Estimation of Knowledge, attitude, and practices of Tuberculosis among Tuberculosis Patients in Penang: A prospective study

Abstract

Background: A clear understanding of knowledge, attitudes, and practices (KAP) of tuberculosis (TB) patients is important to encourage patients' contribution to TB prevention and control. Appropriate knowledge, positive attitude, preventing transmission and early diagnosis of TB are key factors in improving patient outcomes.

Objective: This study aimed to investigate the knowledge, attitude, and practices about TB and determine related influencing factors.

Methodology: A cross-sectional study based on a validated structured tool using Cochrane sampling was conducted among TB patients more than 18 years of age. Descriptive statistics were used to summarize socio-demographic characteristics and TB knowledge, attitude, and practices level. To compare scores of each domain with various demographic factors, the Kruskal Wallis H test was applied.

Results: Total participants in the study were 337. Of these, 231(68.5%) were male and 106(31.5%) were females with a mean age of 46.5±17.1 years. A significant difference was observed between males and females TB knowledge and practices concerning age. Patients with ≥ 12 years of educational background profoundly have better knowledge.

Conclusion: Overall, TB patients have shown encouraging results of the study, but poor attitudes and practicing behaviors are observed among TB patients. More extensive strategies should be developed to enhance the campaign of awareness programs among TB patients to improve preventing behavior towards disease.

Keywords: Knowledge, attitude and practices, tuberculosis, Malaysia.

Introduction

Tuberculosis (TB) is a disease of poverty, and financial torment, discrimination, stigma, and prejudice are often faced by the people who suffered from TB [1]. In Malaysia, TB is a significant health problem with the current incidence rate of 92 per 100,000 and the mortality rate of 4.1 per 100,000 population annually [2]. TB incidence rate has reduced worldwide by 2% yearly from 2000 to 2015 after the advent of the End TB strategy [3]. However, this slow rate of decline is not sufficient to control the TB pandemic in the Asian region. In Malaysia, the decrease in TB incidence has stalled from 90 per 100,000 population in 2015 to 92 per 100,000 population in 2019.

TB continues to be 2nd dominant cause of deaths attributable to a single infection disease ranking above HIV. WHO reported 1.4 million deaths among HIV-negative people and an additional 0.35 million deaths from HIV-associated TB in 2019 [1]. Appropriate and in-time TB diagnosis and adequate management facilities can perform a major role in monitoring and controlling TB endemic. To minimize TB incidence and to achieve the target of the End TB Strategy, it is necessary to recognize and manage primary and secondary TB cases along with appropriate awareness among communities.

One of the most important predictors of poor health is a lack of awareness and education followed by insufficient utilization of health care services, low degree of disease screening, maladaptive disease prevention behavior [4], [5] and encouragement towards various alternates for their healthcare-seeking [6] which in turns is associated with increased noncompliance of treatment rate [7], [8]. Knowledge, attitude, and practices (KAP) work has long been the primary educational treatment strategy for monitoring any disease globally [4]. Literature has shown that KAPs are linked to successful disease control and improvement of an individual's health [9].

Methods

Study settings and population source

The present study was conducted in the respiratory clinic of Hospital Palau Pinang; a public sector tertiary care hospital that covers a large proportion of the Penang state population in Northern Malaysia. Geographically, it occupies a large area and is one of the rapidly growing largest urbanized states with the highest population density of 1.767 million. Hence, researching this sole public sector hospital reflects the true picture of state data. The study was carried out from January to September 2019. All qualifying candidates were ≥18 years of age, literate, and can comprehend Malay or English. Study participants were newly diagnosed TB patients with clinical and radiological evidence. Patients with physical or cognitive impairment that prevent them from being able to answer the questions were excluded. The treatment protocol of TB patients enrolled in this study has been previously reported [10], [11].

Sample size and sampling technique

The required sample size was determined by visualizing the TB prevalence rate in Malaysia which is 92 in 100,000 population. The sample size was calculated by using the Cochrane

formula based on the assumption of 95% confidence interval, 5% margin of error, and 10% non-respondent rate in our estimate, a total calculated sample was 430. Nevertheless, 337 patients show their consent as a part of this study. Other patients refused to participate because of lack of time, lack of interest, and language barrier. Finally, the data were collected from all the eligible respondents.

Comment [WC1]: What data of the respondents? Education level? Salary? Or else?

Development of data collection tool

The questionnaire has been intended to assess the level of knowledge, attitude, and practices towards TB among patients. The data collection tool for TB knowledge, attitude, and practices containing 16 questions was designed after an extensive review of available literature related to the topic [12], [13] and based on current Malaysian National Tuberculosis Program (NTP) guidelines. The questionnaire was in English language and translated into the Malay language by linguistic experts and then forward and backward translation was done.

The forward translation was done from the English language to the Malay language to produce a version that was semantically and conceptually as close as to the original version.

Backward translation was done from Malay to the English language by another translator. The translated version was pre-tested among 10 physicians, 10 nurses, and 10 medical academia experts and was finally updated as recommended by experts. All domains of scales displayed good internal consistency. The reliability coefficient of the TB tool was 0.72, which was within the acceptable limits (Cronbach's $\alpha > 0.7$). During the pre-test, the questionnaire was evaluated for its clarity, accuracy, reliability, the sensitivity of the subject matter, and cultural acceptability in the region.

Before distributing the questionnaire, written consent for participating in this study was taken from each patient. The questionnaire was self-administered to patients according to their ease of understanding and took at least 15-20 min to complete without any external assistance.

Scoring of TB knowledge attitude and practices questionnaire

The patient's demographics and medication history were collected. TB questionnaire contains a total of 16 questions comprised of three domains, including 7 questions for knowledge of TB, 6 questions about the attitude towards TB, and 3 questions regarding practices of TB. Each domain has multiple choices and participants could choose the most suitable answer for given questions based on their knowledge and experience?. The frequency of correct and incorrect answers was recorded for the knowledge domain while in the case of attitude and practices positive behavior was considered as the correct answer and negative approach was taken as an incorrect answer.

Data collection

After the data has been processed and modified, all responses were entered and analyzed in SPSS. Before data entry, manual data cleaning checks were used to identify unreadable marks on questionnaires, blank questions, and wrong coding. After completing the manual check process, frequencies were presented for each response and evaluated for the presence of missing responses. Descriptive statistics using frequency distribution tables were calculated to summarize socio-demographic characteristics and the level of knowledge, attitude, and practices concerning TB. To compare scores of each domain with various demographic factors, the inferential statistics, i.e., Kruskal Wallis H test was applied.

Results:

Demographic and clinical characteristics of the participants:

Total 337 TB patients responded to the questionnaire. Of these, 231(68.5%) were male and 106(31.5%) were females with a mean age of 46.5±17.1 years. The majority of participants (56.7%) were living in rural areas. Most of them reported being currently married 233(69.1%). For the level of education, 268(79.5%) have ≤ 12 years of education. The proportion of employment was high 245(72.7%) but the majority of participants 208(61.7%) had low income (>2000 RM).

Comment [WC2]: Logically, the low income should be noted less than certain amount of money, not more than

Table 1 Demographical characteristics of the study sample

Characteristics	Patients n=337(%)
Gender	
Male	231(68.5)
Female	106(31.5)
Mean age± S.D (years)	46.5±17.1
Age range	
18-35	92(27.4)
35-50	103(30.5)
50-65	90(26.7)
>65	52(15.4)
Race	
Malay	137(40.6)
Chinese	152(45.2)
Indians	37(11)
Others	11(3.2)
Education	
No formal education	25(7.4)
≤ 12 years	268(79.5)
>12 years	44(13.1)
Smoking	
Yes	188(55.7)
No	149(44.3)
Residence	
Rural	191(56.7)
Urban	146(43.3)
Income Level	
< 2000	208(61.7)
3000-5000	129(38.3)
Marital Status	
Single	72(21.4)
Married	233(69.1)

Comment [WC3]: What is the basis in grouping the respondent's education level?

Divorce	32(9.5)
Employment Status	
No	92(27.3)
Yes	245(72.7)
Hospital visitors	
General people	312(92.6)
Prisoners	25(6.4)

Comment [WC4]: No information about the respondent's job?

Knowledge of TB

Knowledge about the cause, symptoms, mode of transmission, prevention, and treatment of TB are discussed in detail in Table 2. Around 229(68.0%) TB patients answered "bacteria/ germs" as a cause of TB. For TB knowledge about the signs and symptoms of TB cough, > 3 weeks 244(72.4%) was the most commonly mentioned symptom of TB followed by weight loss 64.30%, shortness of breath 35.6%, and chest pain 30.50%. The majority of patients 281(83.4%) knew that TB is a curable disease. When inquired about pulmonary TB treatment duration, 266(78.9%) choose 6 months in response. The most frequently mentioned possible source of transmission was air droplet 236(70%). Some people also mentioned sharing feeding utensils, handshaking, sharing regular use things, and others as a model of TB transmission. In the case of preventive measures for TB, 178(52.8%) choose covering mouth and nose.

Comment [WC5]: Specific percentage?

Table 2. Assessment of patient's Knowledge towards Tuberculosis

Variables	Patients n=337(%)
A. Knowledge of TB	
Cause of TB	
Bacteria/ germs	229(68.0)
Smoking	59(17.5)
Dust	7(2.1)
Malnutrition	2(0.6)
Cold air	9(2.7)
Don't know	31(9.2)
Source of information to know about TB	

Newspaper and electronic Media (TV, Radio)	153(45.4)
Family	47(13.9)
Friends and colleagues	179(53.1)
Health workers	184(54.5)
Most common Sign /Symptom of TB	
Chest pain	103(30.5)
Cough > 3 weeks	244(72.4)
Shortness of breath	120(35.6)
Weight loss	217(64.3)
Fatigue and fever	91(27.0)
Don't know	29(8.6)
TB is a curable disease	
No	31(9.2)
Yes	281(83.4)
Don't know	25(7.4)
Duration of Pulmonary TB	
3 months	11(3.3)
6 months	266(78.9)
9 months	11(3.3)
More than 9 months	20(5.9)
Don't know	29(8.6)
~~source~~ Source of TB transmission	
Air droplet (sneezing and coughing)	236(70.0)
Shake handing	13(3.9)
Sharing foodstuff and dishes	16(4.7)
Sharing regular use things	7(2.1)
Unhygienic work	8(2.4)
Don't know	57(16.9)
Prevent from TB disease	
Good nutrition	26(7.7)
Avoid sharing foodstuff and pots	79(23.4)
Covering mouth and nose	178(52.8)
Using separate room	18(5.3)
Don't know	36(10.7)

Attitude towards TB

Attitude towards TB disease in the current study area is summarized in Table 3. Among the study population, 142(42.1%) declared TB as an extremely serious disease while more than half of the study participants 161(47.8%) took it as a serious disease. Regarding the selection

institution for treatment, 304(90%) preferred public sector hospitals. 285(84.6%) started TB treatment early and 52(15.4%) were delayed treatment, where the most prevalent reason for delayed treatment was "cannot leave work". About their reaction, if they had TB 119(35.5%), the patient's response was "shocked".

Table 3. Assessment of patient's attitude towards Tuberculosis

Attitude towards TB	
TB is a serious disease	
Strongly agree	142(42.1)
Agree	161(47.8)
Disagree	8(2.4)
Don't know	26(7.7)
Prefer for TB cure	
Private TB clinic	27(8.0)
Public hospital	304(90.2)
Pharmacy	0(0)
Traditional healer	3(0.9)
Self-treatment	3(0.9)
Symptoms of having TB	
By persistent coughing	181(53.7)
Sputum with blood	41(12.2)
Loss of appetite	12(3.6)
Fever and fatigue	28(8.3)
Come to hospital for another disease	75(22.3)
Reaction to know about TB diagnosis	
Fear	77(22.8)
Shocked	119(35.3)
Embarrassed	15(4.5)
Depressed	58(17.2)
Angry	25(7.4)
No any feelings	43(12.8)
TB treatment start	
Right after diagnosis	285(84.6)
Delayed	52(15.4)
Reasons ~~of~~ for delayed treatment	
Cannot leave work	14(4.2)
Health facilities too far	8(2.4)
Transportation problem	10(3.0)
Cost	5(1.5)
Don't know where to go	5(1.5)
Frightened to know if something worse	6(1.8)

Any other reason	4(1.2)
Not applicable on participants	285(84.6)

Practices towards TB

About 163(48.4%) of the participants desire to help other TB patients, while 100(29.7%) tend to stay away. They were also asked how a person who has TB is usually regarded/treated in their family and 228(67.7%) of them reported caring response by the family. On inquiring about their fear after getting TB, 147(43.6%) complained about "social isolation" and only 36(10.7%) were afraid of income reduction (Table 4).

Table 4 Assessment of practices of patients towards Tuberculosis

Practices towards TB	
Feeling for other TB patients	
Desire to help	163(48.4)
Tend to stay away	100(29.7)
Depression	11(3.3)
No any feelings	63(18.7)
Family members behave with TB patient	
Avoid you	37(11.0)
Separate your utensils	46(13.6)
Caring for you	228(67.7)
Do nothing	26(7.7)
Fear after getting TB	
Family negligence	81(24.0)
Social isolation	147(43.6)
Reduction of income	36(10.7)
Increased financial burden	73(21.7)

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Internal consistency of Malay version of TB knowledge, attitude, and practices tool

Cronbach's alpha test of internal consistency was used for the measurement of reliability for the knowledge assessment data tool. The total standardized Cronbach's alpha as a measure of

reliability was 0.72, which showed good internal consistency of the scale. Each item in the scale shared significantly to the overall reliability coefficient; deleting any of the items decreased the alpha level. The corrected item-with correlation ranged from 0.078 to 0.588 (Table 5). The TB knowledge, attitude, and practices tool ~~was~~ were declared as a reliable instrument to assess the level of knowledge among the TB patients, as Cronbach's alpha value was within acceptable ranges. The test-retest reliability of the Malay version of TB knowledge, attitude, and practices tool were good with an ICC of 0.723, (95% CI: 0.678-0.765; $P < 0.00$).

Table 5 Reliability and validity test of TB scale

TB question No.	Mean ±SD	Corrected Item Total Correlation	Cronbach's Alpha if Item Deleted
Question 1	2.28 ± 2.0	0.430	0.697
Question 2	2.2 ± 1.4	0.279	0.714
Question 3	2.47 ± 1.4	0.448	0.695
Question 4	1.85 ± 0.5	0.588	0.706
Question 5	2.17 ± 1.0	0.397	0.705
Question 6	1.98 ± 1.8	0.369	0.705
Question 7	2.66 ± 1.3	0.394	0.702
Question 8	1.66 ± 0.8	0.465	0.703
Question 9	1.85 ± 0.5	0.385	0.713
Question 10	2.18 ± 1.6	0.263	0.718
Question 11	2.60 ± 1.7	0.574	0.676
Question 12	1.11 ± 0.3	-0.109	0.730
Question 13	7.35 ± 1.8	-0.078	0.766
Question 14	1.84 ± 1.1	0.503	0.694
Question 15	2.47 ± 0.9	0.403	0.705
Question 16	2.18 ± 1.0	0.240	0.717

Discussion:

This study was conducted to assess TB knowledge among TB patients and identifies weak prospects of TB awareness and key areas that need to be strengthened by continuous re-training

of all TB patients. The main findings of this study are based on calculating the correct response of participants a) patient's knowledge regarding TB was comparatively higher than the attitude and practices b) overall attitudes regarding TB disease was positive c) practice competencies were good towards TB.

The current study differs from previously conducted KAP studies [14]–[16] in certain aspects. First, the present study was conducted among TB patients in tertiary care hospitals of the Malaysian state for evaluating their knowledge about TB. Secondly, a scoring system was developed and scores of participants for each domain were analyzed and correlated with various demographic factors.

Demographic characteristics have shown (Table 1) that most of our respondents were Chinese and the majority lie in the age group of 35-50 years. Besides that, 79.5% have ≤ 12 years educational background which is consistent with findings (63.5%) conducted in Malaysia [17]. Unlike our results, another study reported different education statuses in another state of Malaysia [18]. The majority of participants were not well educated. Perhaps the reason behind the good percentage of overall TB knowledge is patient counseling, provided by the two trained staff nurses to all newly diagnosed TB patients under the supervision of a physician, corroborated by other studies [19], [20].

Comment [WC6]: Where can we find the result of the comparison between aspects?

Comment [WC7]: Where can we find the result of the correlation between demographic factor with the KAPs?

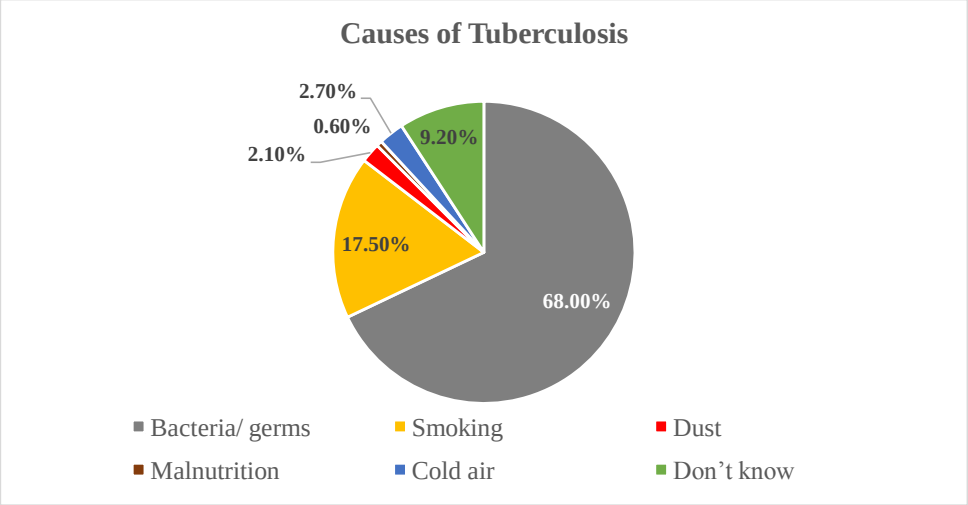

Figure 1 Various responses of causes of TB.

Around 70.0% of total patients knew the correct cause and source of TB infection, figure 1. While 17.5% considered smoking as a reason for TB. In line with our findings, 60.0% reported bacteria as the cause of TB [21] and conflicted with our findings another study reported 9.9% of participants knew Bacteria as a cause of TB [22].

Comment [WC8]: Any explanation on this pro and contra results?

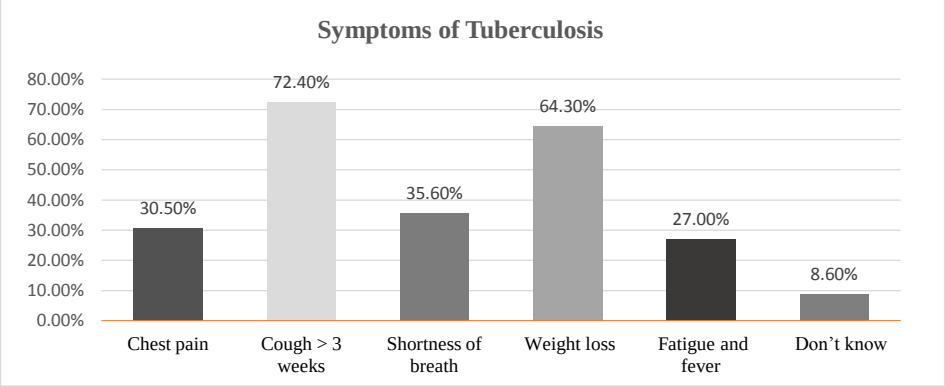

Figure 2 Patient's response to symptoms of TB.

Based on the current study findings, the participants had basic awareness about TB knowledge scale particularly (cause of disease, sign symptoms of disease, the transmission of disease, and prevention of disease, treatment duration). In the current study, 72.40% of patients knew cough for more than 3 weeks is one of the symptoms of TB infection. Fact that cough is mentioned as a common symptom of TB is significant as it would make a positive impact on the health-seeking behavior of the person. The finding is corresponding to the study in Ethiopia –[15] and contradicted the study conducted in China [23].

In this study, 90.0% of the patients preferred public hospitals for treatment. The selection of the public sector for treatment might be because of free TB treatment facilities, responsible surveillance team pursuing non-compliance to medication, and serious monitoring of the patient for successful treatment rate and strict implementation of directly observed treatment (DOT) strategy. These findings are also supported by the earlier studies in Ethiopia where 71% [15] and 48% [24] patients preferred government health units for treatment some whereas. Around 83.4% of patients knew TB is a curable disease and 70.0% were aware of the absolute mode of TB transmission. Another study conducted in Ethiopia reported 79.9% knew the correct mode of acquiring TB [25]. Similarly, the patients attributed casual interaction such as eating together or sharing foodstuff and utensils with the infected individual as the source of transmission. About 52.8% knew how to prevent TB disease.

Previous research has documented that stigmatization towards TB is often reported by fear of social isolation [26]. Similar to current results (Table 3) social isolation was the leading threat of patients [27]. Hence, healthy workers need to address these misconceptions and disseminate accurate information to patients, as ignorance may promote stigmatization and social isolation of

Comment [WC9]: Any further explanation?

Comment [WC10]: Not mentioned in the questionnaire?

Comment [WC11]: Any further explanantion?

Comment [WC12]: Please support the argumentation for the findings

those diagnosed with TB. Lack of knowledge about transmission routes of TB may also provoke TB stigma.

Table 6 Mean score of knowledge, attitude, and practices of TB ~~with respect to~~concerning demographics characteristics (n=337).

Characteristics	Knowledge score (Mean rank)	*P-value*	Attitude score (Mean rank)	*P-value*	Practices score (Mean rank)	*P-value*
Gender						
Male	158.6	**<0.001**	168.1	0.80	158.8	**0.01**
Female	191.5		170.7		186.0	
Age (years)						
18-35	187.7	**0.04**	169.9	0.56	173.6	0.48
35-50	155.0		159.4		167.4	
50-65	176.4		177.7		171.4	
>65	150.6		171.2		150.4	
Ethnicity						
Malay	174.3	0.22	176.7	0.18	169.7	0.80
Chinese	166.7		158.0		168.3	
Indian	175.1		175.8		163.6	
Others	113.4		200.6		142.0	
Residence						
Rural	171.3	0.60	172.1	0.46	162.0	0.21
	165.9		164.8		174.5	
Income level						
Low	168.4	0.91	173.3	0.26	171.5	0.30
High	169.8		162.0		160.8	
Education						
No formal education	101.7	**< 0.001**	154.6	0.71	174.8	0.75
<12 years	170.2		170.3		165.6	
≥12 years	200.43		168.7		174.8	

Comment [WC13]: Define low and high income!

The mean score of TB knowledge was significantly higher (P-value <0.001) in the current study (Table 6). The knowledge proportion regarding TB among female TB patients was good. In line

with our results, studies reported TB knowledge levels (68%) [14] and 54% [15]. The attitude towards TB disease was also portrayed positively because of good knowledge of TB disease which resembles other studies showing a positive attitude, 57.1% [15]. TB was perceived as a serious disease by 89.9% of the patients (Table 3) similar to earlier research 55.4% [15] and 84% [12].

The findings of this study strongly indicate that further programs for the community focused on increasing public awareness and critical interventions are compulsory to improve the Knowledge, attitudes, and practices towards TB disease. Meanwhile, to ensure the success of the national TB program, the authorities such as the federal ministry of health, regional health offices, and non-governmental organizations (NGOs) should give priority attention towards disseminating TB guidelines. On the other hand, utilization of the media can play an essential role in teaching the people, as well as health education programs to increase communities' understanding about tuberculosis are required. Current study findings can be used as scientific evidence to help design and provide effective health education in clinical settings.

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A limitation inherent in most KAP studies is the cross-sectional study design and convenience sampling technique used to recruit the participants that could have created some bias. The present study was conducted in limited resources. Future studies need to include a more extensive sample of TB patients from different health centers and tertiary hospitals in Penang to explore more accurate and in-depth results. In addition, lack of focus group discussions, which could have been used to interpolate the findings, lacked information about MDR TB.

Conclusion:

In general, the TB patients had basic knowledge, despite that, a substantial number of patients have perceived that good nutrition and avoided sharing foodstuff and use the separate room as a

preventing measure of TB. Therefore, health education strategy and awareness programs among TB patients might bring significant change in their knowledge especially about transmission, preventive measures to improve the family and community behavior with TB patients.

Comment [WC14]: In conclusion, the author should write a summary of the findings and the achievement of the new research objectives, closing with the impact of this research.

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical approval

The study was approved by the Medical Research Ethics Committee (MREC), Ministry of Health, and Malaysia (Registration ID: NMRR-18-1145-40397; MREC reference: dim. KKM/NIHSEC P18-1198(6).

Consent for publication:

Not applicable

References

Comment [WC15]: Please add more updated citations

[1] World Health Organization, "Global tuberculosis report 2020: executive summary," 2020.

[2] W. H. O. WHO, "Tuberculosis (TB)," 2019. https://www.who.int/news-room/fact-sheets/detail/tuberculosis (accessed Oct. 26, 2019).

[3] A. O. Bashorun *et al.*, "Knowledge, attitude and practice towards tuberculosis in Gambia: a nation-wide cross-sectional survey," *BMC Public Health*, vol. 20, no. 1, pp. 1–13, 2020.

[4] Y. Fan *et al.*, "Development and psychometric testing of the Knowledge, Attitudes and Practices (KAP) questionnaire among student Tuberculosis (TB) Patients (STBP-KAPQ) in China," *BMC Infect. Dis.*, vol. 18, no. 1, p. 213, 2018.

[5] F. Gimenez-Sanchez *et al.*, "Treating cardiovascular disease with antimicrobial agents: a survey of knowledge, attitudes, and practices among physicians in the United States," *Clin. Infect. Dis.*, vol. 33, no. 2, pp. 171–176, 2001.

[6] G. del C. Á. Gordillo, J. E. D. Jiménez, and D. M. Rosales, "La búsqueda de atención para la tuberculosis en Chiapas, México," *Rev Panam Salud Pública*, vol. 9, no. 5, p. 285, 2001.

[7] I. Putera, T. A. Pakasi, and E. Karyadi, "Knowledge and perception of tuberculosis and the risk to become treatment default among newly diagnosed pulmonary tuberculosis patients treated in primary health care, East Nusa Tenggara: a retrospective study," *BMC Res. Notes*, vol. 8, no. 1, p. 238, 2015.

[8] A. Saifodine, P. S. Gudo, M. Sidat, and J. Black, "Patient and health system delay among patients with pulmonary tuberculosis in Beira city, Mozambique," *BMC Public Health*, vol. 13, no. 1, p. 559, 2013.

[9] E. L. A. Matsumoto-Takahashi, P. Tongol-Rivera, E. A. Villacorte, R. U. Angluben, M. Jimba, and S. Kano, "Patient knowledge on malaria symptoms is a key to promoting universal access of patients to effective malaria treatment in Palawan, the Philippines," *PloS One*, vol. 10, no. 6, p. e0127858, 2015.

[10] F. Ariffin, A. Ahmad Zubaidi, M. Md Yasin, and R. Ishak, "Management of pulmonary tuberculosis in health clinics in the Gombak district: How are we doing so far?," *Malays. Fam. Physician Off. J. Acad. Fam. Physicians Malays.*, vol. 10, no. 1, pp. 26–33, Apr. 2015.

[11] D. S. Selimin, A. Ismail, N. Ahmad, R. Ismail, N. F. Mohd Azman, and A. Azman, "Tuberculosis Treatment Outcome in Patients with TB-HIV Coinfection in Kuala Lumpur, Malaysia," *J. Trop. Med.*, vol. 2021, p. e9923378, May 2021, doi: 10.1155/2021/9923378.

[12] K. Adane, M. Spigt, L. Johanna, D. Noortje, S. F. Abera, and G.-J. Dinant, "Tuberculosis knowledge, attitudes, and practices among northern Ethiopian prisoners: Implications for TB control efforts," *PLOS One*, vol. 12, no. 3, p. e0174692, 2017.

[13] S. Tasnim, A. Rahman, and F. Hoque, "Patient's knowledge and attitude towards tuberculosis in an urban setting," *Pulm. Med.*, vol. 2012, 2012.

[14] A. S. Kasa, A. Minibel, and G. M. Bantie, "Knowledge, attitude and preventive practice towards tuberculosis among clients visiting public health facilities," *BMC Res. Notes*, vol. 12, no. 1, p. 276, 2019.

[15] D. Tolossa, G. Medhin, and M. Legesse, "Community knowledge, attitude, and practices towards tuberculosis in Shinile town, Somali regional state, eastern Ethiopia: a cross-sectional study," *BMC Public Health*, vol. 14, no. 1, p. 804, 2014.

[16] A. Noé *et al.*, "Knowledge, attitudes and practices regarding tuberculosis care among health workers in Southern Mozambique," *BMC Pulm. Med.*, vol. 17, 2017, doi: 10.1186/s12890-016-0344-8.

[17] S. F. M. Salleh, N. A. A. Rahman, N. I. A. Rahman, and M. Haque, "Knowledge, Attitude and Practice towards Tuberculosis among Community of Kulim Municipal Council, Kedah, Malaysia," *Int. Med. J.*, vol. 25, no. 5, pp. 299–303, 2018.

[18] H. A. Rahman, "Knowledge, Attitude and Practice on Tuberculosis (TB) among Community in Kajang, Selangor: A Cross-Sectional Study," *Asia Pac. Environ. Occup. Health J.*, vol. 1, no. 1, 2015.

[19] P. W. Colson, J. Franks, R. Sondengam, Y. Hirsch-Moverman, and W. El-Sadr, "Tuberculosis knowledge, attitudes, and beliefs in foreign-born and US-born patients with latent tuberculosis infection," *J. Immigr. Minor. Health*, vol. 12, no. 6, pp. 859–866, 2010.

[20] N. G. Kigozi, J. C. Heunis, M. C. Engelbrecht, A. P. J. van Rensburg, and H. D. van Rensburg, "Tuberculosis knowledge, attitudes and practices of patients at primary health care facilities in a South African metropolitan: research towards improved health education," *BMC Public Health*, vol. 17, no. 1, p. 795, 2017.

[21] T. Dorji, T. Tshering, and K. Wangdi, "Assessment of knowledge, attitude and practice on tuberculosis among teacher trainees of Samtse College of Education, Bhutan," *PLOS ONE*, vol. 15, no. 11, p. e0241923, Nov. 2020, doi: 10.1371/journal.pone.0241923.

[22] A. T. Angelo, T. E. Geltore, and T. Asega, "Knowledge, Attitude, and Practices Towards Tuberculosis Among Clients Visiting Tepi General Hospital Outpatient Departments, 2019," *Infect. Drug Resist.*, vol. 13, pp. 4559–4568, Dec. 2020, doi: 10.2147/IDR.S287288.

[23] Y. Zhao, J. Ehiri, D. Li, X. Luo, and Y. Li, "A survey of TB knowledge among medical students in Southwest China: is the information reaching the target?," *BMJ Open*, vol. 3, no. 9, p. e003454, 2013.

[24] S. Melaku, H. R. Sharma, and G. A. Alemie, "Pastoralist community's perception of tuberculosis: A quantitative study from Shinille area of Ethiopia," *Tuberc. Res. Treat.*, vol. 2013, 2013.

[25] A. Esmael, I. Ali, M. Agonafir, A. Desale, Z. Yaregal, and 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.*, vol. 88, no. 4, pp. 785–788, Apr. 2013, doi: 10.4269/ajtmh.12-0312.

[26] A. Courtwright and A. N. Turner, "Tuberculosis and Stigmatization: Pathways and Interventions," *Public Health Rep.*, vol. 125, no. Suppl 4, pp. 34–42, 2010.

[27] N. H. Long, E. Johansson, V. K. Diwan, and A. Winkvist, "Fear and social isolation as consequences of tuberculosis in VietNam: a gender analysis," *Health Policy*, vol. 58, no. 1, pp. 69–81, 2001.