan guutummaa guutuutti hinfayyaama.\*

1Hindeggeru

2Adda hinbafanne

3Nan deggera

Yaaliin TB battalatti godhamu dhibee TB irraa fayyuu saffisiisuu dabda'a

1Hindeggeru

2Adda hinbafanne

3Nan deggera

Yeroon yaalamuun rakko TBt aanee dhufu danda'u hambisa

1Hindeggeru

2Adda hinbafanne

3Nan deggera

Fudhannaa qoricha TB irratti harca'iinsi jiru qorichaan walburumsa fida

1Hindeggeru

2Adda hinbafanne

3Nan deggera

Dhiba' ummaan yaalii TB tatamsa' ina TB babal' isa

1Hindeggeru

2Adda hinbafanne

3Nan deggera

Battalatti yaalii TB yoo geggeessite, baasii kees hanguma sana xiqqeessita

1Hindeggeru

2Adda hinbafanne

3Nan deggera

waan Hirmattaniif Galaatoomaa!

## Appendix A

**Table 2:** Bivariate logistic regression analysis to determinants patient delay in pulmonary tuberculosis diagnosis in Jimma Zone from December 2023 to March 2024 (Case=124, Control=128).

Variables	Category	Case	Control	COR(95%CI)	p-value
Sex	Male	52(41.9)	75(58.6)	1	.008*

	Female	72(58.1)	53(41.4)	1.96(1.19,3.23)	
Place of residence	Urban	20(16.2)	28(21.8)	1	.247*
	Rural	104(83.8)	100(78.2)	1.46(.771, 2.75)	
Marital status	Married	96(77.41)	75(58.59)	1	.011*
	Unmarried	20(16.12)	43(33.59)	.363(.197, .669)	
	Divorced/widowed	8(6.45)	10(6.25)	.625(.235, 1.66)	
Occupational status	Farmer	80(64.51)	77(60.66)	1	.255
	Student	21(16.94)	21(16.41)	.487(.487, 1.902)	
	Unemployed	15(12.1)	15(11.72)	.441(.441, 2.102)	
	Others	8(6.45)	15(11.72)	.206(.206, 1.280)	
Educational status	Illiterate	61(49.1)	37(28.9)	3.96(1.29, 12.13)	.002*
	Read and write only	10(8.06)	16(12.5)	1.50(.405, 5.552)	
	Primary school (1-8)	48(38.7)	63(49.3)	1.83(.603, 5.542)	
	High school (9-12) and above	5(4.03)	12(7.8)	1	
First action upon recognized illness	Visit HC/Hospital	68(54.83)	81(54.4)	1	.126*
	Visit traditional remedy /religious	27(21.77)	26(49.1)	1.24(.660, 2.317)	
	Visit low level HF	29(23.39)	21(42.0)	1.65(.861, 3.143)	
Advises to come to TB center?	Family members	23(18.55)	23(17.97)	1	.110*
	Self-initiatives	67(54.03)	46(35.10)	1.46(.731, 2.901)	
	Private health workers	22(17.74)	49(38.28)	.449(.209, .966)	
	Others(Neighbors, HDA, Previous TB, Friends at work)	12(9.68)	10(7.81)	1.20(.433, 3.324)	
Source of information about TB	Hospital staffs	22(17.7)	22(17.18)	1	.559
	Friend	25(20.16)	28(21.8)	.893(.401, 1.98)	

	Private clinic health workers	56(45.16)	53(41.4)	1.06(.525, 2.128)	
	Television	12(9.6)	11(8.5)	1.09(.398, 2.99)	
	Radio	8(6.)	9(7.0)	.889(.290, 2.73)	
	Other	1(0.8)	5(3.9)	.200(.022, 1.85)	
Consultation services	No	96(77.4)	91(71.1)	1.39(.790, 2.46)	.252
	Yes	28(22.6)	37(28.9)	1	
Physical examination services	No	72(58.1)	70(54.7)	1.15(.697, 1.89)	.589
	Yes	52(41.9)	58(45.3)	1	
Sputum examination services	No	78(62.9)	65(50.8)	1.19(.720, 1.95)	.503
	Yes	46(37.1)	63(49.2)	1	
X-ray services	No	83(66.9)	66(51.6)	1.36(.822, 2.25)	.231
	Yes	41(33.1)	62(48.4)	1	
TB services	No	84(67.7)	71(55.4)	1.20(.722, 1.99)	.480
	Yes	40(32.3)	57(44.6)	1	
Financial support to go to TB center?	Self	16(34.8)	30(23.44)		.015*
	Family	87(70.16)	85(66.41)	1.92(.976, 3.77)	
	Friends	14(11.9)	10(7.82)	2.63(.953, 7.23)	
	Others	7(5.65)	3(2.34)	4.37(.994, 19.26)	
Age	15-23	26(20.95)	46(35.9)		.001*
	24-30	46(37.09)	53(41.4)	1.54(.824, 2.86)	
	31-50	35(28.26)	25(19.5)	2.47(1.226, 5.05)	
	>50	17(13.7)	4(3.12)	7.52(2.28, 24.73)	
Monthly Income	<400	5(4.03)	5(3.9)	1.05(.295, 3.73)	.813
	401-801	18(14.5)	17(13.2)	1.11(.543, 2.27)	

	>801	101(81.4)	106(82.8)		
Distance from residency to HF in KM	0-6	4(14.8)	23(17.10)		.001*
	6.1-10	8(57.1)	6(4.68)	7.67(1.71, 14.35)	
	10	112(53.1)	99(77.34)	6.51(2.17, 19.46)	
Knowledge	Lower level	69(55.6)	46(35.9)	3.33(1.71, 6.51)	.000*
	Moderate level	37(29.8)	42(32.8)	1.96(.962, 3.984)	
	Higher level	18(22.5)	40(31.25)		
Perception	Negative	78(62.9)	40(31.25)	3.73(2.21, 6.28)	.000*
	Positive	46(37.1)	88(68.75)		
Money spent for each visit	<5000	88(70.97)	85(66.41)		.294
	5000-10000	29(23.39)	34(26.57)	.824(.462, 1.48)	
	>10000	4(3.23)	7(5.47)	.552(.156, 1.95)	

*\*indicates candidate variables selected for multivariate analysis (P-value<0.25), COR: Crude odd ratio, AOR: Adjusted odd ratio, 1: reference categories, CI: Confidence interval*

## Appendix B

### Multicollinearity Test

		Coefficients <sup>a</sup>	
		Collinearity Statistics	
Model		Tolerance	VIF
1	Sex	.961	1.041

Place of residence	.903	1.107
Marital status	.907	1.103
Educational status	.793	1.262
First action upon recognized illness	.942	1.061
Who advises you to come to this TB center?	.947	1.056
Overall financial support to go to TB center?	.862	1.160
Age	.724	1.382
Distance from residency to HF in KM	.933	1.072
Knowledge	.772	1.296
Perception	.853	1.172
a. Dependent Variable: Patient delays in Pulmonary tuberculosis diagnosis		

<b>Hosmer and Lemeshow Test</b>			
Step	Chi-square	df	Sig.
1	3.941	8	.862
5	10.369	8	.240