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Assessing Oman's knowledge, attitude and practice regarding tuberculosis: a cross-sectional study that calls for action

Sulien Al Khalili*, Fatma Al Yaquobi, Bader Al Abri, Khalsa Al Thuhli, Sabria Al Marshoudi, Bader Al Rawahi, Seif Al-Abri

Directorate General for Disease Surveillance and Control, Ministry of Health, P.O. Box 393, 100, Muscat, Oman

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ABSTRACT

Background: Tuberculosis (TB) remains a major public health issue. Elimination mandates collaboration between decision makers, practitioners and the community. Few studies address the knowledge, attitude and practice (KAP) from countries with low incidence.

Aim: Assess KAP regarding TB in Oman.

Method: A cross-sectional survey based on validated questionnaire conducted via phone on randomly selected participants.

Results: A total of 1048 participants completed the questionnaire. Males accounted for 63% (n=664) of respondents, Omanis 76% (n=796) and 18–39-year-olds 50% (n=527). The overall knowledge was fair (53%), overall attitude scored good and fair (46%) equally and a good score (78%) for overall practice. While female gender associated with higher knowledge (53.9%, n=201), males showed higher attitude and practice, (48.5%, n=322) and (80.3%, n=533) respectively. Omani nationality correlated with higher knowledge (49.1%, n= 391) and attitude (46.9%, n=373) whereas non-Omani nationality correlated with higher practice (85.3%, n=214). Literacy was associated with higher knowledge (73.3%, n=11) and attitude (60%, n=9).

Conclusion: Despite efforts by the Ministry of Health, more must be done to raise TB knowledge to encourage preferable attitudes and practice. Interventions to improve KAP are required to speed up disease reduction rate. Utilization of different resources, especially digital platforms, for knowledge dissemination should consider community diversity, including the presence of expatriates.

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Introduction

Despite its roots in antiquity, TB continues to be a major public health issue of concern. This has been underscored by the impact of the COVID-19 pandemic, how resources shifted from one communicable disease to another, leaving TB glossed over and leading to a global drop in new diagnoses and reporting of cases. Between 2019 and 2020, there was a fall of 18% (from 7.1 million to 5.8 million) in the number of notifications of people newly diagnosed with TB. In addition, compared to 2019, there was a decline in the TB incidence rate by 1.9%. As a reflection of delayed access to the

diagnosis and management, there were an estimated 1.3 million TB deaths among HIV-negative people in 2020 and around 214,000 among people living with HIV (WHO, 2021). Oman is a low TB incidence country with an annual incidence rate of less than 7 cases per 100,000 in 2020. Out of a total population of 4.6 million, 38% are expatriates from South East Asia who travel to Oman for employment.¹ The epidemiology of TB in Oman follows that of low incidence countries, and active TB is mainly diagnosed in expatriates arriving from South East Asia as a result of reactivation of latent TB infection (LTBI) acquired in their countries of origin (Al Yaquobi et al, 2018).

In order to eliminate TB in Oman, the country has launched a TB elimination strategy and has taken initiatives to achieve the strategy's targets and objectives by 2035 (Al Abri et al, 2020a,b). Most efforts to control tuberculosis focus on the clinical aspects

* Corresponding author.

E-mail addresses: sulienkhalili18@gmail.com (S. Al Khalili), fatmayaquobi@gmail.com (F. Al Yaquobi), bdr.abri@hotmail.com (B. Al Abri), khalsa5544@gmail.com (K. Al Thuhli), dr.salmarshoudi@gmail.com (S. Al Marshoudi), baderalrawahi4@gmail.com (B. Al Rawahi), salabri@gmail.com (S. Al-Abri).

¹ <https://data.gov.om/search?query=Population>

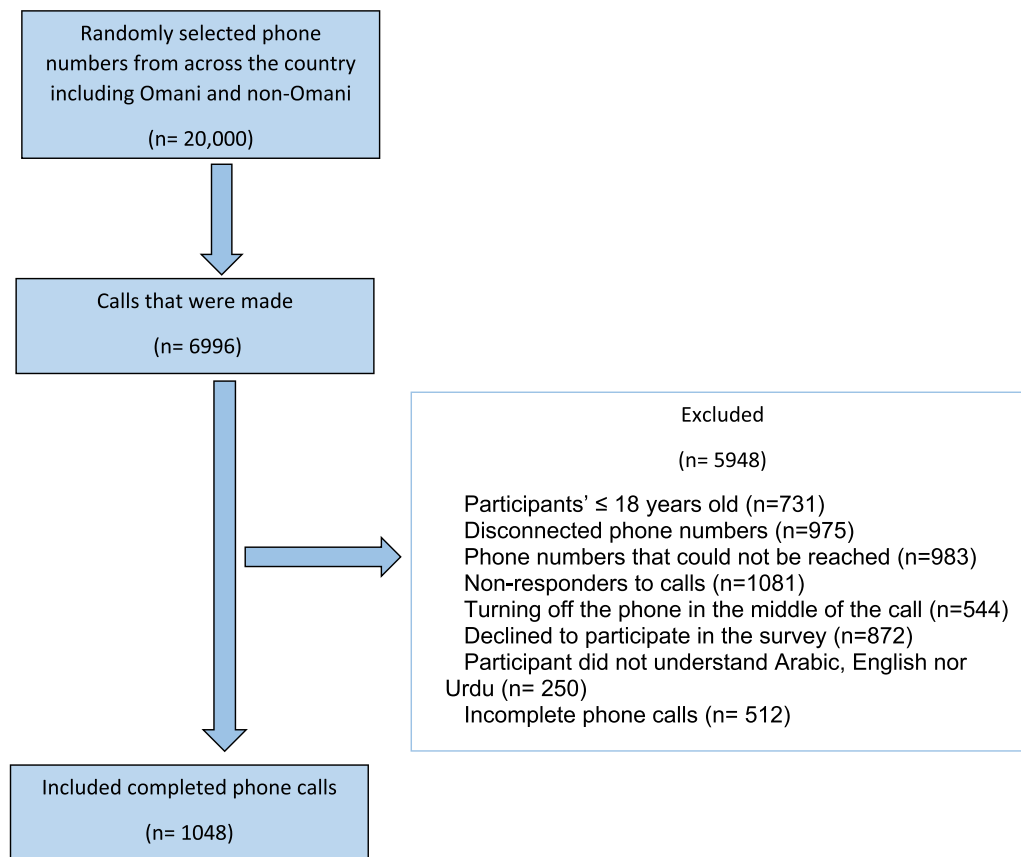


Figure 1. The study flow chart.

of the disease over the human aspects; however, TB prevention programs require community participation because TB problems are very much influenced by knowledge and behavior (Ramadhany et al, 2020). A study conducted in the Somali community living in Finland revealed that 53% of respondents had low knowledge levels, and only 63% had a positive attitude toward TB (Hussein et al, 2019).

An example of a negative attitude toward TB would be to believe claims about the disease that are not true. Misinformation affects TB control in many aspects such as transmission, management, and attitude toward infected people. A study conducted in Tunisia showed that 86.1% had misconceptions about transmission, and only 22.1% were aware that there was free care available. It also showed a significant level of stigma with an average score of 54.9% (Bensalah et al, 2017). Another regional study conducted in the Kingdom of Saudi Arabia in 2017 revealed that the attitude toward TB was negative among most of the participants (Bin Huwaymil et al, 2017).

As well as forming a base for public awareness, assessing the level of KAP is considered a tool to determine the best method for delivering effective information on TB to the public. For instance, 46.8% of Tunisians cited television as their main source of TB information (Bensalah et al, 2017). For a successful TB program, collaboration with the public is crucial and it starts by assessing and tackling gaps in the knowledge toward better attitudes and practice surrounding TB. A local study from Oman conducted in 2008 showed that private general practitioners had statistically significantly lower TB suspicion and TB knowledge scores than public general practitioners (Al-Maniri et al, 2008). However, there is no updated local community based study in this regard so far, hence, the knowledge gaps in the people of Oman, their attitudes and practices is explored in our study.

Materials and methods

Study design and participants

Participants in this cross-sectional phone-based survey were randomly selected from the national phone registry. Registry aiming to be representative of all governorates. Inclusion criteria was that respondents be at least 18 years old (see Supplementary Materials – S1). The interviews were conducted from March 3 to 18, 2021 with the assistance of the National Centre for Statistics and Information (NCSI)² and the Ministry of Health call center. Each interview was preceded by verbal consent in one of the three languages used (Arabic, English or Urdu); respondents were excluded if they did not speak any of these languages.

Sample size calculation

Sample size was calculated as 1067 with the 95% confidence level and a 3% degree of precision (margin of error); however, we manage to complete 1048 calls to include in the analysis. The sample frame included twenty thousand phone numbers randomly selected for both nationals and non-nationals from all governorates in the country. A total number of 6996 calls were made to reach a completed calculated sample size of 1048 calls. Five thousand, nine hundred and forty-eight respondent's calls were excluded from the study due to a variety of reasons, such as unqualified respondents <18 years, respondents unable to speak any of the three languages offered, those unwilling to participate or who were unresponsive, had a busy signal, or were unable to complete the call for techni-

² <https://www.ncsi.gov.om/Pages/NCSI.aspx>

cal reasons or if the respondent terminated the call mid-interview (Figure 1).

Questionnaire and data collection

Phone-based questionnaires were used for data collection. The survey included 27 standardized questions (see Supplementary Material – S2) adapted from A Guide to Developing Knowledge, Attitude and Practice Surveys (WHO and Stop TB Partnership, 2008). The questionnaire was divided into four parts; the first section gathered sociodemographic characteristics such as age, sex, nationality, educational status, employment information and governorate of residence; the second part assessed knowledge; the third part elicited attitudes toward tuberculosis and people infected with it; and the final, fourth part included questions on practice toward tuberculosis.

In order to check for compatibility, the questionnaire was translated to Arabic then to English again. A one-day training course was conducted by the research team for interviewers regarding survey and data collection. Fifty-six calls were made as a pilot study to test the reliability of the questions (test-retest) and the time required to interview a participant. These results were not included in the final study analysis. The research team made sure that data was appropriately collected, saved and reviewed daily.

Thirteen questions regarding knowledge of TB were included. The response was classified as good, fair or poor (see Supplementary Materials – S3). To calculate the score, a good answer was computed as “1” and a poor answer as “0”. For other questions, a third option was added as fair and computed as “2”. For questions where more than one answer was to be selected, response options were recorded as good = “selecting the accurate answer”, poor = “selecting inaccurate answer” and fair = “selecting any of inaccurate answers with the accurate answer”. The score for the question about signs and symptoms was classified into three categories as follows: 3 = “very evident symptoms”, 2 = “less frequent symptoms”, 1 = “rare symptoms” and 0 = “don’t know”.

The attitude section included five items evaluating the level of personal and community attitude toward TB as a disease and people infected with it. The response options were classified as good, fair or poor (see Supplementary Materials – S3), regarding personal and community feelings toward TB infected people, good = “selecting the favorable answer”, poor = “selecting unfavorable answer” and fair = “selecting neutral answer”. A question about personal reaction in cases found to have TB has no score as it expresses personal feelings. Same with a question about knowing someone with TB in which response options were 0 = “No” and 1 = “Yes”.

The practice section consists of five items. The questions where more than one answer could be selected, response options were recorded as: good = “selecting the favorable answer”, poor = “selecting unfavorable answer” and fair = “selecting any of the unfavorable answers with at least one favorable answer” (see Supplementary Materials – S3).

Statistical analysis

Data was analyzed by using Statistical Package for Social Sciences software, version 16.0 (SPSS Inc., Chicago, IL). Categorical variables were presented as weighted proportions whereas continuous variables were presented as mean and standard deviation. Normality of data was tested using the Kolmogorov-Smirnov test. Both descriptive and inferential statistics involving Chi-square test were used to present results. Mann-Whitney test and Kruskal-Wallis test were used to investigate the correlations between different factors and the KAP regarding tuberculosis. For

each test, a P value of less than 0.05 was considered statistically significant.

Results

Sociodemographic characteristics

A total of 6996 calls were made of which 5948 were excluded and 1048 were included wherein participants completed the phone-based questionnaire (Figure 1A). Males accounted for 63% of the respondents. Omanis constituted 76% of the participants. The highest percentage of non-national respondents came from India (9%). Half of the respondents were in the 18–39-year-old age group (50%) with the mean age 40.03 and a standard deviation of 11.4. The highest number of participants were from the Muscat governorate (31%) and the lowest from Al Wusta and Musandam governorates (1% each) (results are proportional to the governorate populations). Most participants were high school graduates (34%). Around 57% of participants were employed and most (70%) worked in a non-health care specialty.

The baseline characteristics of the respondents are shown in Table 1.

KAP scoring and correlation

Overall, knowledge scores for TB were 70%, attitude 69% and practice 67%. The overall knowledge scoring was fair (53%) while the attitude had an equal score for good and fair (46%) each. On

Table 1
Sociodemographic profile of study participants.

Demographic characteristic	Total number (%)
18–39	1048 (100)
40–59	527 (50.3)
60+	449 (42.8)
Male	69 (6)
Female	664 (63)
Omani	373 (36)
Non-Omani	796 (76)
Bangladesh	251 (24)
India	31 (3)
Pakistan	97 (9.3)
Philippines	60 (5.7)
Muscat	14 (1.3)
Dhofar	324 (31)
Musandam	93 (9)
Al Buraimi	10 (1)
Ad Dakhiliyah	26 (2)
N. Batinah	122 (12)
S. Batinah	141 (13)
S. Sharqiyah	135 (13)
N. Sharqiyah	66 (6)
Al Dhahirah	60 (6)
Al Wusta	56 (5.3)
No school	10 (1)
Religious school only	42 (4)
Literacy classes only	24 (2)
Elementary	13 (1)
High school	179 (17)
Higher education (post-graduate and professional)	361 (34)
college	233 (22)
Non-health care	189 (18)
Health care (government)	733 (70)
Health care (private)	45 (4)
Employed	6 (0.6)
Retired	595 (57)
Self-employed or business owner	103 (10)
Student	24 (2)
Unemployed	29 (3)
	289 (28)

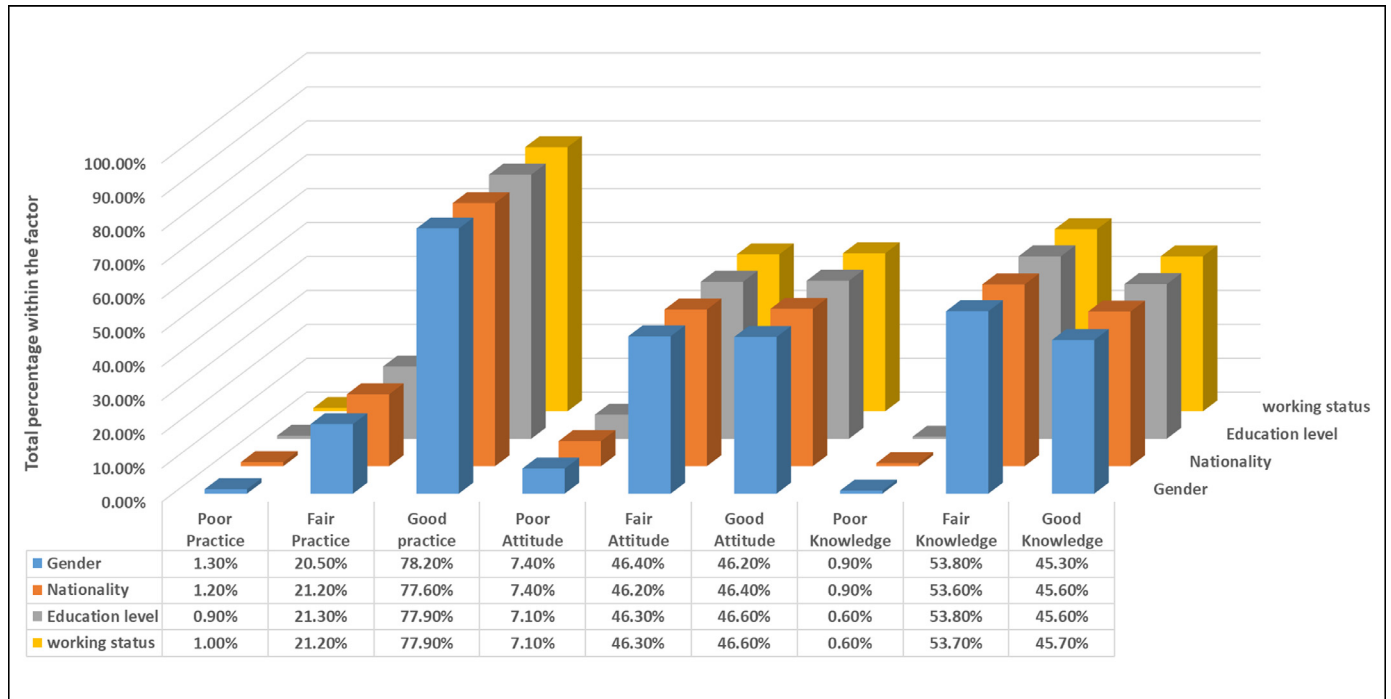


Figure 2. Effects of different factors (gender, nationality, education level and working status) on the overall knowledge, attitude and practice scores.

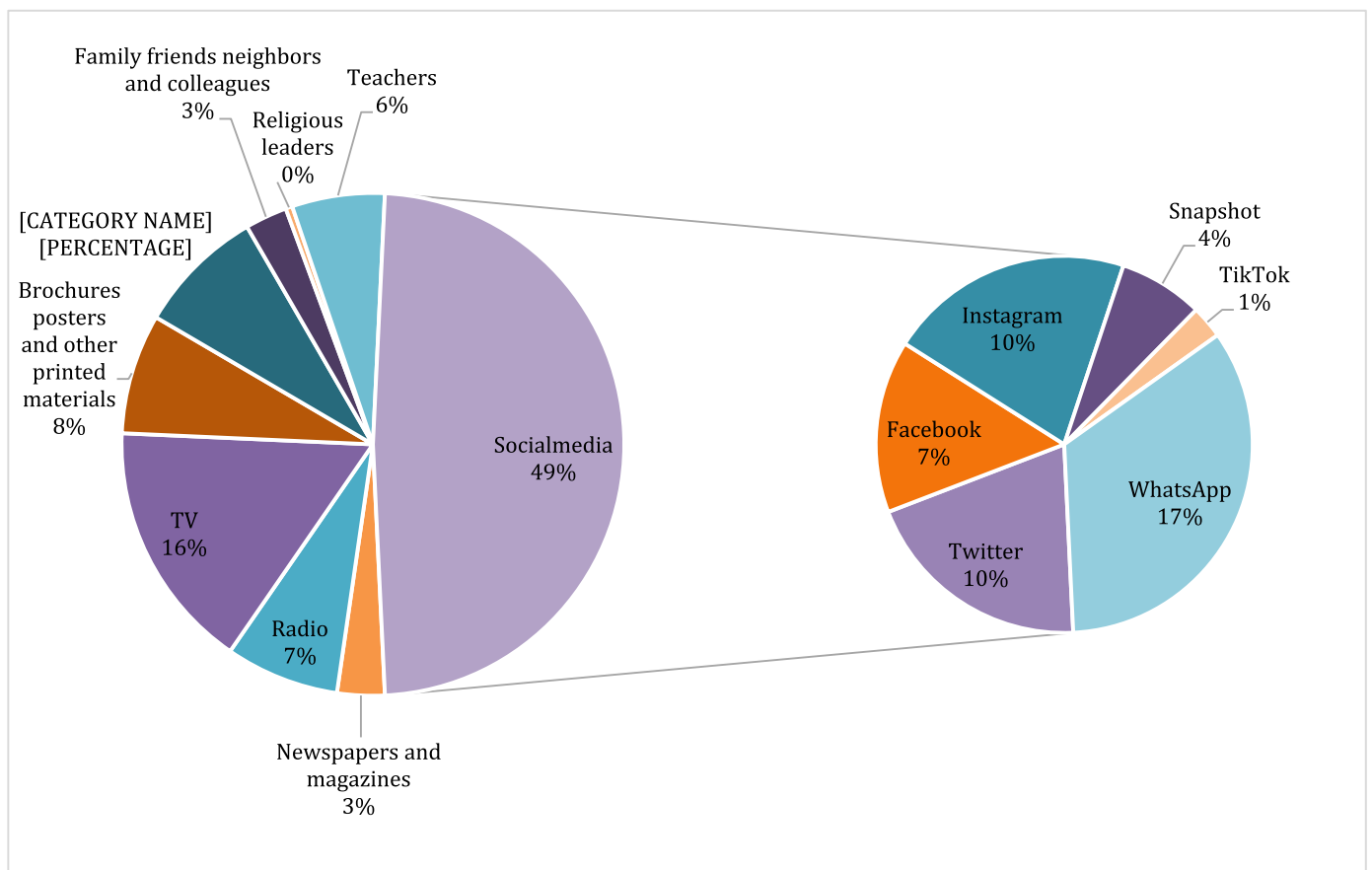


Figure 3. Sources of information on TB that respondents think can most effectively reach people.

Table 2

The scoring of the knowledge, attitude and practice based on gender, nationality, education level and working status.

Factors	KnowledgeN(%)Good / Fair / Poor			AttitudeN(%)Good / Fair / Poor			PracticeN(%)Good / Fair / Poor		
<u>Gender</u>									
Male	269	387	8	322	300	42	533	125	6
	(40.5)	(58.3)	(1.2)	(48.5)	(45.2)	(6.3)	(80.3)	(18.8)	(0.9)
Female	201	171	1	157	181	35	278	88	7
	(53.9)	(45.8)	(0.3)	(42.1)	(48.5)	(9.4)	(74.5)	(23.6)	(1.9)
<u>Nationality</u>									
Omani	391	400	5	373	366	57	598 (75.1)	188	10
	(49.1)	(50.3)	(0.6)	(46.9)	(46)	(7.2)		(23.6)	(1.3)
Non-Omani	86	161	4	113	118	20	214	34	3
	(34.3)	(64.1)	(1.6)	(45)	(47)	(8)	(85.3)	(13.5)	(1.2)
<u>Education level</u>									
No school	11	31	0	23	15	4	41	1	0
	(26.2)	(73.8)	(0)	(54.8)	(35.7)	(9.5)	(97.6)	(2.4)	(0)
Elementary	57	121	1	84	80	15	148	27	4
	(31.8)	(67.6)	(0.6)	(46.9)	(44.7)	(8.4)	(82.7)	(15.1)	(2.2)
College	168	193	0	179	152	30	271	88	2
	(46.5)	(53.5)	(0)	(49.6)	(42.1)	(8.3)	(75.1)	(24.4)	(0.6)
Higher education	86	101	2	75	102	12	143	46	0
	(45.5)	(53.4)	(1.1)	(39.7)	(54)	(6.3)	(75.7)	(24.3)	(0)
Religious school	136	96	1	102	120	11	183	48	2
	(58.4)	(41.2)	(0.4)	(43.8)	(51.5)	(4.7)	(78.5)	(20.6)	(0.9)
Literacy classes	7	15	2	14	9	1	17	6	1
	(29.2)	(62.5)	(8.3)	(58.3)	(73.5)	(4.2)	(70)	(25)	(4.2)
	11	4	0	9	5	1	9	6	0
	(73.3)	(26.7)	(0)	(60)	(33)	(6.7)	(60)	(40)	(0)
<u>Working status</u>									
Employed	254	336	5	278	278	39	462	129	4
	(42.7)	(56.5)	(0.8)	(46.7)	(46.7)	(6.6)	(77.6)	(21.7)	(0.7)
Unemployed	143	145	1	126	130	33	223	60	6
	(49.5)	(50.2)	(0.3)	(43.6)	(45)	(11.4)	(77.2)	(20.8)	(2.1)
Student	9	20	0	9	20	0	24	5	0
	(31)	(69)	(0)	(31)	(69)	(0)	(82.8)	(17.2)	(0)
Self-employed or business owner	11	13	0	12	12	0	18	6	0
	(45.8)	(54.2)	(0)	(50)	(50)	(0)	(75)	(25)	(0)
Retired	60	46	0	61	43	2	85	21	0
	(56.6)	(43.4)	(0)	(57.5)	(40.6)	(1.9)	(80.2)	(19.8)	(0)

the other hand, a good score (78%) was seen in the practice of respondents as shown in Figure 2.

Table 2 and 3 summarize the scoring and the correlation between KAP based on gender, nationality, education level and working status. Although female gender is associated with higher knowledge (53.9%) (P = 0.000), male gender is associated with higher attitude and practice (48.5%) (P = 0.024) and (80.3%) (P = 0.028) respectively. Omani nationality is associated with higher knowledge (49.1%) (P = 0.000), and attitude (46.9%) whereas non-Omani nationality is associated with higher practice (85.3%) (P = 0.001). Attending a literacy class was associated with higher knowledge (73.3%) (P = 0.000) and attitude (60%) and those who did not attend school showed higher practice (97.6%) (P = 0.009). In addition to that, retirees showed higher knowledge and attitude (56.6% and 57.5%) (P = 0.020 and 0.024) respectively in comparison to those who were employed.

Good knowledge scores were associated with female gender, being of Omani nationality, attending literacy classes and being retired. Good attitude was not statistically significantly associated with any parameter. Good practice was associated with male gender, being non-Omani and not attending school.

A correlation between different domains of the questionnaire was assessed. A positive correlation was observed between knowledge and attitude, while a negative correlation was noted between knowledge and practice as seen in Table 4.

Source of information

While 46% of the respondents heard about TB for the first time from friends, neighbors and colleagues; teachers (21%) and television (11%) were the other common sources of information. Health care workers comprised only 6% as a source. In terms of social media, WhatsApp (2%) was the most predominant source of information among other sources. (Supplementary Material – S1)

Forty-nine percent of the respondents thought that different social media modalities could most effectively reach people with information on TB as shown in Figure 3 with WhatsApp being the preferred modality (17%) followed by Instagram for Omanis and Facebook for non-Omanis.

Discussion

Despite the Omani population’s high knowledge of TB, our study showed that the overall KAP score is fair. In addition, there was an equal score of good and fair attitudes. For example, a question about the seriousness of acquiring TB can be scored as good if answered as very serious, scored fair if answered somewhat serious or scored poor if answered not very serious. Another example is the attitude question which asks respondents how a person with TB is treated by the community. Answers were that most people reject him or her (poor); most people are friendly, but they generally avoid him or her (fair); and the community mostly supports and helps him or her (good). In fact, a fair category was added to further elaborate on weaknesses to make it easy to be tackled by education and awareness later. Otherwise, the fair score could be regarded as good as the respondents demonstrated partial favorable knowledge and attitudes.

Gender differences in TB knowledge and practice have been reported by several studies conducted in China’s rural population, and in Ghana and India where women tend to have less knowledge about TB compared to men (Wang et al, 2008; Zhang et al, 2007; Boah et al, 2021; Sreeramareddy et al 2013). In contrast to these studies, our study revealed that women demonstrated higher levels of knowledge than men did, the same finding was observed among females from Pakistan (Khan et al, 2020). This could be related

Table 3 The correlation between knowledge, attitude, practice, and different factors.

Factors	KnowledgeNumber / Mean rank / P value	AttitudeNumber / Mean rank / P value	PracticeNumber / Mean rank / P value
Gender			
Male	493	533	530
Female	564	494	499
Nationality			
Omani	543	527	511
Non-Omani	463	516	564
Education level			
No school	423	555	42
Elementary	451	520	179
High school	528	533	361
College	189	189	512
Higher education	588	515	526
Religious school	415	24	482
Literacy classes	667	15	431
working status			
Employed	505	524	521
Unemployed	542	495	517
Student	29	29	29
Self-employee or business owner	524	558	24
Retired	580	589	106

Table 4

The association between KAP.

Variables	Spearman's RHO	test P value
Knowledge, attitude	- 0.75	0.016*
Knowledge, practice	- 0.155	0.000*
Attitude, practice	- 0.51	0.102

* Statistically significant at $p < 0.05$

to the increased educational levels among females in our country. Additionally, during the past 10 years, there has been an increase in exposure to media supported by the revolution of smartphones and other devices; hence, there has been a significant rise in the utilization of such devices in social media as an easy access source for health education materials. However, that higher level of knowledge was not translated into a higher level of practice among women.

Although Omanis showed a higher knowledge score, non-nationals demonstrated a higher practice score. Similar findings were found from a recent study from Saudi Arabia (Alkulaib et al, 2017). This could be explained by the countries of origin of this population as many come from TB high incidence countries where awareness is high among the general population thus reflected in good practice (Al Yaquobi et al, 2018).

As inferred by the responses to attitude questions, the level of stigma toward TB patients seems to be low; however, attitudes need to improve to offer support to TB patients, not just acceptance. This finding was opposite to what was reported by another study done in Gambia in which unfavorable attitudes, including avoiding patients with TB, was predominant (77%) (Bashorun et al, 2020).

In comparison to unsatisfactory practice toward TB reported from Mecha District communities in Ethiopia, where only 48% had good practice regarding the prevention of TB, our study demonstrated a good score in the area of practice (78%) (Kasa et al, 2019).

Our study showed a statistically significant association between better knowledge and a decreased level of education unlike the finding from the Gambian study which showed the biggest effect coming from secondary school and above in which teachers were the second greatest source of information (21%) (Bashorun et al, 2020). Suggesting that schools retained significance as a source of information thus can be utilized to enhance public awareness early in life (Bashorun et al, 2020). Our study demonstrates the modernization effect of shifting toward social media utilization as a desirable source of information on TB compared to the traditional sources.

To our knowledge, this is the first nationally representative population study that investigated KAP with respect to TB in Oman. Strengths of the study include randomization through NCSI. In addition, the study represented populations from all governorates and included both nationals and non-national residents of Oman. On the other hand, the lack of participation from people who did not speak one of the three languages offered could be considered a limitation.

This KAP survey reveals the misconceptions and the misunderstandings that may represent a potential barrier for behavioral change required to implement the planned activities toward TB elimination in Oman. This makes the awareness-raising process easier so that it is directed at changing specific misconceptions. Additionally, the results of this KAP study suggests an intervention strategy that reflects specific local circumstances and the influencing cultural factors thus leading to plan activities that are suited to the respective population involved. Moreover, this data can and will be utilized as a baseline for any future assessments to help measure the effectiveness of health education activities and the ability to change health-related behaviors. Despite the above-

mentioned benefits of this KAP study, future studies using in-depth interviews and discussions with the same population groups would be more informative.

Conclusions

Despite all efforts by the Ministry of Health, more must be done to raise TB knowledge toward preferable attitudes and practice among the public. Interventions to improve TB KAP are required as part of Oman's End TB strategy to speed up the reduction rate of TB in the country. Utilization of different resources, especially digital platforms for knowledge dissemination, should consider the diversity of the composition of the community, including the presence of expatriates.

Transparency declaration

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Author contributions

Conceptualization Sulien Al Khalili, Fatma Al Yaquobi, Bader Al Abri, Khalsa Al Thuhli, Bader Al Rawahi, Seif Al-Abri.

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Ethical standards

Ethical approval was obtained from the Center of Studies and Research at the Ministry of Health. Verbal informed consent was obtained from all the participants after an explanation of the study purpose and the confidentiality of the information.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.ijid.2022.06.002](https://doi.org/10.1016/j.ijid.2022.06.002).

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