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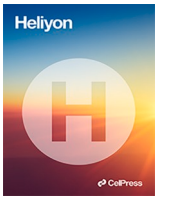

Knowledge, attitude and practice on prevention and control of pulmonary tuberculosis index cases family in Shebedino District, Sidama Region, Ethiopia

Mekbib Madebo [a], Bargude Balta [b], Deresse Daka [c,*]

[a] Leku Hospital, Sidama Region, Ethiopia
[b] Hawassa University Comprehensive Specialized Hospital, Hawassa, Ethiopia
[c] Hawassa University College of Medicine and Health Science, Hawassa, Ethiopia

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ABSTRACT

Introduction: Tuberculosis is a leading cause of death, despite being a largely curable and preventable disease. The goals of TB control are to reduce infection transmission, morbidity, and mortality until TB cannot be a threat to public health any longer while preventing drug resistance. Assessing KAP on TB control and prevention among family members is more essential, and taking action based on the result can break the transmission of TB infection.

Methods: From August to September 2022, a community-based cross-sectional study method was used. A total of 422 participants were selected from a list of sample frames who were family members of PTB patients who had used anti-TB medication in the previous 12 months prior to the study period using a systematic random sampling method. SPSS version 25 software was used to analyze the data. Bivariate and multivariate analyses were used to determine variables related to KAP on TB prevention and control. A variable with p-values less than 0.25 was included in the multivariable logistic regression model to find independent determinant factors. In the multivariate logistic regression, variables with p-values $\leq$0.05 were identified as statistically significant.

Result: A total of 414 family members responded to the survey questionnaire. The average knowledge score on TB was 17.11 $\pm$ 6.34. The majority (51.9%) of respondents had a good knowledge of TB cases. One-third of those polled had an unfavorable attitude towards PTB prevention, with a mean score of 3.16 $\pm$ 1.78 and 55.1% had good practice in preventing tuberculosis. Marital status (AOR = 1.7, 95% CI: 1.5–2.5) was an independent predictor of knowledge. Practice level is independently affected by occupation (AOR = 3.9; 95% CI = (1.7–8.7)) and health education on PTB (AOR = 2.4; 95% CI = (1.6–3.9).

Conclusion: Knowledge, attitudes, and preventive practices about tuberculosis were not satisfactory when compared to several national and international studies. It is necessary to strengthen the program for health education and awareness-building on PTB.

* Corresponding author.
E-mail address: drsdk200@gmail.com (D. Daka).

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1. Introduction

Mycobacterium tuberculosis is a pathogenic bacterium causing tuberculosis, which is a life-threatening human disease [1]. It was previously known as "*phthisis*" [1]. Tuberculosis (TB) is an infectious disease that is a main source of illness and is one of the main causes of death globally, caused by *M. tuberculosis* complex (MTBC) [2,3]. Until the coronavirus (COVID-19) pandemic, tuberculosis was the leading cause of death from a single infectious agent, ranking above HIV/AIDS [3].

M. tuberculosis is a causative agent of pulmonary tuberculosis and affects the lungs and other sites primarily in adults, with more cases among men [2–4]. About 85% of people who develop tuberculosis disease can be successfully treated with a 6-month drug regimen, and regimens of 1–6 months can be used to treat tuberculosis infection [3,4]. The reduction of tuberculosis infection is achieved through multi-sectoral action [3]. Some countries have already reduced the burden of tuberculosis disease to fewer than 10 cases and less than 1 death per 100,000 people per year [5].

Globally, about 10 million people developed tuberculosis in 2019, of which an estimated 1.2 million deaths were reported from single infectious agents [5]. The disease spreads from person to person through the air when individuals who are sick with pulmonary tuberculosis expel tubercle bacilli into the air during coughing, sneezing, speaking, and singing [2–4]. The risk of infection is different among different key populations, such as the prison population, than the general population [6]. Tuberculosis occurs in every part of the world [3,4]. In 2020, the largest number of new tuberculosis cases occurred in the WHO South-East Asian Region, with 43% of new cases, followed by the WHO African Region, with 25% of new cases, and the WHO Western Pacific, with 18% [5].

Ethiopia is a high TB burden country [7] that is highly affected by tuberculosis, with an incidence of 140/100,000 people, hence being included under high TB-, TB/HIV-, and MDR-TB-burden countries across the globe [5]. In 2018, 114,233 tuberculosis cases were notified in the country, with a case/fatality ratio of 17% (9–25%) [4].

Transmission of TB is the result of four major factors: susceptibility of the host, degree of infectiousness of the source case, level of exposure (closeness, frequency, and duration), and environmental factors (ventilation) [3,8]. The risk of transmission and establishing TB infection for a susceptible individual is higher [3,4,8]. Various actions are needed to reduce transmission of TB, such as early case detection, reduced exposure, and adherence to treatment [8]. Early case detection remains one of the most important interventions for reducing the risk of TB transmission [3,6,8]. TB contact investigation, basic infection control behavior-change campaigns, education, and infection control messages have been needed for promoting early identification of cases and TB treatment adherence [8].

One of the main goals of the End TB Strategy is to increase the coverage of TB therapy by detecting and treating primary and secondary TB patients [6]. There is still a large disparity between the number of incident instances and those that have been notified, despite continued efforts [9–11]. The substantial burden of undiagnosed TB patients discovered in the population during TB prevalence surveys in Ethiopia and other countries in Africa [9–14].

Understanding who gets missed and figuring out how to reduce detection delays are necessary for closing the TB case-finding gap [15]. Lack of high-quality services may influence TB services [15]. Another crucial factor, though, may be the failure to identify the seriousness of a particular symptom complex, which results in people delaying seeking medical attention despite the availability of qualified services [15,16]. Delays in case identification, reporting, and treatment are known to be linked to stigma and inadequate awareness about TB, including false beliefs about transmission and prevention, as well as a lack of confidence in accessible health care facilities and employees [17–24].

Knowledge of TB symptoms and indications has been demonstrated to influence care-seeking behavior [6,24–27]. Therefore, in order to enhance or contribute to the success rate of TB case detection and treatment, interventions to address these social or community-level issues are necessary [3,6]. Because of this, the World Health Organization's End TB strategy's second pillar, which includes strong community involvement, advocacy, communication, and social mobilization initiatives, is crucial [6].

Members of a person's household (HH) who have infectious TB are at a greater risk of contracting the infection and ultimately acquiring the disease [28]. To reduce exposure to HH, homes should be adequately ventilated, anyone who coughs should be educated on cough protocol and respiratory hygiene [28], spend as much time as possible outside, sleep in an adequately ventilated room, avoid contact with children (under 5 years old) and people who have immune system disorders, and limit time spent in crowded places like markets, churches, and public transportation [8,29].

The public's awareness, attitude, and behavior towards TB prevention, treatment, and control must be adequate for the aims of TB control to be achieved [30]. Information about health care can reach many people rapidly and boost their knowledge level [31]. Information from electronic media and health education initiatives might be used to gain knowledge [32–34]. Numerous studies have focused on the knowledge, attitude, and preventative practices (KAP) of TB patients [35–37] or those with other diseases, but they have not adequately addressed the KAP of family members of TB patients. Therefore, the purpose of this study was to assess the KAP for TB control and prevention among family members in Shebedino Woreda, Sidama Region, southern Ethiopia.

2. Materials and method

2.1. Study area

A community-based cross-sectional study design was conducted between August and September 2022 in Shebedino district, which is one of the 36 districts of Sidama Region. It is situated 300 km from Addis Ababa, the capital city of Ethiopia. The district is located 27 km from the regional city of Hawassa. The climatic condition of Shebedino district is 'woyina dega'. As the data from the district health office shows, it has 26 kebeles (3 urban and 23 rural). The total population of the district is 261,128 (128,736 males and 132,392 females). The district has 1 general hospital, 6 health centers, and 26 health posts. The staple foods in the woreda are maize and

'kocho'.

2.2. Source and study population

The source population included all family members of index cases who had received anti-TB treatment within the previous 12 months.

2.3. Study population

The study population was composed of randomly selected adult (≥18 years) individuals who live as HH members of all age groups of anti-TB treatment in the 12 months prior to the study period in public health institutions in Shebedino district.

2.4. Inclusion and exclusion criteria

In this study, adults (≥18 years) and individuals who have been living with TB patients as HH members, including adult TB patients, were included. Severely ill individuals, those who cannot perform interviews with the data collector, and those who have no family members were excluded from the study.

2.5. Sample size calculation

The sample size was calculated using a single population proportion for knowledge, attitude, and practice, with population proportions of 96.1%, 52.6%, and 17%, respectively [38]. Hence, using the formula

$n = \frac{Z^2 * P(1-P)}{d^2}$.

Where n = sample size,

$Z_{\alpha/2}$ = significance level at α = 95%

p = prevalence from previous studies. The prevalence of knowledge, attitude and practice with population proportion of 96.1%, 52.6%, and 17% respectively.

d = margin of error of 0.05, with the assumptions of 95% confidence interval and using the above single population proportion formula the sample size can be calculated as:

Knowledge: $n = \frac{(1.96)^2 0.961(1-0.961)}{0.05^2} = 58.$

Attitude: $n = \frac{(1.96)^2 0.526(1-0.526)}{0.05^2} = 384.$

Practice: $n = \frac{(1.96)^2 0.17(1-0.17)}{0.05^2} = 217.$

Hence, the sample sizes for knowledge, attitude, and practice, including the non-respondent rate of 10%, were obtained as 64, 422, and 239.

Also, the sample size for associated factors, which have a relationship with KAP on prevention and control of TB among family

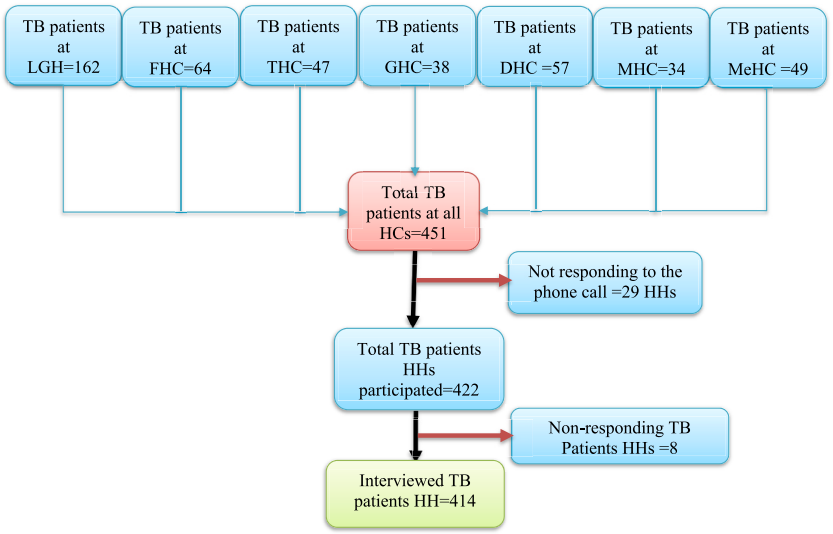

Fig. 1. Schematic representation of sampling procedure (**LGH**: Leku General Hospital, **FHC**: Furra Health Center, **THC**: Telamo Health Center, **GHC**: Gebrekirstos Health Center, **DHC**: Dobetoga Health Center, **MHC**: Morrocho Health Center, **MeHC**: Mero Health Center).

members of TB patients, is calculated using EPI-Info version 3.5.1 software. Based on some of the significant factors like educational status, occupational status, and marital status [38], the sample sizes were 224, 101, and 246 respectively. Therefore, the sample size calculated as 422 was used as a sample size for this study because it is the largest sample size calculated, which is important to get a precise result and is sufficient to address the other objectives targeted.

2.6. Sampling procedures

At the very beginning a sampling frame was developed for family members of TB patients those have been taking anti-TB treatment in the past 12 months; prior to starting data collection; in the public hospital and health centers. After taking the list of TB patients contact addresses from the TB treatment registration books at Leku General Hospital (LGH), Furra Health Center (FHC), Telamo Health Center (THC), Gebrekirstos Health Center (GHC), Dobetoga Health Center (DHC), Morrocho Health Center (MHC), and Mero Health Center (MHC), we obtained the number of adult (≥18 years of age) family members of TB patients. Finally, individuals from the HHs were selected using a systematic sampling technique. Among 451 TB patient HHs, there were 956 family members with a 2.1 HH proportion (Fig. 1).

2.7. Data collection tools and procedures

A semi-structured questionnaire adapted and modified from previous studies was used to collect socio-demographic, economic, and other data. The questionnaire was first written in English, then translated into Sidamic and Amharic, and finally returned to English by a third individual to ensure consistency. For one day, five diploma nurse data collectors and one supervisor were hired and trained.

2.8. Data quality assurance

The data collectors and the supervisor started data collection after the training. The quality of the data was checked for completeness and consistency every day. Also, during data analysis, the completeness and consistency of the collected data were checked.

Table 1
Socio-demographic characteristics of the study participants among, family members of TB patients in Shebedino woreda, Sidama region, Ethiopia 2022 (N = 414).

Variables	Responses	No.	(%)
Age	18–21	48	11.6
	21–30	140	33.8
	31–40	111	26.8
	41–50	91	22.0
	51–60	17	4.1
	>60	7	1.7
Gender	Male	213	51.4
	Female	201	48.6
Marital status	Single	140	33.8
	Married	222	53.6
	Widowed	48	11.6
	Divorced	4	1.0
Religion	Protestant	220	53.1
	Orthodox	83	20.0
	Catholic	32	7.7
	Muslim	79	19.1
Residence in last 5 years	Urban	143	34.5
	Rural	271	65.5
Occupation	Government Employed	60	14.5
	Merchant	81	19.6
	Farmer	89	21.5
	Student	76	18.4
	unemployed	43	10.4
	Others	65	65.7
Educational status	No formal education	185	44.7
	Primary	79	19.1
	Secondary	83	20.0
	Secondary and above	67	16.2
Monthly Income	<1000	272	65.7
	2000–3000	66	15.9
	>3000	76	18.4
Type of Media that they use	No any Media	19	4.6
	Radio	211	51.0
	TV	79	19.1
	Mobile	105	25.4

2.9. Data processing and analysis

The data were coded and entered into Epi-data, then transported to Statistical Package for Social Sciences (SPSS) IBM version 25 for analysis. Descriptive statistics were run, and means, ratios, standard deviations, frequencies, and percentages were generated. Bivariable and multivariable analyses were done to identify factors associated with the dependent variables. Bivariable analysis was used to identify candidate variables for multivariable logistic regression. Multivariable logistic regression analyses with a 95% confidence interval were generated for variables with a p-value less than 0.25 during bivariate analysis. Variables with a p-value less than 0.05 in the final multivariable model were recognized as statistically significant and were announced as associated factors. Tables, graphs, and different charts were used to present the results.

2.10. Ethical clearance

Ethical approval to start the study was primarily obtained from the Institutional Review Board (IRB) of Pharma College *No. PH/11/06*. Permission was obtained from the selected health institutions included in the study. An informed consent was obtained from the individuals before starting the interview and data collection.

3. Results

3.1. Socio-demographic characteristics

A total of 422 participants were interviewed, with a response rate of 98%. The mean (standard deviation) age was 34.56 (11.19). The majority of 140 (33.8%) of the participants were in the age category of 21–30 years old. Half of the studied participants 213 (51.4%) were male, 140 (33.8%) were single, and 222 (53.6%) were married. The majority of the study participants, 271 (65.5%), were rural residents, and 143 (34.5%) were urban residents. About 185 (44.7%) had no formal education, 79 (19.1%) attended primary education, 83 (20.0%) had secondary education, and 67 (16.2%) had secondary education and above. The occupational status of the study participants was: 43 (10.4%) were unemployed or housewives; 89 (21.5%) were farmers; 60 (14.5%) were government employees; and 65 (65.7%) were merchants. Most study participants get information through Radio 211 (51.0%) (Table 1).

3.2. KAP status on family members of TB patients

More than half (51.9%) of the 414 patient family respondents in the study area had a good level of knowledge. However, 228 (55.1%) of participants had an unfavorable attitude, and more than half (228) (55.1%) of the participants had a good practice in the prevention of tuberculosis (Table 2).

The majority reported that 326 (78.7%) knew that tuberculosis is not a hereditary disease. Also, half of the respondents (326, or 78.7%) answered that they had heard about tuberculosis. About 222 (53.6%) know fever is a sign and symptom of TB, 316 (76.3%) know that TB is a preventable disease, and 298 (72.0%) know coughing $\geq$2 weeks is a sign and symptom of TB disease. Furthermore, about 324 (78.3%) believe that tuberculosis is a curable disease, and 277 (66.9%) responded that TB needs specific drug therapy. Also, more than half of respondents (222 (53.6%)) replied that TB cannot be cured with traditional medications, and 283 (57.5%) understood that withdrawal of anti-TB medication results in severe consequences such as drug resistance, relapse, or even death (Table 3).

3.3. Factors associated with the knowledge of participants towards the prevention of tuberculosis

In the bivariate analysis, occupation of the participants, marital status, education level, and monthly income were factors related to the knowledge of the patient's family towards the prevention of TB. However, multivariate analysis revealed that the marital status of the married was 3.9 times more likely to be aware of TB prevention than the rest of the population [AOR = 3.9; 95% CI = 1.7–8.7), P = 0.002]. (Table 4).

Table 2
The knowledge, attitude, and practice statutes among, family members of TB patients in Shebedino woreda, Sidama region, Ethiopia 2022 (n = 414).

Variables		frequency	Mean (SD)
Knowledge	Poor	199 (48.1%)	17.11 ± 6.34
	Good	215 (51.9%)	
Attitude	Favorable	186 (44.9%)	3.16 ± 1.78
	Unfavorable	228 (55.1%)	
Practice	Good Practice	228 (55.1%)	9.75 ± 4.26
	Poor practice	186 (44.9%)	

Table 3
The knowledge of the study participants among, family members of TB patients in Shebedino Woreda, Sidama region, Ethiopia 2022 (n = 414).

The knowledge of study participants on PTB	No	Yes
	N (%)	N (%)
Have you ever heard about TB?	88(21.3)	326(78.7)
Do you think a bacterium is the cause of TB?	154(37.2)	260(62.8)
Do you think a cold air is a cause of TB?	245(59.2)	169(40.8)
Do you think the cause of TB is due to a punishment of God?	205(49.5)	209(50.5)
Do you think TB is communicable from person to person?	105(25.4)	309(74.6)
Is coughing (breathing) one of the modes of TB transmission?	132(31.9)	282(68.1)
Do you think sharing dishes, plates, cups and spoons with TB patient are some of the mode of TB transmission?	142(34.3)	272(65.7)
Is living with TB patient one of the mode of TB transmission?	165(39.9)	249(60.1)
Is hereditary one of the modes of TB transmission?	88(21.3)	326(78.7)
Is coughing ≥2 weeks a sing and symptom of TB disease?	116(28.0)	298(72.0)
Is fever a sing and symptom of TB disease?	192(46.4)	222(53.6)
Is night sweating a sing and symptom of TB disease?	146(35.3)	268(64.7)
Is weight loss a sing and symptom of TB disease?	164(39.6)	250(60.4)
Is loss of appetite a sing and symptom of TB disease?	147(35.5)	267(64.5)
Is TB preventable disease?	98(23.7)	316(76.3)
Is covering mouth while coughing a method of TB prevention?	93(22.5)	321(77.5)
Is avoiding sharing of cups with TB patients a method of TB prevention?	118(28.5)	296(71.5)
Is ventilation living rooms and opening car's window a method of TB prevention?	113(27.3)	301(72.7)
Is isolation of TB patient a method of TB prevention?	138(33.3)	276(66.7)
Is vaccination of children a method of TB prevention?	143(34.5)	271(65.5)
Is TB curable?	90(21.7)	324(78.3)
Is TB specific drug therapy a method to cure TB?	137(33.1)	277(66.9)
Is praying and fasting a method to cure TB?	174(42.0)	240(58.0)
Are Traditional medicines a method to cure TB?	192(46.4)	222(53.6)
Do you know the amount of cost for TB treatment?	127(30.7)	287(69.3)
Is inadequate diet favoring TB disease?	145(35.0)	269(65.0)
Are drug resistance, relapse or/and death some of the negative effects of withdrawal of anti-TB medication?	176(42.5)	238(57.5)

Table 4
Factors associated with knowledge of participants towards prevention of TB among family members of TB patients, Shebedino woreda, Sidama region, Ethiopia, 2022(n = 414).

Variables	Group	Knowledge		COR95%CI	AOR 95% CI
Occupation		Good	Poor		
	Government	37	23	1	
	Merchant	29	52	0.936 (0.202–0.775)	0.2(0.085–0.469)
	Unemployed	18	25	0.512 (0.234–1.117)	0.871(0.377–2.013)
Marital status	Single	86	54	1	1
	Married	117	105	0.7 (0.455–1.076)	3.9 (1.7–8.7)
	Widowed	10	38	0.165 (0.076–0.359)	0.5(0.064–3.896)
Educational level	No formal education	79	106	0.179(0.092–0.351)	1(0.604–1.909)
	Primary	37	42	0.212 (0.100–0.449)	1.4(0.782–2.476)
	Secondary	45	38	0.285 (0.136–0.600)	**4.3(2.032–8.9)** *
	Secondary and Above	54	13	1	
Monthly income	<1000	147	125	0.510 (0.296–0.880)	.242(0.119–0.491)
	1000–3000	15	51	0.128 (0.060–0.272)	1.394(0.712–2.729)
	>3000	53	23	1	

*Significant (P < 0.05).

Table 5
The practice of the study participants among, family members of TB patients in Shebedino woreda, Sidama region, Ethiopia 2022.

The attitude of study participants on PTB	No	Yes
	N (%)	N (%)
Would you feel hope if you were found to have TB?	186(44.9)	228(55.1)
Would you tell to others if you develop TB?	218(52.7)	196(44.3)
Do you stay away if you get people with TB?	239(56.5)	175(42.3)
Do you allow your daughter (son) to marry cured TB patients?	180(43.5)	234(56.5)
TB can be ordered by God as punishment?	86(20.8)	328(79.2)
Overcrowding has contribution to TB transmission?	246(59.4)	168(40.6)
TB can be prevented by holly water and traditional medicine?	156(37.7)	258(62.3)

3.4. Level of attitude toward pulmonary tuberculosis among family members of TB patients

More than half of the respondents (55.1%) responded that they would not give up hope if they were infected with TB. About 218 (52.7%) study participants did not volunteer to disclose to others if they had TB (Table 5).

3.5. Factors associated with the attitude of participants towards the prevention of tuberculosis

Logistic regression was used to determine the set of predictor variables that predicted patient families' attitudes towards TB prevention. After controlling for the effects of potentially confounding variables using multiple logistic regressions, living in an urban area is significant in the multivariate analysis ($p \leq 0.05$). This study revealed that patient families who reside in urban areas have a 53% more favorable attitude than those who live in rural areas [AOR = 0.470; 95% CI: 0.273–0.808] (Table 6).

3.6. Level of practice on pulmonary tuberculosis among family members of TB patients

About 255 (61.5%) and 245 (59.2%) of the participants were neither screened for TB infection nor received health education on TB. From all of the participants, 186 (44.9%) had poor practices towards TB prevention practice. More than half of the respondents (235; 56.8%) have a good practice of covering their mouth and nose during coughing (Table 7).

3.7. Bivariate and multivariate analysis of factors associated with TB prevention practice

A bivariate Cox regression model of educational status, occupation, residences, monthly income, and health education on TB showed a significant association with TB prevention practice (Table 8). Following multivariate analysis, two baseline characteristics were found to be independent predictors of excellent practice: employment AOR = 3.9; 95% CI = (1.7, 8.7) and health education on TB AOR = 2.4%; 95% CI = (1.6, 3.9).

4. Discussion

The community's low preference for utilizing community health professionals and the lack of awareness about the disease's spread and propagation were major obstacles. In order to address these, Ethiopia will need to increase its community-level activities. In order to fill knowledge gaps and reach the most vulnerable and impacted groups, the findings also point to the necessity of targeted health education programs.

The present study offers information on the knowledge, self-reported attitudes, and practices towards prevention and control of tuberculosis among family members of TB patients in Shebedino district, Sidama region, Ethiopia, in 2022. The current study revealed that the overall knowledge about TB was 51.9% CI (47.3, 56.3), which was lower than a study done in south-west Ethiopia, which was West Gojjam Zone 54% [23], Gambela 57.6% [39], Punjab, Pakistan 57.6% [37], Iran 62% [40], Nekemte West Ethiopia 93% (50), Jimma Zone, Oromia Region 96.1% [30], in Ethiopia 95.5% [41], but higher than studies done southern part of Bhutan 41.4% [42]. The disparity could be due to the significance of mass media in disseminating health information, which amplifies the promotion of health education conducted in different settings, or it could be related to the variation of the study setting.

According to this survey, 78.7% of participants had heard about tuberculosis (TB) and how to avoid it, which is comparable to the

Table 6
Factors associated with Attitude of participants towards prevention of tuberculosis among family members of TB patients, Shebedino woreda, Sidama region, Ethiopia, 2022(n = 414).

Variables	Group	Attitude		COR95%CI	AOR 95% CI
		Favorable	Unfavorable		
Occupation	Government	33	27	1	
	Merchant	37	44	0.588(0.266–1.300)	1.133 (0.551–2.239)
	Unemployed	15	28	0.737 (0.551–2.329)	0.737 (0.370–1.470)
Residence	Urban	52	91	0.584 (0.386–0.885)	**0.478 (0.273–0.808)***
	Rural	134	137	1	1
Marital status	Single	67	73	1	1
	Married	107	115	0.287 (0.133–0.620)	2.198(0.58–8.312)
	Widowed	10	38	0.266 (0.711–3.446)	0.99(0.217–4.510)
	Divorced	2	2	0.713(0.243–2.09)	0.688(0.274–1.732)
Educational level	No formal education	76	109	0.992 (0.491–2.004)	0.479(0.131–1.749)
	Primary	28	51	1.69 (1.0008–2.862)	1.858(0.941–3.667)
	Secondary	45	38	0.76 (1.007–3.108)	1.073(0.463–2.486)
	Secondary and above	37	30	1	1
Monthly income	<1000	118	154	1	1
	1000–3000	28	38	1.450 (0.871–2.415)	0.615 (0.310–1.219)
	>3000	40	36	0.645 (0.302–1.337)	0.635 (0.302–1.337)

*Significant ($P < 0.05$).

Table 7
The practice of the study participants among, family members of TB patients in Shebedino woreda, Sidama region, Ethiopia 2022.

The Practice of study participants on PTB	No	Yes
	N (%)	N (%)
Have you ever screened for TB?	159(38.4)	255(61.6)
Have you ever got health education about TB?	169(40.8)	245(59.2)
Have you ever been covered your mouth during coughing?	179(43.2)	235(56.8)
Does your house have windows?	124(30.0)	290(70.0)
Do you open your home window regularly?	160(38.6)	254(61.4)
Do you open car windows during travelling?	165(39.9)	249(60.1)
Are you dispose sputum during coughing?	145(35.0)	269(65.0)
If you have TB, do you consult health worker?	82(19.8)	332(80.2)
If you have TB, do you cover your mouth and nose during coughing and sneezing?	118(28.5)	296(71.5)
If you develop TB symptoms, will you go to the health facility?	128(30.9)	286(69.1)
If you have fewer than five-year-old children, did you make them vaccinated to prevent TB?	178(43.0)	236(57.0)
Have you advised TB patients to take their drugs properly?	123(29.7)	291(70.3)
Have you washed your hand regularly?	78(18.8)	336(81.2)
Have you made isolation of TB patient in your family?	169(40.8)	245(59.2)
Have you been avoid sharing dishes during TB patients is present in your family?	197(47.6)	217(52.4)

Table 8
Bivariate and multivariate analysis of factor associated with practice on TV prevention in Shebadinho Sidama region (n = 414).

Variable	Practice		COR (95% C I)	P-Value	AOR (95% CI)	p-Value
	Good	Poor				
Occupation						
Employed	48	12	1		1	
Marchant	39	42	4.3(2.2,9.7)	0.00	3.9(1.7,8.7)	**0.001**
Farmer	51	38				
Student	40	36				
Unemployed	72	58				
Residence						
Urban	88	55	1		1	
Rural	140	131	1.5(1,2.3)	0.05	1.03(0.6)	0.9
Education						
No formal education	86	99	0.39(0.2,0.7)	0.002	0.5(0.3,1.1)	0.07
Primary	40	39	0.47(0.2,0.9)	0.028	0.7(0.3,1.4)	0.3
Secondary	56	27				
Above secondary	46	21	1		1	
Monthly income						
<1000 birr	53	130	0.47(0.3,0.8)	0.007	0.7(0.4,1.4)	0.4
1000–3000	33	33	0.4(0.2,0.9)	0.017	0.6(0.3,1.3)	0.2
>3000	53	23	1		1	
Health education on TB						
Yes	180	112	1		1	
No	48	74	2.5(1.6,3.8)	0.00	2.4((1.6,3.9)	**0.00**

findings of the research conducted by Ato and his colleague, 78.8% [43]. On the other hand, it is less than the research conducted by Datiko and his colleague 95.5% [41], Abebe G et al., 83.0% [19], Mesfin and his colleague 86% [44], Tolossa and his colleague 94.9% [20], Melaku and his colleague 92.8% [45], Deribew and his colleague 94.4% [46], Lu and his colleague 89% [47], Legesse et al., 95.6% [48], Bati and his colleague 94.3% [39] and Tsegaw and his colleague 99.6% [49].

Although TB is well-known in the research region, there is a large disparity in the respondents' understanding of the etiology of the illness. However, 62.8% of the participants agreed that the infection was caused by bacteria or germs, which was greater than in the previous research done in Ethiopia 28.5% [41], Somali region, Ethiopia 22.9% [20], Shinille area, Ethiopia 10.1% [45], Ethiopia, 50% [46], Afar region, Ethiopia 0.3% [48], and Gambela region, Ethiopia 3.3% [39]. This is due to the fact that modern society is increasingly tied to improved technology, various information-dissemination techniques like social media, and other things. Additionally, we conduct our research in and around the local training facility, which is frequently occupied by practicing students.

Also, this study is lower than the study done in Addis Ababa, Ethiopia, which is 81.5% [42]. This might be due to the fact that people in Addis Ababa, the capital of the country, have better economic and social conditions and are consequently more aware of the causes of TB and how to prevent it. However, poor awareness regarding the etiology of the disease may have a negative impact on patients' attitudes towards health-seeking behavior and preventive methods, as most people with such beliefs may not visit health facilities or may consider various traditional alternatives.

This study revealed that 40.8% of the study participants agreed that TB is caused by cold air, which is done in the Somali region of Ethiopia (42%) [20]. However, it is higher than the studies done in Gambela, Ethiopia, 16.6% [39] and in Yirgacheffe, Ethiopia, 32.9%

[49] and lower than the studies done in Afar, Ethiopia, 45.9% [48], rural communities of Ethiopia 46% [50], and Shinille, Ethiopia, 89.9% [45]. Also, a qualitative focus group discussion study done in Tanzania indicated that TB infection is due to cold air [51]. This could be a result of the belief in certain societies that exposure to cold air, particularly that enters through open windows, may seriously harm the lungs and lead to coughing fits that eventually develop into TB.

In this study, more than 50% of the participants believed that TB happened due to the penalty of God, which is higher than the studies done in Addis Ababa, Ethiopia 18.5% [42] and North Shoa, Ethiopia 19% [43]. Additionally, more than half of the participants knew that TB is cured by prying and fasting. This could happen as a result of the community's supernatural beliefs that everything is entwined with sin and curses. Hence, more than half of them used to treat TB traditionally.

In this study, 44.9% CI (39.9, 49.4) of participants had a favorable attitude, which is higher than the studies conducted in different settings: south-west Ethiopia shows a favorable attitude of 40.8% [31], and the Gambella region shows a favorable attitude of 40.8% [35]. On the other hand, the proportion of good attitudes in this study was lower than the results for the southern part of Bhutan 93% [42], the Somali region, Ethiopia 57.1% [32] and Nekmet, western Ethiopia 78.5% [50]. Unfavorable attitudes in this study were mainly associated with living areas, of which few were seen among rural residents [52].

The practice level of the current study was 55.1% CI (50.3, 59.9) which is higher than the study done in the southern part of Bhutan 39% [42], south-west Ethiopia 45.9% [37], Gambela region Ethiopia 45.9% and lower than Nekmet, western Ethiopia 70% [50]. This finding implies that there is a significant gap in preventive practice for TB infection control. It is a well-known fact that knowledge and attitude levels can influence people's practices regarding prevention [15].

In this study, about 62.3% of the participants believed that prying, application of holy water, and traditional medicines like herbals were the remedies for TB infection. Also, another study confirmed that using traditional methods is like prying 0.8% [52], holly water 20.3% [43], herbs 3.8% [52], 5.9% [53], 72.2% [48] and 5.6% [43], in different communities. This might be due to the cultural and environmental differences of the studied communities.

Practice level is independently affected by occupation (AOR = 3.9; 95% CI: 1.7–8.7) and health education on TB. AOR = 2.4%; 95% CI (1.6–3.9) are independent predictors of good practice. It could be due to exposure to sensitizing TB prevention awareness. In this study, those who are married are 1.7 times more aware of TB prevention than the rest of the population (AOR = 3.9; 95% CI = 1.7–8.7), P = 0.002) [35,52].

4.1. Strengths and limitations of the study

A cross-sectional study was carried out on the patient's family; conclusions cannot be extrapolated to the broader population.

5. Conclusion

In comparison to numerous national and international studies, knowledge, attitude, and preventative practice about tuberculosis were not sufficient. The findings of this study revealed that while the majority of participants got information regarding the disease, their practical knowledge, attitude, and practice were not comparable to the information they received. This encourages healthcare providers and other concerned parties to advise on methods to raise awareness about the disease. Stakeholders strengthening the implementation of TB infection control actions requires training of health workers and health extension workers with an emphasis on practical factors. Giving on-the-job training to health extension workers is critical for improving TB infection control practices and spreading TB awareness in the community.

Author contribution statement

Mekibib Madebo: Conceived and designed the experiments.
Bergude Balta: Analyzed and interpreted the data.
Deresse Daka: Analyzed and interpreted the data; Wrote the paper.

Data availability statement

Data included in article/supp. material/referenced in article.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:Deresse Daka reports was provided by Pharma College. Deresse Daka reports a relationship with Parma that includes: non-financial support and speaking and lecture fees. Deresse Daka has patent issued to Not Applicable. Corresponding Author previously employed Hawassa University.

Abbreviations and acronyms

CI Confidence Interval
KAP Knowledge, Attitude, Practice

PTB Pulmonary Tuberculosis
TB Tuberculosis

References

[1] E. Cambau, M. Drancourt, Steps towards the discovery of Mycobacterium tuberculosis by robert koch, 1882. Clinical Microbiology and Infection 20 (3) (2014) 196–201.
[2] B.R. Bloom, et al., Tuberculosis, in: K.K. Holmes, et al. (Eds.), Major Infectious Diseases, The International Bank for Reconstruction and Development/the World Bank © 2017 International Bank for Reconstruction and Development/the World Bank, Washington (DC), 2017.
[3] WHO. https://www.who.int/news-room/fact-sheets/detail/tuberculosis, 2021, 14 Oct 2021 [cited 2022 Jan 6].
[4] Who, Global tuberculosis report 2020, Glob. Tuberc. Rep (2020).
[5] WHO, Global, Tuberculosis Report, 2020; World Health Organization, Geneva, Switzerland, 2020.
[6] WHO, Global Tuberculosis Report, World Health Organization, Geneva, Switzerland, 2019.
[7] WHO, Global Tuberculosis Report 2022, World Health Organization, Geneva, 2022. *Licence: CC BY-NC-SA 3.0 IGO*.
[8] EFMH, NATIONAL GUIDELINES for TB, DR-TB and LEPROSY IN ETHIOPIA. November 2017, Addis Ababa Ethiopian Federal Ministry of Health..
[9] A. Kebede, et al., The first population-based national tuberculosis prevalence survey in Ethiopia, 2010-2011, Int. J. Tubercul. Lung Dis. 18 (6) (2014) 635–639.
[10] Ministry of Health and Child Care, The Zimbabwe National Population Based Tuberculosis Prevalence Survey, 2014.
[11] Ministry of Health National TB Control Programme, Technical report, Malawi tuberculosis prevalence survey (2016) (2013-2014).
[12] Department of public health federal republic of Nigeria, Report of the first national TB prevalence survey 2012, Nigeria (2014).
[13] M. Senkoro, et al., Prevalence of pulmonary tuberculosis in adult population of Tanzania: a national survey, 2012, Int. J. Tubercul. Lung Dis. 20 (8) (2016) 1014–1021.
[14] N. Kapata, et al., The prevalence of tuberculosis in Zambia: results from the first national TB prevalence survey, 2013–2014, PLoS One 11 (1) (2016), e0146392.
[15] R. Subbaraman, T. Jhaveri, R.R. Nathavitharana, Closing gaps in the tuberculosis care cascade: an action-oriented research agenda, Journal of clinical tuberculosis and other mycobacterial diseases 19 (2020), 100144.
[16] H. Sultan, S. Haroon, N. Syed, Delay and completion of tuberculosis treatment: a cross-sectional study in the West Midlands, UK, J. Publ. Health 35 (1) (2013) 12–20.
[17] T.M. Wondawek, M.M. Ali, Delay in treatment seeking and associated factors among suspected pulmonary tuberculosis patients in public health facilities of Adama town, eastern Ethiopia, BMC Publ. Health 19 (1) (2019) 1–7.
[18] K. Adane, et al., Tuberculosis knowledge, attitudes, and practices among northern Ethiopian prisoners: implications for TB control efforts, PLoS One 12 (3) (2017), e0174692.
[19] G. Abebe, et al., Knowledge, health seeking behavior and perceived stigma towards tuberculosis among tuberculosis suspects in a rural community in southwest Ethiopia, PLoS One 5 (10) (2010), e13339.
[20] D. Tolossa, G. Medhin, M. Legesse, Community knowledge, attitude, and practices towards tuberculosis in Shinile town, Somali regional state, eastern Ethiopia: a cross-sectional study, BMC Publ. Health 14 (1) (2014) 1–13.
[21] S. Paul, et al., Knowledge and attitude of key community members towards tuberculosis: mixed method study from BRAC TB control areas in Bangladesh, BMC Publ. Health 15 (1) (2015) 1–8.
[22] D.G. Storla, S. Yimer, G.A. Bjune, A systematic review of delay in the diagnosis and treatment of tuberculosis, BMC Publ. Health 8 (1) (2008) 1–9.
[23] A.S. Kasa, A. Minibel, G.M. Bantie, Knowledge, attitude and preventive practice towards tuberculosis among clients visiting public health facilities, BMC Res. Notes 12 (1) (2019) 1–6.
[24] C. Lienhardt, et al., Factors affecting time delay to treatment in a tuberculosis control programme in a sub-Saharan African country: the experience of the Gambia, Int. J. Tubercul. Lung Dis. 5 (3) (2001) 233–239.
[25] F. Getnet, et al., Delay in diagnosis of pulmonary tuberculosis in low-and middle-income settings: systematic review and meta-analysis, BMC Pulm. Med. 17 (1) (2017) 1–15.
[26] Y.R. Yang, et al., Evaluation of the tuberculosis programme in Ningxia Hui Autonomous region, the People's Republic of China: a retrospective case study, BMC Publ. Health 12 (2012) 1–8.
[27] A. Asres, D. Jerene, W. Deressa, Delays to anti-tuberculosis treatment intiation among cases on directly observed treatment short course in districts of southwestern Ethiopia: a cross sectional study, BMC Infect. Dis. 19 (2019) 1–9.
[28] M.R. Reichler, et al., Risk and timing of tuberculosis among close contacts of persons with infectious tuberculosis, J. Infect. Dis. 218 (6) (2018) 1000–1008.
[29] S. Chavis, N. Ganesh, Respiratory hygiene and cough etiquette, Infection Control in the Dental Office (2019 Nov 18) 91–103, https://doi.org/10.1007/978-3-030-30085-2_7.
[30] A. Faris, G. Germossa, D. Beyene, Knowledge, attitude and practice on prevention and control of tuberculosis among Bilida Kebele residents, Mana Woreda, Jimma Zone, Oromia region, south west Ethiopia, Health Sci. J. 12 (5) (2018) 589.
[31] P. Eibich, L. Goldzahl, Health information provision, health knowledge and health behaviours: evidence from breast cancer screening, Soc. Sci. Med. 265 (2020), 113505.
[32] L.W.T.H. Baker, S. Singer, M.K. Bundorf, Use of the Internet and e-mail for health care information, results from a national survey 289 (2003) 2400–2406.
[33] L. Renganathan, S. Ray, D. Nagpal, Use of internet for accessing healthcare information among patients in an outpatient department of a tertiary care center, Journal of Marine Medical Society 19 (1) (2017).
[34] W. Jacobs, A.O. Amuta, K.C. Jeon, Health information seeking in the digital age: an analysis of health information seeking behavior among US adults, Cogent Social Sciences 3 (1) (2017), 1302785.
[35] A. Esmael, A. I, M. Agonafir, A. Desale, Z. Yaregal, K. Desta, Assessment of patients' knowledge, attitude, and practice regarding pulmonary tuberculosis in eastern amhara regional state, Ethiopia: cross-sectional study, Am. J. Trop. Med. Hyg. 88 (4) (2013) 785–788.
[36] N.P. Hoa, N.T.K. Chuc, A. Thorson, Knowledge, attitudes, and practices about tuberculosis and choice of communication channels in a rural community in Vietnam, Health Pol. 90 (1) (2009) 8–12.
[37] M.U. Mushtaq, et al., Knowledge, attitudes and practices regarding tuberculosis in two districts of Punjab, Pakistan, Int. J. Tubercul. Lung Dis. 14 (3) (2010) 303–310.
[38] L.C. Bashorun Ao, S. Omoleke, L. Kendall, S. Donkor, M.A. Kinteh, Knowledge, attitude and practice towards tuberculosis in Gambia: a nation-wide cross-sectional survey, BMC Publ. Health 20 (1566) (2020).
[39] J. Bati, L.M.a.M.G., Community's knowledge, attitudes and practices about tuberculosis in Itang Special District, Gambella Region, South Western Ethiopia 13 (734) (2013) 1–9.
[40] F.B. Amiri, et al., Knowledge, attitude, and practices regarding HIV and TB among homeless people in Tehran, Iran, Int. J. Health Pol. Manag. 6 (x) (2017) 1–7.
[41] D.G. Datiko, et al., Knowledge, attitudes, and practices related to TB among the general population of Ethiopia: findings from a national cross-sectional survey, PLoS One 14 (10) (2019), e0224196.
[42] M. Gelaw, et al., Attitude and social consequences of tuberculosis in Addis Ababa, Ethiopia, East Afr. Med. J. 78 (7) (2001) 382–387.
[43] M.L. Ato, M.T. Sis, Assessment of knowledge, attitude and practice of tuberculosis transmission and prevention among tuberculosis patients at Kuyyu hospital, North Shoa zone, Oromia regional state, Ethiopia, Anatol J Family Med 2 (3) (2019) 91–97.

[44] M.M. Mesfin, et al., Community knowledge, attitudes and practices on pulmonary tuberculosis and their choice of treatment supervisor in Tigray, northern Ethiopia, Ethiop. J. Health Dev. 19 (I) (2005) 21.
[45] S. Melaku, H.R. Sharma, G.A. Alemie, Pastoralist Community's Perception of Tuberculosis: A Quantitative Study from Shinille Area of Ethiopia, Tuberculosis Research and Treatment, 2013, 2013, 475605.
[46] A. Deribew, et al., Prejudice and misconceptions about tuberculosis and HIV in rural and urban communities in Ethiopia: a challenge for the TB/HIV control program, BMC Publ. Health 10 (1) (2010) 400.
[47] S.H. Lu, et al., Public awareness of tuberculosis in China: a national survey of 69 253 subjects, Int. J. Tubercul. Lung Dis. 13 (12) (2009) 1493–1499.
[48] M. Legesse, et al., Knowledge and perception of pulmonary tuberculosis in pastoral communities in the middle and Lower Awash Valley of Afar region, Ethiopia, BMC Publ. Health 10 (1) (2010) 187.
[49] D. Hibstu, B. Bago, Knowledge, attitude and practice of tuberculosis and its transmission among high school students in Yirgacheffe town, Gedeo zone, southern Ethiopia, J Infect Dis Preve Med 4 (1000142) (2016) 2.
[50] S. Yimer, et al., Health care seeking among pulmonary tuberculosis suspects and patients in rural Ethiopia: a community-based study, BMC Publ. Health 9 (1) (2009) 454.
[51] P. Mangesho, et al., Commnity knowledge, attitudes and practices towards tberculosis and its treatment inMpwapwa district, central Tanzania, Tanzan. J. Health Res. 9 (1) (2007) 38–43.
[52] A.Y. Kidanemariam, et al., Community knowledge, attitude and practice towards tuberculosis in nakfa subzone: cross-sectional study, 2021, Journal of Environmental Science and Public Health 7 (2) (2023) 44–56.
[53] F. Melaku, et al., Assessment of community knowledge about Tuberculosis and its treatment in rural areas of Shashemane, Southern Ethiopia, J. Publ. Health Epidemiol. 7 (3) (2015) 91–97.