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Knowledge of Doctors in Ministry of Health Facilities on Clinical Practice Guidelines Management of Tuberculosis (3rd Edition) in Malaysia

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Clinical Practice Guidelines (CPG) Management of Tuberculosis (3rd edition) provides evidence-based guidance to standardise the management of tuberculosis (TB) at all levels of health care setting in Malaysia. Having adequate knowledge in the management of the disease is a prerequisite in ensuring quality care. This study aimed to investigate the level of knowledge of this CPG among medical officers and specialists in public hospitals as well as health clinics in Selangor state of Malaysia. Of the total 465 respondents only 28% demonstrate good level of knowledge based on the 40 test questions. However, the proportion of doctors showing good level of CPG knowledge increased to 74.9% for 'must know" questions. Higher percentage of doctors with good knowledge of tuberculosis was observed among doctors at specialist level and those who worked in health clinics. Doctors who were involved in managing TB patients and attended TB training had better level of knowledge.

Keywords: Tuberculosis; Public health; CPG; Malaysia

I. INTRODUCTION

Tuberculosis (TB) remains a public health concern both globally and in Malaysia. Worldwide, in 2014, TB caused 1.5 million deaths (0.4 million among HIV-positive patient) and it affected 9.6 million people, with 12% of these new TB cases were HIV-positive (WHO 2015). Tuberculosis is a main contributor to the burden of disease in low- and middle-income countries (Corbett *et al.*, 2016). In Malaysia, TB cases continues to rise and leading to high morbidity and mortality rates (Ministry of Health 2012). The incidence in Malaysia was 82.1 per 100,000 population in year 2014 (TBIS 2015). The state of Sabah recorded the highest prevalence of TB cases in Malaysia (TBIS 2015; Iyawoo 2004; Dony 2004). It was followed by Selangor with an increasing trend been demonstrated, 4148 cases in 2013,

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4365 cases in 2014 and 4429 cases in 2015 (TBIS 2015). This problem worsens with the HIV pandemic, neglect towards the disease and high movement of population both local and internationally (Ministry of Health 2012).

Although TB is curable, it remains one of the world's biggest threats (WHO 2015). Late presentation, inaccurate diagnosis, inappropriate treatment, and high treatment default rates (e.g. in immigrants and children) are some of the issues in the management of TB (Ministry of Health 2012). Incomplete treatment in patients with TB may lead prolonged infectiousness, relapse and death in individuals (Munro *et al.*, 2007). Poor adherence also contributes to drug resistance which has important public health consequences (Karumbi *et al.*, 2015). Detection and treatment gaps in TB must be addressed to reduce this burden (WHO 2015). One of important element for TB control strategy to succeed is appropriate management of suspected persons and patients with TB by healthcare providers. They play a vital role in the TB management programme and hence require adequate knowledge, attitudes and skills in the effective management of TB (Hoa *et al.*, 2005). Having adequate knowledge in the management of the disease is a prerequisite in ensuring quality care will be given to patients by practicing recommendations stipulated in the guideline.

CPG Management of TB (3rd edition) was published in 2012 and disseminated nationwide. This CPG provides evidence-based guidance to standardise the management of patient with TB in Malaysia specifically in the treatment, diagnosis, screening, prevention and referral for patients with confirmed TB, suspected TB and including latent TB infection (Ministry of Health, 2012). The national training of core-trainer session has been conducted in 2013 involving core-trainers from every state which then was followed by subsequent echo-training by these core trainers. In 2015, a total of 4236 healthcare providers from all categories were reported to have been trained on this CPG. Utilisation survey conducted on this CPG demonstrated proportion of utilization was 81.6% among doctors from selected Ministry of Health healthcare facilities. However, knowledge of the target users which includes primary care doctors, physicians and those who are involved in managing these cases remain uncertain.

This study was carried out to investigate the level of knowledge of this CPG among them in selected Ministry of Health (MOH) healthcare facilities. This acted as a part of evaluation to assess the effectiveness of CPG implementation and facilitate its ongoing use. Specific objectives of the study were to determine the level of knowledge of doctors on CPG Management of TB (3rd edition) by categories (Specialists, Medical Officers), to compare the level of knowledge of doctors in different types of healthcare facilities (health clinics, hospitals) and to determine the factors associated with the level of knowledge of doctors on CPG Management of TB (3rd edition).

II. MATERIALS AND METHOD

A. Study Population and Sampling

A cross sectional study was conducted from February to October 2016 among medical officers (MOs) and specialists in health clinics and public hospitals in Selangor. For hospitals, doctors from the Medical and Paediatric Departments including TB/Chest clinic were involved. For health clinics, MO and Family Medicine Specialists were involved. Doctors from 1Malaysia clinics and District Health Office as well as house officers were not included in the study.

A proportionate multistage random sampling stratified by health facilities was used for recruitment of study participants. This sampling method was chosen to ensure representativeness of the sample. Based on current doctors' population of 4100 in Selangor (from Human Resources Unit, Selangor State Health Department 2015) and assumption of doctors' level of knowledge on CPG TB were at least 50%, the sample size was calculated using design effect of 1. Considering the possibility of 20% non-response rate, the minimum sample size required was 457 doctors.

B. Instrument

A validated self-administered questionnaire (CPG Knowledge Study Feedback Form) was used for data collection. The questionnaire used close ended questions. It was divided into two sections (refer Appendix 1). Section A consisted of demographic details of participant while section B consisted of knowledge questions in true or false form, adopted from the CPG Management of TB (3rd edition) Training Module test questions. The knowledge questions were divided into eight topics on management of TB with five sub-questions in

each topic. The eight topics included pulmonary TB treatment, extrapulmonary TB, latent TB infection, paediatric and maternal TB, TB-HIV co-infection, common adverse drug reactions, management of common adverse drug reactions and TB control.

Level of knowledge was grouped into two; good or poor. Those who answered correctly for all five sub-questions in a topic was grouped as having good level of knowledge, while those answered wrongly for at least one question was grouped as having poor level of knowledge. Altogether there were 40 sub-questions from eight topics assessed in this study. Out of those, 24 sub-questions were selected as "must know" questions.

Table 1. List of knowledge statement used in the questionnaire

1. Pulmonary TB treatment (PTB)
1.1. More than 2 months antiTB treatment interruption in maintenance phase requires restarting treatment if total dose patient completed is <80% (true)
1.2. *Six-month antiTB treatment duration is adequate for smear positive pulmonary TB (PTB) (true)
1.3. Maintenance regimen three times per week can only be performed under direct supervision (true)
1.4. *Fixed-dose combination is preferred to separate-drugs combination in improving adherence to antiTB treatment (true)
1.5. *Directly observed therapy must be performed by a healthcare worker only (false)
2. Extrapulmonary TB
2.1. *Six-month antiTB regimen is adequate in the treatment of TB meningitis & spine (false)
2.2. *In principle, at least 6 months of antiTB treatment is recommended in TB lymphadenitis & ocular TB (true)
2.3. In all miliary TB, 6-month antiTB treatment is adequate (false)
2.4. Corticosteroids are important in the treatment of TB pericarditis & meningitis (true)
2.5. Corticosteroids are beneficial in pleural and peritoneal TB (false)
3. Latent TB infection
3.1. *Chest radiograph is typically normal (true)
3.2. *Patients usually have mild symptoms (false)
3.3. *Mantoux test of at least 10mm is required to make the diagnosis in HIV-infected patients (false)
3.4. Interferon-Gamma Release Assays are more specific than Mantoux test in identifying latent TB infection (LTBI) (true)
3.5. Diagnosis is established when Mycobacterium tuberculosis is isolated from sputum culture but not on direct smear (false)
4. Regarding paediatric and maternal TB
4.1. *Most children with PTB are sputum smear positive (false)
4.2. The risk of active TB after exposure is higher for infants & young children under 5 years than older children (true)
4.3. *Sputum TB culture should be done together with sputum smear for the diagnosis of PTB (true)
4.4. Ethambutol cannot be used in children (false)
4.5. *Streptomycin must be avoided in pregnant mothers (true)
5. Concerning TB-HIV co-infection
5.1. Patients with HIV & EPTB may have concomitant PTB (true)
5.2. *Isoniazid prophylaxis therapy for 6 months should be offered to HIV patients after ruling out active TB (true)
5.3. *If CD4 <50 cells/µl, initiate Highly Active Antiretroviral Therapy 2 weeks after starting intensive phase of antiTB treatment (true)
5.4. TB-immune Reconstitution Inflammatory Syndrome rarely occurs in patients with CD4 <50 cells/µl (false)
5.5. *Co-trimoxazole preventive therapy should be initiated as soon as possible & given throughout TB treatment (true)
6. Common adverse drug reactions
6.1. Adverse events occur more commonly during maintenance phase (false)

6.2. *Patients developing pruritus after commencing antiTB therapy should have their therapy discontinued immediately (false)
6.3. *Among all first-line antiTB drugs, rifampicin is the most common cause of Drug-Induced Hepatitis (DIH) (false)
6.4. *In asymptomatic patients who develop DIH during treatment, antiTB must be stopped if alanine aminotransferase is 3 times upper limit of normal (false)
6.5. Symptoms suggestive of optic neuritis need to be elicited in patients taking ethambutol at each clinic visit (true)
7. Management of common adverse drug reactions
7.1. *Patients who remain sputum smear positive for AFB after 2 months of treatment should be referred to specialists with experience in TB management (true)
7.2. *Nephropathy is a common complication of isoniazid therapy (false)
7.3. In patients clinically responding well to TB treatment, it is mandatory to repeat chest x-ray (CXR) & sputum acid fast bacilli at 4 months (false)
7.4. *In patients who have successfully completed TB treatment, it is routine to follow them up for at least one year (false)
7.5. All cases of TB lymphadenitis need to be referred to specialist for management (false)
8. Regarding TB control
8.1. *Every TB case should be tested for Human Immunodeficiency Virus (HIV) (true)
8.2. *Bidirectional screening for diabetes & TB leads to detection of more diabetes and TB cases (true)
8.3. Children with TB usually acquire their disease from another child with TB (false)
8.4. *Close contacts of a sputum positive case should be given BCG vaccination (false)
8.5. *Personal protective equipment is adequate to protect healthcare providers from TB (false)

*highlighted rows represent critical questions that doctors are expected to know ('must know' questions)

C. Ethical Approval

This study was registered with National Medical Research Register (NMRR ID Ref: 16-764-30744) and approved by the MOH Medical Research and Ethics Committee. Permission was also obtained from the State Health Director to conduct study at the selected public hospitals/clinics.

D. Data Collection

A total of 500 questionnaires were distributed from 30 May 2016 to 30 June 2016. Questionnaires were delivered by appointed study coordinator to participants in several sittings in two weeks in each facility. Each study participant was required to complete the questionnaire within 20-30 minutes under supervision. Completed questionnaires were collected and returned for data analysis.

E. Statistical Analysis

The completed questionnaires were checked and entered statistical software by trained personnel. Statistical tests were conducted at 5% significance level using Stata version 13 and the IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp. Descriptive and bivariate analysis were conducted. Exposure variables were described according to its frequency and percentage. Chi-square statistics was used to measure the association between categorical variables.

III. RESULT

A. Characteristics of Participants

The study involved 20 public healthcare facilities in Selangor which comprised of 11 government hospitals and 9 district health centres (known as Pejabat Kesihatan Daerah, PKD, in Malay). A total of 465 doctors participated in this study (36.9% from hospitals and 63.1% from health clinics).

Mean age of participants was 33.2 years (standard deviation

(SD) =5.1, range=25-56). A total of 337 participants (72.5%) were female doctors and 126 participants (27.1%) were male doctors. Two participants (0.4%) did not document their gender. Majority of participants were MOs (84.3%). The remaining participants were specialist. Mean length of service of participants was 7.4 years (SD=4.5, range 0-30) and mean duration in current posting was 3.3 years (SD=2.8, range= 0-15). Large proportion of participants worked in outpatient/health clinics (63.4%), followed with Medical Department (22.8%) and Paediatric Department (13.8%). Among the participants, 299 participants (64.3%) did not attend any training on CPG Management of TB. However, 425 participants (91.4%) reported their involvement in managing TB patients.

B. Knowledge of doctors on CPG Management of TB by Designation, Healthcare Facilities, History of Training and Involvement in TB Management

Table 2 shows proportion of participants' correct answers to knowledge questions by designation, healthcare facilities, attendance of TB CPG training and involvement in managing TB patients. None of the categories of doctors displayed 100% correct answers for any of TB topics. Overall, there was higher percentage of correct answers across all eight TB topics among specialists in comparison to MOs. By healthcare facilities, higher proportion of correct answers was demonstrated in doctors from clinic compared to hospital. Higher percentage of correct answers also have been observed among doctors who attended TB CPG training and managing TB patients compared to those who did not attend training and did not manage TB patients.

Among the eight TB topics, high percentages of correct answers among doctors were observed from three TB topics namely Pulmonary TB treatment, Regarding Paediatric & Maternal TB and Concerning TB-HIV Infection. Several questions under the following topics reported significantly low percentage of correct answers (less than 40% correct answers), which include: Common adverse drug reactions (Q6.4: Drug induced hepatitis), Management of common drug reactions (Q7.4: Follow up after completion of TB treatment; Q7.5: TB lymphadenitis) and TB control (Q8.5: Personal protective equipment).

Table 2. Percentage of correct answers by respondent category (designation, healthcare facilities, TB CPG training attendance and involvement in managing TB patients)

	Designation		**Healthcare facilities**		**Attendance of TB CPG training**		**Involvement in managing TB patients**	
	MO	**Specialist**	**Clinic**	**Hospital**	**Yes**	**No**	**Yes**	**No**
1. Pulmonary TB treatment (PTB), n (%)								
Q1.1	359 (93.7)	62(95.4)	277(94.9)	155(90.6)	149(94.9)	275(92.3)	394(93.1)	36(94.7)
Q1.2	345(90.1)*	65 (98.5)*	26 (90.4)	161 (93.6)	147 (93.0)	270 (90.6)	391 (92.0)	32(86.5)
Q1.3	231(61.3)	42 (64.6)	179(62.4)	104(61.2)	89(57.8)	187 (63.4)	255 (61.0)	27(73.0)
Q1.4	355 (93.2)	63(95.5)	273 (94.1)	158 (91.9)	151 (96.2)	273 (91.9)	398(94.1)*	31(83.8)*
Q1.5	278(72.8)	52(78.8)	225(77.1)	119(69.6)	124(79.0)	215(72.1)	312(73.8)	30(78.9)
2. Extrapulmonary TB, n(%)								
Q2.1	364(94.8)	65(98.5)	278(94.9)	165(95.9)	153(96.8)	284(95.0)	407(95.8)	35(92.1)
Q2.2	265(69.4)	53(80.3)	206(70.8)	117(68.0)	116(73.4)	201(67.7)	298(70.3)	23(62.2)
Q2.3	270(71.1)	46(69.7)	213(73.2)	111(65.3)	53(33.8)	80(27.0)	298(70.6)	26(70.3)
Q2.4	331(86.9)*	63(95.5)*	258 (88.7)	150(87.7)	144(91.1)	260(87.8)	375(88.7)	32(86.5)
Q2.5	216 (57.3)	41(62.1)	149(51.7)*	122(71.8)*	97(62.6)	171(58.0)	254(60.8)	17(44.7)
3. Latent TB infection, n(%)								
Q3.1	371(96.6)	64(98.5)	286(97.6)	163(95.3)	157(99.4)*	284(95.3)*	412(97.2)	35(92.1)

Q3.2	205(53.5)*	49(75.4)*	178(61.0)*	85(49.7)*	102(65.0)*	157(52.7)*	242 (57.2)	20 (52.6)
Q3.3	279(73.4)	53(81.5)	227(78.8)*	116(67.4)*	129(81.6)*	211(71.8)*	315(74.6)	27(75.0)
Q3.4	325(86.2)	58(89.2)	255(88.9)	143(84.1)	135(86.5)	257(87.7)	368(87.4)	28(82.4)
Q3.5	242(63.9)*	55(83.3)*	198(68.8)	109(63.4)	113(72.4)*	187(63.2)*	286(67.8)	20 (55.6)
4. Regarding paediatric and maternal TB, n(%)								
Q4.1	320(84.2)	60(90.9)	257(88.9)*	134(77.9)*	141(89.8)*	244(82.4)*	359 (85.1)	30 (81.1)
Q4.2	335 (87.9)	63(95.5)	268(91.8)*	143(84.1)*	145(92.4)	259(87.2)	375 (88.9)	35 (92.1)
Q4.3	309(80.9)*	61(93.8)*	228(78.4)*	156(91.2)*	130 (82.8)	246 (82.8)	354 (83.7)	29 (78.4)
Q4.4	250(66.3)*	52 (80.0)*	190 (66.7)	124 (72.1)	119(76.3)*	191(65.2)*	285 (68.2)	27 (73.0)
Q4.5	357 (94.7)	62 (95.4)	277(96.2)*	152(89.9)*	146 (93.6)	275 (93.9)	394 (93.6)	33 (97.1)
5. Concerning TB-HIV co-infection, n(%)								
Q5.1	368 (96.6)	64 (98.5)	284 (97.6)	163 (95.9)	154(99.4)*	285(95.6)*	408 (96.9)	37 (97.4)
Q5.2	299(79.3)*	60 (90.9)*	252(87.8)*	119(69.6)*	130(83.3)	233 (79.3)	341 (81.2)	28 (77.8)
Q5.3	322 (85.6)	59(92.2)	256(89.2)*	139(82.7)*	133 (86.4)	255 (87.0)	362 (86.8)	32 (88.9)
Q5.4	269 (71.9)	50(78.1)	207 (72.9)	126 (74.6)	123(79.4)*	204(70.3)*	306 (73.7)	26 (72.2)
Q5.5	278(74.7)*	59 (92.2)*	212 (74.9)	138 (82.1)	121 (79.1)	223 (76.9)	325 (78.7)	24 (66.7)
6. Common adverse drug reactions, n(%)								
Q6.1	338(88.5)*	64(97.0)*	263 (90.4)	153 (89.0)	144 (91.1)	265 (89.2)	386(91.0)*	29 (78.4)*
Q6.2	301(78.6)*	63 (95.5)*	244 (83.6)	133 (77.3)	131 (82.9)	241 (80.9)	352(82.8)*	25 (67.6)*
Q6.3	184 (48.3)	38 (59.4)	148 (51.2)	85 (49.7)	91 (58.3)*	138(46.6)*	214 (50.8)	17 (45.9)
Q6.4	101 (26.6)	24 (36.4)	72 (24.9)*	61 (35.5)*	46 (29.1)	85 (28.8)	124 (29.3)	8 (22.2)
Q6.5	343 (89.8)	57 (87.7)	259 (89.0)	155 (90.6)	140 (89.2)	267 (89.9)	384 (90.6)	29 (80.6)
7. Management of common adverse drug reactions, n(%)								
Q7.1	374 (97.7)	65 (98.5)	287 (98.3)	166 (97.1)	156 (98.7)	289 (97.3)	418(98.4)*	33 (91.7)*
Q7.2	266(69.6)*	54 (81.8)*	198(68.0)*	133(77.8)*	124(79.0)*	202(68.0)*	307 (72.4)	23 (63.9)
Q7.3	221 (58.0)	38 (58.5)	192(66.2)*	77 (45.3)*	98 (62.4)	165 (55.9)	245 (58.1)	23 (63.9)
Q7.4	166 (43.5)	26 (40.0)	135(46.2)*	62 (36.7)*	67 (42.9)	127 (42.8)	179 (42.3)	17 (47.2)
Q7.5	135(35.5)*	37 (56.9)*	97 (33.6)*	80 (47.1)*	64 (40.8)	108 (36.7)	163 (38.7)	13 (36.1)
8. Regarding TB control, n(%)								
Q8.1	358 (93.2)	58 (87.9)	280(95.6)*	151(87.8)*	153(96.8)*	270(90.3)*	397(93.4)*	32 (84.2)*
Q8.2	349 (91.1)	57 (87.7)	284(96.9)*	136(80.0)*	150(94.9)*	262(88.2)*	385 (91.0)	33 (86.8)
Q8.3	309 (80.9)	56 (84.8)	238 (81.8)	142 (82.6)	133 (84.7)	242 (81.2)	350 (82.5)	29 (78.4)
Q8.4	304 (79.4)	49 (74.2)	246(84.2)*	118(68.6)*	122 (77.2)	236 (79.2)	330 (77.6)	33 (89.2)
Q8.5	121(31.6)*	29 (43.9)*	103 (35.3)	53 (30.8)	51 (32.5)	103 (34.4)	136 (32.1)	18 (47.4)

*statistically significant difference, $p < 0.05$

#highlighted rows represent critical questions that doctors are expected to know ('must know' questions)

C. Level of knowledge of CPG Management of TB

In general, based on eight TB topics which include 40 knowledge questions, only 28% of doctors had good level of knowledge (showed all correct response for all sub-questions). There were 39% of specialists and 26.2% of MOs who possessed good level of knowledge. However, the authors observed an overall higher percentage of doctors (74.9%) displaying good TB knowledge with 24 'must know' knowledge questions (80.2% specialists and 74.6% MOs).

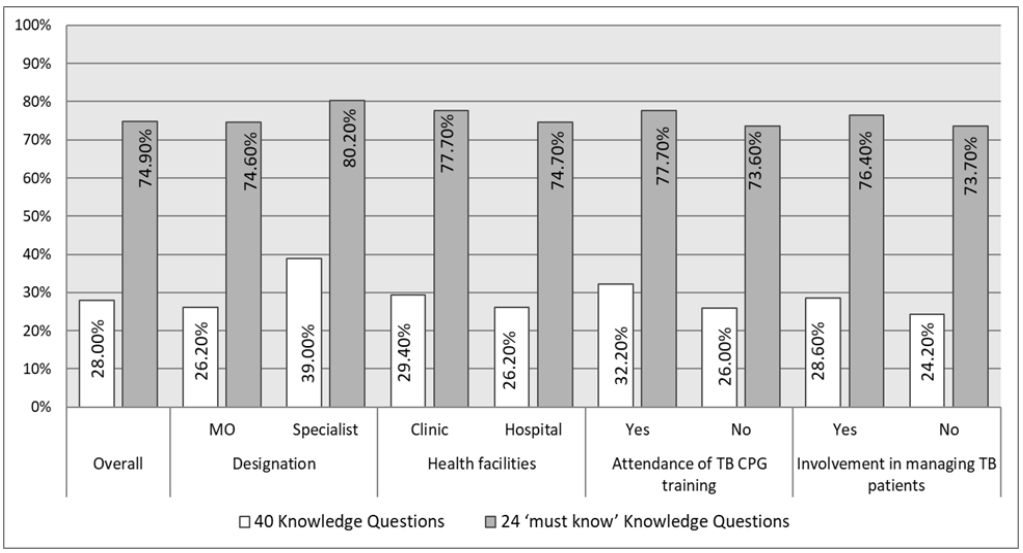

Figure 1. Percentage of doctors with good level of knowledge according to designation, healthcare facilities, TB CPG training and involvement in managing TB patients

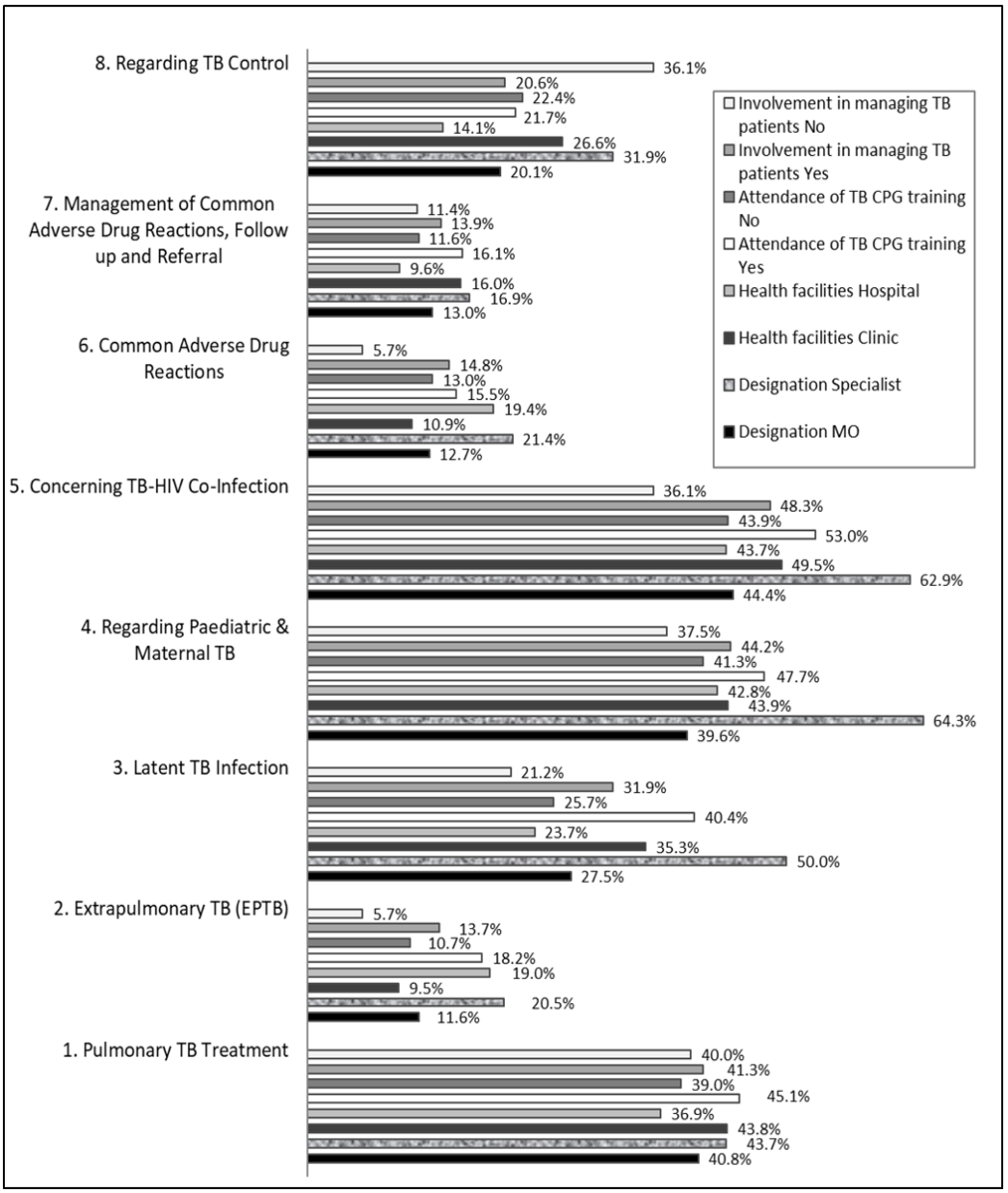

Figure 2. Percentage of good knowledge according to TB topics

A comparison between healthcare facilities revealed higher percentage of doctors with good level of knowledge from clinic. Similar finding was also found with doctors who attended TB CPG training and who were involved in managing TB patients (Figure 1).

Figure 2 displays the breakdown of percentage of doctors into good and poor level of knowledge for 40 knowledge questions according to eight TB topics. The doctors were categorized according to their designation, health facilities, attendance to TB CPG training and involvement in TB management. Good level of knowledge was displayed by ≥50% specialists, in three TB topics namely Latent TB Infection, Paediatric & Maternal TB and TB-HIV Co-Infection. Three topics were identified to have among the lowest percentage of doctors with good level of knowledge namely extrapulmonary TB, common adverse drug reactions and management of common adverse drug reactions. Doctors who worked in health clinics possessed better knowledge compared to doctors in hospital except for on the topic of extrapulmonary TB.

IV. DISCUSSION

In the present study, majority of the participants demonstrated suboptimal knowledge on the CPG Management of TB based on 40 test questions. The proportion of doctors with good level of knowledge was only 28%. Level of knowledge of 'must know' questions in the CPG TB was acceptable with 74.9% of doctors possessing good level of knowledge. Higher percentages of doctors with good knowledge of TB were observed among doctors at specialist level and those who worked in health clinics.

This finding is similar to one study conducted by Hoffman *et al.* (2016) where a survey was done among 384 health professionals in China, India, Iran and Mexico (low-middle income countries) on their knowledge and practices related to TB treatment (Hoffman *et al.*, 2016). Their result revealed that only 45 out of 384 (12%) respondents correctly answered all five knowledge questions regarding TB care. Highest result in Mexico with 22% answered all five questions correctly, followed by Iran (19%), China (5%) and India (5%) (Hoffman *et al.*, 2016). The study also identified two significant factors associated with health professionals' knowledge scores related to TB treatment. The two factors were being a specialist physician with odds ratio (OR) of 2.84 and working with researchers to improve their clinical practice or quality of working life (OR=1.48) (Hoffman *et al.*, 2016).

Our study also revealed that doctors who were involved in managing TB and attended TB training had better level of knowledge. A study in Southern Mozambique has also been done on knowledge, attitudes and practices regarding TB care among health workers. It was shown that compared to those never worked with TB patients, working with TB patients for one year (p=0.04) and between one and five years (p=0.01) were associated with a 2.3-point increase in knowledge score (Noé *et al.*, 2017). Similar pattern of finding was reported in a Tunisian study, which found improvement in the diagnosis of TB (increased 5.5 times) and chronic respiratory disease (increased by 50%) following training of their integrated syndromic guidelines among general practitioners in primary health care settings. The trainings and its resulting improvement in diagnosis lead to reduction in the average cost of drug prescription by 19% (Abouda 2015).

A study in the UK reported disparity in some aspects of clinical care of TB in children among the paediatric TB specialists. The discrepancies occurred due to the wide variations between the national and international TB guidelines regarding the management of childhood TB. In term of latent TB infection, the dissimilarities of clinical care among specialists include when: (i) interpreting tuberculin skin tests (TSTs) results, (ii) using the interferon-gamma release assays, and (iii) deciding the age limits for preventive treatment of TB contacts with initially negative TSTs. Other than that, differences in clinical care such as: (i) monitoring of multidrug-resistant TB contacts without earlier preventive treatment, (ii) use of pyridoxine, (iii) duration of treatment of osteoarticular TB, and (iv) during the monitoring for ethambutol ocular toxicity, was also detected between the guidelines (Turkova 2014). Similarly, Méchaï *et al.* (2015) found that the awareness of TB guidelines in France needed to be increased as the handling of isolation precautions for patient with sputum smear-positive TB were widely varied among the 311 recruited physicians. These findings highlighted the importance of having a similar, or at least, a close pattern of guidelines, not just in TB management, but in any medical guidelines for medical practitioners as it

concerns people's life.

There are a few strengths in this study. It provides baseline level of knowledge of the CPG management of TB (3rd edition) among doctors. To date, this is the first study assessing our doctors' knowledge on the guideline. The study had a good response rate. The findings of the study could be useful in assisting the planning and implementation of the TB programme for improving the provision of care for TB patients. The results could generate hypotheses for a more rigorous study in the future, for example, a cohort study. The study has at least two limitations. Since the study only included doctors from public health facilities, it might not be adequately representative to reflect level of TB knowledge of doctors in Selangor. The questionnaire used in the study was mainly focusing on knowledge on TB management. The participants might have obtained the knowledge from resources other than the Malaysian CPG Management of TB which may contribute to possible variations in TB management thus leading to incorrect answers. In terms of translating knowledge into action, correct answers do not necessarily reflect actual practices at the clinical setting.

V. CONCLUSION

Proportion of doctors demonstrating good level of knowledge based on 'must know' questions was 74.5% compared to 28% based on all 40 questions. Clinical specialization, having trained in TB CPG and being involved in managing TB patients resulted in better knowledge on TB management. The assessment of knowledge on TB management provides valuable baseline information concerning actual level of knowledge among doctors treating TB cases. Hence, efforts need to be put forward directed towards continuous education of doctors by means of training besides having structured objective assessment. Targeted strategies should be developed in order to refine doctors' knowledge and understanding in this area, for example implementing different training approach, allocating continuing professional development points for career pathway and making compulsory attachment to TB clinic for all doctors managing TB. An audit on TB knowledge by the respective organisation may be conducted as a mechanism to evaluate healthcare providers' actual level of knowledge.

VI. ACKNOWLEDGEMENTS

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Appendix 1

No : .....
(for researcher use only)

CPG KNOWLEDGE STUDY EVALUATION FORM
CPG MANAGEMENT OF TUBERCULOSIS (3RD EDITION)
(NMRR-16-764-30744)

Clinical Practice Guidelines (CPG) Management of Tuberculosis (3rd Edition) was developed to assist healthcare providers in making evidence-based decisions about appropriate management and treatment of tuberculosis. CPGs are distributed based on healthcare facility and it can be downloaded from the MOH and Academy Of Medicine (Malaysia) website. Its uptake is essential to ensure its recommendations being practiced and benefit the users. Your feedback is valuable to us in evaluating and improving the National CPG Programme. We will ensure the confidentiality and anonymity of the information given.

A. PERSONAL DETAILS

Please fill in and tick (√) appropriately for all the informations required.

1) Age : ..... Years
2) Gender : ☐ Male ☐ Female
3) Designation : ☐ Medical Officer ☐ Specialist
4) Length Of Services : ..... Years
5) Length in current posting : .....

6) Type of Healthcare facilities :

- ☐ MOH Hospital with Specialist
- ☐ MOH hospital without Specialist
- ☐ MOH health Clinic

7) Name Of Hospital/KK : .....

8) Department/ward: ☐ Medical ☐ Pediatric ☐ OPD/Health Clinic ☐ Others (please specify) : .....

9) Have you attended any training based on this CPG? ☐ Yes ☐ No

10) Have you been involved in managing TB patients? ☐ Yes ☐ No

11) If yes, when was the last time you managed TB patients? .....

B. KNOWLEDGE OF THE ABOVE CPG

Please fill in the empty box by writing either **TRUE** or **FALSE** or tick (√) appropriately for each of the statement. Answer **ALL** the questions.

1) In Pulmonary Tuberculosis treatment (PTB):		**TRUE**	**FALSE**
i.	More than 2 months antiTB treatment interruption in maintenance phase requires restarting treatment if total dose patient completed is <80%.		
ii.	6-month antiTB treatment duration is adequate for smear positive pulmonary tuberculosis (PTB).		
iii.	Thrice weekly maintenance regimen can only be performed under direct supervision.		
iv.	Fixed-dose combination is preferred to separate-drugs combination in improving adherence to antiTB treatment.		
v.	Directly observed therapy must be performed by a healthcare worker only.		
2) The following is/are TRUE about Extrapulmonary TB (EPTB):		**TRUE**	**FALSE**
i.	6-month antiTB regimen is adequate in the treatment of TB meningitis & spine.		
ii.	In principle, at least 6 months of antiTB treatment is recommended in TB lymphadenitis & ocular TB.		
iii.	In all miliary TB, 6-month antiTB treatment is adequate.		
iv.	Corticosteroids are important in the treatment of TB pericarditis & meningitis.		
v.	Corticosteroids are beneficial in pleural & peritoneal TB		

3) In Latent TB Infection (LTBI):		TRUE	FALSE
i.	Chest radiograph is typically normal.		
ii.	Patients usually have mild symptoms.		
iii.	Mantoux test of at least 10 mm is required to make the diagnosis in HIV-infected patients.		
iv.	Interferon-Gamma Release Assays are more specific than Mantoux test in identifying latent tuberculosis infection (LTBI).		
v.	Diagnosis is established when *Mycobacterium tuberculosis* is isolated from sputum culture but not on direct smear.		
4) Regarding paediatric & maternal TB:		**TRUE**	**FALSE**
i.	Most children with PTB are sputum smear positive.		
ii.	The risk of active TB after exposure is higher for infants & young children under 5 years than older children.		
iii.	Sputum TB culture should be done together with sputum smear for the diagnosis of PTB.		
iv.	Ethambutol cannot be used in children.		
v.	Streptomycin must be avoided in pregnant mothers.		
5) Concerning TB-HIV Co-Infection :		**TRUE**	**FALSE**
i.	Patients with HIV & EPTB may have concomitant PTB.		
ii.	Isoniazid prophylaxis therapy for 6 months should be offered to HIV patients after ruling out active TB.		
iii.	If CD4 <50 cells/µl, initiate Highly Active Antiretroviral Therapy 2 weeks after starting intensive phase of antiTB treatment.		
iv.	TB-Immune Reconstitution Inflammatory Syndrome rarely occurs in patients with CD4 <50 cells/ µl.		
v.	Co-trimoxazole preventive therapy should be initiated as soon as possible & given throughout TB treatment.		
6) About management of common adverse drug reactions, follow-up & referral:		**TRUE**	**FALSE**
i.	Adverse events occur more commonly during maintenance phase.		
ii.	Patients developing pruritus after commencing antiTB therapy should have their therapy discontinued immediately.		
iii.	Among all first-line antiTB drugs, rifampicin is the most common cause of Drug-Induced Hepatitis (DIH)		
iv.	In asymptomatic patients who develop DIH during treatment, antiTB must be stopped if Alanine Aminotransferase is 3 times upper limit of normal.		
v.	Symptoms suggestive of optic neuritis need to be elicited in patients taking ethambutol at each clinic visit.		
7) The following statements are TRUE regarding management of common adverse drug reactions, follow-up & referral:		**TRUE**	**FALSE**
i.	Patients who remain sputum smear positive for AFB after 2 months of treatment should be referred to specialists with experience in TB management.		
ii.	Nephropathy is a common complication of isoniazid therapy.		
iii.	In patients clinically responding well to TB treatment, it is mandatory to repeat chest x-ray (CXR) & sputum acid fast bacilli at 4 months.		
iv.	In patients who have successfully completed TB treatment, it is routine to follow them up for at least one year.		
v.	All cases of TB lymphadenitis need to be referred to specialist for management.		
8) Regarding TB control:		**TRUE**	**FALSE**
i.	Every TB case should be tested for Human Immunodeficiency Virus (HIV).		
ii.	Bidirectional screening for diabetes & TB leads to detection of more diabetes & TB cases.		
iii.	Children with TB usually acquire their disease from another child with TB.		
iv.	Close contacts of a sputum positive case should be given BCG vaccination.		
v.	Personal protective equipment is adequate to protect healthcare providers from TB.		