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RESEARCH ARTICLE

Knowledge, Attitude and Practice towards Tuberculosis and its Treatment in Qassim Region, Saudi Arabia: A Cross-sectional Study

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Abstract:

Purpose:

Tuberculosis (TB) remains a major public health concern worldwide and is considered one of the leading causes of death globally. Presently, TB control remains a global struggle, despite a decline in the percentage of cases. In Saudi Arabia, the annual incidence rate of TB is 12 per 100,000 individuals. Although TB incidence has decreased in the country, it has not been fully controlled. Awareness and public education are important in preventing the spread of TB. The objective of this study is to evaluate the knowledge, attitudes, and practices (KAP) regarding TB and its treatment within the community, while also examining potential gender differences in KAP.

Methods:

A cross-sectional survey was carried out online among the general population in the Qassim Region of Saudi Arabia, and statistical analysis was performed using multivariate logistic regression, chi-square, and t-tests.

Results:

A total of 450 participants were included in the study; 71.6% of respondents were males, and most of the respondents (71.3%) had a high level of education. Slightly more than half (55.3%) of the respondents have a good level of knowledge. The total percentage of people who have positive attitudes is 46.7%. Within gender, analysis shows that about 48.4% of males and 42.2% of females have a positive attitude. The total percentage of people who have a good practice is 82.4%. Within gender, analysis shows that females (91.4%) have a good practice compared to males (78.9%). The multivariate logistic regression analysis showed that having a family history of TB was independently associated with a higher level of knowledge, whereas younger age was associated with a positive attitude. On the other hand, gender and education were independently associated with the practice.

Conclusion:

The knowledge and attitude towards TB among the targeted population were generally moderate, with slightly higher levels of knowledge observed among females. Furthermore, a positive trend of good practices was observed within the study population, particularly among females

Keywords: Sex differences, Tuberculosis, Treatment, Drug resistance, Adherence, Knowledge, Positive attitude, Practice.

1. INTRODUCTION

Tuberculosis (TB) is a major global health concern caused by a bacterium called *Mycobacterium tuberculosis* (Mtb). It affects millions of individuals annually, ranking as the primary infectious cause of death worldwide, followed by the human immunodeficiency virus (HIV) [1]. It is estimated that approxi-

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mately one-quarter of the world's population is infected with M.tb and at risk of developing TB. According to the World Health Organization report [1], in 2019, around 10 million people worldwide were diagnosed with TB, which is a number that has remained relatively constant in recent years, corresponding to 130 cases per 100,000 population. During the same year, there were roughly 1.2 million TB-related deaths among individuals who were HIV-negative, and an additional 208,000 deaths were reported among HIV-positive patients.

Tuberculosis, a serious and highly contagious disease, is prevalent in many countries across the world, including Saudi Arabia. This disease is of particular relevance in the Kingdom due to its unique population dynamics, which include a large number of expatriates from TB-endemic areas in Africa and Southeast Asia, as well as millions of pilgrims who visit the country each year during the Hajj and Umrah seasons [2]. Tuberculosis is considered a social disease, and social factors such as poverty, low socioeconomic status, overcrowding, poor housing, illiteracy, and having a large family have been identified as contributing to its spread [3].

The Oxford English Dictionary (1999) defines knowledge as "the facts, feelings, or experiences known by an individual or a group of people" [4]. Knowing any disease is essential to optimize patients' treatment and improve their quality of life [5]. Furthermore, knowledge serves as a significant factor in shaping an individual's attitude and practices toward a disease [6]. Studies have shown that a lack of knowledge can hinder appropriate and positive healthcare-seeking behaviors. Suitable knowledge of TB, like other chronic diseases, is significantly associated with positive healthcare-seeking action [7]. The existing literature suggests that TB control can be enhanced by improving knowledge and attitudes towards the disease [8]. It has been demonstrated that having greater knowledge about TB is significantly associated with improved treatment compliance and cure rates among TB patients [9]. Moreover, improved knowledge and awareness can strengthen control measures and potentially reduce the transmission of the disease [10]. Despite the importance of public education and awareness in preventing the spread of tuberculosis, certain studies have revealed a lack of adequate information and misconceptions regarding this infectious disease [11, 12]. Consequently, it might be necessary to introduce extensive educational programs to combat the spread of this preventable disease.

To the best of our knowledge and through an extensive literature review, no previous studies have reported on TB-related knowledge, attitude, and practice (KAP) among the general population in the Al Qassim region. Therefore, the aim of this study was to assess the general public's KAP towards TB in the region and to compare gender differences in KAP.

2. METHODOLOGY

This cross-sectional study was conducted among the general population of Saudi Arabia over a period of three months, from January 2021 to April 2021, and data was collected using an online self-reported questionnaire. The target population was the general population residing in the Al-Qassim Province, with the exclusion criteria being individuals under 18 years old. The questionnaire was developed from various KAP studies deemed suitable for our research [13 - 15]. The initial English draft of the questionnaire was evaluated by a panel of three local experts in questionnaire design, who independently assessed its content, question format, sequencing, and overall clarity. However, no modifications were deemed necessary by the experts.

The final English draft was translated to Arabic through forward translation and then back to English by different language centers. The final English version was compared to the original questionnaire for consistency.

The questionnaire comprised 21 items that encompassed the following areas. The first section of the questionnaire comprised nine items that focused on the socio-demographic and general information of the participants. The second section consisted of six items that addressed participants' knowledge of TB and its treatment. The first item in this section was framed using three possible answers {'Droplets', 'Sharing eating utensils' 'I don't know'}, while others were framed using three possible answers {'Yes', 'No', 'unsure'}. The third section contained six questions that aimed to assess the community's attitude and practices towards TB. regarding the attitude part in this section three questions (1,2,4) were framed using three or four possible answerers, while question number 3 was framed using two answers {'Yes', 'No'}. The two practice questions were framed with three potential answers, with the first option being the correct choice.

A score of 1 was given for each correct answer for knowledge or positive reaction regarding attitude and a score of zero for an incorrect answer or negative reaction. "I don't know""/"unsure" was recorded as an incorrect answer. The total knowledge and attitude scores were 6 and 4 scores respectively. Regarding the practice score, the participants were categorized into two groups. The first group included participants with poor practice (had 0-1 score), and the second group included participants with good practice (had 2 scores). The total practice scores were 2. To assess face validity, accuracy, and simplicity a pilot study was conducted on 15 individuals. The pilot study results were not included in the final analysis.

To determine the sample size, Raosoft software was used with a 95% confidence level, 5% margin of error, and 50% response distribution, which resulted in a sample size of 385. An attrition rate of 15% was applied, bringing the target sample size to approximately 442 participants, which was ultimately rounded up to 450 members. The estimated population size in the Al-Qassim Province is around 1,455,000 (General Authority for Statistics, 2016). The survey was finalized and prepared for distribution using Google form and sent using WhatsApp (Facebook, Inc., USA). The ethical approval was obtained from the Health Research Ethics Committee at Qassim University, Saudi Arabia (Reference number 20-04-07 on 19th of January 2021). Before they started responding to the survey, the participants were briefed about the aims of the study, and data protection of the participants, and were informed that participation was voluntary so, they could start answering the questions only after their agreement The data were analyzed using the Statistical Package for Social Sciences software (SPSS, version 24, SPSS, Chicago, IL, USA). Both descriptive and inferential analyses were conducted, and the Chi-square test and Student's t-test were utilized to determine the relationship between the dependent and independent variables. A p-value less than 0.05 was regarded as significant for the association. Additionally, the normal distribution of continuous variables was evaluated using the Kolmogorov-Smirnov (K-S) test.

3. RESULTS

3.1. Socio-socio-demographic Characteristics

A total of 450 participants took part in the study, of whom 322 (71.6%) were male, with a mean age of 29.5 years (SD ± 8.2), ranging from 18 to 52 years. The mean age of males and females was relatively similar, with values of 29.6 (SD ± 8.2) and 29.3 (SD ± 8.3), respectively. The majority of the subjects had a relatively high level of education, with 321 (71.3%) having obtained a university degree. Furthermore, in terms of monthly income and marital status, the majority of participants were students (183, 40.7%). Slightly over half (54.0%) of the participants were unmarried. The majority of study respondents (180, 40.0%) belonged to the younger age group of 15-24 years. Only 4 (0.9%) and 18 (4.0%) of respondents reported that they and their relatives had a history of TB respectively. Among the study participants, 83.3% had heard of TB. Of the total population, 260 (57.8%) reported that they had adequate information about TB. The most common sources of information were the media, public education, and schools. Socio-socio-demographic characteristics of the study population are shown in Table **1**.

Table 1. Socio-demographic characteristics (n = 450).

Variable	Male	Female	Total (%)
Gender	322 (71.6)	128 (28.4)	450 (100.0)
Mean Age (±SD)	29.6 (± 8.2)	29.3 (± 8.3)	29.5 (±8.2)
Age (year)	-	-	-
15-24	120 (37.3)	60 (46.9)	180 (40.0)
25-34	107 (33.2)	29 (22.7)	136 (30.2)
35-44	79 (24.5)	34 (26.6)	113 (25.1)
45-54	16 (5.0)	5 (3.9)	21 (4.7)
Place of residence	-	-	-
Buraydah	45 (14.0)	9 (7.0)	54 (12)
Unaizah	134 (41.6)	88 (68.8)	222 (49.3)
Al Rass	41 (12.7)	8 (6.3)	49 (10.9)
Al Bukayriyah	25 (7.8)	3 (2.3)	28 (6.2)
Al Badaa	17 (5.3)	4 (3.1)	21 (4.7)
Other	60 (18.6)	16 (12.5)	76 (16.9)
Occupation	-	-	-
Employee	156 (48.4)	14 (10.9)	170 (37.8)
Not employee	37 (11.5)	24 (18.8)	61 (13.6)
Student	124 (38.5)	59 (46.1)	183 (40.7)
Housewife	5 (1.6)	128 (24.2)	36 (8.0)
Marital status	-	-	-
Single	197 (61.2)	46 (35.9)	243 (54.0)
Married	124 (38.5)	77 (60.2)	201 (44.7)
Divorced	1 (0.3)	1 (0.8)	2 (0.4)
Widowed	0 (0.0)	4 (3.1)	4 (0.9)
Level of education	-	-	-
Primary	7 (2.2)	11 (8.6)	18 (4.0)
Secondary	79 (24.5)	32 (25.0)	111 (24.7)
University	236 (73.3)	85 (66.4)	321 (71.3)
Had a history of TB	-	-	-
Yes	1 (0.3)	3 (2.3)	4 (0.9)
No	321 (99.7)	125 (97.7)	446 (99.1)
Had a relative history of TB	-	-	-
Yes	13 (4.0)	5 (3.9)	18 (4.0)
No	309 (96.0)	123 (96.1)	432 (96.0)
Did you hear about TB?	-	-	-
Yes	269 (83.5)	106 (82.8)	375 (83.3)
No	53 (16.5)	22 (17.2)	75 (16.7)

Table 2. Responses to TB knowledge questions (n=450).

Item	Male (%)	Female (%)	Total (%)	p Value*
How is tuberculosis transmitted?			-	**0.05***
Droplets	160 (49.7)	78 (60.9)	238 (52.9)	-
Sharing eating utensils	41 (12.7)	17 (13.3)	58 (12.9)	-
Don't know	121 (37.6)	33 (25.8)	154 (34.2)	-
Should a TB patient eat with his family?		-	-	0.85
Yes	20 (6.2)	7 (5.5)	27 (6.0)	-
No	157 (48.8)	66 (51.6)	223 (49.6)	-
Unsure	145 (45.0)	55 (43.0)	200 (44.4)	-
Does the patient's family need to be screened for TB?			-	0.31
Yes	209 (64.9)	91 (71.1)	300 (66.7)	-
No	17 (5.3)	8 (6.3)	25 (5.6)	-
Unsure	96 (29.8)	29 (22.7)	125 (27.8)	-
Is TB curable with proper treatment?		-	-	0.51
Yes	228 (70.8)	92 (71.9)	320 (71.1)	-
No	8 (2.5)	1 (0.8)	9 (2.0)	-
Unsure	86 (26.7)	35 (27.3)	121 (26.9)	-
Can TB cured with 4 weeks of treatment?		-	-	0.016*
Yes	32 (9.9)	20 (15.6)	52 (11.6)	-
No	69 (21.4)	14 (10.9)	83 (18.4)	-
Unsure	221 (68.6)	94 (73.4)	315 (70.0)	-
Can treatment be stopped once the patient's symptom symptom-free even though the prescribed treatment duration has not been reached?				0.59
Yes	11 (3.4)	7 (5.5)	18 (4.0)	-
No	161 (50.0)	64 (50.0)	225 (50.0)	-
Unsure	150 (46.6)	57 (44.5)	207 (46.0)	-

Note: * Significance set at $p < 0.05$, results obtained using Chi-square test.

3.2. Knowledge of Tuberculosis

The maximum total knowledge score for TB was 6, with a mean score of 2.7. Just over half of the respondents (52.9%) knew that TB is transmitted through airborne droplet nuclei. Approximately half of the participants (223 individuals, 49.6%) reported that TB patients should not eat with their family. A majority of the participants (300 individuals, 66.7%) were aware that family members need to be screened for TB. Over two-thirds of the respondents (320 individuals, 71.1%) reported that TB is a curable disease. When the participants were asked about the curability of TB with a 4-week course, only 83 respondents (18.4%) reported that TB cannot be cured. However, when asked about the duration of TB treatment, half of the respondents reported that treatment cannot be stopped once symptoms disappear and that the full treatment duration must be completed. Based on the responses to the questions, 249 individuals (55.3%) were categorized as having a good level of knowledge about TB. In terms of gender, females had slightly more knowledge compared to males, with the proportion of males and females with good knowledge being 57.8% and 54.3%, respectively. However, there was no significant difference in the mean knowledge scores between genders, as revealed by the t-test. Table **2** presents the responses to the TB knowledge questions among the study population.

3.3. Attitude

The maximum attitude score was 4 while the mean score was 1.5. About 46.7% of the study population has a positive attitude. Gender analysis showed that males have more positive attitudes compared to females, the proportion of males and females with a positive attitude were 48.4% and 42.2% respectively. The t-test did not find any significant difference in the average attitude scores between genders.

In response to the question "What is your feeling about TB patients?" most of the participants (37.8%) did not feel a certain emotion. As for the question "What is your reaction if you had TB symptoms?" 84% of participants had a positive attitude expressed by the willingness to visit the health care facility. Regarding a willingness to work with previously treated TB patients, about 76.7% of the study population responded positively. Only 23.8% of participants stated that TB is dangerous and serious for the community. Table **3** shows the participant's responses towards attitude questions.

3.4. Practice

The total practice scores were 2 while the mean score was 1.8. Study results showed that 82.4% of participants have good practice. Within gender the analysis shows that females have good practice compared to males, the proportion of females and males having good practice were 91.4% and 78.9% respectively. T-test shows a significant difference in mean

practice scores between genders (*p*=0.004). In response to the question "What is your choice for TB treatment?" 84% of the participants chose modern healthcare which revealed a good practice. As for the question "When you will visit the health facility?" 96% of participants reported that they would visit a healthcare facility once they realized that the symptoms may be related to TB disease (Table **4**).

3.5. Chi-Square Test for Knowledge, Attitude, and Practice

Chi-square analysis showed an association between level of knowledge and age (*P*=0.013), occupation (*P* =0.013), and those who had a family history of TB (*P* =0.015). Regarding attitude, there were statistically significant associations between attitude and age (*P* =0.05), occupation (*P* =0.014),

those who had a history of TB (*P* =0.032) and also those who had a relative with a history of TB (*P* =0.027). Also, statistically significant associations were found between gender (*P* =0.002), occupation (*P* =0.004) and practice. Table **5** shows the association between the level of knowledge, attitude, practice and socio-socio-demographic factors. The overall assessment of knowledge, attitude and practice are shown in Fig. (**1**). When all socio-demographic variables were categorized into 2 groups, an association was shown only between knowledge and those who had a family history of TB (*P* =0.015). Regarding attitude, the association has been shown with age (*P* =0.032), those who had a family history of TB (*P* =0.032), and those who had a relative history of TB (*P* =0.027). In regards to the practice, the association was found with gender (*P* =0.002), and marital status (*P* =0.039).

Table 3. Attitude among general population (n=450).

Item	Male (%)	Female (%)	Total (%)	*P*-Value*
What is your reaction if you have TB symptoms?		-	-	0.45
Feeling of fear	36 (11.2)	21 (16.4)	57 (12.7)	-
Feeling of shame	1 (0.3)	0 (0.0)	1 (0.2)	-
Sadness/Despair	10 (3.1)	4 (3.1)	14 (3.1)	-
Visit the health facility (£)	275 (85.4)	103 (80.5)	378 (84.0)	-
What is your feeling about TB patients?			-	0.67
Compassion and willingness to help (£)	23 (38.2)	46 (35.9)	169 (37.6)	-
Mercy and distancing themselves from them	53(16.5)	25 (19.5)	78 (17.3)	-
I fear them because they might infect me	26 (8.1)	7 (5.5)	33 (7.3)	-
I don't have an exact feeling	120 (37.3)	50 (39.1)	170 (37.8)	-
Are you willing to work with previously treated TB Patients?			-	0.97
Yes (£)	247 (76.7)	98 (76.6)	345 (76.7)	-
No	75 (23.3)	30 (23.4)	105 (23.3)	-
What is your thought on the seriousness of TB?		-	-	0.43
Very dangerous (£)	85 (26.4)	22 (17.2)	107 (23.8)	-
Rather dangerous	117 (36.3)	59 (46.1)	176 (39.1)	-
Not dangerous	24 (7.5)	15 (11.7)	39 (8.7)	-
Don't know	96 (29.8)	32 (25.0)	128 (28.4)	-

Note: * Significance set at p < 0.05, results obtained using Chi-square test; **£**= Positive reaction.

Table 4. Practice among general population (n=450).

Item	Male (%)	Female (%)	Total (%)	*P*-Value*
What is your choice for TB treatment?	-	-	-	**0.007***
Modern healthcare §	260 (80.7)	118 (92.2)	378 (84.0)	-
Traditional healers	9 (2.8)	3 (2.3)	12 (2.7)	-
I don't know	53 (16.5)	7 (5.5)	60 (13.3)	-
When you will visit health facility?	-	-	-	0.53
Once I realize that the symptoms may be related to TB §	307 (95.3)	125 (97.7)	432 (96.0)	-
3-4 weeks after the onset of TB symptoms	10 (3.1)	2 (1.6)	12 (2.7)	-
I will not go to the doctor	5 (1.6)	1 (0.8)	6 (1.3)	-

Note: * Significance set at p < 0.05, results obtained using Chi-square test;**§**= Correct answer.
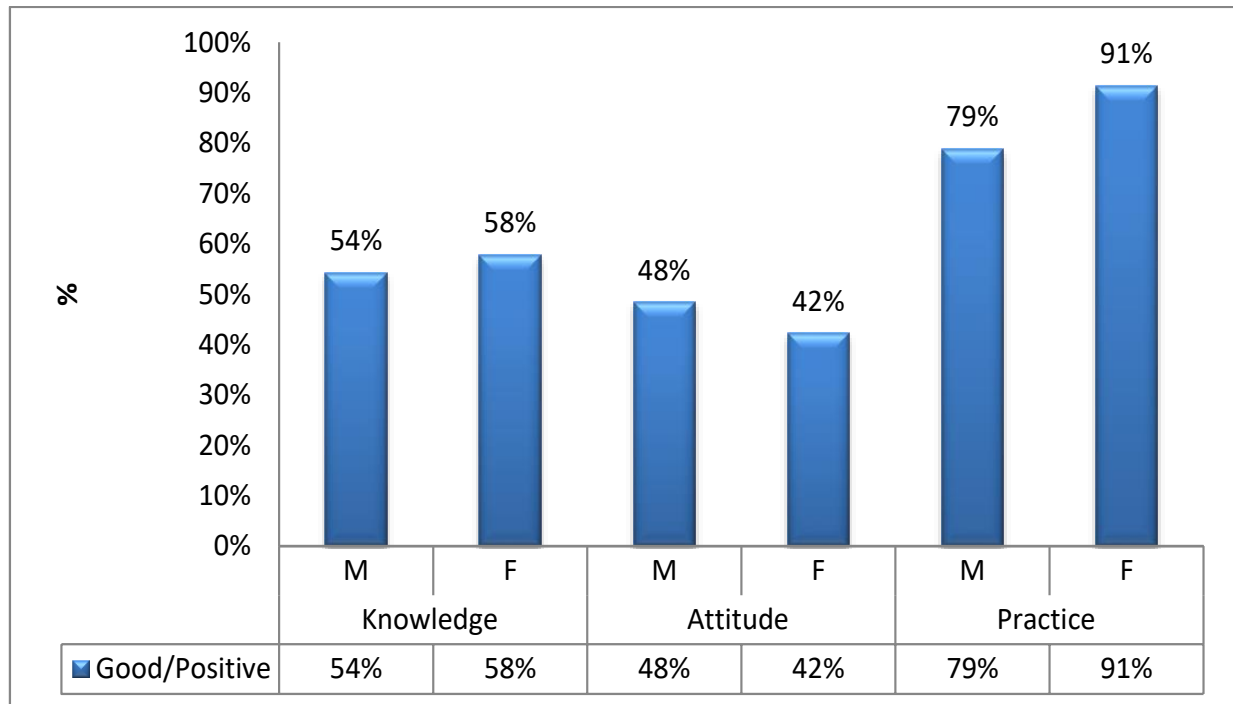
Fig. (1). Knowledge, attitude, practice assessment.

Table 5. Association between socio-demographic factors and knowledge, attitude and practice (n=450).

Factor	Knowledge		-	Attitude		-	Practice			-
-	Good n (%)	Poor n (%)	*P* value*	Positive n (%)	Negative n (%)	*P* value*	Good n (%)	Poor n (%)	*P* value*	
Gender	-	-	0.51	-	-	0.23	-			**0.002***
Male	175 (54.3)	147 (45.7)	-	156 (48.4)	166 (51.6)	-	254 (78.9)	68 (21.1)		-
Female	74 (57.8)	54 (42.2)	-	54 (42.2)	74 (57.8)	-	117 (91.4)	11 (8.6)		-
Age	-	-	0.013*	-	-	0.05*	-			0.22
15-24	115 (63.9)	65 (36.1)	-	94 (52.2)	86 (47.8)	-	154 (85.6)	26 (14.4)		-
25-34	62 (45.6)	74 (54.4)	-	58 (42.6)	78 (57.4)	-	105 (77.2)	31 (22.8)		-
35-44	61 (54.0)	52 (46.0)	-	53 (46.9)	60 (53.1)	-	96 (85.0)	17 (15.0)		-
45-54	11 (52.4)	10 (47.6)	-	5 (23.8)	16 (76.2)	-	16 (76.2)	5 (23.8)		-
Level of education	-	-	0.89	-	-	0.84	-			0.09
Primary	9 (50.0)	9 (50.0)	-	9 (50.0)	9 (50.0)	-	12 (66.7)	6 (33.3)		-
Secondary	62 (55.9)	49 (44.1)	-	54 (48.6)	57 (51.4)	-	90 (81.1)	21 (18.9)		-
University	178 (55.5)	143 (44.5)	-	147 (45.8)	174 (54.2)	-	269 (83.8)	45 (16.2)		-
Marital Status	-	-	0.26	-	-	0.17	-			0.19
Single	138 (56.8)	105 (43.2)	-	109 (44.9)	134 (55.1)	-	191 (78.6)	52 (21.4)		-
Married	106 (52.7)	95 (47.3)	-	96 (47.8)	105 (52.2)	-	174 (86.6)	27 (13.4)		-
Divorced	1 (50.0)	1 (50.0)	-	1 (50.0)	1 (50.0)	-	2 (100.0)	0 (0.0)		-
Widowed	4 (100.0)	0 (0.0)	-	4 (100.0)	0 (0.0)	-	4 (100.0)	0 (0.0)		-
Occupation	-	-	0.013*	-	-	0.014*	-			0.004*
Employee	88 (51.8)	82 (48.2)	-	80 (47.1)	90 (52.9)	-	140 (82.4)	30 (17.6)		-
Not employee	26 (42.6)	35 (57.4)	-	18 (29.5)	43 (70.5)	-	41 (67.2)	20 (32.8)		-
Student	117 (63.9)	66 (36.1)	-	97 (53.0)	86 (47.0)	-	157 (85.8)	26 (14.2)		-
Housewife	18 (50.0)	18 (50.0)	-	15 (41.7)	21 (58.3)	-	33 (91.7)	3 (8.3)		-
Had History of TB	-	-	0.43	-	-	0.032*				0.39
Yes	3 (75.0)	1 (25.0)	-	4 (100.0)	0 (0.0)	-	4 (100.0)	0 (0.0)		-

(Table 7) contd.....

Factor	Knowledge		-	Attitude		-	Practice		-
-	Good n (%)	Poor n (%)	P value*	Positive n (%)	Negative n (%)	P value*	Good n (%)	Poor n (%)	P value*
No	246 (55.2)	200 (44.8)	-	206 (46.2)	240 (53.8)	-	367 (82.3)	79 (17.7)	-
Had relative with history of TB	-	-	0.015*	-	-	0.027*			0.60
Yes	15 (83.3)	3 (16.7)	-	13 (72.2)	5 (27.8)	-	16 (88.9)	2 (11.1)	-
No	234 (54.2)	198 (45.8)	-	197 (45.6)	235 (54.4)	-	335 (82.2)	77 (17.8)	-

Note: * Significance set at p < 0.05, results obtained using Chi-square test.

Table 6. Multivariate logistic regression analysis (n=450).

Factor	-	Knowledge		Attitude		Practice	
-	n (%)	OR (95% CI)	P value*	OR (95% CI)	P value*	OR (95% CI)	P value*
Gender	-	-	-	-	-	-	-
Male	322 (71.6)	-	-	-	-	-	-
Female	128 (28.4)	.88 (.54-1.43)	.60	1.57 (.96-2.58)	.073	2.85 (1.33-6.07)	.007*
Age	-	-	-	-	-	-	-
< 45	429 (95.3)	-	-	-	-	-	-
≥ 45	21 (4.7)	1.02 (.42-2.52)	.96	3.11 (1.09-8.86)	.033*	.54 (.18-1.60)	.27
Level of education	-	-	-	-	-	-	-
Undergraduate	129 (28.7)	-	-	-	-	-	-
Graduate	321 (71.3)	1.04 (.67-1.59)	.87	1.08 (.70-1.66)	.74	1.78 (1.02-3.12)	.043*
Marital Status	-	-	-	-	-	-	-
Unmarried	249 (55.3)	-	-	-	-	-	-
Married	201 (44.7)	1.19 (.75-1.89)	.45	.74 (.47-1.18)	.21	1.59 (.84-3.00)	.15
Occupation	-	-	-	-	-	-	-
Unemployed	170 (37.8)	-	-	-	-	-	-
Employed	280 (62.5)	1.16 (.72-1.89)	.54	1.21 (.74-1.98)	.45	1.23 (.65-2.35)	.52
Had a History of TB	-	-	-	-	-	-	-
Yes	4 (0.9)	-	-	-	-	-	-
No	446 (99.1)	.78 (.06-9.84)	.85	-	-	-	-
Had a relative with a history of TB	-	-	-	-	-	-	-
Yes	18 (4.0)	-	-	-	-	-	-
No	432 (96.0)	4.60 (1.21-17.46)	0.025*	2.44 (.81-7.49)	.11	.76 (.17-3.52)	.73

3.6. Logistic Regression Analysis for Knowledge, Attitude, and Practice

The multivariate logistic regression analysis revealed that a family history of TB (adjusted odds ratio [aOR] 4.60, 95% confidence interval [CI] 1.21-17.46) and age (aOR 3.12, 95% CI 1.09-8.86) were independently associated with the level of knowledge and attitude, respectively. Regarding practice, gender (aOR 2.85, 95% CI 1.34-6.07) and education (aOR 1.78, 95% CI 1.02-3.12) were independently associated factors. Table **6** presents the results of the multivariate logistic regression analysis.

4. DISCUSSION

Despite the majority of the study participants (83.3%) reported having heard of the disease only 249 participants (55.3%) were categorized as having a good level of knowledge about TB, these findings are consistent with certain studies [14, 16, 17]. However, unlike the present study, only 19.4% and 36.5% of respondents in Saudi and Ethiopian studies [15, 18] were classified as having good knowledge about TB. After comparing the educational backgrounds of participants in the current study with those in Saudi and Ethiopian studies [15, 18], we found that the education levels were similar. In all three studies, more than 50% of participants had higher education. This similarity leads us to speculate that the differences in knowledge outcomes between the studies could be attributed to variations in the preparedness of health authorities to conduct educational campaigns on tuberculosis in their respective countries

While discussing the route of transmission of TB, 52.9% of the respondents in the current study stated that TB is transmitted by droplets, these findings are consistent with some previous studies [14 - 17] and in contrast with others [19, 20]. When the study participants were asked about eating together with family, only 6% of respondents had a positive response. Regarding the need of family members to be screened for tuberculosis, about 66.7% have a positive response towards the necessity of screening, a consistent finding with a Malaysian study [21]. The majority of participants were aware that TB is a highly infectious but curable disease, with 71.1% reporting that it is curable. These findings are consistent with previous research [14, 15]. However, when participants were asked about the curability of TB with a 4-week course, only 18.4% of

respondents believed that TB could not be cured with this duration, which is similar to findings reported in earlier studies [12, 18, 21]. This misconception can negatively impact adherence to anti-TB medication and increase the risk of drug resistance [22]. Conversely, when participants were asked about the duration of treatment and the possibility of stopping treatment once symptom-free, only 50.0% recognized that treatment cannot be stopped within 4 weeks or once symptoms disappear and that the full treatment duration must be completed, which supported by other studies [12, 21, 23 - 25]. However, these findings were inconsistent with those reported in some other studies in the literature [19, 26, 27]. The results of the current study showed that females exhibited a higher level of knowledge about tuberculosis as compared to males. These findings are in agreement with some previous studies [16, 17, 19] and in contrast with Chinese studies [28]. Most of the existing literature on knowledge and perception of tuberculosis focuses on TB patients and individuals seeking healthcare. As the majority (71.3%) of the participants in the current study were well-educated, the higher level of TB knowledge among females in this study may be attributed to the fact that they are typically more eager and studious than males. Among the study participants, a significant proportion were aware of the common symptoms of TB, such as coughing with bloody sputum (68.2%), fever (43.7%), and weight loss (38.1%). This awareness of the clinical presentation of TB could aid in controlling the spread of this highly infectious and epidemic disease by promoting early medical consultation. This study found that media such as television is the most mentioned source to obtain TB-related information, which is consistent with previous studies conducted in Malaysia and Pakistan [17, 29]. Participants in the current study also identified public education and media campaigns as effective ways to increase health awareness and knowledge about medical conditions, emphasizing the important role of health administration in this regard. The overall attitude of the respondents towards TB can be concluded as moderate, as 46.7% of the study participants have a positive attitude. More than two-thirds (84%) of the respondents in this study have a positive attitude to go to the hospital if they have TB. This result is in agreement with studies conducted in Saudi Arabia [15] and Malaysia [17] but does not seem to be consistent with studies conducted in Vietnam [30]. Most of the study participants (37.8%) did not feel a certain emotion; this result is in agreement with the Ethiopian study [14] but does not seem to be consistent with the local study [15] where only 8.1% of participants reported that they have no exactly feeling toward TB patients. About 23.8% of the study sample reported a seriousness of TB; this finding is consistent with the Saudi Arabian study [15] and contrasts with the Ethiopian study [14]. In general, there was no significant difference in attitude between males and females and this finding is in agreement with the study in Riyadh [15] and in contrast with the Ethiopian study [14]. The overall practice is good as 82.4% of participants have good practice with TB. Most of the respondents (84.0%) and (96.0%) respectively reported their choice for treatment is modern healthcare and they will visit a health facility once they realize that the symptoms may related to TB. These results are consistent with the local study conducted in Riyadh [15]. The current study findings show that females have a better practice than males these findings are in line with previous literature [15] and in contrast with the Malaysian study [17]. Differences in demographic data between studies and differences in study sites may explain this variation. Here are some key implications that can arise from our study results:

1. The results can inform the development of targeted educational campaigns to improve understanding of TB, its transmission, symptoms, and treatment. By addressing misconceptions and increasing awareness, these campaigns can contribute to early detection, improved treatment adherence, and reduced transmission.

2. The results can inform the development of guidelines and interventions to improve practices.

3. The findings can provide valuable insights that inform public health interventions, guide policy decisions, and enhance the effectiveness of TB control programs. By addressing knowledge gaps, improving attitudes, and promoting best practices, the management and control of TB can be strengthened, leading to better outcomes for individuals and communities affected by the disease.

5. STRENGTHS AND LIMITATIONS

This study is the first of its kind to address the gender differences in knowledge, attitude and practice toward TB and its treatment. However, it has some limitations: First, it lacks generalizability to the Saudi population as most of the participants were from the Al Qassim region. Second, it is important to note that the sample in this study was slanted toward young, educated males, which raises concerns about its representativeness. Third, as the study has a cross-sectional design, a strict causal interpretation of the results is not possible. Fourth, self-reporting surveys may cause social desirability bias where participants may have answered attitude and practice questions positively based on what they perceive to be expected from them.

CONCLUSION

Based on current results, we conclude that the public population in Al Qassim Province has a moderate level of knowledge about TB. Few individuals have wrong beliefs about TB that may raise the risk of getting infected by TB patients and this will lead to noncompliance to treatment and cause complications. Furthermore, slightly more than half of people have unfavorable attitude level which stops them from seeking treatment because of fear and prevent them from helping TB patients. Although the current study findings demonstrated a high degree of good practice, there is still room for improvement. Education plays a critical role in increasing knowledge about TB and can be achieved through frequent health education campaigns aimed at raising awareness of the disease within the community which is crucial for controlling the infection.

RECOMMENDATION

Based on the findings of our study regarding the relationship between knowledge and factors such as

occupation, age, and family history, we strongly recommend conducting further research to explore and understand this relationship in greater depth.

AUTHORS' CONTRIBUTIONS

We declare that this work was done by the authors named in this article and all liabilities about claims relating to the content of this article will be borne by the authors. M.S. and M.A. are supervisors and principal investigators of the study. M.S. and M.A. planned the first draft of the manuscript and formatted it according to the journal requirements and performed the statistical analysis. All authors participated in the design of the study and critically reviewed the draft of the manuscript. Also, all authors revised and approved the final version of the manuscript.

LIST OF ABBREVIATIONS

TB	=	Tuberculosis
M.tb	=	*Mycobacterium tuberculosis*
HIV	=	Human immunodeficiency virus
K-S	=	Kolmogorov-Smirnov
CI	=	Confidence interval

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Committee of Research Ethics, Deanship of Scientific Research, Qassim University (Reference number 20-04-07 on 19th of January 2021).

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

FUNDING

None.

STANDARD OF REPORTING

STROBE guidelines and methodologies were followed in this study.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest to disclose.

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