



Knowledge, Attitude, and Stigma on Tuberculosis and the Associated Factors for Attitude Among Tuberculosis Contacts in Malaysia

Malezya'daki Tüberküloz Temaslılar Arasında Tüberküloz Konusunda Bilgi, Tutum ve Stigma ve İlişkili Faktörler

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ABSTRACT

Objective: Tuberculosis (TB) is an old disease and it has infected millions of people worldwide. Since it is a highly infectious disease, many people became TB contact due to prolonged exposure to a person with TB infection. This group of people is at a higher risk of getting latent and active TB infection, hence a vulnerable group for active TB screening. This study explored the factors that determined the attitude score, the level of knowledge, attitude, and stigma (KAS) regarding TB disease among TB contact.

Methods: This cross-sectional study used a validated KAS questionnaire, performed among 338 TB contacts from 5 health clinics in Kedah, Malaysia. The respondents were selected via convenience sampling. Simple and multiple linear regressions were used to analyze the data.

Results: The mean KAS scores of participants are 73.5% [standard deviation (SD)=17.06], 83.0% (SD=10.33), and 67.0% (SD=16.72), respectively. Higher income ($p=0.001$), better knowledge score ($p<0.001$), and higher stigma score ($p=0.003$) are the significant associated factors for the attitude score.

Conclusions: This study revealed that most of the TB contacts have good knowledge and constructive attitude toward TB prevention and screening, but their level of stigma on TB is high. The implementation of TB education and intervention programs among TB contacts are required especially among low-income groups.

Keywords: Tuberculosis, TB contact, knowledge, attitude, stigma

ÖZ

Amaç: Tüberküloz (TB) eski bir hastalıktır ve dünya çapında milyonlarca insanı enfekte etmiştir. Oldukça bulaşıcı bir hastalık olduğu için, birçok kişi TB enfeksiyonu olan bir kişiyle uzun süre maruziyetten dolayı TB temaslı olmuştur. Bu gruptaki kişilerin, latent ve aktif TB enfeksiyonuna yakalanma riski daha yüksektir, bu nedenle aktif TB taramasına yatkın bir gruptur. Bu çalışmada, tüberküloz temaslıların tüberküloz hastalığına ilişkin tutum puanını, bilgi, tutum ve stigma (KAS) düzeyini belirleyen faktörler araştırılmıştır.

Yöntemler: Bu kesitsel çalışmada, Malezya, Kedah'taki 5 sağlık kliniğinden 338 TB temaslı arasında uygulanan, doğrulanmış bir KAS anketi kullanıldı. Ankete katılımcılar uygun örnekleme yoluyla seçildi. Verilerin analizinde basit ve çoklu doğrusal regresyonlar kullanıldı.

Bulgular: Katılımcıların ortalama KAS puanları sırasıyla %73,5 [standart sapma (SS)=17,06], %83,0 (SS=10,33) ve %67,0 (SS=16,72) idi. Daha yüksek gelir ($p=0,001$), daha iyi bilgi puanı ($p<0,001$) ve daha yüksek stigma puanı ($p=0,003$), tutum puanı için önemli ilişkili faktörlerdir.

Sonuçlar: Bu çalışma, tüberküloz temaslılarının çoğunun tüberküloz önleme ve taraması konusunda iyi düzeyde bilgiye ve yapıcı tutuma sahip olduğunu, ancak tüberküloza dair stigma düzeylerinin yüksek olduğunu ortaya koydu. Özellikle düşük gelirli gruplarda tüberküloz temaslıları arasında tüberküloz eğitimi ve müdahale programlarının uygulanması gerekmektedir.

Anahtar kelimeler: Tüberküloz, TB teması, bilgi, davranış, stigma

INTRODUCTION

Tuberculosis (TB) is a preventable and in most instances a curable disease. However, this disease still poses a public health crisis worldwide. It is a communicable disease with a high burden toward health economic, particularly in low-and middle-income countries. According to the

World Health Organization (WHO), in 2019, about 10 million people developed TB, and 1.4 million died of it making it one of the top 10 causes of mortality¹. Malaysia has been categorized as a country with an intermediate TB burden, with a TB notification rate of less than 100 cases for every 100,000 population².

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The risk of acquiring TB infection is higher among TB contacts compared with non-contacts, and the rate of infection is highest in the first three years³. 'TB contact investigations' were considered a core activity by the WHO for early identification of active TB, and contact tracing has been implemented in Malaysia to control the transmission of TB^{2,4}.

TB contacts defined as family members living in the same room with the index cases for more than 30 days or family members or other people who lived with smear-positive pulmonary TB cases for more than half a year². A follow-up of TB contacts comprised of four visits with 0-, 3-, 6-, and 12-month interval. Data from 2015 showed that approximately 189,337 (78.2%) of 242,200 contacts were screened during the first visit². This screening program contributes largely toward early recognition of latent TB infection and active TB infection among this group.

In Malaysia, TB control services have undergone substantial changes in the past decade. Nonetheless, the detection of TB cases in Malaysia is still below that estimated by the WHO, in which approximately 6000 cases were still undetected in 2014. Geographically, in 2015, Kedah is among the top 10 Malaysia states with a high TB burden². Therefore, TB knowledge and positive attitude toward TB infection among TB contacts may significantly enhance efforts to prevent further transmission of TB.

Previous research conducted in Malaysia revealed that knowledge and awareness regarding TB infection were poor⁵. The level of knowledge and perceived risk of TB influence the tendency of an individual to seek for care. Poor knowledge on the causative agent, transmission routes, symptoms, and prevention of TB is always related to poor treatment-seeking behaviour⁶. Additionally, healthcare-seeking behavior are correlated with TB-related knowledge and stigmatization⁷. Low levels of knowledge on TB can lead to multiple complications and worse health outcomes and delay health-seeking behavior, subsequently causing lack of adherence, resulting in multidrug resistance, treatment failure and ultimately, death⁸. Hence, knowledge and correct information regarding TB is important to increase the awareness of TB in the population.

Numerous studies were conducted in many parts of the world to explore the level of knowledge, attitude, and stigma regarding TB infection have revealed limited knowledge on the disease among the general population and noted several misconceptions regarding this⁹. Overall, TB-related knowledge and attitude vary across countries, ranging from supportive to highly stigmatized views toward the disease and the patients. Adequate

knowledge and positive attitudes regarding TB must improve health-seeking behavior of the population regarding this infection^{10,11}.

TB is a highly stigmatized disease, which can be encountered at various social settings, such as the home, workplace and the community¹². The stigma has been defined as the situation of individuals who are disqualified from full social acceptance and is a trait that lowers an individual from being a normal person to a tainted one¹³. Stigma negatively impacts the public health approach for early diagnosis and treatment. Additionally, patients conceal their diagnosis from either or both their family members and co-workers due to TB-associated stigma, thus hindering contact tracing and the detection of new cases^{14,15}.

TB contacts are at a risk of developing active TB disease, with most disease diagnosed before or within 3 months after index patient diagnosis. Understanding the perspectives of TB-related knowledge, attitude, and stigma (KAS) among TB contacts was thought to be correlated with health-seeking behavior and early case detection. Therefore, prompt intervention can be provided to treat the disease effectively and improve the overall prognosis.

This study explored the factors that determined the attitude score, the level of KAS regarding TB disease among TB contact.

MATERIALS and METHODS

The study was approved by The Human Research Ethics Committee of Universiti Sains Malaysia (USM/ JEPeM/19030613) and the Medical Research & Ethics Committee, Ministry of Health, Malaysia (NMRR-19-1041-46799-IIR) (date: June 13, 2019).

Study Design

This is a cross-sectional study conducted at five health clinics of Bandar Alor Setar, Kedah from September 2019 until March 2020.

Study Setting

The health clinic of Jalan Putra, health clinic of Simpang Kuala, health clinic of Kuala Kedah and health clinic of Pokok Sena are health clinics with the highest number of TB contacts under the district health office of Kota Setar.

Sample Size Calculation

The sample size chosen was from the biggest sample size calculated on the basis of our study objectives. It

was the objective to determine the level of knowledge of TB among TB contacts. We use a single mean formula with a 95% confidence interval (CI) and a standard deviation of 1.76 based on the knowledge score on TB contact from a study done in Malaysia (Nik Rosmawati and Mohd Zahirudin, 2015). Sample sizes were calculated using various precision, and a sample size of 305 was finally chosen with a precision of 2 while taking into consideration available resources. Anticipating a 10% of non-response rate, a sample size of 338 was decided for this study.

$$n = \frac{[Z_{\alpha/2} \times \sigma]^2}{\Delta^2}$$

Δ^2

n= Minimum sample size required

Z= value at 95% level of significance on standard normal distribution = 1.96

D= detectable difference from population mean

σ = standard deviation

Data Collection Tools and Procedures

Tool

A validated unpublished Malay version of a questionnaire on TB KAS (Rosnani Z, Nik Rosmawati NH, WMZW Mohammad, Universiti Sains Malaysia, 2017) was chosen as a tool in this study due to its relevancy to the study objectives.

The questionnaire consisted of four parts. The first part consisted of the questions on the demographic and medical characteristics of the participants.

The second part of the questionnaire assessed knowledge of TB. It consisted of three subdomains and 25 items that covered general understanding of TB (11 items) and symptoms (9 items) and prevention of TB (5 items). All correct responses will be given score of '1' and the wrong answer or indicate uncertainty will be given of '0'. The total score for knowledge was 25. Those with a higher scores indicate better knowledge regarding TB.

The third part of the questionnaire assessed the participant's attitudes toward TB and people with the disease. It consisted of 5 items on the cognitive and behavioral responses toward TB prevention. A 5-point Likert scale was used to assess the attitude section with the maximum score for the most positive attitude: '5',

strongly agree; '4', agree; '3', unsure; '2', disagree, and '1', strongly disagree. The higher the score, the better was the TB contact's attitude regarding TB itself and toward people with TB infection. All the scores were reversed for negative statements.

The last part assessed stigma toward patients with TB. It consisted of 11 items. We also used a 5-point Likert scale to assess this part with the maximum score for the most stigmatised statement: '5', strongly agree; '4', agree; '3', unsure; '2', disagree and '1', strongly disagree. The maximum score was 55. Negative statement toward stigma was scored in reverse.

Higher scores in this part indicate higher stigma regarding TB.

Participant Recruitment Process

One patient with TB will have at least 10 contacts who were identified by a district health team. They will be given an appointment date to be screened for active TB at the nearest health clinics according to their convenience. The list of all TB contacts will to attend the screening at the health clinics chosen above during the date of our study were reviewed on the basis of the inclusion and exclusion criteria of our study a week before. Inclusion criteria were, adults 18 years old or older, can understand Bahasa Malaysia and TB contacts of index patient within 3 months of diagnosis. The exclusion criteria were non-Malaysian, patient with concomitant infection with human immunodeficiency virus due to the high possibility of added stigma and TB contacts that do not come for TB screening on the date of the appointment given.

We use non-probability sampling method whereby all eligible participants were approached by the researchers to explain regarding the study and obtaining consent on the day of their appointment. Once the participant agreed and completed written consent, the questionnaire was then distributed to the participants. Face-to-face instruction on how to complete the questionnaire was performed by the researcher. The time taken to answer the whole questionnaire was approximately 15-20 min. The investigator waited for the participants to answer the questionnaire and then reviewed each questionnaire to ensure its completeness and the questionnaire were collected on the same day.

Statistical Analysis

The data were analyzed using SPSS software version 24. Descriptive analysis was used to determine the level of knowledge, level of attitude, and level of stigma

toward TB among TB contacts. Categorical variables were presented as frequency and percentage, while numerical variables were presented as the mean and standard deviation if the data were normally distributed and presented as median with interquartile ration if the data was skewed. For the level of KAS, the score was calculated in the percentage format, with the numerator being the sum of correct responses and the denominator being the total score of the items in the knowledge questionnaire.

To identify the determinative factors for attitude score, multiple linear regression was used. The dependent variable was the attitude score expressed in percentage. All clinically significant variables and variables with p-value less than 0.25 from simple linear regression were included in multiple linear regression¹⁶. Confounders in the model were controlled.

In multiple linear regression, variable selection was performed by automatic stepwise, forward, and backward methods. All possible two-way interaction terms and multicollinearity of the variables were checked. The model reasonably fitted well. Model assumptions are met. No interaction between independent variables and no multicollinearity problem.

RESULTS

A total of 345 participants were approached to take part in the study, and 338 participants finished the study, giving a 98.0% response rate. The participants mainly Malay TB contacts (90.2%) with a mean age of 39.86 (12.54) years old.

Male to female participants nearly equals with 48.2% versus 51.8%. 75.7% of the participants were married. 92.6% of the participants have education level of secondary schools and onwards. 67.5% of the participants were working in offices and 32.5% works outdoors or retired.

97.0% of the participants have heard about TB and the sources of the information reported were from reading materials and social media mostly. Other sources include pamphlets /posters, TB exhibitions, and family and friends. Interestingly, the least source of information was from the healthcare worker.

Our participants were mostly healthy, less than 5% had chronic obstructive pulmonary disease or chronic kidney disease, and more than 70% were non-smokers. However, about 12% had comorbidity with diabetes mellitus.

Detailed sociodemographic characteristics and clinical data of the participants are presented in Table 1.

Table 1. Socio-demographic and medical characteristics of the participants (n=338).

Variable	Result
Age in years, mean \pm SD	39.86 (12.54)
Monthly income in RM, mean \pm SD	2515.98 (2100.50)
Gender, n (%)	
Male	163 (48.2)
Female	175 (51.8)
Race, n (%)	
Malay	305 (90.2)
Chinese	25 (7.4)
Indian	2 (0.6)
Others	6 (1.8)
Marital status, n (%)	
Single	72 (21.3)
Married	256 (75.7)
Divorced	10 (3.0)
Religion, n (%)	
Islam	305 (90.2)
Other	33 (9.8)
Education, n (%)	
Primary	25 (7.4)
Secondary onwards	313 (92.6)
Occupation, n (%)	
Non-office	100 (32.5)
Office	228 (67.5)
Heard TB, n (%)	
Yes	328 (97.0)
No	10 (3.0)
History of TB, n (%)	
Family member	118 (34.9)
Non-family member	220 (65.1)
Smoking status, n (%)	
Yes	58 (17.1)
No	251 (74.3)
Ex-smoker	29 (8.6)
Source of info on TB, n (%)	
Social media	77 (22.8)
Reading materials	87 (25.7)
Exhibition	37 (10.9)
Pamphlet/poster	43 (12.7)
Family	28 (8.3)
Friend	39 (11.5)
Healthcare worker	27 (8.0)

Table 1. Continued	
Variable	Result
Diabetes, n (%)	
No	297 (87.9)
Yes	41 (12.1)
COPD, n (%)	
No	328 (97.0)
Yes	10 (3.0)
CKD, n (%)	
No	335 (99.1)
Yes	3 (0.9)
SD: Standard deviation, RM: Ringgit Malaysia, TB: Tuberculosis, COPD: Chronic obstructive pulmonary disease, CKD: Chronic kidney disease	

The mean percentage (SD) for KAS scores toward TB were 73.5% (17.06), 83.0% (10.33), and 67.0% (16.72), respectively. With mean monthly income of RM 2515.98 (SD =2100.50).

Factors Associated with the Attitude Score

The simple linear regression analysis used to predict the factors associated with the attitude score identified 8 variables with p-values less than 0.25. The variables were race, income, heard about TB, smoking, chronic kidney disease, knowledge score, and stigma score variables, and these were included in the next analysis, which is the multiple linear regression, illustrated in Table 2.

The analysis showed that the attitude score was significantly associated with factors namely, knowledge score, stigma score, and monthly income, as illustrated in Table 3. Other variables were not statistically significant.

Income is positively and significantly associated with the attitude score; in every RM 1 increase in income, the attitude score will increase by 0.001 percent (95% CI: 0.00-0.001) when the knowledge and stigma scores were adjusted. The knowledge score is positively and significantly associated with the attitude score. Every percent increase in the knowledge score corresponds to a 0.138 percent rise of the attitude score (95% CI: 0.077-0.199) when income and the stigma score were adjusted. Surprisingly, the stigma score is positively and significantly associated with the attitude score. Every percent increase in stigma score corresponds to a 0.097 percent rise of the attitude score (95% CI: 0.034-0.16) when income and the knowledge score were adjusted.

DISCUSSION

This cross-sectional study intended to assess TB contact' KAS and significant factors that contribute to

their attitude on TB. There are limited studies among TB contact performed in Malaysia. To the best of our knowledge, this is the first cross-sectional study aiming to estimate the level of KAS among TB contacts in a Malaysian population.

Level of Knowledge of Tuberculosis

In this study, the mean percentage for knowledge score among TB contacts was 73.5% indicating that they have a satisfactory level of knowledge with regard to TB. This is good compared to the study done previously among the general population in Malaysia, which revealed, the overall knowledge on TB appears poor⁵.

A cross-sectional study involving 12 health facilities in Brazil and conducted among 138 index cases and 98 contacts found that contact' knowledge about TB transmission and symptoms were satisfactory at 67% and 87%, respectively, which is consistent with our study⁴. Studies on knowledge on TB, particularly among TB contacts, were very limited across the world. A sub-population analysis from a general population study in Ethiopia demonstrated that patients with TB and their families had a higher level of knowledge on TB compared with the general population¹⁷. To date, we found only these two studies that assessed the knowledge of TB among contacts and index cases. Adequate knowledge about TB and its prevention in the community is required as a nationwide response to end TB¹⁸.

In our study, 97% of the respondents were aware and heard of TB. The main sources of information regarding TB were from mass media, which includes radio and television (22.8%), newspaper, magazines and books (25.7%) and pamphlets (12.7%). This can be due to information that can be easily accessed through the internet and electronic media. Only a small portion of our study population acquired information on TB from healthcare workers (8%). Therefore, mass media could be an important tool in the success of passive case findings and treatment for TB⁹.

Studies conducted in many other parts of the world to explore the KAS regarding TB infection have revealed limited knowledge on the disease among the general population and noted several misconceptions regarding this disease⁹.

A study conducted in a population of Saudi Arabia involving 2056 adults showed that the majority of respondents (74.9%) have inadequate knowledge about TB, and only 25.1% have good knowledge regarding TB¹⁹. However, since these studies were performed among the

general population, we need to be cautious in comparing their results with ours.

Overall, TB-related knowledge and attitude vary across countries, ranging from supportive to highly

stigmatized views toward the disease and patient. Adequate knowledge and positive attitudes regarding TB must improve health-seeking behavior of the population in regard to this infection^{10,11}.

Table 2. Associated factors toward attitude score by univariate analysis (n=338).

Variables		Crude OR	95% CI	p-value
Age (year)		-0.001	-0.90, -0.87	0.98
Gender	Male	1	-	-
	Female	-0.67	-2.88, 1.55	0.55
Race	Malay	1	-	-
	Chinese	-0.15	-4.38, 4.08	0.94
	India	-2.87	-17.31, 11.56	0.70
	Other	5.79	-2.59, 14.18	0.18
Marital status	Married	1	-	-
	Single	0.54	-2.17, 3.25	0.70
	Divorced	-2.51	-9.06, 4.06	0.45
Religion	Muslim	1	-	-
	Non-Muslim	0.76	-2.96, 4.49	0.69
Education	Up to primary education	-1.11	-5.33, 3.11	0.61
	Secondary education onward	1	-	-
Occupation	Office	1	-	-
	Non-office	-1.19	-3.54, 1.17	0.32
Income		0.001	0.000, 0.001	<0.001
Heard about TB	Yes	1	-	-
	No	-6.33	-12.83, 0.16	0.056
History of TB	Family member	1	-	-
	Non-family member	0.67	-1.64, 2.99	0.57
Smoking status	Yes	-2.29	-5.24, 0.67	0.13
	Ex-smoker	-1.39	-5.37, 2.59	0.49
	Non-smoker	1	-	-
Source of information on TB	Social media/reading materials/ exhibition/ pamphlet/poster	2.191	-1.92, 6.30	0.296
	Closed contact	0.159	-4.46, 4.78	0.946
	Healthcare worker	1	-	-
Diabetes	No	1	-	-
	Yes	0.31	-3.08, 3.70	0.86
COPD	No	1	-	-
	Yes	0.67	-5.85, 7.20	0.84
CKD	No	1	-	-
	Yes	-9.70	-21.45, 2.05	0.106
Knowledge score		0.16	0.09, 0.22	<0.001
Stigma score		0.12	0.06, 0.19	<0.001

*Statistically significantly associated at $p < 0.05$, Crude OR: Crude odd ratio, TB: Tuberculosis, I: Reference, COPD: Chronic obstructive pulmonary disease, CKD: Chronic kidney disease, CI: Confidence interval

Table 3. Factors associated with attitude score using multivariate analysis (n=338).

Variables	Adjusted regression coefficient	95% CI	t-stat	p-value
Income	0.001	0.000-0.001	3.07	0.001
Knowledge score	0.138	0.077-0.199	4.94	<0.001
Stigma score	0.097	0.034-0.160	2.49	0.003

*Statistically significantly associated at $p < 0.05$, t-stat: t-statistic, CI: Confidence interval
Adjusted regression coefficient = 12.1%
The model reasonably fits well. Model assumptions are met. No interaction between independent variables and no multicollinearity problem

Level of Attitude on Tuberculosis

The TB contacts in this study were found to have positive attitudes toward TB prevention with a mean percentage for attitude score of 83.0%. In a study involving 98 contacts, 43% of them displayed a positive attitude toward TB in which they had performed or would perform tests for TB screening.

A positive attitude toward TB were all shown in studies done among the general population from Africa and Indonesia^{20,21}.

According to another study performed among families of patients with TB, the respondents were supportive of patients with TB within the household and helped the patients adhere to the treatment²².

However, a negative attitude toward TB persists in some societies and can lead to delay in diagnosis and eventually treatment²³. The negative attitude may discourage individuals from actively seeking medical treatment, disclose the status of the disease, and may terminate ongoing treatment²³.

Thus, the importance of attitude evaluation toward TB and its associated factors among this very high-risk group. Different societies and populations have different levels of acceptance toward TB; however, a positive attitude toward TB is important for early diagnosis and prompt treatment¹⁰.

Level of Stigma on Tuberculosis

Our study found that the level of stigma toward the disease among TB contacts is high, with a mean percentage for stigma score of 67.0% (16.72). There is very limited study performed specifically among TB contacts in assessing the level of stigma. A nationwide survey in Ethiopia on TB stigma involving three groups: general population (1783 participants), patients with TB (844 participants), and their families (836 participants) found that the mean stigma score was 18.6 for the general population, 20.5 for families, which we considered as TB contacts, and 21.3 for TB patients¹².

A community-based survey conducted in 30 districts of India reported that 73% of the general population had a stigmatizing attitude toward patients with TB²³. According to a study performed in China, the mean (SD) score of TB-related stigma was 9.07 (5.62), which indicates a high stigma on TB. The results showed that 30.95% of participants had moderate stigma and 19.47% had high stigma on TB²⁴. Compared with other studies done across multiple regions, high stigma was found in studies conducted in central Pakistan, China, and India^{7,25,26}.

The stigma is a social process that cannot be quantified precisely due to its multidimensions and obscure borders. There is no standard method of measurement; some studies use validated stigma scales, whereas others rely only on questionnaires. In view of the methodological differences, it is impossible to make comparisons across studies concerning the magnitude of the stigma on TB.

In a study performed among patients with TB patients in Turkey, they measure stigma level indirectly by assessing patient perception regarding their relation with family members and close friends after being diagnosed with TB. They found that more than half (57.7%) of their patients with TB changed their relationship with their children, (41.4%) with their spouse, (39.1%) with their closest friend in life, and (33.8%) with their own parents²⁷.

Nevertheless, research shows that despite wide variations, TB-related stigma is present in different cultures across nations and interventions on multiple levels needed to reduce it^{15,25}.

Our study in assessing the level of stigma in a way might confer a small benefit to our participants in recognizing their stigma, and perhaps with new information from this study could reduce their stigma level slightly.

Significant Factors That are Associated with the Attitude Score

This research found that income and the knowledge and stigma scores are statistically significant with the attitude score, which means that participants' income

status and knowledge and stigma scores on TB have a strong influence on the attitude score. Participants who have higher knowledge score and higher income had a better attitude toward TB.

These similar findings were also found in the studies in Nigeria and India whereby poverty, no formal education and, low-income status associated inversely with attitude score^{11,26}.

In Nigeria, age and gender were also significantly associated with the attitude toward TB¹¹. The study illustrated that only 44.3% of respondents in the community accepted patients with TB and they were mostly from the rural area¹¹.

Other studies in Nigeria found that literacy status and religion were also significantly associated with attitude toward TB⁶. However, our study did not find these factors to be of significant.

We could not explain the reason why a higher stigma score contributed to a better attitude score in this study, we have searched other studies to find some explanation but did not find a satisfactory reason.

Strengths and Weaknesses

The study strength is that this is the first local study that quantitatively assessed KAS among TB contacts in Malaysia. However, there are some limitations to address. First, a causal relationship cannot be established as a cross-sectional study design was applied. Second, we used a convenience sampling method, in which the selection is based on the participants' attendance to treatment centres. Even though TB contacts were given a date for the screening and follow up, many of them did not come according to the date given and some even defaulted from the follow-up. The majority of the participants were Malays as Malays is the biggest ethnic group in Malaysia; however, it does not represent the whole population of Malaysia, which has other ethnic groups.

The state and local authorities should empower the usage of mass media as the main channel to provide TB-related information to the TB contacts. Further studies should include TB contacts that did not come for TB screening or defaulted follow-up and suggest to apply random sampling in this population. We did not control the number of TB contacts with a patient with TB in this study, and this might create bias. At the time of the analysis, the 15 variables chosen to be included were thought to be medically important and hence they are included. However, our final model showed a 12.1%

variation in the attitude score in the study participants. It may be better to examine the variables that are thought to be determinative with several models in the future study.

TB contacts are the reservoir for TB infection; therefore, good knowledge regarding TB symptoms and treatment is mandatory for early detection and treatment in this vulnerable group. Treatment for latent TB is one of a ways to tackle the TB reservoir issue. Closer monitoring and stricter follow-up and perhaps a stricter law regarding this infectious disease are needed for the country to achieve TB-free in 2035.

CONCLUSION

In conclusion, this study revealed that in general, our TB contacts have sufficient knowledge, constructive attitude however a high stigma regarding TB disease. The stigma toward TB causes a delay in seeking treatment. Therefore, TB stigma needs to be understood within the socio-cultural context to reduce the barriers to TB diagnosis and treatment. This study found that TB contacts with a lower income, will have a poor attitude toward TB. Therefore, more programs to improve healthcare awareness, close monitoring of the follow-up, and defaulter recalled should be carried out more vigorously in this group.

Ethics

Ethics Committee Approval: The study was approved by The Human Research Ethics Committee of Universiti Sains Malaysia (USM/JEPeM/19030613) and the Medical Research & Ethics Committee, Ministry of Health, Malaysia (NMRR-19-1041-46799-IIR) (date: June 13, 2019).

Informed Consent: Once the participant agreed and completed written consent, the questionnaire was then distributed to the participants.

Peer-review: Externally and internally peer-reviewed.

Author Contributions

Surgical and Medical Practices: S.Y.L., R.Z., N.M., Concept: S.Y.L., R.Z., Design: R.Z., N.M., Data Collection and/or Processing: S.Y.L., Analysis and/or Interpretation: S.Y.L., R.Z., N.M., Literature Search: S.Y.L., R.Z., N.M., Writing: S.Y.L., R.Z., N.M.

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