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St. Paul's Hospital Millennium Medical College

**Prevalence of Pulmonary Tuberculosis Among Holy Water Attendees and
Barriers to Utilizing TB Health Care Services in Addis Ababa, Ethiopia**

BY

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Declaration

I, the undersigned, declare that the thesis comprises my own work. In compliance with internationally accepted practices, I have acknowledged and referred to all materials used in this work. I understand that non-adherence to the principles of academic honesty and integrity, misrepresentation/ fabrication of any idea/data/fact/source will constitute sufficient ground for disciplinary action by the college and can also evoke penal action from the sources which have not been properly cited or acknowledged.

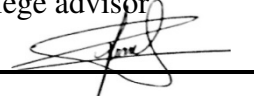
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Abbreviations

AIDS- Acquired Immune Deficiency Syndrome

HIV- Human Immunodeficiency Virus

MTB- Mycobacterium Tuberculosis

PTB- Pulmonary Tuberculosis

RIF- Rifampicin

TB- Tuberculosis

URTI- Upper Respiratory Tract Infection

Xpert- GeneXpert

WHO - World Health Organization

Abstract

Background: The probability of transmission of Pulmonary Tuberculosis (PTB) depends on the infectiousness of the source patient and on the nature of the environment where exposure occurs. In the effort of meeting the End TB goal, TB screening among key population and settings is one of the strategies where Holy water sites and its attendees are among them. It is estimated that 80% of the population in Ethiopia uses holy water for various reasons that include chronic illnesses. The huge gatherings in and around holy water places, and the absence of screening for any easily transmissible infectious diseases like TB brings a great concern for potential transmission of TB particularly of pulmonary TB (PTB). Such practice delays timely detection of TB and proper treatment potentially exacerbating the spread of PTB within the community.

Objective: To investigate the prevalence of PTB and examine potential barriers contributing to low TB service utilization among presumptive PTB cases attending selected holy water sites in Addis Ababa, Ethiopia.

Method: An explanatory mixed-methods study was conducted at 11 purposively selected holy water sites in Addis Ababa, Ethiopia. A quantitative survey of 225 attendees with presumptive TB was followed by in-depth interviews with nine attendees and six healthcare providers. Quantitative data were entered into REDCap and analyzed using R Studio v4.5.1, including descriptive statistics and logistic regression. Qualitative data was managed in MAXQDA 2025, and thematic analysis was employed.

Result: A total of 1600 holy water users were screened for potential TB signs and symptoms. Among them, 225 reported having two or more symptoms of TB and were included in the study. The prevalence of PTB was 2.7% (375 per 100,000). In the multivariate model, only cigarette smoking remained significantly associated with PTB (AOR: 6.99; 95% CI: 1.21–41.0; $p = 0.024$). Qualitative analysis revealed barriers to TB care, including limited awareness, delayed health-seeking, reliance on spiritual healing, stigma, socioeconomic hardship, and systemic healthcare challenges.

Conclusion: PTB remains a concern among holy water users, with socio-cultural factors shaping health-seeking behavior. Integrating biomedical case-finding with faith-sensitive, community-based approaches is a key to improving TB detection and control.

Keywords: TB, Prevalence, Barriers, Addis Ababa, Holy water

1. Introduction

1.1. Background

Pulmonary Tuberculosis (PTB) is an infectious disease of the lungs caused by *Mycobacterium tuberculosis* (MTB). Classic symptoms include persistent cough, weight loss, fever, night sweats, and hemoptysis, though presentations can vary (1). Transmission occurs when infectious droplets are expelled into the air by coughing or sneezing and subsequently inhaled by others. The risk of transmission is heightened in crowded, poorly ventilated environments and depends on the infectiousness of the source and the exposure setting (2). If left untreated, PTB can be fatal, but standardized first-line treatments recommended by the World Health Organization (WHO) are highly effective when administered properly (3).

Holy water sites in Ethiopia serve as vital for spiritual healing, providing religiously grounded treatments for a range of illnesses through rituals, prayer, and communal support. These sites are deeply embedded in local cultural and religious practices, often functioning as primary or supplementary venues for treatment(4). Many individuals in Ethiopia still seek alternative treatments for TB, including visits to spiritual holy water sites, due to strong cultural beliefs in their healing power, as well as psychological and social motivations, such as relief from stigma (5,6). These sites attract large numbers of people from diverse regions, often resulting in overcrowded and poorly ventilated conditions that facilitate the transmission of TB. Studies have shown that the prevalence of PTB among holy water attendees is significantly higher than in the general population, with point prevalence rates reported as high as 1,183 per 100,000 attendees and a pooled prevalence of 12.3% among key and vulnerable populations in such hotspot settings (5–7). Given the elevated risk of TB transmission in crowded settings such as holy water sites and the significant barriers to accessing formal TB care, targeted interventions including systematic screening, health education, and improved infection control, are essential to reduce the burden of TB among these vulnerable populations (5–7).

Barriers to TB health services can be broadly categorized to individual factors like misinformation, lack of awareness, stigma, and economic constraints, and systemic factors including the necessity of multiple healthcare visits (a median of three visits was reported) due to resource limitations at facilities (e.g., lack of tests or inconvenient hours), provider mismanagement, and the absence of formal referral mechanisms between healthcare sectors(8,9).

1.2. Statement of the problem

Despite significant progress in the global fight against TB, the disease remains one of the leading causes of morbidity and mortality, particularly in low- and middle-income countries. In 2023 alone, an estimated 10 million new TB cases were recorded worldwide, with 1.25 million deaths attributed to the disease. The burden is weighty in Africa, which accounts for approximately 24% of global TB cases (3).

Africa continues to suffer disproportionately from the epidemic due to the intersection of several high-risk factors, including widespread poverty, high HIV prevalence, weak health systems, and inadequate access to quality healthcare services (10,11). Furthermore, the emergence and spread of multidrug-resistant TB (MDR-TB) in the region present a formidable challenge to already overstretched public health systems. Another concerning aspect is the spatial heterogeneity of TB prevalence within countries and territories, which complicates intervention efforts and demands context-specific responses (11,12).

Ethiopia, as one of the 30 high-TB and MDR-TB burden countries identified by the WHO, illustrates the complexity of the TB epidemic in sub-Saharan Africa (5,7,8). According to 2016 report the national pooled prevalence of TB is estimated at 0.19%. However, this national figure masks significant geographic and demographic variations, with urban centers such as Addis Ababa reporting rates as high as 0.28% (12,13). Similarly, the national TB incidence rate, estimated at 112 per 100,000 population annually, tends to be markedly higher in specific hotspot areas, especially in urban settings, border regions, and certain congregate environments (14). Of particular concern are key vulnerable populations, including prisoners and those frequenting spiritual healing centers, where the pooled TB prevalence is elevated, reaching levels as high as 11.7% (7).

In recent years, attention has increasingly turned toward a unique and under-researched TB hotspot in Ethiopia, such as spiritual holy water sites. These religious locations attract thousands of individuals seeking spiritual healing. Despite their significance, holy water sites remain largely outside the scope of formal TB control strategies. A study conducted in seven holy water sites in Northwestern Ethiopia from February 01 to March 30, 2015 showed the prevalence of pulmonary TB among attendees at these sites can reach as high as 21.8%, with point prevalence rates ranging from 795 to 1,183 per 100,000 individuals, figures that are several times greater than the national average. Such settings are typically characterized by

overcrowding, poor ventilation, limited sanitation, and prolonged close physical contact, all of which create an ideal environment for TB transmission (6,7).

Despite the known risks, interventions tailored to holy water sites remain minimal or absent. There is limited integration of TB screening, awareness campaigns, infection control practices, or referral mechanisms in these high-risk settings. As such, the failure to systematically address TB transmission in spiritual congregate settings represents a critical blind spot in Ethiopia's fight against the disease. Despite growing evidence of high TB prevalence in these settings, there remains a significant knowledge gap in understanding the social, cultural, and psychological factors that drive people to prioritize spiritual healing over biomedical care. To the best of our knowledge, no study has examined barriers that influence care-seeking behavior among holy water users, particularly in the context of TB symptoms and diagnosis.

1.3. Significance of the study

This research is significant for several interconnected reasons, particularly within the context of Ethiopia's ongoing efforts to reduce TB incidence and mortality. It addresses an important behavioral and sociocultural dimension that has received limited attention: the barriers to formal healthcare among holy water attendees. Understanding the motivations behind these care-seeking decisions is essential for developing patient-centered interventions that bridge the gap between spiritual and formal health systems.

Findings from this study have the potential to inform the design and implementation of targeted interventions at holy water sites directly. By identifying both the burden of disease and the factors contributing to diagnostic and treatment delays, the study will provide evidence necessary for integrating holy water sites into national TB surveillance and control frameworks.

Furthermore, this research aligns with Ethiopia's commitment to achieving the global End TB Strategy goals by offering data that can support more inclusive, equitable, and contextually relevant health policies. Policymakers, public health officials, and TB control programs can use the study's insights to better address the needs of high-risk and underserved populations.

2. Objectives

2.1. General Objective

To investigate the prevalence of PTB and examine potential barriers contributing to low TB service utilization among presumptive PTB cases attending selected holy water sites in Addis Ababa, Ethiopia.

2.2. Specific Objectives

- To determine the prevalence of PTB among holy water attendees in Addis Ababa, Ethiopia
- To explore the possible barriers among holy water attendees to utilize TB health care services

3. Literature Review

3.1. Prevalence of TB in overcrowded areas and mass gatherings

TB is a global public health concern, and Ethiopia is one of the countries heavily burdened by this infectious disease. TB is a major health issue in Ethiopia, contributing significantly to the country's disease burden. According to reports, Ethiopia is among the 22 high TB burden countries, with a high number of missed and infectious TB cases in the community. A study conducted in 10 districts in Ethiopia has shown that 428 (46%) had sought care from at least one informal provider: 223 (24%) had been treated with holy water. 111 patients (12%) reported visiting at least two different informal providers prior to the first visit to a public health facility (15).

A study in Northwestern Ethiopia has showed that about two-thirds of patients with active TB remain undiagnosed and untreated creating an increased transmission in the community. This factor is intensified further in areas like holy water sites where people come together from different areas in search of cure for their illness. These areas are characterized by overcrowding, inadequate ventilation which are the main risk factors for TB (16–18).

Even though little is known about the prevalence of TB in holy water sites, different studies have assessed the risk of transmission in mass gatherings like holy water sites. A study conducted in Saudi, Mecca, during a Hajj season indicated that 0.7% of the pilgrims with cough from high and medium TB-burden countries had undiagnosed active PTB. Most of the TB cases identified through the Xpert MTB/RIF assay were older male pilgrims (19). Another study in the same location revealed that 1.4% of Hajj pilgrims from TB-endemic countries with cough had undiagnosed active TB which could pose a significant risk of transmission (20).

A systematic review conducted to summarize the magnitude of TB among refugees and migrants showed an incidence rate ranging from 19 to 754 per 100,000 population and a prevalence rate ranging from 18.7 to 535 per 100,000 population. The study indicated that the burden of TB was much higher in these refugee camps than in the host countries. Overcrowding could be one factor for the increased TB burden among refugees (21,22).

One problem associated with overcrowding is participants having a poor knowledge on infection prevention mechanisms. Considering the findings of the study conducted in India on 2016, it is evident that there are significant knowledge gaps regarding the transmission risk of TB among

attendees of mass gatherings. The majority (97%) of the attendees had poor knowledge on upper respiratory tract infections (URTI) and 88.5% reported inappropriate practices (22).

One study conducted in Northwest Ethiopia has indicated that the prevalence of smear positive PTB among holy water attendees was 2.9% (11/382). The point prevalence was 795/100,000 holy water attendees. This was seven times higher than the national population survey. More than two third of the cases were found on rural dwellers and old peoples aged more than 46 (23).

3.2. Barriers for TB health care

To effectively combat the global burden of PTB, it is crucial to understand and address the barriers that hinder its diagnosis and treatment. These barriers can occur at various levels, including individual, socio-cultural, and health care systems.

A systematic review in 11 high-burden countries showed that being female and rural residence was associated with longer patient delay. Patient delay was also associated with other individual, interpersonal, and community risk factors such as poor TB knowledge, long chains of care-seeking through private/multiple providers, perceived stigma, financial insecurities, and poor access to healthcare (24).

Another study in Pakistan indicated low income and poverty as the major barrier for diagnosis and treatment followed by unaware of TB center, stigma, and treatment from local traditional healers. Old age was also another factor related to treatment delay (25).

A study conducted in 12 districts in Shandong province of China has found that the economic status of patients with TB was a key barrier to accessing TB treatment. The study indicated that the high health expenditures related to treatment may hamper the care-seeking process.

The study also found that the degree of symptoms and understanding of possibility of curing TB was related to the delay in initiation of treatment. However, health insurance status showed no effect on treatment delay (26). A recent qualitative study in Iran also showed several barriers for TB care and treatment. Few of them were poor knowledge of patients about TB symptoms, and the COVID-19 pandemic which disrupted TB services at health facilities. The participant's belief in traditional medicine and self-treatment was also another factor leading them not to go to diagnostic centers

and stay in the community. Fears of social stigma and Unawareness about availability of free services were some of the socio-economic barriers for TB care (27).

Similarly, in a hospital based cross-sectional which was conducted in Malawi, knowledge that more than 3 weeks of coughing is a symptom of TB was significantly associated with patient delay for treatment. Other factors that were found to affect timely care were distance from the nearest health facility and the type of health facility first visited by the patients (28). These findings are concurrent with the study in Tanzania where patients with poor knowledge that chest pain was one of the TB symptoms and those who believe that TB is always associated with HIV/AIDS delayed seeking TB health care (29).

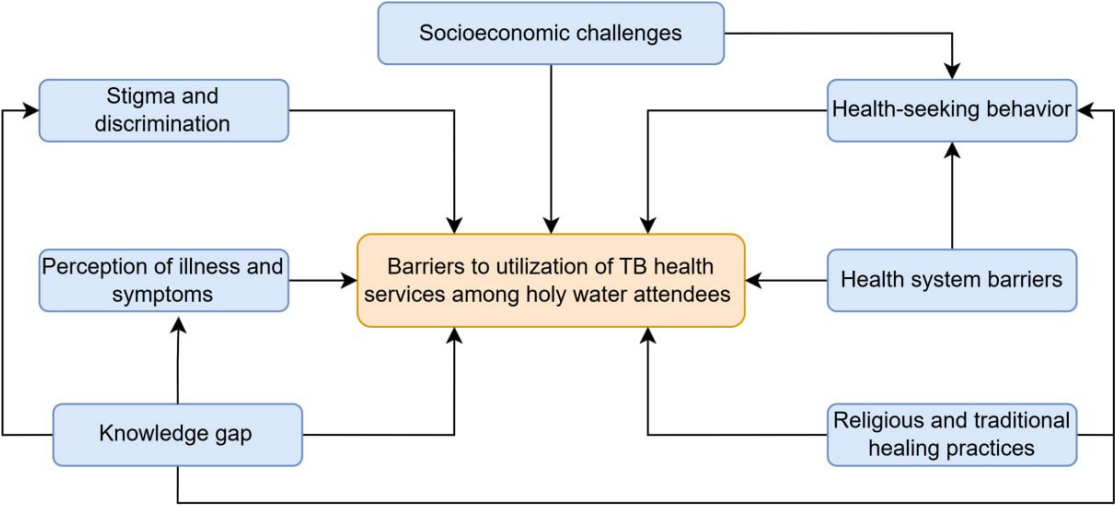
In Ethiopia, different studies showed different barriers for TB care among patients. One study indicated the first visit to non-formal health providers and self-treatment as an important factor barrier for treatment. Patients' delay was also significantly associated with older age (>45 years) and distance (>10 km) from a health care facility (30).

A study conducted in North-West zone of Tigray region, North Ethiopia also indicated a limited knowledge about pulmonary tuberculosis, seeking treatment from traditional or religious healers before visiting health facilities, and not seeking treatment early from health facilities for financial problem as reasons for delayed TB diagnosis and treatment (31). Another study in Lay Armacho district, North Ethiopia indicated old age as a barrier for TB care. The study mentioned that the reason for this could be the tendency of old peoples to visit traditional healers or “holy water”. Other barriers such as educational level (secondary and above), perceived health status (perceived wellness), and having previous history of TB treatment were also mentioned in the study. Similar study in East Gojjam Zone, Northwest Ethiopia indicated getting treatment from holy water and traditional healers as a major factor for patient treatment delay (32,33).

On the contrary, another nationwide mixed method cross-sectional study in Ethiopia indicated health system factors such as cost of seeking care and inadequate community-based TB care as barriers of TB health care (34). Limited access to formal health services and traditional beliefs hinders prompt biomedical diagnosis of TB among pastoralist patients in Ethiopia's SRS, with nomadic pastoralists being the most affected (35).

3.3. Conceptual framework

Figure 1: Conceptual framework for the study “Prevalence of Pulmonary Tuberculosis Among Holy Water Attendees and Barriers to Utilizing TB Health Care Services in Addis Ababa, Ethiopia”



4. Methods

4.1. Study design

A sequential explanatory mixed method, beginning with quantitative methods followed by qualitative methods, was conducted at selected holy water sites in Addis Ababa, Ethiopia.

4.2. Study setting

The exact number of holy water sites in Addis Ababa is unknown, as attempts to obtain official data from the Addis Ababa Hagere-Sibket office under the Ethiopian Orthodox Tewahedo Church (EOTC) were unsuccessful. An initial mapping identified 40 holy water sites across the city with holy water sites. From these, 11 sites were purposively selected from nine sub-cities based on their high flow of attendees. These sites are included.

- Entoto Hamere Noh Kidane Mihiret Gedam (Gulele Sub-city), Entoto Mariyam Church (Gulele Sub-city), Egizabiherab Church (Nifas Silk Lafto Sub-city), Tsadiku Abune Gorgoryos Church (Kirkos Sub-city), Katsila Mariyam Church (Lemi Kura Sub-city), Dileber Medihaniyalem Church (Nifas Silk Lafto Sub-city), Kidus Yohannes Church (Arada Sub-city), Petros-we-Poulos Church (Kolfe Keraniyo Sub-city), Semit Kidus Giorgies Church (Bole Sub-city), Abune T/haymanot Church (Addis Ketema Sub-city), and Debire Bitaniya T/haymanot Church (Kolfe Keraniyo Sub-city)

4.3. Source population

All holy water attendees at churches in Addis Ababa, Ethiopia

4.4. Study population

All holy water attendees (age greater than or equal to 18 years) who have at least two of the PTB signs and symptoms at the selected churches with holy water in Addis Ababa, Ethiopia.

4.5. Operational definition

A TB patient is a person who has a positive Xpert MTB/RIF Ultra (Xpert Ultra) result for MTB complex DNA with/without resistance to rifampin (RIF).

The Xpert Ultra is a rapid molecular diagnostic test that can detect MTB complex DNA and RIF resistance in sputum samples in about 90 minutes. The World Health Organization recommends the use of Xpert Ultra as a first-line diagnostic test for suspected TB cases, including people with signs and symptoms of TB.

4.6. Quantitative study

4.6.1. Sampling technique and sample size determination

A purposive sampling technique was used to select holy water sites and study participants. A population

proportion of 50% was used for the sample size calculation due to the lack of prior studies conducted in a study area and population comparable to ours. Although a cross-sectional study conducted in northwestern Ethiopia reported a TB prevalence of 2.9% among holy water attendees, applying this estimate to our setting would result in a very small sample size and may not adequately capture the true burden of disease. In the absence of reliable and context-specific prevalence data, using a 50% proportion is a standard and conservative approach, as it yields the maximum sample size and ensures sufficient statistical power. Thus, with a 95 % confidence level, and a margin of error of 5%, the sample size has been calculated using a single population proportion formula as follows:

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

Where:

- N = required sample size
- Z = Z-score corresponding to a 95% confidence level (1.96)
- p = estimated prevalence (0.5)
- d = margin of error (0.05)

$$n = \frac{(1.96)^2 \cdot 0.5 \cdot (1 - 0.5)}{(0.05)^2} = \frac{3.8416 \cdot 0.25}{0.0025} = 384.16$$

By adding a 10% non-response rate, the final sample size was **422 Holy water attendees**.

Participant selection was conducted using population-proportionate sampling, ensuring that the number of participants recruited from each site reflected the daily attendee flow.

4.6.2. Eligibility criteria

Inclusion criteria

Holy water attendees at the selected churches are showing possible PTB signs and symptoms.

Exclusion criteria

Holy water attendees at the selected churches who were on TB treatment by the time of the study, aged under 18 years, and who had a mental illness were excluded.

4.6.3. Data collection tool and procedure

Primary data on socio-demographic characteristics, health care accessibility, and participants' knowledge were collected using a standardized questionnaire designed in the REDCap data

management tool. The questions were administered verbally to eligible holy water attendees, and responses were entered directly into REDCap by the data collectors.

A total of six trained data collectors (one physician, two nurses, two health officers, and one laboratory technologist) were involved in the process. A pre-screening form was used to identify participants who met the inclusion criteria. Data collection was carried out between May 2024 and August 2025.

For all eligible participants, spot sputum samples were collected, stored in a cold chain, and transported to the central laboratory for analysis. Two diagnostic methods were employed:

1. **GeneXpert MTB/RIF assay** – conducted at ALERT Specialized and Comprehensive Hospital. This is a rapid, automated molecular test that detects MTB DNA and simultaneously identifies RIF resistance. It provides results within two hours and is recommended by the WHO as an initial diagnostic test for TB.
2. **Culture method** – conducted at the Armauer Hansen Research Institute (AHRI). Sputum samples were cultured on Lowenstein-Jensen (LJ) solid media, which is a gold-standard method for confirming pulmonary tuberculosis. Although culture requires longer incubation times (up to 6–8 weeks), it is highly sensitive and allows detection of viable MTB even in cases with low bacterial load.

4.6.4. Data processing and analysis

The data collected on Redcap was exported to R studio version 4.5.1. For Univariate analysis, each variable was summarized using a frequency table. Bivariate analysis was conducted to identify any association between each independent variable with the outcome variable. Variables with p-value less than 0.25 were considered for inclusion in the multiple logistic regression model to identify independent predictors associated with the outcome variable. Adjusted odds ratio (AOR) and corresponding 95% confidence intervals were reported. Those variables with a p-value of less than 0.05 were considered statistically significant.

4.7. Qualitative study

4.7.1. Sampling technique and sample size determination

For the qualitative phase, holy water attendees who presented with at least two presumptive TB symptoms (cough lasting more than two weeks, fever, weight loss, or night sweats) were purposively selected for in-depth interviews. Selection was based on their ability to provide

rich and relevant information regarding their experiences.

In addition, health care providers (HCPs) directly involved in TB service delivery were included as key informants. The health centers from which HCPs were recruited were chosen purposively based on their high patient load for TB services. The final qualitative sample size was determined based on the principle of data saturation, or the point at which no new themes or insights emerge from additional interviews. In total, nine holy water attendees and six HCPs from three health centers will participate in the qualitative study.

4.7.2. Data collection tool and procedure

An interview guide with a flexible probing technique was used on purposefully selected key informants. Three trained data collectors conducted qualitative interviews. All interviews were conducted in Amharic and were tape-recorded. Participants were encouraged to express their ideas freely and describe their experiences in detail. The qualitative interview aimed to explore perceived barriers to utilizing TB health care services among holy water attendees.

4.7.3. Data processing and analysis

The tape-recorded interviews were transcribed by an intelligent transcription method into Amharic and were translated into English. MAXQDA 2025 software was used to code and categorize qualitative data. After the data was thoroughly read text by text, basic meaning units were identified and given names. Similar codes were grouped under the same categories. Major sub-themes were identified, and extended themes were developed. Thematic analysis was used to describe findings.

4.8. Data Quality Control Measures

To ensure the consistency and reliability of data collection tools, a pre-test on 5% of the sample size was conducted outside the study area and before the actual data collection time. Throughout the data collection period, the data was checked daily by the principal investigator for completeness, accuracy, clarity, and consistency. Any errors or ambiguities, and incompleteness were corrected as soon as possible. Similarly, for the qualitative study, the interview guides were tested and rechecked to eliminate any leading or ambiguous questions.

4.9. Ethical considerations

Ethical clearance and approval were obtained from the Institutional Review Board of Saint Paul's Hospital Millennium Medical College and the AHRI Alert Ethical Review Committee (AAERC). Letters of support were obtained from SPHMMC, AHRI and the Addis Ababa Regional Health Bureau.

After explaining the purpose, the possible benefit of the study, and confidentiality, written consent was obtained from selected holy water attendees who have voluntarily agreed to take part in this study. Confidentiality of collected information was maintained by using non-personal identifier codes for the respondents.

5. Result

5.1. Quantitative study

5.1.1. Socio-demographic characteristics of participants

A total of 1,600 individuals screened, and 225 participants who experienced at least two signs and symptoms of PTB were included in the study. Most of these participants 139 (61.8%) were female and aged more than 45 years (120/225, 53.3%). Approximately one-fourth of the participants, 58 (25.8%) were illiterate and unable to read or write.

Table 1: Socio-demographic characteristics of study participants (N=225)

Variable	categories	N	%
Age	18 – 30	41	18.2
	31 – 45	60	26.7
	> 45	124	55.1
Gender	Female	145	64.4
	Male	80	35.6
Marital status	Single	71	31.6
	Married	72	32.0
	Widowed	47	20.9
	Divorced	35	15.5
Educational Status	Can't read or write	63	28.0
	Primary school	93	41.3
	High school plus	69	30.7
Total Family Size	1-5	164	73.9
	>5	61	27.1
Monthly income	1500 ETB	103	45.8
	1500 - 4500 ETB	67	29.8
	> 4500 ETB	55	24.4

5.1.2. Prevalence of Tuberculosis among holy water attendees

The prevalence of PTB, as determined by GeneXpert testing, was 2.7% (6/225). This corresponds to a point prevalence of 375/100,000 among holy water users. Additionally, three of the participants who tested positive by GeneXpert were also confirmed positive by culture. Participants aged 31-45 had a higher rate of GeneXpert positive PTB (3/6; 50%) and more than 80% (5/6; 83.3%) had never received treatment for PTB. Among those who tested positive, only one individual (16.7%) demonstrated adequate knowledge of tuberculosis.

Table 2: Proportion of GeneXpert positive holy water attendees with socio-demographic characteristics

Variable	GeneXpert positive n (%), N=6	GeneXpert negative n (%), N=219
Age group		
18 – 30	1 (16.7)	40 (18.3)
31 – 45	3 (50.0)	57 (26.0)
> 45	2 (33.3)	122 (55.7)
Sex		
Female	3 (50)	142 (64.8)
Male	3 (50)	77 (35.2)
Educational status		
Can't read	1 (16.7)	62 (28.3)
Elementary	3 (50.0)	90 (41.1)
High school plus	2 (33.3)	67 (30.6)
Total family size		
1-5	3 (50.0)	161 (73.5)
>5	3 (50.0)	58 (26.5)
Monthly income		
1500 ETB	3 (50.0)	100 (45.7)
1500 - 4500 ETB	2 (33.3)	65 (29.7)
> 4500 ETB	1 (16.7)	54 (24.6)
Treated for TB before		
Yes	1 (16.7)	37 (16.9)
No	5 (83.3)	182 (83.1)
History of contact with TB participants		
Yes	1 (16.7)	35 (16.1)
No	5 (83.3)	183 (83.9)
Any household members diagnosed with TB recently		
Yes	0 (0)	11 (5.0)
No	6 (100)	207 (95.0)
History of previous stays at holy water sites?		
Yes	1 (16.7)	81 (37.2)
No	5 (83.3)	137 (62.8)
Health facility available near your Household		
Yes	5 (83.3)	189 (86.7)
No	1 (16.7)	29 (13.3)
Do you smoke?		
Yes	3	31 (14.2)

No	3	187 (85.8)
Do you drink alcohol?		
Yes	2 (33.3)	74 (34.0)
No	4 (66.7)	144 (66.0)
Knowledge about TB signs, symptoms, transmission, and prevention		
Good	1 (16.7)	74 (33.8)
Poor	5 (83.3)	145 (66.2)

5.1.3. Risk factors for GeneXpert positive pulmonary tuberculosis

Many of the p-values are above 0.05, and the confidence intervals are wide-highlighting lack of association is due to the highly unequal cell sizes (6 vs. 225). When the cell counts are this imbalanced, the estimated association becomes unstable and unreliable.

sampling limitations. Please justify? Emphasize that most variables did not reach significance, and that the small number of TB-positive cases reduces confidence in the findings.

In the bivariate analysis, most socio-demographic and behavioral variables showed no statistically significant association with PTB. However, larger family size (>5 members) and cigarette smoking were significantly associated with PTB. In the multivariable analysis, only cigarette smoking remained significantly associated with PTB (AOR: 6.99; 95% CI: 1.21–41.0; p = 0.024). Cigarette smokers had seven times higher chances of being PTB positive compared to non-smokers.

Table 3: Bivariate and Multivariate analysis of risk factors for GeneXpert positive PTB among study participants

Variables		PTB status (No.)		COR (95% CI)	P- value	AOR (95% CI)	P- value
		Positive	Negative				
Age group	18 – 30	1	40	1			
	31 – 45	3	57	2.11 (0.25 - 43.4)	0.53		
	> 45	2	122	0.66 (0.61 – 14.3)	0.73		
	Female	3	77	1			
	Male	3	142	1.84 (0.3 – 10.2)	0.46		
Educational status	Can't read	1	62	1			
	Elementary	3	90	2.07(0.26 - 42.3)	0.53		
	High school plus	2	67	1.85(0.17 - 40.4)	0.62		
Total family size	1-5	3	161	1		1	
	>5	3	58	2.78 (0.50 – 15.4)	0.22*	3.38 (0.59 – 19.9)	0.16
Monthly income (ETB)	1500	3	100	1			
	1500 - 4500	2	65	1.03(0.13 - 6.35)	0.98		
	> 4500	1	54	0.62(0.03 – 4.95)	0.68		
Treated for TB before	Yes	1	37	0.984 (0.1 - 6.34)	0.99		
	No	5	182	1			

History of contact with TB patients	Yes	1	35	1.05 (0.05 – 6.75)	0.97		
	No	5	183	1			
History of previous stays at holy water sites	Inside	1	81	1			
	Outside	5	137	1.06(0.16 -20.5)	0.96		
Health facility available near Household	Yes	5	189	0.77 (0.12 –15.0)	0.81		
	No	1	29	1			
Smoking cigarettes	Yes	3	31	6.03(1.08 -33.9)	0.032*	6.99 (1.21 - 41.0)	0.024**
	No	3	187	1			
Drinking alcohol	Yes	2	74	0.97(0.13 - 5.1)	0.98		
	No	4	144	1			
Knowledge about TB signs, symptoms, transmission, and prevention	Yes	1	74	0.39(0.02 – 2.49)	0.4		
	No	5	145	1			

COR= crude odds ratio, AOR = adjusted odds ratio, 95% CI = 95% confidence interval
*p < 0.25: included in multivariate model (marked with *)*
*p < 0.05: statistically significant (marked with **)*

5.2. Qualitative study

5.2.1. Perceived barriers for TB service utilization identified from interviews with holy water attendees

A total of nine participants were recruited for in-depth interview, including five women and four men. The analysis contains six interconnected themes that show the barriers to timely and effective TB care among individuals attending holy water sites in Addis Ababa. These themes highlight how people's interpretations of illness, reliance on religious healing, stigma, socio-economic hardship, health-seeking behaviours, and systemic shortcomings collectively contribute to accessing medical services and create difficulties in completing treatment. Each theme is described below, with supporting explanations and illustrative quotations.

Perceptions of Illness and Symptoms

A recurring finding was that participants' understanding of TB symptoms was strongly shaped by prior knowledge and everyday experiences. Rather than recognizing persistent cough, night sweats, or weight loss as clinical signs of TB, many interpreted them as symptoms of less severe conditions, such as the common cold, flu, or even exposure to cold weather. This misunderstanding reduced the urgency to seek medical attention and often delayed biomedical diagnosis.

For instance, one participant explained:

“I thought it was just the flu. I felt like I was getting better and kept saying, ‘Oh, it’s just this or that.’ So, I just waited to get better.” (EK_012, Male, 54)

Another emphasized environmental explanations:

“I didn’t protect myself from the cold, and that’s how I got sick.” (EK_011, Male, 38)

Religious and Traditional Healing Practices

Religious and traditional healing practices emerged as a dominant influence on how participants responded to TB symptoms. Holy water sites, fasting, ritual washing, and spiritual interpretations of illness were described as both sources of comfort and as barriers to medical treatment adherence. For many, spiritual remedies were considered not only legitimate but also superior to medical care, reflecting deep-rooted cultural and religious beliefs.

As one participant shared:

“She showed me the miracles and testimonies—on TikTok, actually. She showed me videos of the miracles there, so I went. I stayed there for more than a month. To be honest, it decreased. There was nothing much anymore.” (EM_013, Male, 27)

Yet, these practices often conflicted with medical instructions, complicating the simultaneous use of biomedical and spiritual therapies:

“I first thought it was possible to do both, to use the holy water and the medical treatment side by side. But the medical rule is that the medication should be swallowed on an empty stomach then after 30 minutes you have to eat food...if you eat food, it’s not allowed to drink or bathe in holy water.” (EM_013, Male, 27).

Stigma and Community Perceptions

Stigma associated with TB was another significant barrier, shaping participants’ willingness to disclose their condition, seek biomedical treatment, or adhere to prescribed regimens. Stigmatizing attitudes ranged from outright blame and exclusion to subtle forms of isolation, often underpinned by misconceptions that TB is a curse, divine punishment, or highly contagious.

One respondent recalled being accused of introducing disease into a “blessed” community:

“You are going to infect our holy place. No disease has ever come to our place. We are a place of prayer that is blessed. You brought this from wandering around from somewhere.”
(EM_013, Male, 27)

Others feared social consequences if their condition became public:

“If it becomes known that you’re taking TB medication, they will expel you. They won’t let you stay.” (EM_013, Male, 27)

Health-Seeking Behaviour and Delayed Care

Closely linked to illness perceptions and stigma, health-seeking behaviours revealed patterns of avoidance, delay, and reliance on alternative pathways. Many participants described minimizing their symptoms, resorting to pharmacy-based self-medication, or postponing formal medical care until symptoms became debilitating. Fear of diagnosis, mistrust of health services, and cultural norms around endurance also contributed to these delays.

As one participant admitted:

“I go to a pharmacy. I always think it’s a common flu... they give me syrup or a tablet. I take it for two or three days, and then it leaves me.” (SG_018, Male, 51)

Others simply avoided care altogether:

“I don’t like to go. I don’t know why, I just don’t feel like it.” (EK_011, Male, 38)

Socio-Economic Factors

Economic hardship was a pervasive theme, shaping both the decision to seek care and the capacity to maintain treatment. Participants consistently described financial barriers, including the costs of registration, medication, and transport. These expenses were often weighed against basic survival needs, resulting in postponement or abandonment of care.

One participant stressed the role of poverty:

“The lack of money affects you a lot because how will you get treated? How will you follow up? You can’t do anything without money.” (EK_012, Male, 54)

Others noted the discouragement created by hidden costs:

“When I went there to get a card, they asked me for 60 birrs. ‘If I pay 60 birrs just for a card, where is the rest going to come from?’” (EM_013, Male, 27)

Another participant observed:

“Another big barrier is cost. When people think about getting medical care, the first thing on their mind is how much it will cost. They worry more about the bill than the disease itself.” (SG_004, Female, 29)

Health System and Provider Barriers

Finally, participants highlighted multiple challenges within the health system itself, including long waiting times, inefficiencies in referrals, and negative encounters with health providers. These barriers discouraged individuals from returning for follow-up care and reinforced preferences for alternative healing sites.

One participant explained the challenge of long delays:

“It takes a long time; it’s not fast. You don’t get your turn quickly.” (EK_012, Male, 54)

Others described hostility or neglect from providers:

“When I went for my appointment, she told me, ‘There’s another test.’ ... While we were arguing, she said, ‘I won’t treat you.’ And on the third day, the next day, when I went, she ignored me and refused.” (EM_001, Male, 32)

Even routine interactions left some patients discouraged:

“I had gone last year. But the doctors don’t treat you well. I don’t know why—maybe because they are overwhelmed with people.” (EM_001, Male, 32)

These systemic shortcomings contributed to mistrust and avoidance, reinforcing broader patterns of delayed or disrupted TB care.

5.2.2. Perceived barriers for TB service utilization identified from Key informant interview

This section presents the key themes that emerged from the analysis of interviews with 6 key informants, including health workers, regarding barriers to tuberculosis (TB) health services. The findings are structured under six main themes: (1) Knowledge and Awareness Gaps, (2) Health-Seeking Behaviours, (3) Structural and Systemic Barriers, (4) Socioeconomic Challenges, (5) Stigma and Discrimination, and (6) Hospitality of the Health Provider. Each theme is discussed below

Knowledge and Awareness Gaps

A recurrent theme across participants was the limited awareness of TB among communities, including misconceptions about the disease, its causes, and its continued prevalence. Several health workers emphasized that many people still confuse TB with common colds or other respiratory illnesses, delaying appropriate care.

One participant explained:

“The biggest reason is the lack of knowledge... They also believe that serious illnesses like TB no longer exist. Many people are shocked when we tell them it’s TB. Their first question is, ‘Does that still exist?’” (AB_001, Female, CO)

Misinformation also extends to attributing TB to spiritual or moral causes. As one TB focal person noted:

“Some say TB is punishment from God. Others think it’s just a cold or lung cancer. Because of these ideas, they don’t seek care.” (AB_002, Male, TB Focal)

Health-Seeking Behaviours

Participants described complex and often ineffective health-seeking pathways among TB patients. Many individuals first seek care at pharmacies or private clinics, where they receive inappropriate or incomplete treatments, only presenting at TB clinics when symptoms have worsened.

One clinician explained:

“Most TB patients who come here have already taken medicine bought from a pharmacy once or twice... By the time they come to us, they are already exhausted.” (AB_001, Female, CO)

Others turn to spiritual or traditional healing practices, such as visiting tsebel (holy water sites), often abandoning medical treatment in the process.

As one TB focal recounted:

“We try to call them. For instance, there was a patient who died. She went to tsebel. When patients disappear like that, we can’t label them as ‘cured’ or ‘completed.’” (AB_002, Male, TB Focal)

Structural and Systemic Barriers

The organization of TB services within the health system was also identified as a significant barrier. Health workers highlighted challenges in screening and diagnosis, noting limited access to diagnostic tools such as X-rays or Fine Needle Aspiration (FNA) at the health center level.

As one TB focal explained:

“Tests like X-ray and FNA aren’t available at health center level. X-rays are expensive... If at least X-ray and FNA were available at the health center, that would reduce the problem.” (AB_002, Male, TB Focal)

Long waiting times, distance to health centers, and rigid Directly Observed Therapy (DOT) schedules were also mentioned as structural barriers, making it difficult for patients to adhere to treatment.

“Our health center is far from them. They must walk for two or three hours to reach it. The time it takes for them to come for DOT every day is a challenge.” (HM_001, Female, TB Focal)

Socioeconomic Challenges

Participants consistently emphasized the link between TB and poverty. Patients often struggle to afford diagnostic tests, transportation, or adequate nutrition during treatment.

“Many TB patients are low-income housemaids, people living on the street. When you ask them to pay for a test, they can’t afford it.” (AB_002, Male, TB Focal)

Economic hardship also affects adherence to DOT, with patients unable to take time off daily labour jobs to attend treatment.

“The challenges for patients, as an institution, we provide services for two woredas: Woreda 11 and Woreda 14. In Woreda 14, there are three or four zones, including Sheger city. Our health center is far from them. They must walk for two or three hours to reach the Woreda 11 health center. So, that's the first challenge. The second is that, in Addis Ababa, people live their lives by doing daily labor. So, the time it takes for them to come for DOT [Directly Observed Therapy] for 56 days, when we tell them to come and take their medicine every day, is a challenge for them.” (HM_001, Female, TB Focal)

Stigma and Discrimination

Stigma emerged as another barrier to TB services, with patients fearing social isolation, eviction, or rejection from their communities if diagnosed.

One health worker explained:

“Those who live in rented houses, when we tell them to bring their contacts, they say, ‘We will not tell them, because if we tell them that we have TB, they will evict us from the compound.’” (HM_002, Female, CO)

Hospitality of the Health Provider

Finally, the attitude and approach of healthcare providers played a crucial role in whether patients engaged with TB services. Some patients reportedly avoided certain facilities due to negative experiences with staff.

As one TB focal noted:

“They don’t feel comfortable going back there. That’s why many of them stay and continue treatment here. Without good service and hospitality, patients don’t want to come back.” (KF_001, Male, TB Focal)

Conversely, providers who emphasized empathy, calm discussions, and family-like support reported higher adherence among patients.

“For me, mostly, it’s about having a calm discussion with them... If you do this, in my experience, nearly 100% will accept the treatment.” (KF_002, Male, cough CO)

Key informants’ recommendation

Key informants reported expectations for a more responsive and patient-centered TB care system. They emphasize the pivotal role of government and health authorities in creating an enabling environment, from regulating pharmacies and strengthening diagnostic capacity to adapting treatment delivery models and investing in a skilled, motivated TB workforce.

“The government should strictly regulate pharmacies to ensure they do not sell any medications without a prescription. This will encourage people to visit health facilities.” (AB_001, Female, CO)

“The government should ensure that health centers are equipped with X-ray machines and provide FNA services for free, so that patients especially those with PNEG can be diagnosed more easily.” (AB_002, Male, TB Focal)

"The government should revise the DOT program to ensure it occurs at least once a week, as daily visits would be difficult for patients especially those who are severely ill helping them adhere to treatment by reducing travel costs, time, and other burdens." (HM_001, Female, TB Focal)

"The concerned body should ensure that staff assigned to the TB room are dedicated to that role, properly trained, and motivated to serve patients. Additionally, regular and timely training is mandatory." (KF_001, Male, TB Focal)

6. Discussion

In our study, the prevalence of pulmonary TB by GeneXpert testing was 2.7%, corresponding to a point prevalence of 375 per 100,000 holy water users. Notably, half of these were also culture-positive, thereby confirming active disease in those cases. This represents approximately a 1.35-fold increase from the prevalence of bacteriologically confirmed PTB reported by Ethiopia's National TB Prevalence Survey 2011 (36), suggesting that holy water sites may serve as focal points for TB transmission or reservoirs of undiagnosed cases. The elevated prevalence in this specific setting highlights the importance of targeted active case finding and tailored interventions to address TB among this unique population. Factors such as prolonged close contact, shared communal spaces, and potential delays in seeking biomedical care due to socio-cultural practices could contribute to this increased burden.

The GeneXpert-based prevalence in this study is somewhat lower than the smear-positive prevalence reported by Derseh et al. (2017) among holy water users, which was 2.9% (point prevalence 795/100,000). That earlier study used smear microscopy (fluorescence microscopy) for primary detection, with GeneXpert as a supplementary test for rifampicin resistance. The fact that the prevalence is slightly lower in our study suggests that GeneXpert may detect fewer additional cases in this sample or population differences are at play. The lower point prevalence (375 vs. 795/100,000) in our study may also be partly explained by differences in the population characteristics, as many of the holy water attendees in our sample were temporary visitors who traveled from elsewhere rather than residing at the holy water sites, thereby reducing their cumulative exposure to potential transmission (6).

Moreover, the prevalence observed in our study was also considerably lower than that reported by Reta et al. (2024), who found a culture-confirmed prevalence of 21.8% among symptomatic holy water attendees, corresponding to a point prevalence of 1,183 per 100,000. This discrepancy may be explained by large number of samples used by this study (7).

The findings of the qualitative study demonstrate that community perceptions of symptoms strongly shape health-seeking behavior, often leading to underestimation of illness severity and significant delays in accessing biomedical care. This means that similar misunderstandings have been noted before in Ethiopia and other high-burden areas, where people often assume that

symptoms like a persistent cough are due to minor issues such as the common cold instead of something more serious (34).

Religious practices, while central to community identity and psychosocial well-being, were also shown to inadvertently disrupt treatment adherence, with patients turning to holy water or spiritual healers instead of biomedical treatment. This dual role of religion in offering support yet delaying formal care aligns with findings from Ethiopia and other locations, and it highlights the potential for faith-based institutions to serve as partners in treatment support (30,37,38). Stigma also emerged as one of the most pervasive barriers, manifesting as emotional distress, secrecy, avoidance of services, and even refusal of treatment. Consistent with studies from Ethiopia and Ghana, stigma was found to undermine disclosure, contact tracing, and treatment seeking, leading to transmission within communities (39,40). Socio-economic vulnerability further compounded these challenges, as poverty not only delayed care-seeking but also undermined consistent follow-up and adherence. These findings resonate with the wider literature that links TB outcomes to poverty, food insecurity, and loss of income (41).

This study also highlights the importance of quality health care, as interactions with health workers influenced patients' willingness to remain engaged in treatment. Health workers' frustration that patients did not internalize messages points to the need for more dialogic and trust-based communication. When systemic barriers such as medicine shortages or unfriendly services are intersected with stigma and socio-economic vulnerability, patients are often disengaged from biomedical care and turned to alternatives. This aligns with broader health systems research demonstrating that the quality and responsiveness of care are decisive in sustaining patient adherence (42).

7. Conclusion and Recommendations

This study demonstrates that PTB remains a considerable health concern among holy water users. Although this prevalence is lower than previously reported among similar populations in Ethiopia, the persistence of undiagnosed cases highlights that holy water sites continue to serve as pockets of transmission and reservoirs of untreated TB. The predominance of cases among individuals who had no prior history of TB treatment underscores the need for strengthened active case finding and tailored interventions in these settings.

The qualitative findings further reveal community beliefs, religious practices, stigma, and socio-economic vulnerability collectively shape health-seeking behavior among holy water attendees. Misinterpretation of symptoms, reliance on spiritual healing, and the stigma contribute to delays in diagnosis and undermine treatment continuation. Poverty and health system limitations further complicate these challenges, creating a cycle of delayed care and ongoing transmission. Importantly, the role of faith-based institutions emerged as both a barrier and a potential opportunity, suggesting that collaboration with religious leaders and communities could enhance case detection, adherence, and support for patients.

Overall, this thesis highlights that addressing TB in holy water settings requires a dual approach: strengthening biomedical case detection and treatment through tools like GeneXpert and culture, while simultaneously engaging with the social, cultural, and economic determinants that drive health-seeking behavior. Tailored health education, stigma reduction, socio-economic support, and improved patient-provider communication are essential to sustain adherence and ensure long-term TB control. Integrating biomedical strategies with culturally sensitive, community-based approaches is therefore critical for reducing the hidden burden of TB among holy water users and advancing Ethiopia's progress toward national and global TB elimination targets.

Future follow-up studies are recommended to track incidence and treatment outcomes among holy water users over time, which would provide stronger evidence on the role of these sites in sustaining PTB transmission. Expanding screening across numerous holy water sites in different regions is important for more effectively capturing variations in prevalence and the surrounding contextual risk factors.

Policymakers should aim to integrate holy water sites into TB control strategies by including them as targeted locations for active case-finding campaigns, with mobile diagnostic services available for symptomatic attendees. It is also crucial to strengthen partnerships with religious leaders and institutions to promote TB awareness, reduce stigma, and encourage early referral to biomedical treatment, leveraging the influence of faith-based actors as allies rather than barriers.

8. Strength and limitation of the study

The key strength of this study is that it tried to explore barriers to PTB diagnosis and care among holy water users in Addis Ababa using a mixed-methods approach. The study provides a comprehensive understanding of both the socio-cultural factors influencing TB healthcare seeking in this unique setting.

However, the study also has several limitations. First, not all participants who were screened for TB symptoms underwent diagnostic testing, which may have led to an underestimation of the true prevalence. Additionally, chest X-ray was not performed for participants with a cough who were unable to produce sputum, potentially missing cases of GeneXpert-negative or subclinical PTB. This highlights the need for broader non-sputum-based screening strategies in similar high-risk settings. Another limitation could be that the small number of TB cases identified may have limited the power of quantitative analysis to detect significant risk factors.

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10. Annex

Annex I. Information sheet quantitative study (English version)

Study Title: Prevalence of Tuberculosis among holy water attendees and barriers to utilizing TB healthcare services in Addis Ababa, Ethiopia

Institution: Saint Paul's Hospital Millennium Medical College

Principal Investigator: Elleni Zeleke

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Dr. Kidist Bobosha (Ph.D) (kidist.bobosha@ahri.gov.et)

Introduction

TB affects different parts of society in our world. It is more likely to spread in areas where there are mass gatherings of people. Holy water sites are considered as one of the places where people gather in numbers.

Purpose: This study aims to assess the prevalence of TB and barriers to accessing TB health care services among holy water attendees in Addis Ababa, Ethiopia. To determine the prevalence, we will conduct a test by taking sputum samples from willing participants and we may take a phone number to inform you of the result. If the TB bacteria is found in the sputum sample taken from you and you are willing, you will be linked to a health facility near you to receive the treatment.

As one of our participants, you will be asked to share your knowledge and experience about TB and provide a sputum sample; You will be asked to sign the consent form.

Duration: The discussion will take around 30-45 minutes

Benefit of the study: There is no direct benefit to you now. However, the information that will be obtained from you will help the researchers recommend to the government and other stakeholders to design appropriate interventions to address the problem.

Risk to the study: The study will not impose any risk on the participants, except for the time spent discussing the topic, which is estimated to be 30- 45 minutes.

Right of participants: You have the full right to participate or to refuse to participate. You can ask any questions if anything is unclear to you.

Annex II. Consent form quantitative study (English Version)

I, the undersigned, confirm that it is with a clear understanding of the objectives and conditions of the study that I give my consent to be part of the study. I have been given the necessary information about the research. I have understood that it is my right to withdraw from the study at any time; the study has been explained to me in the language I understand.

Participant

Name _____ Signature: _____ Date: _____

Interviewer

Name _____ Signature: _____ Date: _____

Annex III. Structured questionnaire for quantitative study

Study Title: Prevalence of Tuberculosis among holy water attendees and barriers to utilizing TB healthcare services in Addis Ababa, Ethiopia

Participant's ID: ☐☐☐☐☐☐

Section I: Sociodemographic characteristics of participants

1. Gender ☐ Male ☐ Female
2. Age ☐ 18-30 ☐ 31-45 ☐ ≥ 45
3. Marital status ☐ Single ☐ Married ☐ Widowed ☐ Divorced
4. Education status ☐ Can't read and write.
☐ Primary school
☐ High school (9-12)
☐ >12 grade
5. Total family size ☐ 1- 5 ☐ >5
6. Occupation ☐ Government employee ☐ Housewife
☐ Private employee ☐ Student
☐ Unemployed ☐ Other _____
7. Monthly Income ☐ < 1500 ETB ☐ 1500 – 4500 ETB ☐ > 4500 ETB

Section II: Risk factors for smear-positive pulmonary tuberculosis

8. Have you ever been treated for TB? ☐ Yes ☐ No
9. Do you have a history of contact with TB patients? ☐ Yes ☐ No
10. Has anyone from your household members been diagnosed with TB recently?
☐ Yes ☐ No
11. Have you ever had any of the following symptoms for two weeks or more?
☐ Cough ☐ Fever ☐ Night sweats
☐ Chest pain ☐ Weight loss ☐ Loss of appetite
12. Did you seek treatment for any of the above symptoms in the past?
☐ Yes ☐ No
13. Do you have a history of previous stays at holy water sites? ☐ Yes ☐ No

14. If yes, how long was the longest duration you stayed at holy water sites?

(in days)

15. Are you staying at the holy water site or traveling from elsewhere?

☐ Staying at the holy water site

☐ Traveling from elsewhere

[Questions numbers 16- 22 will be filled for people staying at the holy water site]

16. How many days did you spend at the holy water site on your current visit?

☐ < 3 days ☐ 3-7 days ☐ 8- 21 days ☐ >21 days

17. Do you share cups for drinking? ☐ Yes ☐ No

18. Do you share a room in the holy water site? ☐ Yes ☐ No

19. If yes, how many people are in your room including you? _____

20. If yes, do any of your roommates have the following symptoms?

☐ Cough ☐ Fever ☐ Night sweats

☐ Chest pain ☐ Weight loss ☐ Loss of appetite

21. How long do you spend time with your roommates per day?

☐ Less than five hours ☐ Five and more hours

22. Do you get enough ventilation in your room? ☐ Yes ☐ No

23. Do you have a health center near your residence? ☐ Yes ☐ No

24. How far (by foot) is the nearest health center from your residence?

☐ <10 min ☐ 10-15 min ☐ 15-30 min ☐ > 30 min

25. Do you smoke? ☐ Yes ☐ No

26. Do you drink alcohol? ☐ Yes ☐ No

Section III: Knowledge of smear-positive pulmonary tuberculosis among study subjects

27. Have you ever heard about TB? ☐ Yes ☐ No

28. If yes, where did you first hear about TB?

☐ Mass media (TV, Radio, Magazine...) ☐ Social media

☐ Health Facilities ☐ Other

29. What do you think are the causes of TB?

☐ Tiny organisms ☐ Evil spirit

☐ Cold Weather ☐ Don't know

30. What do you think is the transmission route of TB?

☐ Coughing/sneezing ☐ Shaking hands

☐ Eating together ☐ Don't know

31. What are the Symptoms of TB?

☐ Cough ☐ Fever ☐ Weight Loss

☐ Chest pain ☐ Loss of appetite ☐ Others ☐ Don't know

32. Which of the following do you think can be applied to prevent TB?

☐ Covering mouth when coughing

☐ Avoid handshakes

☐ Avoid sharing dishes

☐ Washing hands after touching items

☐ Closing windows

☐ Through good nutrition

☐ Don't know

33. Do you think TB is curable with medical treatment? ☐ Yes ☐ No

Annex IV. Information sheet qualitative study (English version)

Study Title: Prevalence of Tuberculosis among holy water attendees and barriers to utilizing TB healthcare services in Addis Ababa, Ethiopia

Institution: Saint Paul's Hospital Millennium Medical College

Principal Investigator: Elleni Zeleke

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Email: elluzeleke@gmail.com

Advisors:

Mr. Berhanu Teshome (MPH, Asst Prof.) (berteshome19@gmail.com)

Mr. Anduamlak Gizaw (MPH, Asst Prof.) (gizandal@gmail.com)

Dr. Berhanu Seyoum (Ph.D) (berhanu.seyoum@ahri.gov.et)

Dr. Kidist Bobosha (Ph.D) (kidist.bobosha@ahri.gov.et)

Purpose: The aim of this study is to assess barriers to utilizing TB healthcare services in among holy water attendees in Addis Ababa, Ethiopia

Duration: The discussion will take around 30-45 minutes

Benefit Of the study: There is no direct benefit to you now. However, the information that will be obtained from you will help the researchers to recommend the government and other stakeholders to design appropriate interventions to address the problem.

Risk of the study: The study will not impose any risk on the participants except spending 30-45 minutes on the discussion.

Right of participants: You have full right to participate or to refuse to participate. You can ask any questions if anything is unclear to you.

Confidentiality: Samples and personal health data collected during the study will be encrypted and your laboratory and medical data will be used only by the researchers involved in the study.

Annex V. Consent form for qualitative study

I, the undersigned, confirm that it is with a clear understanding of the objectives and conditions of the study that I give my consent to be part of the study. I have been given the necessary information about the research. I have understood that it is my right to withdraw from the study at any time; the study has been explained to me in the language I understand.

Participant

Name _____ Signature: _____ Date: _____

Interviewer

Name _____ Signature: _____ Date: _____

Witness

Name _____ Signature: _____ Date: _____

Interview code: _____

Annex VI. Interview Guide

Interview guide for holy water attendee key informants

Participant ID: _____

1. Age: _____
2. Gender: _____
3. Highest Education attended: _____
4. Occupation: _____
5. Area of residence: _____

TB Experience

1. Have you ever been diagnosed with TB and treated?
2. If yes, where did you seek treatment for TB, and what were some of the challenges you faced in getting treatment?
3. If not, why did you not seek treatment?
4. Can you tell me about some of the things that made it difficult to get treatment?
5. Did you face any financial barriers to getting treatment for TB?
6. Did you face any transportation barriers to getting treatment for TB?
7. Did you face any stigma or discrimination related to TB?
8. Did you face any other barriers to getting treatment for TB?

Impact of Barriers

1. How did the barriers you face affect your ability to get the care you needed for TB?
2. Did the barriers you faced have any impact on your health?
3. Did the barriers you face have any impact on your family or community?

Solutions

1. Can you think of any ways to address the barriers that people face in accessing and utilizing TB healthcare services?

2. What would make it easier for you to get treatment for TB?
3. What would make it easier for other people to get treatment for TB?

Interview guide for Health Extension Workers (HEWs) and other Health Care Professionals

1. What are the main barriers that people in Addis Ababa face in accessing and utilizing TB healthcare services?
2. How do these barriers affect people's ability to get the care they need?
3. Do TB patients prefer spiritual healing rather than seeking medical treatment for TB?
4. How does this affect TB patients?
5. What would make it easier for you, as HEWs and HCPs, to help these people to access and utilize TB healthcare services?
6. Can you share some examples of barriers that you have seen or experienced in your work?
7. What are some potential solutions to address these barriers that people face in accessing and utilizing TB healthcare services?
8. What are some of the most effective ways that you have found to help people overcome these barriers?
9. Are there any specific programs or initiatives that you think would be helpful in addressing these barriers?

Annex VII. Information sheet quantitative study (Amharic Version)

የጥናት ርዕስ: የቲቢ ስርጭት በጸበል ተጠማቂያን መካከል እና የቲቢ የጤና አጠባበቅ አገልግሎቶችን ለመጠቀም

ያሉ እንቅፋቶች በአዲስ አበባ፣ ኢትዮጵያ።

ተቋም: የቅዱስ ጳውሎስ ሚሊኒየም የህክምና ኮሌጅ

ዋና ተመራማሪ: እሌኒ ዘለቀ

ሞባይል: 0911-99-65-11

ኢሜል: elluzeleke@gmail.com

አማካሪ:

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አንዱአምላክ ግዛው (MPH, Asst Prof.) (gizandal@gmail.com)

ዶ/ር ብርሀኑ ስዩም (Ph.D) (berhanu.seyoum@ahri.gov.et)

ዶ/ር ቅድስት በበሻ (Ph.D) (kidist.bobosha@ahri.gov.et)

መግቢያ

የቲቢ በሽታ የተለያዩ በአለማችን ያሉ የማህበረሰብ ክፍሎችን የሚያጠቃ ቢሆንም፤ እንደሚታወቀው የቲቢ በሽታ ብዙ ሰዎች በብዛት የሚገኙበት አካባቢ ላይ የመስፋፋት እድሉ ከፍተኛ ነው፤ ሰዎች በብዛት ከሚገኙበት አካባቢ የጸበል ቦታዎች ተጠቃሽ ናቸው።

የዚህ ጥናት ዓላማ:

የዚህ ጥናት አላማ በአዲስ አበባ፣ ኢትዮጵያ በሚገኙ ጸበል ተጠማቂያን መካከል ያለውን የቲቢ ስርጭት እና የቲቢ የጤና አጠባበቅ አገልግሎት ለማግኘት ያሉ እንቅፋቶችን መገምገም ነው። ስርጭቱ ምን ያህል እንደሆነ ለማወቅ ፈቃደኛ ከሆኑ ተሳታፊዎች የአክታ ናሙና በመውሰድ ምርመራ የምናደርግ እና፤ ውጤቱንም ለማሳወቅ ስልክ ቁጥር የምንወስድ ይሆናል። ከእናንተ ከሚወሰደው የአክታ ናሙና ላይ የቲቢ ባክቴሪያ ቢገኝ እና ፈቃደኛ ቢሆኑ በእርሶ አቅራቢያ ከሚገኝ የጤና ተቋም ጋር በማገናኘት ህክምናውን እንዲያገኙ ይደረጋል።

እርሶ ከተጠማቂያን መካከል አንዱ በመሆንዎ ስለ ቲቢ በሽታ ያሉትን እውቀት እና ተሞክሮ እንዲያካፍሉን እና የአክታ ናሙና እንዲሰጡ ይጠየቃሉ፤ ለዚህም ፈቃደኝነትን ለማረጋገጥ የስምምነት ቅጹ ላይ ይፈርማሉ ።

የሚፈጀው ጊዜ: ውይይቱ ከ30-45 ደቂቃ አካባቢ ይወስዳል

የጥናቱ ጥቅም: አሁን ምንም አይነት ቀጥተኛ ጥቅም አያገኙም። ነገር ግን ከእናንተ የሚገኘው መረጃ ችግሩን

ለመቅረፍ የሚያስችል እቅድ ለመንደፍ ለመንግስት እና ሌሎች ባለድርሻ አካላት ግብአት ሆኖ ያገለግላል።

የጥናቱ ስጋት፡- ጥናቱ ለውይይቱ ከ30-45 ደቂቃ ከማሳለፍ በስተቀር በተሳታፊዎች ላይ ምንም አይነት አደጋ አይፈጥርም።

የተሳታፊዎች ሙብት፡ ለመሳተፍ ወይም ላለመሳተፍ ሙሉ ሙብት አለዎት። ለእርስዎ ግልጽ ያልሆነ ነገር ካለ ማንኛውንም ጥያቄ መጠየቅ ይችላሉ።

ምስጢራዊነት፡ በጥናቱ ወቅት የሚሰበሰቡ የናሙናም ሆነ የግል ጤና መረጃዎች በሚስጥራዊ ኮድ ይያዛሉ የእርስዎ የላቦራቶሪ እንዲሁም የህክምና መረጃዎች ለምርምሩ ተሳታፊ ለሆኑ ተመራማሪዎች ብቻ ይውላል።

Annex VIII. Consent form (Amharic Version)

እኔ፣ ከዚህ በታች የፈረምኩት፣ የጥናቱን ዓላማዎች እና ሁኔታዎች በግልፅ በመረዳት የጥናቱ አካል ለመሆን ፍቃድ ሰጥቻለሁ። ስለ ጥናቱ አስፈላጊ መረጃ ተሰጥቶኛል። በማንኛውም ጊዜ ከጥናቱ መውጣት መብቴ እንደሆነ ተረድቻለሁ፣ ጥናቱ በምረዳው ቋንቋ ተብራርቶልኛል።

ተሳታፊ

ስም _____ ፊርማ: _____ ቀን: _____

ጠያቂ

ስም _____ ፊርማ: _____ ቀን: _____

ምስክር

ስም _____ ፊርማ: _____ ቀን: _____

Annex X. Information sheet for qualitative study (Amharic Version)

የጥናት ርዕስ፡ የቲቢ ስርጭት በጸበል ተጠማቂያን መካከል እና የቲቢ የጤና አጠባበቅ አገልግሎቶችን ለመጠቀም ያሉ እንቅፋቶች በአዲስ አበባ፣ ኢትዮጵያ፡፡

ተቋም፡ የቅዱስ ጳውሎስ ሚሊኒየም የህክምና ኮሌጅ

ዋና ተመረማሪ፡ እሌኒ ዘለቀ

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ዓላማው፡ የዚህ ጥናት አላማ በአዲስ አበባ፣ ኢትዮጵያ በሚገኙ ጸበል ተጠማቂያን መካከል ያለውን የቲቢ ስርጭት እና የቲቢ የጤና አጠባበቅ አገልግሎት ለማግኘት ያሉ እንቅፋቶችን መገምገም ነው፡፡

የሚፈጀው ጊዜ፡ ውይይቱ ከ30-45 ደቂቃ አካባቢ ይወስዳል

የጥናቱ ጥቅም፡ አሁን ምንም አይነት ቀጥተኛ ጥቅም አያገኙም፡፡ ነገር ግን ከእናንተ የሚገኘው መረጃ ችግሩን ለመቅረፍ የሚያስችል እቅድ ለመንደፍ ለመንግስት እና ሌሎች ባለድርሻ አካላት ግብአት ሆኖ ያገለግላል፡፡

የጥናቱ ስጋት፡- ጥናቱ ለውይይቱ ከ20-25 ደቂቃ ከማሳለፍ በስተቀር በተሳታፊዎች ላይ ምንም አይነት አደጋ አይፈጥርም፡፡

የተሳታፊዎች መብት፡ ለመሳተፍ ወይም ለመሳተፍ ሙሉ መብት አለዎት፡፡ ለእርስዎ ግልጽ ያልሆነ ነገር ካለ ማንኛውንም ጥያቄ መጠየቅ ይችላሉ፡፡

ምስጢራዊነት፡ ውይይቱን በድምጽ መቅጃ እንቀዳለን እና በኋላ ወደ ጽሁፍ ከተገለበጠ በኋላ እስከመጨረሻው ይሰረዛል፡፡ ምላሻችሁ ከአጥኚ ቡድኑ ውጪ ማንም አይደርስበትም እና የምትሰጡት ማንኛውም መረጃ ሚስጥራዊ ይሆናል፡፡

Annex XI. Consent form for qualitative study (Amharic Version)

እኔ፣ ከዚህ በታች የፈረምኩት፣ የጥናቱን ዓላማዎች እና ሁኔታዎች በግልፅ በመረዳት የጥናቱ አካል ለመሆን ፍቃድ ሰጥቻለሁ። ስለ ጥናቱ አስፈላጊ መረጃ ተሰጥቶኛል። በማንኛውም ጊዜ ከጥናቱ መውጣት መብቴ እንደሆነ ተረድቻለሁ፤ ጥናቱ በምረዳው ቋንቋ ተብራርቶልኛል።

ተሳታፊ

ስም _____ ፊርማ: _____ ቀን: _____

ጠያቂ

ስም _____ ፊርማ: _____ ቀን: _____

ምስክር

ስም _____ ፊርማ: _____ ቀን: _____

የቃለ መጠይቅ ኮድ: