Tuberculosis Knowledge, Attitude and Preventive Practices among Patients Visiting Selam Public Health Center: A Cross-Sectional Study

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ABSTRACT: Tuberculosis (TB) remains the major public health problem and killed over 49,000 people in 2016 alone and continues to be the major challenge of the country. This study aimed to assess TB knowledge, attitude and practice (KAP) of patients who visited Selam Health Center (SHC), Gullele sub-city in the north of Addis Ababa. A cross-sectional study was conducted from the beginning of February to the end of March 2019. A well-structured questionnaire was used to collect patients' KAP data. Quantile regression model was used to analyze the association between dependent and independent variables. A total of 384 SHC patients were enrolled. All respondents had heard about TB, 65.9% described TB as a very serious disease and 61.2% mentioned bacteria as causative agent. Almost 60% don't know the mode of transmission of TB and 56.2% identified the major symptoms of TB. Majority (72.9%) of them had an unacceptable attitude towards TB patients. Nearly 80% sought treatment after two weeks of symptoms, 52.9% preferred health centers, while 47.1% refused to go to health centers because of costs, lack of trust on health workers, transportation problems and fear of job loss. Quantile regression analysis revealed that there was a statistically significant correlation between knowledge and attitude ($r_s = 0.01$, $p = 0.007$) and attitude and practice ($r_s = 0.14$, $p = 0.021$). The present findings revealed that patients' knowledge on cause and symptoms of TB was fairly high but most failed to know the route of transmission and perceived a negative attitude towards TB patients. Health centers and other stakeholders should provide health education and health extension services for the community to reduce the spread of TB and its consequences.

Key words/phrases: Addis Ababa, Gullele sub-city, KAP, Selam health center (SHC), Tuberculosis, Quantile regression model

INTRODUCTION

Pulmonary tuberculosis (PTB) is the oldest communicable disease of humans that is caused by rod-shaped bacterium known as *Mycobacterium tuberculosis* (Cruz-Knight and Blake-Gumbs, 2013). The disease is spread by expelled droplet nuclei (1-5 µm in size) from diseased person to the air during coughing, sneezing, shouting and singing (WHO, 1999). Tuberculosis (TB) primarily affects the lungs known as TB but it can also affect other parts of the body known as extra-pulmonary TB (EPTB) (Cruz-Knight and Blake-Gumbs, 2013; Ramirez-Lapausa *et al.*, 2015). Although *M. tuberculosis* is the common causative agent of TB, *M. bovis* is also reported as a potential pathogen in the developing countries (Jain, 2011). Currently TB is considered as one of the top 10 causes of death and major public health problem of the world. About a quarter of the world's population is infected with *M. tuberculosis* and nearly 10 million people develop TB every year (WHO, 2019).

According to World Health Organization (WHO) (2019), the global TB-related deaths showed a declining trend due to reducing the health risk factors (smoking, diabetes and HIV infection), adequate provision of treatment to latent TB infection, and multisectoral action on TB - determinants (poverty, housing quality and undernutrition). However, further efforts are required to end TB and achieve the 2025 strategy plan. Thus, universal health coverage, and multisectoral approach (MSA) towards border determinants such as poverty, housing quality and

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undernutrition are the major challenges of TB control.

Global annual estimates of 1.2 million deaths from TB were reported in 2018, of which Ethiopia accounts for an estimated death rate of 22 per 100,000 population (WHO, 2019). Ethiopia is one of the 30 countries with the highest burden of TB, TB /HIV and multidrug resistant tuberculosis (MDR-TB). Although the countrywide TB treatment and cure rates reached 91 and 70% respectively (FMoH, 2014), TB remains the major public health problem and killed over 49,000 people in the 2016 alone (Amare Deribew *et al.*, 2018).

Several studies have revealed that TB infection is strongly associated with social and economic determinants of the population, and disproportionately disseminated and bunched among underprivileged and economically poor societies (Figueroa-Munoz and Ramon-Pardo, 2008; Jackson *et al.*, 2006; WHO, 2005). TB and poverty is arbitrated by poor living conditions (poorly ventilated housing), overcrowding, undernutrition, smoking, stress, social deprivation and poor social capital (Figueroa-Munoz and Ramon-Pardo, 2008). Most of the public health problems including TB have been emanating from misunderstanding of the social determinants of health (Shi *et al.*, 2009) .

Social misconception towards the cause of TB, and inadequate knowledge about the transmission, prevention and control of TB were the most common problems for prevention and control strategies in most regions of Ethiopia, including the capital city, Addis Ababa (Datiko *et al.*, 2019; Ahmed Esmael *et al.*, 2013; Ayele Semachew Kasa *et al.*, 2019). The prevalence of TB in overcrowded conditions such as in public universities, referral hospitals, health centers and prisons has also increased due to lack of awareness towards the disease (Kelemework Adane *et al.*, 2016; Ayele Semachew Kasa *et al.*, 2019; Abiyu Mekonnen *et al.*, 2020; Yoseph Worku *et al.*, 2018).

Due to low awareness, many of TB patients suffered from stigma and discrimination from the community, work mates and detached from social values (Datiko *et al.*, 2020; Sommerland *et al.*, 2017), such issues further translated into poor health care seeking behavior and health systems, which leads to high transmission and prevalence of TB among the societies (Barter *et al.*, 2012). Furthermore, poor transportation facilities together with distance from health centers, costs and other socio-cultural factors significantly affect the treatment seeking behaviors of the patients and hampered the success of public health efforts of most countries, including Ethiopia (Barter *et al.*, 2012; Sommerland *et al.*, 2017). Furthermore, the current nationwide study including Addis Ababa city showed insufficient knowledge about mode of transmission of TB, limited urban health extension service and low service utilization by the community were the key challenges of TB control and prevention strategies of the country (Aderajew Mekonnen Girmay *et al.*, 2019; Datiko *et al.*, 2019).

Therefore, in order to address the bottleneck of effective TB prevention and control strategies of the country, increasing awareness of the general public and studying the TB patients' KAP are indispensable. Previous KAP studies have indicated various factors which were limiting the success of TB control and prevention in the country, however, KAP study focusing on patients visiting health centers is limited. This study was sought to assess pulmonary tuberculosis KAP among patients visiting SHC in Addis Ababa, Ethiopia.

MATERIALS AND METHODS

Study area and design

A cross-sectional research was conducted at SHC of Gullele sub-city of Addis Ababa city. Patients come from the sub-city and the surrounding rural areas to the adult (age ≥ 18 years) outpatient departments (OPD) for various medical reasons from beginning of February to end of March 2019. Gullele sub-city is one of the ten sub-cities of Addis Ababa City Administration (AACA) which is located in the North of Addis Ababa with a total population of 284,865 (http://www.addisababa. gov.et/el/web/guest/gullele-sub-city). In the sub-city, there are two referral hospitals, ten public health centers and over thirty private health clinics. Among which, SHC has an achievement of 13% TB cure rate, 50.5% of TB success rate and 100% of Bacillus Calmette-Guerin (BCG) vaccination coverage (SHC, 2019). We selected this health center because TB cure and success rates were relatively lower than other centers in the same sub-city. The sub-city has 10 *Woredas*, SHC is located in *Woreda* 9 (Fig. 1) and dedicated to deliver health services to 43, 715 population.
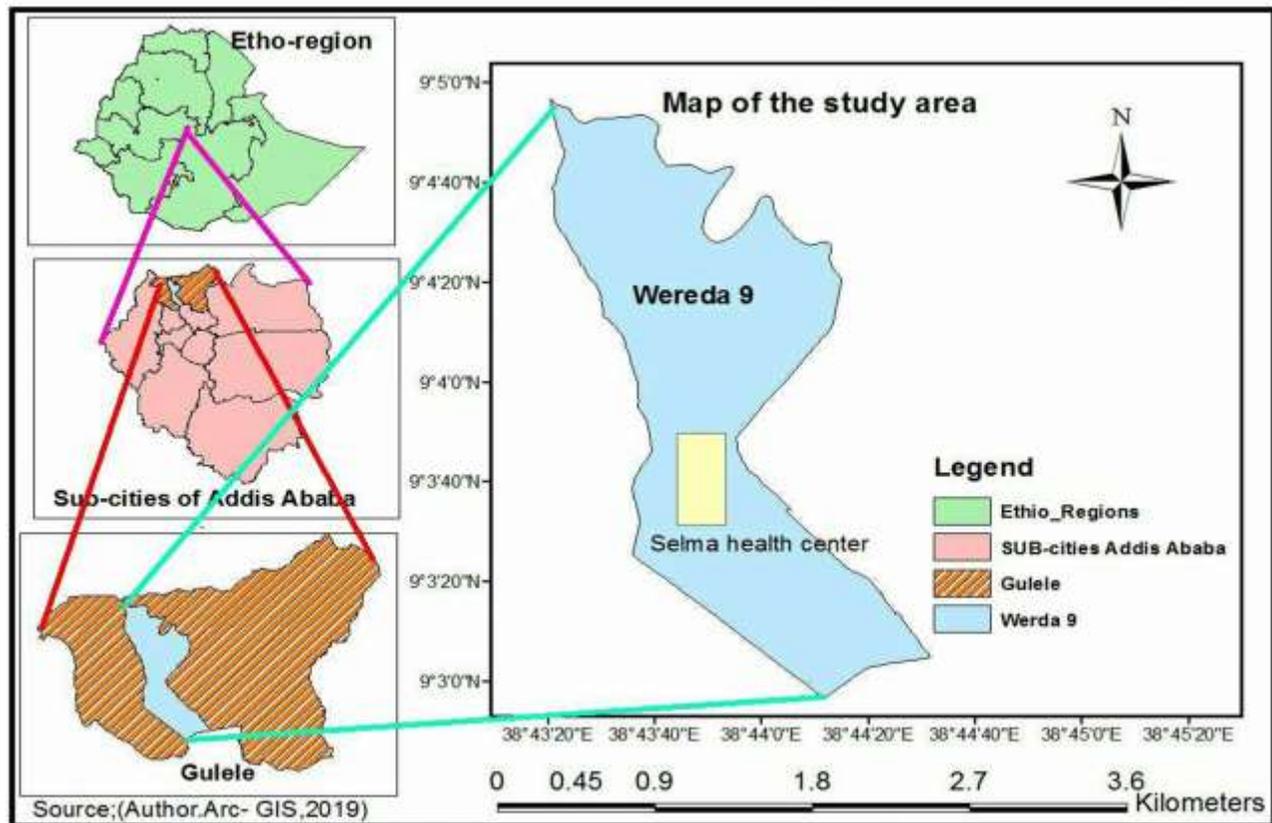
Figure 1: Map of the study area and Selam Health Center (SHC)

Sample size and sampling techniques

The sample size was determined by single population proportion formula $n = (\frac{Z\alpha}{2})^2 \times \frac{P(1-P)}{d^2}$ (Charan and Biswas, 2013). Assuming 50% of the patients have knowledge on TB (*p* = 0.5) and using 95% confidence interval (Zα/2 = 1.96) with 5% of marginal error (d = 0.05). Based on the above assumptions and adding 10% non-response rate, the total calculated sample size was 422. Data from patients who visited the health center was collected using self-administered questionnaire from beginning of February to end of March 2019. Patients visiting SHC during the study period were consecutively recruited until the required sample size was achieved. However, patients who were unable to communicate, mentally handicapped and children less than 18 years old were excluded. Patients who were unable to read and write were assisted by an enumerator.

The questionnaire was developed from previously published literature on TB studies (Datiko *et al.*, 2019; Ahmed Esmael *et al.*, 2013; Ayele Semachew Kasa *et al.*, 2019) and carefully modified to the context of the local patients. First, the questionnaire was developed in English and then translated into Amharic by a person who has fluency in both languages and then back to English to ensure consistency. Then pre-test was conducted on 5% of the total expected sample size at the selected health center. The pre-test result was combined to the standard of the final questionnaire. The questionnaire contained 28 relevant questions in four sections. Section-I: socio-demographic questions, Section-II: TB knowledge related questions, Section-III: questions to assess the patients' attitude towards TB, Section-IV: questions related to patients' preventive practice toward TB.

Scoring

The overall KAP scoring system was performed based on the method reported elsewhere (Alotaibi *et al.*, 2019) with some modifications. For the correct KAP response, 1

point was given and for the incorrect or uncertain (don't know) response 0 score was given. For questions having multiple correct answers, the same scoring was followed but the score was divided by the total number of multiple responses in the question to normalize the result between 0 and 1. The overall KAP scores were then standardized to the range of 0 and 1. The final mean scores were then further divided into 3 categories to reflect the level of KAP among patients. These were: poor (score ≤ 0.4), good (score > 0.4-0.7), high (score > 0.7-1).

Data analysis

The completeness and consistency of the coded data were double checked and entered into the computer using SPSS software (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Descriptive statistics such as frequency, percentage, and standard deviations were computed to summarize categorical variables. Quantile regression model was used to evaluate the association between dependent and independent variables. *P* < 0.05 was considered as statistically significant and factors that contribute to lack of KAP to TB were identified. Finally, relevant discussion, conclusion and recommendation were made based on the results obtained from the study.

Ethical consideration

Addis Ababa University, College of Natural and Computational Sciences, Institutional Review Board (AAU-CNCS-IRB, Ref. No: CNSDO/185/12/19) approved the study. All the study participants were clearly informed about the purpose of the study and consented to participate. The researcher informed the confidentiality of the respondents' information and assured all data will only be used for research purposes. All respondents signed the consent form prior to filling the questionnaire.

RESULTS

Socio-Demographics

A total of 384 study participants were enrolled with a response rate of 91.0%. Of these, 50.8% and 49.2% were male and female, respectively. Participants' age distribution were 25.3% between 18-30 years, 38.8% between 31-40 years, 30.7%, between 41-50 and 5.2% are >50 years old. Majority

(72.9) of the respondents were married. Over 65% of the participants had an educational status of secondary and above, about 50% were employed (Table 1).

Table 1. Sociodemographic characteristics of the study participants (*N* = 384).

Variables	Category	Frequency	Percent
Sex	Male	195	50.8
	Female	189	49.2
Age in years	18-30*	97	25.3
	31-40	149	38.8
	41-50	118	30.7
	>50	20	5.2
Marital status	Single	82	21.4
	Married	280	72.9
	Divorced	21	5.5
	Widowed	1	0.3
Education	Illiterate	12	3.1
	Primary	113	29.4
	Secondary	139	36.2
	Above secondary	120	31.3
Occupation	Employed	196	51.0
	Housewife	26	6.8
	Trader	75	19.5
	Farmer	3	0.8
	Daily laborer	84	21.9
Monthly income (ETB)	< 1000	25	6.5
	1001-2000	84	21.9
	2001-3000	170	44.3
	> 3000	105	27.3
Residence	Urban	373	97.1
	Rural	11	2.9
Distance from SHC	< 5 km	57	14.8
	5-9 km	109	28.4
	10-14 km	171	44.5
	> 15 km	47	12.2

*ETB: Ethiopian Birr, * for the statistical analysis, we used this age range.*

TB related knowledge of the participants

Regardless of the sources of information, all study participants had heard about TB, 65.9% of them described TB as a very serious disease and 61.2% knew that bacteria is the causative agent of TB. Nearly 65% of the participants know the TB predisposing factors. Among the total respondents, 57.8% don't know mode of transmission of TB, while 42.2% correctly mentioned the aerosol route of TB transmission.

About one-third (37.5%) of the study participants mentioned that TB can affect any body parts particularly the lung and almost the same figure (33.9%) of participants also knew the relationship of malnutrition and TB. Over 50% of

the study participants identified the major symptoms of TB. About 40% of the participants agreed on the curability of TB. Among one-hundred fifty study participants who said TB is curable, most (71.3%) mentioned that taking prescribed drugs can help the patient to recover from the disease (Table 2).

Attitude about TB

Among the overall study participants, about 70% of them were willing to inform either to their close friends or to their spouse/parents if they acquired TB infection, while over a quarter (27.3%) of them were willing to talk with doctors/health workers. However, if they developed symptoms of TB, only 28.6% were willing to go to health centers for diagnosis, while others either don't go (66.7%) or don't know what to do (4.7%). Over 70 % of the participants had an unacceptable attitude towards TB patients (Table 3).

Table 2 Assessment of the level of knowledge about TB (*N* = 384).

Variables	Category	Frequency	Percent
Sources of information about TB	Radio	67	17.4
	Television	129	33.6
	Health workers	45	11.7
	Teachers	89	23.2
	Family, friends & neighbors	49	12.8
	Religious leaders	5	1.3
How do you describe TB?	Very serious	253	65.9
	Somewhat serious	23	6.0
	Not very serious	108	28.1
Cause of TB	Bacteria	235	61.2
	Virus	104	27.1
	Fungi	20	5.2
	Protozoa	25	6.5
Who can be infected with TB?	Anyone	135	35.2
	HIV-infected people	106	27.6
	Poor people	52	13.5
	Alcoholics	33	8.6
	People who have been in prison	58	15.1
Do you know the modes of transmission of TB?	Yes	215	56.0
What are the modes of transmission?	No	169	44.0
Transmission methods (*N* = 215)	Exposures to cold	27	12.6
	Coughing and sneezing	162	75.3
	Physical contact	11	5.1
	Hand shaking	15	7
Body parts affected by TB	Any part mainly the lungs	144	37.5
	Don't know	240	62.5
Do you know the relationship between malnutrition & TB?	Yes	130	33.9
	Not sure	188	49.0
	Don't know	66	17.2
Symptoms of TB	Cough	81	21.1
	Chest pain	52	13.5
	Fever	43	11.2
	Headache	115	29.9
	Weight loss	40	10.4
	Nausea	39	10.2
	Don't know	14	3.6
Is TB curable disease?	Yes	150	39.1
	Not sure	149	38.8
	I don't know	85	22.1
How can it be cured? (*N* = 150)	Taking prescribed drugs	107	71.3
	Taking herbal medicines	28	18.7
	Taking enough rest without medication	4	2.7
	Praying	11	7.3

Practices related to TB

The general trend of most of the participants, 70.8% indicate that they had visited health centers in various frequencies such as twice per year (20.8%), once per year (20.1%) and once in the past 5 years (29.9%). Almost half (48.7%) reported that covering mouth & nose during coughing & sneezing were the best prevention practices against TB. Almost 80% reported that they would seek healthcare facilities after 2 weeks of TB symptoms. As shown in Table 4, over half (52.9%) of them also reported that they preferred to go to health centers if they developed TB symptoms, while 19.8% go to pharmacy, 22.4% to spiritual/traditional healers and 4.9% follow other self-treatment options. Among the 47.1% respondents who don't go to health centers, (48.1%) reasoned high cost, (19.3%) lack of trust on health workers, (11.6%) transportation problem (9.9%) worried of job loss, (8.3%) not decided where to go and (2.8%) dislike the attitude of the health workers.

Table 3. Attitudes of the study participants about TB (*N* = 384).

Variables	Category	Frequency	Percent
Whom will you inform if you get TB?	Doctors/health workers	105	27.3
	Spouse/parents	129	33.6
	Close friends	140	36.5
	No one	10	2.6
If you developed symptoms of TB, would you be willing to be diagnosed?	Agree	110	28.6
	Disagree	256	66.7
	Neutral	18	4.7
If someone is diagnosed with TB, what would be your response	Help them	104	27.1
	Stay away from these people	223	58.1
	Fear them	57	14.8

Table 4 Practices related to TB among the study participants (*N* = 384).

Variables	Category	Frequency	Percent
How frequently did you visit the health center?	Twice per year or more	80	20.8
	Once per year	77	20.1
	Once in the past 5 years	115	29.9
	Never in the past 5 years	112	29.2
TB prevention practice	Covering mouth & nose during coughing & sneezing	187	48.7
	Close window & door	51	13.3
	Avoid hand shaking	44	11.5
	Praying	27	7.0
	Avoid sharing dishes	25	6.5
	Good nutrition	14	3.6
	Don't know	36	9.4
TB testing practice whenever there is cough	Always	31	8.1
	Sometimes	315	82.0
	Never	38	9.9
When do you seek health care services?	After realizing TB symptoms	38	9.9
	After 2 weeks of symptoms	307	79.9
	I will not go to health center	39	10.2
If you developed symptoms of TB, what would be your treatment option	Go to health centers	203	52.9
	Go to pharmacy	76	19.8
	Go to spiritual/traditional healers	86	22.4
	Pursue other self-treatment options	19	4.9
Reasons for not visiting health center (*N* = 181)	Cost	87	48.1
	Do not trust health workers	35	19.3
	Not sure where to go	15	8.3
	Difficulties with transportation	21	11.6
	Fear of job loss	18	9.9
	Dislike attitudes of health workers	5	2.8

Selected demographic variables and KAP scores

Summary of quantile regression results indicated that there was a statistically significant correlation between knowledge and attitude (r_s = 0.01, p = 0.007) and attitude and practice (r_s = 0.14, p = 0.021). (Table 5). In general, study participants with an educational status of college and above had better knowledge, positive attitude and good practice towards TB than patients with lower educational status.

Table 5. Summary of the association between selected variables and KAP scores at the 25th, 50th and 75th quantiles.

Variable	Categories	Coef for knowledge scores (SE)			Coef for attitude scores (SE)			Coef for practice scores (SE)		
		25th	50th	75th	25th	50th	75th	25th	50th	75th
Intercept		**0.421**	**0.612**	**0.533**	**0.642**	**0.772**	**0.567**	**0.643**	**0.849**	**0.571**
		(0.063)	(0.057)	(0.072)	(0.067)	(0.041)	(0.058)	(0.079)	(0.064)	(0.052)
Education	Illiterate	0.219	0.325	0.196	0.55	0.724	0.732	0.282	0.221	0.451
		(0.213)	(0.312)	(0.276)	(0.176)	(0.671)	(0.821)	(0.321)	(0.185)	(0.234)
	Primary	0.018	0.000	0.396	**0.12**	**0.072**	0.106	0.068	0.063	0.023
		(0.211)	(0.664)	(0.212)	(0.044)	(0.002)	(0.191)	(0.242)	(0.347)	(0.521)
	Secondary	0.039	0.059	0.060	0.061	0.033	0.022	0.00	0.016	0.189
		(0.294)	(0.231)	(0.137)	(0.706)	(0.629)	(0.661)	(0.85)	(0.294)	(0.231)
	College & above	**0.329**	**0.389**	**0.396**	**0.12**	**0.072**	**0.23**	**0.143**	**0.121**	**0.224**
		(0.003)	(0.003)	(0.013)	(0.044)	(0.002)	(0.051)	(0.023)	(0.014)	(0.034)
Residence	Urban	**0.546**	**0.586**	**0.487**	0.22	**0.084**	0.060	0.058	0.038	0.106
		(0.002)	(0.001)	(0.002)	(0.144)	(0.001)	(0.249)	(0.198)	(0.534)	(0.278)
	Rural	0.019	0.011	0.027	0.030	0.022	**0.00**	**0.00**	**0.018**	0.00
		(0.101)	(0.146)	(0.437)	(0.133)	(0.247)	(0.027)	(0.018)	(0.047)	(0.091)

*Coef; regression coefficient, SE; Standard error
Coefficient in bold indicates statistically significant p-value associated with the coefficient

DISCUSSION

The current study showed that almost all the health center patients were informed about TB regardless of the sources of information. This indicates that radio, television, school teachers, family, friends, neighbors, health workers and religious leaders were sources of information for the society about TB. However, the contribution of the healthcare professionals towards awareness creation on TB among the society was very low (11.7%) compared to the study conducted in eastern Amhara regional state, Ethiopia where the contribution of the health care professionals in awareness creation was 66.6% (Ahmed Esmael *et al.*, 2013) and in Nigeria it was 47.2% (Nsofor and Okonkwo, 2020). The differences might be attributed to poor knowledge of TB and negative attitude of the health professional as it was also mentioned elsewhere (Lertkanokkun *et al.*, 2013; Noe *et al.*, 2017; Bezawit Temesgen Sima *et al.*, 2019).

In addition to this, majority of the patients don't know the basic knowledge of TB transmission route. This finding was in agreement with the study conducted in Ethiopia (Ahmed Esmael *et al.*, 2013).) Remarkably, most of the study participants have mentioned TB as a serious disease of humans which is caused by bacteria. Also identified the major symptoms of TB as well as the predisposing factors, such HIV, poor living style, and alcohol. This finding indicates sources of information such as radio, television and regular health education provided at health centers played a significant role in the awareness creation among the patients. This study was consistent with the study conducted in public health centers in Ethiopia (Ayele Semachew Kasa *et al.*, 2019) and hospitals in Nigeria (Nsofor and Okonkwo, 2020).

This study also showed that the health center patients have greater 97.4% willingness to talk about TB if they acquired the disease. However, over 70.1% of them were willing to talk with non-health professionals such as close friends, spouses or parents, while only about quarter of them want to talk with doctors or health workers which is very lower (27.3%) compared to a report from India, 67.2% (Konda *et al.*, 2016). This suggests that the SHC patients have some inconveniences or misconceptions towards the health professionals.

This was further explained by majority (72.9%) of them have preferred to stay away or fear from TB patients. The overall attitude of SHC patients towards TB was lower than a finding of a study conducted in West Gojam zone of Ethiopia (Ayele Semachew Kasa *et al.*, 2019).

The current study revealed that the critical preventive practice towards the disease such as covering mouth and nose during coughing and sneezing was 48.7%, which is lower than a finding of similar study conducted in West Gojam zone of Ethiopia 66.5% (Ayele Semachew Kasa *et al.*, 2019), and higher than in Rwanda 27.3% (Chinenye, 2015). The discrepancy might be due to differences in health policy, health intervention systems and the study populations. In the current study, parallel association was not found between participants' knowledge and practice this might be due to many factors including religion, cultural taboos and socio-economic determinants, which might hinder the participants' use of their knowledge into practice.

It was encouraging that the about 80% of TB patients sought healthcare facilities after 2 weeks of realizing the symptoms. This was fairly consistent with the preventive practice reported in the general population survey of Ethiopia (Datiko *et al.*, 2019). However, about half (52.9%) of the participants would prefer public health facilities, which is much lower than the study conducted by the national survey of Ethiopia, 96% (Datiko *et al.*, 2019). These differences might be due to the comprehensiveness of the study design and population involved in the national survey.

As Barter *et al.* (2012) nicely presented, TB patients costs (cost of hospitalization, medication, transportation, and care) was the major determinant for TB control and prevention in most sub-Saharan African regions including Ethiopia. Our study also revealed the same TB -related costs behind the TB patients, particularly patients who lived in the capital city of Addis Ababa (Table 4). Currently all government hospitals and health centers are providing free cost of TB diagnosis and treatment. However, distance from health centers and transportation costs in the modern cities were more complicated in developing countries like Ethiopia (Ahmed Esmael *et al.*, 2013). This implies that TB control program should be shifted to home to home service delivery (health extension service) and provide special care for the patient's *in-situ*. Since such approaches have been successful in

preliminary disease control programs in the big city like Addis Ababa (Aderajew Mekonnen Girmay *et al.*, 2019).

This study has some limitations as described below. Since the study was conducted in one health center, therefore, it may not represent existing KAP of the entire public and private health centers patients in Addis Ababa. The response of the questions might be dependent on the level of understanding of the study participants. Tailor-made questions provided to the study participants might also lead to response bias though we tried to reduce the bias by engaging well trained data collector. Furthermore, the study was conducted only in one health center patients who came for various health complications including TB, not involving TB patients in the directly observed treatment, short-course (DOTS) program. Finally, after identifying the actual sample size, statistically significant differences might arise from the fact that weighting of categories with wider range of differences was not conducted and thus resulted in non-proportional number of patients in the categories of residence and education.

CONCLUSIONS

The current study revealed that patients' knowledge on cause and symptoms of TB was high but most failed to know the route of transmission and perceived a negative attitude towards TB patients. We also pointed out that distance from the health center, costs of transportation, fear of job loss and lack of professional ethics among health workers were the major determinants for the patients' health care seeking behavior. The overall KAP towards TB varied with educational status and residence of the patients. Well-educated patients showed better KAP. Health centers and other stakeholders should provide TB related health education and health extension services for the community to reduce the spread of TB and its consequences. Furthermore, important correction measures should be taken to improve health service delivery to the TB -patients by health professionals.

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