

DEVELOPMENT AND VALIDATION OF A QUESTIONNAIRE ON THE KNOWLEDGE OF TUBERCULOSIS AND THE PERCEPTION OF TUBERCULOSIS TREATMENT AMONG TUBERCULOSIS PATIENTS IN MALAYSIA

Omar Salad Elmi¹, Habsah Hasan², Sarimah Abdullah¹, Mat Zuki Mat Jeab³, Wan-Arfah Nadiyah¹, Zilfalil BA⁴, Nyi Nyi Naing¹

¹ Unit of Biostatistics and Research Methodology, School of Medical Science, Universiti Sains Malaysia, Kelantan, Malaysia

² Department of Medical Microbiology and Parasitology, School of Medical Science, Universiti Sains Malaysia, Kelantan, Malaysia

³ Department of Medicine, Respiratory Clinic, Hospital Raja Perempuan Zainab II Kota Bharu, Kelantan, Malaysia

⁴ Department of Paediatrics, School of Medical Science, Universiti Sains Malaysia, Kelantan, Malaysia

Correspondence to: Omar Salad Elmi (nadara2@yahoo.com)

DOI: 10.5455/ijmsph.2014.110120141

Received Date: 03.01.2014

Accepted Date: 11.02.2014

ABSTRACT

Background: A high level of awareness on tuberculosis (TB) is crucial for the success of the prevention and treatment among the high risk populations. Having a good perception about the treatment of TB may increase the acceptance of the control measures in decreasing the spread of the disease.

Aims & Objective: To develop and validate a Questionnaire about the knowledge of the causes, mode of transmission, the prevention of TB and the perception of TB treatment among TB patients in Malaysia.

Materials and Methods: A Cross-sectional study was conducted among TB patients attended the Respiratory Clinic at the Hospital Raja Perempuan Zainab II, Kelantan, Malaysia. This study used a self-administrated questionnaire that takes approximately 10 minutes to complete and was generally well received by the respondent's. The validation involved content validity, exploratory factor analysis for the construct validity and internal consistency for reliability.

Results: A total of seventy TB patients comprising of 39 males (55.7%) and 31 females (44.3%) responded. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was (0.827 and 0.723) and Bartlett's test of Sphericity was highly significant ($P < 0.001$). The exploratory factor analysis was used with the extraction method of the principal component and the varimax rotation with normalization. The factor analysis showed six factors within the 28 items which were associated with TB knowledge, the cause and prevention, the mode of transmission and the perception of TB treatment. The internal consistency was [0.893, 0.552, 0.701 and 0.729] for the four factors of TB knowledge and [0.889 and 0.697] 2 factors for the perception of TB treatment respectively.

Conclusion: The questionnaire on TB knowledge, on the causes, the mode of transmission, and the prevention of TB and the perception of TB treatment was valid and reliable with good items that enables its use for assessing TB knowledge among TB patients and the community.

Key Words: Validity; Reliability; Questionnaire; TB Knowledge; Malaysia

Introduction

Tuberculosis (TB) is one of the most serious public health problems in the low and middle-income countries as well as developed countries. The number of TB cases is increasing, especially within countries where HIV infection is pandemic.^[1] It has been estimated that one-third of the world's population has TB infection, and 9.4 million people are affected annually with approximately 2 million deaths. In South-East Asia, 3 million TB cases occur every year.^[1]

The incidence rate in Malaysia has been increasing from 64.7 per 100,000 populations in year 2000. In the last ten years, the absolute number of new TB cases in the country increased from 15,875 in 2005 to 20,666 in 2011.^[2] Risk factors for the exposure to TB differ from those for the disease development and the increase in new TB cases has been attributed to the emergence of HIV/AIDS and the migration from countries with a high burden of TB.^[3] Previous studies reported that poverty and lack of knowledge of the causes, mode of transmission, prevention

and perception of treatment as well as appropriate treatment are considered as the most important risk factors for exposure to TB^[4,5], in addition to that knowledge about the complications and prevention of any disease is important in order to optimize prevention, enhance treatment, avoid transmission and improve the quality of life.^[5,8] Studies indicated that delay in seeking care among TB patients is common in many developing countries.^[9] The majority of TB patients are first treated by traditional healers/herbalists before they attend healthcare facilities. Delays in seeking care for TB have been linked to stigma in some places; the disease is considered 'dirty' and mainly affects poor people.^[10,11]

In Nepal, delay in seeking healthcare was reported among women in comparison to men with TB.^[12] Studies conducted in Vietnam showed that women with pulmonary TB were diagnosed an average of 2 weeks later than men due to delays caused by the healthcare provider. The gender differences in health seeking behaviour were

associated with a fear of social isolation, economic constraints and the poor quality of health services.^[13,14]

Knowledge and awareness of TB is essential for successful prevention and treatment among vulnerable groups. Therefore, having a valid tool for the assessment of TB knowledge and the perception of TB treatment among the patients and the community is necessary to control the patients.

Materials and Methods

A cross sectional study was conducted among TB patients at a Respiratory Specialist clinic, the Hospital Raja Perempuan Zainab II, Kelantan, Malaysia. Patients who visited this clinic as outpatients and those who were admitted to the Hospital who met the inclusion criteria were invited to participate in the study. The Study recruitment was done from 15th April to 29th August 2012. The study duration was period of five months. The sampling method used in this study was simple random sampling method. The researcher who conducted this study obtained a list of all TB patients who were put under DOST at Respiratory Specialist Chest Clinic Hospital HPRZII. The list of those patients were numbered and also mark and patients was selected randomly.

Patients were eligible if they were confirmed with and were receiving treatment for pulmonary or extra pulmonary TB. The exclusion criteria included patients with non-confirmed M. tuberculosis, TB patient who had completed their treatment, patients who were not able to answer the questionnaire independently, very ill patients and patients who could not read and write. The study was explained to the respondents verbally before they were enrolled into the study and a signed informed consent form was obtained from the patients before they were given the questionnaire.

Developing the Questionnaire (Item Pool)

Data on the knowledge of the cause, prevention, and transmission of TB and the perception of TB treatment was collected. The questionnaire was divided into two main sections: (1) Knowledge; and (2) The perception of TB. Items for knowledge have four domains which include general knowledge, mode of transmission, causes and prevention. Items for perception contain two domains; aversion to treatment and a negative perception towards TB treatment. Some items were taken from previously published questionnaires^[15,16], while others were generated from literature with expert advice from a chest physician and statistician where necessary.

It is believed that this process served to maximize the content validity of the questionnaire so that the items selected were representative of the area of knowledge being measured. Using this pool of items, two reviews were carried out by a panel, which included a microbiologist and a statistician to select the best items for clarity of the questions, accuracy of the TB knowledge being tapped, and interpretability.

The questionnaire was translated from English into Malay and vice versa. The Malay version of questionnaire was used as final questionnaire to collect the data. This study used a self-administered method that took approximately 10 minutes to complete the questionnaire and was generally well received by the respondents. The questionnaire consisted of closed ended questions. There were a total of six questions, (1) general awareness of TB; (2) knowledge of the cause(s) of TB; (3) prevention of TB; (4) mode of TB transmission; (5) aversion to TB treatment; and (6) negative perception towards TB treatment, were asked. Socio demographic characteristics studied included age, gender, race and marital status, number of household members, level of education, occupational status and monthly income of the respondents'.

Ethical Approval

The study was approved by the Human Ethics Committee at the Hospital University Sains Malaysia [ref no: USMCK/PPP/JEJeM/243.3,(4.1)] and the Medical Research Ethics Committee, Malaysia in the Ministry of Health Malaysia (NMRR No:12-90-10809). In this study we strictly ensure the confidentiality of the study respondents'.

Factor Analysis

A Statistical Package for Social Sciences (SPSS) version 18.0.1 (IBM Corporation, New York, USA) was used for the data entry and the data analysis. The data were double checked and cleaned to verify the entire variable was properly documented and to detect any missing or erroneous values during data entry.

The factor analysis was done to determine the construct validity of the questionnaire. Kaiser-Meyer-Olkin measure of the sampling adequacy (KMO) and Bartlett's test of the sphericity was done for sampling adequacy.^[18,19] The sample was considered adequate if the KMO value was more than 0.5 and Bartlett's test was significant ($P < .001$). The Principal Component Analysis (PCA) method for the component extraction was used. Components with Eigen values of over one were retained as components. When the assumptions of all items were uncorrelated with

each other, the varimax rotation with Kaiser normalization was applied in order to optimize the loading factor of each item on the extracted components. Items with a loading factor of more than plus or minus 0.3 were considered as an acceptable loading factor and items below 0.3 were deleted.^[17,18] After completion of the construct validity, the reliability (internal consistency) for each item was tested.

Reliability Analysis

Reliability refers to an instrument's capacity to give consistent results when used or in other words refers to the stability of the consistency.^[18] In this study the internal consistency (IC) of the items was measured by using Cronbach's alpha coefficient. For an assessment on reliability, statistical reliability of individual items was applied. Items with a corrected item total correlation value of more than 0.3 were selected and items with a corrected-item total correlation value of less than 0.3 were deleted.

The Cronbach's alpha was used if the item deleted value could determine which item highly contributed to the reliability of the questionnaire. If the Cronbach's alpha value for those items deleted decreased, it would indicate that the items highly contributed to the alpha value and it has biological meaning with the domains, if the Cronbach's alpha value for those items deleted increased, it would indicate that the items poorly contributed to the alpha value. The items of the Questionnaire were considered to represent a measure of good internal consistency if the total of Cronbach's alpha value was more than 0.6.^[17,18]

Results

The demographic characteristics of this study are shown in Table 1. A total of 70 TB patients which comprised of 39 male patients (55.7%) and 31 female patients (44.3%) were recruited. The majority of the respondents' were Malay (66, 94.3%) followed by Chinese (3, 4.3%) and secondary school (37, 52.9%). Nearly two thirds of the study respondents' (19, 27.1%) were unemployed and 33(47.1%) had a family income of less than RM 675. Eighteen percent of the respondents learned about TB from their family, friends, neighbours and colleagues. More than half (43, 61.4%) of the studies respondents' mentioned that the newspaper and magazines were the most effective source of information reaching the people regarding information on TB.

Results of Factor and Reliability Analyses

The questionnaire had corrected items and a total correlation of more than 0.3 from Q2 – Q9 (corrected items

total correlation, 0.546, 0.656, 0.804, 0.620, 0.812, 0.817, 0.563, and 0.546 respectively. The items that had a high Cronbach alpha value, which means they highly contributed to the items, if those items were deleted, the Cronbach alpha value would have decreased from 0.889 to 0.856 accordingly. On the other hand questions Q1 and Q10 had corrected items and a total correlation of 0.457 and 0.434 respectively. They contributed poorly to the Cronbach alpha value; if those items were deleted, the Cronbach alpha value will be increased from (0.889 and 0.697) to (0.890 and 0.700) accordingly.

Table-1: Demographic and socio economic characteristics of TB patients (n = 70)

	Characteristics	N (%)	Mean (SD)
Gender	Male	39 (55.7)	
	Female	31 (44.3)	
	Age		44.49 (18.56)
Race	Malay	66 (94.3)	
	Chinese	3 (4.3)	
	Other	1 (1.4)	
Marital Status	Single	20 (28.6)	
	Married	44 (62.9)	
	Widower	4 (6.2)	
	Divorced	2 (2.9)	
	Number of Household Members		5.65 (2.70)
Educational Level	No formal education	10 (14.3)	
	Primary	9 (12.9)	
	Secondary	37 (52.9)	
	Diploma	8 (11.4)	
	Degree and above	6 (8.6)	
Occupational Level	Government employee	14 (20.0)	
	Private employee	8 (11.4)	
	Self employed	17 (24.2)	
	Housewife	10 (14.3)	
	Unemployed	19 (27.1)	
Monthly Income (in RM)	< 675	33 (47.1)	
	675-1000	12 (17.1)	
	1001-2000	4 (5.7)	
	2001-3000	6 (8.6)	
	>3000	5 (7.1)	
General Knowledge of TB			
Heard about Tuberculosis	Yes	52 (74.3)	
	No	14 (20.0)	
First Time Learned about TB?	Radio	18 (25.7)	
	TV	2 (2.9)	
	Billboards	12 (17.1)	
	Printed materials (Brochures, posters etc.)	1 (1.4)	
Acquire Information about TB	Health care workers	6 (8.6)	
	Family, friends, neighbours and colleagues	13 (18.6)	
	Religious leaders	8 (11.4)	
	Others	1 (1.4)	
Most Effective Source of Information about TB	Yes	58 (82.9)	
	No	8 (11.4)	
Most Effective Source of Information about TB	Newspaper & Magazines	43 (61.4)	
	Radio	6 (8.6)	
	TV	9 (12.9)	
	Billboards	1 (1.4)	
	Healthcare workers	2 (2.9)	
	Family, friends, neighbours and colleagues	2 (2.9)	
	Religious leaders	5 (7.1)	
	Others	1 (1.4)	

Table-2: Factor and reliability analysis for questionnaire on the perception of TB treatment (n=70)

Domain and Items	Corrected Item- Total Correlation	Total Cronbach's Alpha if Item Deleted	Factor	Cronbach's Alpha
Domain 1 Aversion against treatment				
Q1,1- I am afraid that I will be told I am TB Positive	0.547	0.890	0.705	0.889
Q1,2 - I am afraid that people will talk about my visit to the clinic	0.546	0.888	0.863	
Q1,3 - I don't want to cough into the specimen bottle	0.656	0.879	0.545	
Q1,4 - I am afraid that TB treatment will interfere my social life	0.804	0.858	0.860	
Q1,5 - There are long queues at the clinic	0.62	0.881	0.786	
Q1,6 - I am afraid that I will lose my job/ income	0.812	0.856	0.860	
Q1,7- I am afraid that TB treatment will be unpleased and difficult	0.817	0.856	0.865	
Domain 2 Negative Perception of TB treatment				
Q2,1 - I perceive that TB treatment can take at least one year	0.563	0.541	0.549	0.697
Q2,2 - I perceive that I can die from TB if I do not take my drug regularly	0.546	0.562	0.903	
Q2,3 - I perceive that there is no cure at present for drug resistance TB	0.434	0.700	0.703	

Table-3: Factor and reliability analysis for knowledge (General knowledge, mode of transmission, knowledge on infection) (n=70)

Items & Domains	Corrected Item- Total Correlation	Total Cronbach's Alpha if Item Deleted	Factor	Cronbach's Alpha
Q1 In your opinion who can be infected with TB (General Knowledge about TB Infection)				
Q1,1 - Only homeless people	0.737	0.871	0.870	0.893
Q1,2-Only alcoholic people	0.814	0.859	0.862	
Q1,3 Only people who have been in prison	0.777	0.865	0.831	
Q1,4-Only poor people	0.645	0.886	0.830	
Q1,5-Only drug users	0.683	0.879	0.699	
Q1,6-Only people living with HIV/AIDS	0.638	0.886	0.638	
Q2 How Someone get TB (Knowledge about TB causes)				
Q2,1-Shaking hands with someone with TB	0.448	0.302	0.772	0.552
Q2,2-Through touching items in public places (door knobs, handless in transportation)	0.430	0.337	0.661	
Q2,3- Through Germs in the air when a person with TB coughs or sneezes	0.429	0.601	0.403	
Q2,4 By inhaling TB germs in the Air	0.471	0.560	0.526	
Q3 How TB can be Transmitted (Knowledge about TB Transmission)				
Q3,1-Sharing food	0.575	0.501	0.821	0.662
Q3,2-Eating from same plate	0.514	0.544	0.789	
Q3,3-By sexual intercourse with TB patients	0.429	0.605	0.552	
Q3,4-Sharing cigarette with infected TB	0.270	0.701	0.871	
Q4- How can a person prevent TB (Knowledge about TB prevention)				
Q4,1 By having BCG Vaccination	0.269	0.729	0.702	0.638
Q4,2 Covering mouth and nose when TB patients is coughing	0.549	0.517	0.689	
Q4,3 -Covering mouth and nose when the TB patients sneezing	0.496	0.477	0.662	
Total $\alpha = 0.751$				

Table-4: Deleted items from table 3 (Factor and Reliability Analysis)

Items	Corrected ItemTotal Correlation	Total Cronbach's Alpha if Item is Deleted	Cronbach's Alpha
Q3 How can a person get TB			
Q3,1 - Sharing food	0.660	0.427	0.701
Q3,2 - Eating from the same plate	0.534	0.587	
Q3,3 - By sexual intercourse with TB patients	0.377	0.776	
Q4- How can a person prevent TB			
Q4,1 - Covering the mouth and nose when TB patients are coughing	0.638	0.528	0.729
Q4,2 - Covering the mouth and nose when the TB patients are sneezing	0.604	0.577	
Q4,3 - By inhaling TB germs in the air	0.442	0.762	
Total $\alpha = 0.751$			

As shown in Table 3, question Q1 (Q1,1 - Q1,6) had a corrected items total correlation which is more than 0.34. These questions had a corrected items total correlation (0.737, 0.814, 0.777, 0.645, 0.683 and 0.636 respectively) which highly contributed to the Cronbach's alpha value; if those items were deleted, the Cronbach's alpha would be decreased from 0.893 to 0.886. On other hand, some questions (Q3,4 and Q4,1) had corrected items and a total correlation: (0.270 and 0.296 respectively) which is less than 0.3. These two items need to be eliminated due to poor the Cronbach alpha, therefore if these items were deleted the Cronbach alpha would be increased from

(0.662 and 0.638) to (0.701 and 0.729) respectively. The total Cronbach alpha of these items was 0.751 and it was generally considered to represent a measure of high internal consistency of the questionnaire regarding knowledge, cause, prevention and mode of transmission of TB among TB patients.

The deleted questionnaire from Table 3 is shown in Table 4. The questionnaire had shown the corrected items total Cronbach value which is more than 0.3 from Q3,1 to Q4,3 and highly contributed to the alpha value. If these items were deleted, the biological meaning and/or parsimony of

the result will be changed; it may be statistically significant but has a different meaning.

Discussion

Knowledge and awareness of TB is essential for successful prevention and treatment among vulnerable groups. Therefore, having a valid tool for the assessment of TB knowledge and the perception of TB treatment among the patients and the community is necessary to control the spread of the disease. A newly structured questionnaire was developed to assess the TB knowledge and perception of TB treatment. This present study describes the validity and reliability of the questionnaire. The result of this study shows that more males are infected with TB than the females. A similar finding was reported in a survey of TB knowledge conducted among the Sudanese.^[19]

The majority of our respondents had finished the secondary level, unlike the previous study, that reported the majority of their respondents' having an educational level below the secondary level.^[3] Our finding shows that the majority of the respondents' are low income earners and it has been reported that people from the low income background, mostly from low economic countries, are the ones mostly affected by TB.^[3]

From this study, factor analysis showed that the 28 items from the questionnaire were loaded in 6 domains which comprised of four factors for knowledge and two factors for perception. After the extraction methods were applied, all the items fitted very well according to their groups as all the items had a loading factor of more than 0.3^[20,21], where those with less than 0.3 and did not have a biological meaning were deleted.

The sample for this analysis was adequate as found by the KMO value (0.827, 0723) for knowledge and perception respectively and the Bartlett's test of Sphericity being significant (p -value < 0.001). Finally those items concluded that the questionnaire had a good construct validity and it is evident that the instrument measured what it should measure. The reliability analysis shows that only two items of knowledge were deleted from total items corrected and the correlation was very low (less than 0.3). If those items were deleted the Cronbach alpha value will increase. The items were "Sharing cigarettes with infected TB" and "by having a BCG vaccination". It is believed that smoking cigarettes is one of the risk factors for TB.

The second item on "BCG vaccination" was probably due to a misunderstanding of the term BCG on the questionnaire. Roy et al (1985) reported that a low literacy level has been

regarded as a major factor in the lack of knowledge of the BCG vaccination.^[22] However, Koay et al (2004) reported a different finding in the Kudat District, Sabah, Malaysia. They mentioned that the majority of their respondents' had a good knowledge of the BCG vaccination being a preventive measure against TB.^[3,23] The item 'BCG vaccination' was deleted from the questionnaire because of a low Cronbach's alpha value.

The reliability analysis for the section on perception shows that the majority of the items had acceptable value measures. Only two items were deleted from the section; if those items were not deleted the Cronbach alpha value would have decreased.

The items "I am afraid that I will be told that I am TB Positive" and "I perceive that there is no cure at present for drug-resistance of tuberculosis (MDR-TB)" were deleted. This might be due to their strong belief that people will talk badly about them when they are going to the clinic or people may say they are TB positive. This is suggestive of a stigma within the community where most people think that it is disrespectful to have the TB infection.^[23,24]

Social factors play an important role in the management of TB patients. The stigma associated with the disease often leads to a delay in seeking treatment and poor adherence to the treatment.^[24] June et al (2010) reported a similar finding that people who were diagnosed as having the TB infection thought that society will talk badly of them. The person might also hide their TB infection status for fear of what others may say. They also think that people who acquire TB through drinking and smoking are getting what they deserve and that TB patients are less respected within the community.^[23]

The second reason for deletion in the second items "I perceive there is no cure at present for MDR-TB may be due to a misunderstanding; some of the respondents' who have low knowledge of TB may not understand the medical term "MDR-TB". At the same time people who believe that TB is a curable disease increases the health care seeking behaviour. This was also consistent with the findings of many other studies which has been reported.^[23,25] A similar finding was reported by Mohamed A, et al, (2007), in a national survey study conducted in Pakistan that more than 90% respondents' believed that TB is a treatable disease. The majority of the respondents' did not respond to the question that there is no cure for TB.^[26] This is perhaps due to the high level of awareness of the respondents' that believed that TB is a curable disease. Another similar finding was supported by those studies from Kenya, Indian and Pakistan.^[26-28] In addition, it may

be due to the individual respondent's during the questionnaire. Furthermore, bias may occur when answering the questionnaire based on their common sense or perception. Therefore items on the perception section were acceptable and it is able to measure the level of perception.

A total of 26 out of the 45 items were acceptable which is more than half the total of the items. Thirty five items for knowledge were acceptable. More than half of the items^[16] were eliminated. Eight out the 10 question for perception were accepted. Most of the deleted items were related to knowledge, the cause of TB, prevention, and the mode of transmission. This is probably due to poor understanding of the content of the question or not answering the question honestly despite of their knowledge.

The limitation of this study was that factor analysis was used for the reliability and validity, however, it is recommended that a confirmatory factor analysis should be conducted in the future to measure the knowledge of TB and the perception towards TB treatment.

Conclusion

The questionnaire on the knowledge of TB and the perception of the TB treatment was valid with good reliability and can be used to measure knowledge and perception of TB infection, treatment and prevention in the patients as well as the community.

ACKNOWLEDGEMENT

The authors of this study wish to thank the Ministry of Health, Malaysia, particularly the officers and health staff of the Respiratory Specialist Clinic at the HRPZII, for their assistance during this study. We would like to send our deepest thanks to all the participants who participated in this study for taking time to fill in the questionnaire. My gratitude to Adamu Ahmed Rufaci for his help of the overall manuscript management. This study was supported by the Research University Grant number 1001/PPSP812098 at the USM.

References

- World Health Organization. Global Tuberculosis Control. WHO. 2010.
- Glaziou P, Floyd K, Raviglione M. Global burden and epidemiology of tuberculosis. *Clin Chest Med*. 2009, 30(4):621-636, vii.
- Koay TK. Knowledge and attitudes towards tuberculosis among the people living in Kudat District, Sabah, Malaysia. *Med J Malaysia*. 2004, 59(4):502-511.
- Brennan PJ. Tuberculosis in the context of emerging and reemerging diseases. *FEMS Immunol Med Microbiol*. 1997, 18(4):263-269.
- Lienhardt C. From exposure to disease: the role of environmental factors in susceptibility to and development of tuberculosis. *Epidemiol Rev*. 2001, 23(2):288-301.
- Jaramillo E. The impact of media-based health education on tuberculosis diagnosis in Cali, Colombia. *Health Policy Plan*. 2001, 16(1):68-73.
- Auer C, Sarol J, Jr., Tanner M, Weiss M. Health seeking and perceived causes of tuberculosis among patients in Manila, Philippines. *Trop Med Int Health*. 2000, 5(9):648-656.
- Hoa NP, Chuc NT, Thorson A. Knowledge, attitudes, and practices about tuberculosis and choice of communication channels in a rural community in Vietnam. *Health policy (Amsterdam, Netherlands)*. 2009, 90(1):8-12.
- Zhang T, Liu X, Bromley H, Tang S. Perceptions of tuberculosis and health seeking behaviour in rural Inner Mongolia, China. *Health policy (Amsterdam, Netherlands)*. 2007, 81(2-3):155-165.
- Yamasaki-Nakagawa M, Ozasa K, Yamada N, Osuga K, Shimouchi A, Ishikawa N, Bam DS, Mori T. Gender difference in delays to diagnosis and health care seeking behaviour in a rural area of Nepal. *Int J Tuberc Lung Dis*. 2001, 5(1):24-31.
- Okeke TA, Aguwa EN. Evaluation of the implementation of directly observed treatment short course by private medical practitioners in the management of tuberculosis in Enugu, Nigeria. *Tanzan Health Res Bull*. 2006, 8:86-89.
- Begum V, de Colombani P, Das Gupta S, Salim AH, Hussain H, Pietroni M, Rahman S, Pahan D, Borgdorff MW. Tuberculosis and patient gender in Bangladesh: sex differences in diagnosis and treatment outcome. *Int J Tuberc Lung Dis*. 2001, 5(7):604-610.
- Thorson A, Diwan VK. Gender inequalities in tuberculosis: aspects of infection, notification rates, and compliance. *Curr Opin Pulm Med*. 2001, 7(3):165-169.
- Johansson E, Diwan VK, Huong ND, Ahlberg BM. Staff and patient attitudes to tuberculosis and compliance with treatment: an exploratory study in a district in Vietnam. *Int J Tuberc Lung Dis*. 1996, 7(2):178-183.
- Jenkins D. Tuberculosis: the native Indian viewpoint on its prevention, diagnosis, and treatment. *Prev med*. 1977, 6(4):545-555.
- World Health Organization. Advocacy, communication and social mobilization for TB control: a guide to developing knowledge, attitude and practice surveys. WHO. 2008.
- DeCoster J. Data analysis in SPSS. Available from URL: <http://www.bama.ua.edu/~py602/spss%202005%2009-21.pdf> [Retrieved on 14th Oct 2008]
- Field A. *Discovering statistics using SPSS*. 2nd ed. London: Sage, 2005.
- Mohamed A, Yousif MA, Ottoa P, Bayoumi A. Knowledge of Tuberculosis: A survey among Tuberculosis patients in Omdurman. *Sudanese J Pub Health*. 2007, 2:21-28.
- Streiner LD, Norman GR. *Health measurement scales: a practical guide to their development and use*. 3rd ed. New York: Oxford University Press, 2003.
- Downing SM. Reliability: on the reproducibility of assessment data. *Med educ*. 2004, 38(9):1006-1012.
- Abramson JH. *Survey methods in community medicine, Epidemiological Studies*. 4th ed. London: Churchill Livingstone, 1990.
- Kelly P. Isolation and stigma: the experience of patients with active tuberculosis. *J Community Health Nurs*. 1999, 16(4):233-241.
- Roy RN. Systemic health education of tuberculosis patients and of the population. *Bull Int Union Tuberc Lung Dis*. 1985, 60.
- Grange J, Story A, Zumla A. Tuberculosis in disadvantaged groups. *Curr Opin Pulm Med*. 2001, 7(3):160-164.
- Agboatwalla M, Kazi GN, Shah SK, Tariq M. Gender perspectives on knowledge and practices regarding tuberculosis in urban and rural areas in Pakistan. *East. Mediterr. Health J*. 2003, 9(4):732-740.
- Nair DM, George A, Chacko KT. Tuberculosis in Bombay: new insights from poor urban patients. *Health policy plan*. 1997, 12(1):77-85.
- Liefooghe R, Baliddawa JB, Kipruto EM, Vermeire C, De Munynck AO. From their own perspective. A Kenyan community's perception of tuberculosis. *Trop Med Int Health*. 1997, 2(8):809-821.

Cite this article as: Elmi OS, Hasan H, Abdullah S, Jeab MZM, Nadiyah WA, Zilfalil BA, et al. Development and validation of a questionnaire on the knowledge of tuberculosis and the perception of tuberculosis treatment among tuberculosis patients in Malaysia. *Int J Med Sci Public Health* 2014;3:352-357.
Source of Support: Nil
Conflict of interest: None declared