

## ORIGINAL ARTICLE

# Translation and Validation of Malay Version of the Simplified Diabetes Knowledge Test (DKT)

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## ABSTRACT

**Introduction:** Type 2 diabetes mellitus is a chronic disease which is highly prevalent in Malaysia. In managing diabetes, the American Diabetes Association (ADA) and the International Diabetes Federation (IDF) have advocated self-management to be the basic component of diabetes care. However, an ongoing discussion, education and assessment of the patient's diabetic knowledge should be implemented in the patient's empowerment process. There are various assessment tools available worldwide but very few are available in the Malay language. This study is aimed to perform the Malay translation of the Simplified Diabetes Knowledge Test (DKT) questionnaire and validate it. **Methods:** Forward-backward translation procedure was used to translate the simplified version of the DKT questionnaire. A total of 120 respondents with type 2 diabetes mellitus from a selected government health clinic were recruited to answer the questionnaire which consists of socio-demographic, diabetes characteristics and the 20-item Malay version of simplified DKT questionnaire. Reliability and construct validity were tested with Cronbach's alpha coefficient and Exploratory Factor Analysis. **Results:** Factor analysis with Varimax rotation identified five meaningful domains for the final 18 items. The Cronbach's alpha for the overall scale of the translated questionnaire was 0.573 with values of each five significant domain's Cronbach's alpha ranged from 0.370 to 0.564. **Conclusion:** The Malay version of simplified DKT is valid and reliable to be used as a brief assessment of knowledge among Malaysian diabetic patients.

**Keywords:** Validation, Malay version, diabetes knowledge test (DKT)

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## INTRODUCTION

Type 2 diabetes mellitus is a chronic disease which is highly prevalent in Asia and around the world (1). The Ministry of Health Malaysia has started several initiatives to tackle the problem such as initiating diabetes resource care centers, training and awareness programs (1,2). Furthermore, a family doctor concept has been incorporated in the clinical management of the patient in order to ease the understanding of the patient by the health care providers holistically (1,3). However, despite the improvement in health care and facilities, the prevalence of type II diabetes mellitus in Malaysia is still an alarming trend. According to the National Health and Morbidity Survey 2015 (2), the prevalence of diabetes mellitus in Malaysia is 17.5% which is equivalent to 3.5 million people. The data shows a 2.3%

increase from 2011, where the prevalence was 15.2% of the total population (2).

Several factors other than health care may play a major role in controlling the high prevalence of diabetes mellitus in the country. Education on the illness, which includes lifestyle, nutritional and proper foot care improves patient's self-care behavior and disease knowledge if it is included in the diabetic care of primary care setting (3). In research done among diabetes patients attending follow up, previous researchers had found that patients with good knowledge had better attitude towards their diabetes treatment (5 -16). Positive attitude or good compliance to appropriate self-management leads to better blood sugar level control (17 - 21). In addition, another research by Berikai et. al. (2007) and McCulloch et. al. (2003) has found that poor knowledge leads to poor disease control (6, 22). Thus, it can be concluded that the management of diabetes mellitus does not solely depend on prescription by the treating doctors, but also by continuous information received by the patients (23, 24).

In Malaysia, one important hurdle in improving patient's diabetic knowledge is the low literacy level and educational level among Malaysians (25). Health literacy is defined by the World Health Organization (WHO) as intellectual and social ability which inspire and improve the skill of individuals to involve, to perceive and apply knowledge in a manner which advocate and sustain good health (26). Based on NHMS 2015, only 6.6% of adults in Malaysia had adequate health literacy. The prevalence of health literacy is also reducing with the advancement of age (1). This may cause difficulty in instilling diabetic knowledge since the peak age of the patients with diabetes mellitus in our population is in geriatric group (70-74 years old) (1).

Thus, it is important to conduct a study on the level of knowledge of patients with diabetes mellitus. Assessment of knowledge on diabetes has been an important aspect of evaluation in the care of persons with diabetes in primary care clinics (27, 28). Extensive literature review revealed several diabetes knowledge assessment tools which are available to verify the success of diabetes education in clinical settings. The tools vary from an extensive questionnaire such as the United Kingdom's ADKnowl to a brief questionnaire such as the Michigan's Diabetes Knowledge Test (DKT) and the Australian's Diabetes Knowledge Questionnaire (DKQ) (16, 27, 29). These questionnaires were of different length and forms, making them suitable for the population which they were developed for. However, Australian's Diabetes Knowledge Questionnaire is noted to have a higher number of items with sections specifically tailored to the Australian government health policy, making it less preferable to be used in other countries (29).

However, only few properly validated tools have been developed to measure the extent of diabetic knowledge of the Malaysian population. One of the validated questionnaires is the 14-items Malaysian version of Michigan Diabetes Knowledge Test (DKT). This questionnaire consists of multiple-choice questions, making it difficult to be comprehend by patients with low levels of literacy (7). A simplified version of the DKT was made available in 2010, consisting of 20 items which targeted the patients with low literacy level (8, 30). This simplified version of the DKT is also noted to be easier to be completed compared with the Revised Diabetes Knowledge Scale (8). However, it is available in English language. Therefore, there is an arising need to translate the questionnaire to Malay language to adapt to our Malaysian population. This questionnaire is easier to comprehend in the sense that it is in a choice of "true/false/don't know" response format making it suitable to be administered face-to-face for our population whose the primary language was spoken, not written. Thus, it is important to translate and validate this instrument which can be used for a wide range of socio-demographic background to assess the knowledge of diabetes among patients with type 2 diabetes in Malaysia.

## MATERIALS AND METHODS

This study was conducted cross-sectionally at the Diabetic Unit of Klinik Kesihatan Beserah, a tier-2 government clinic which is located 12 kilometers from Bandar Kuantan (31). It caters to a total of 99 villages across a 31km<sup>2</sup> area with a population of approximately 63,875 people. The number of diabetic patients registered at the clinic as of the year 2016 was 2465 (31).

The required respondents for validating this translated questionnaire were about five persons per question (32). As this translated questionnaire consists of 20 items, the required sample size was about 100 patients. A convenient sampling method was used to sample a total of 120 patients in three weeks duration, which was from 25th July 2017 until 11th August 2017.

### Study Instrument

The 20 items Simplified Diabetes Knowledge Test was developed initially by Collins et. al. in 2010 where the multiple-choice responses of the Revised Diabetes Knowledge Scale were replaced by a 'true or false' format (8). The internal reliability of the original Simplified Diabetes Knowledge Scale was 0.71 with Cronbach's alpha excluding each item ranging from 0.57 to 0.62. The item correlations with the total knowledge test score ranged from 0.26 to 0.58. Based on study done by Collin's et al, the respondents found the Simplified Diabetes Knowledge Test is marginally easier to complete, with more correct responses compared with the Revised Diabetes Knowledge Scale (8). This signifies that Simplified DKT was easier to be answered in comparison to the Revised Diabetes Knowledge Scale as indicated by the number of missing responses. There were no multiple domains in terms of the structure of the items except mainly confined to the knowledge.

### Content Validity

The content validation process involved an expert group consisting of three Family Medicine Specialists, a Public Health Specialist and two Physicians from International Islamic University of Malaysia. They were expert in reviewing and ensuring the content & structure validity of the questionnaire in the translation process. All experts agreed that the items managed to cover major areas related with diabetic problems and useful for Malaysian settings. The statements of the items were also clear and easy to understand.

### Translation Process

English to Malay forward translation of the questionnaire was done by another different Family Medicine Specialist and a Public Health Specialist (both were not involved in the initial content validation). They were both independent and bilingual translators in which one of them was expert in the subject matters and questionnaire concepts. Discrepancies between the

translators were discussed and resolved between them. Backward translation from Malay to English language was then carried out by two Physicians (who are not aware of the initial questionnaire) to look for any inconsistencies in the Malay version of the questionnaire. Unclear wordings in the initial translations were revealed in this process. To avoid bias, the Endocrinologists chosen will be independent and unaware of the intended concepts of the questionnaire. This translation process followed the common protocol in questionnaire translation and validation as stated by Tsang et al (33).

### **Translated Instrument**

The questionnaire has three sections. The first section (Part 1) of the questionnaire consists of the socio-demographic characteristics of the patients. The second section (Part 2) inquired about the diabetic characteristics of the patients and required them to answer in string form. These two sections were not involved in the translation and validation process. The third section (Part 3) of the questionnaire was the translated version of the Simplified Diabetic Knowledge Test assessing the patients' diabetic knowledge (7). This 20-items questionnaire provides three response options which were "true", "false" and "don't know" responses which were easier to be understood by patients. A correct answer was rewarded one mark while a wrong answer was not given any mark. Those who left an item unanswered or who answered more than 1 option, are considered as "don't know" responses and therefore no marks were given for that item (7). A higher accumulative score indicated a better knowledge regarding the diabetes without specific cut off point (27, 28).

### **Face Validation**

Face validity of the translated questionnaire was done by conducting pre-testing among 15 Malay-speaking patients in Klinik Kesihatan Beserah, which was the minimum number required in pilot study as suggested by previous researchers (36). This pretest aims to ensure the readability and comprehensibility of the questions. These patients for the pre-testing met the inclusion criteria of the study but were not included as part of the sample of the actual study. The criteria are: 1) Clinically diagnosed with type 2 diabetes mellitus by a medical professional; 2) Adults aged more than 18 years old; 3) Malaysian; and 4) Able to converse in Malay. Those who are pregnant, diagnosed with terminal illness or having physical disability were not included in this study. The patients were required to answer the questions completely via self-administered method initially and subsequently comment on each question through our interview with them. The comments were then discussed among the researchers and several necessary changes will be done accordingly. The final version of the questionnaire was then distributed to 120 respondents to be filled in via self-administered method.

### **Validity and Reliability Testing**

Factor analysis (FA) was performed to measure the questionnaire's construct validity. In this study, factor analysis was performed to ensure all items tested fall into one factor as during the questionnaire development phase, only one factor was identified which is knowledge. The best items representing each component were identified. The Kaiser-Meyer-Olkin value of more than 0.7 and significant value of the Bartlett's test of sphericity ( $p$  value  $< 0.001$ ) is needed in providing significant components in the factor analysis (37). For reliability testing, Cronbach's alpha was selected to measure the internal consistency between the items (38). A score above 0.7 for Cronbach's alpha was considered as highly consistent while a value of 0.40 – 0.69 is moderately consistent (39). The higher the value for the Cronbach's alpha, the more reliable the questionnaire items (38, 39).

### **Ethical Approval**

This study had ethical approval from the Medical Review & Ethics Committee (MREC), Ministry of Health Malaysia and IIUM Research & Ethics Committee IIUM/305/14/11/2/IREC901. All patients had provided a written consent prior to the administration of the questionnaire.

### **RESULTS**

Socio-demographic characteristics of the 120 respondents were shown in Table I with the median age being 60 years old with the majority (55.8 %) of the respondents being female. Majority of the respondents were Malay and Muslim (93.3%). Most of the respondents, 81.7 % of them were married. Nearly half of the respondents were unemployed or retired (43.3%) while the remaining were employed (34.2) or housewives (22.5). The respondents had a median household income of RM 2500. Nearly a third of the respondents (31.6 %) had completed higher education (minimum diploma). The remaining 68.4% had only a lower education level whereby 6.7% of them did not complete primary school or had no formal education. Meanwhile, 32.5 % had completed primary school and 29.2 % had completed secondary school.

Table II below describes the diabetic characteristics of the respondents where the median age during diagnosis was 50 years. Most of them had family history of diabetes mellitus (65.8%) and the median duration of having diabetes was eight years. 68.3% and 1.7% of the respondents were taking pills only and insulin injection only as their diabetic medication respectively while the remaining 30.0% had a combination of pills and insulin injections as medication. Out of 120 respondents, 37.5% of them had well-controlled diabetes (HbA1c

**Table I: Socio-demographic characteristics of the respondents (N=120)**

	Median (Range)	Frequency (%)
Age	60.0 (33 - 79)	
Gender		
Male		53 (44.2)
Female		67 (55.8)
Race		
Malay		112 (93.3)
Chinese		5 (4.2)
Indian		2 (1.7)
Others		1 (0.8)
Religion		
Islam		112 (93.3)
Buddhism		4 (3.3)
Hinduism		2 (1.7)
Christian		0 (0)
Others		2 (1.7)
Marital Status		
Single		6 (5.0)
Married		98 (81.7)
Divorced		0 (0)
Widow/widower		16 (13.3)
Occupational Status		
Employed		41 (34.2)
Unemployed / Retired		52 (43.3)
Housewife		27 (22.5)
Student		0 (0)
Household Income	2,500 (150 - 12,000)	
Educational Level		
No formal education / not completed primary school		8 (6.7)
Completed primary school		39 (32.5)
Completed secondary school		35 (29.2)
STPM / Diploma / equivalent		19 (15.8)
Degree		16 (13.3)
Post-graduate		3 (2.5)

≤ 6.5) while the other 62.5% had poorly controlled diabetes (HbA1c > 6.5).

For content validation, a modification had been made from the original questionnaire. Item 3 which compares the carbohydrate content of two different types of food was changed according to food that is commonly consumed by the Malaysian population (34, 35). Other food items such as in items 4, 6, 7 and 8 were maintained as they are easily available in Malaysia and commonly consumed by the Malaysian population. From face validation, modifications were done mainly on rephrasing the Malay words item 18 and 19, without

**Table II: Diabetic characteristics of the respondents (N=120)**

	Median (Range)	Frequency (%)
Family History of Diabetes		
Yes		79 (65.8)
No		41 (34.2)
Duration of Diabetes Mellitus		
Age diagnosed	49.93 (10.178)	
Year	8.00 (1 - 37)	
Diabetic medication		
Pills		82 (68.3)
Insulin injection		2 (1.7)
Combination of pills and insulin injection		36 (30.0)
Latest HbA1c result	7.1 (4.5 - 13.2)	
Well-controlled (≤6.5)		45 (37.5)
Poorly controlled (>6.5)		75 (62.5)

changing the construct of the questionnaire.

As shown in Table III below, two insulin items (Item 19 and 20) were excluded from further analysis since the analysis of the two items had caused item 17 to be dropped out from the analysis. Nevertheless, item 17 is a more important item in comparison to items 19 and 20 to be included in the reliability testing and factor analysis because it is one of the general principal items. Thus, we decided to include item 17 and discard items 19 and 20 after verified with the expert panels. Furthermore, Cronbach's alpha value remains within the same range for the total 18 items in comparison to the initial 20 items. Nevertheless, this omission did not affect the validation of the questionnaire since the remaining 18 general items can be used independently (27, 28).

The analysis of 18 items excluding the two insulin items obtained a Cronbach's alpha of 0.573 which is moderately consistent and acceptable. Item 17 was the easiest item with a mean score of 0.97 while item 18 was the hardest with inconsistent response (mean score of 0.08).

Factor analysis of the 18 items showed high value of Kaiser-Meyer-Olkin measure of sampling adequacy (0.602) and significant Bartlett's Test of Sphericity (< 0.001), which give rise to five components (Table 4A). All the 18 analyzed items had an acceptable factor loading ranging from 0.369 to 0.807. Five components identified (as shown in Table IV): awareness domain (Cronbach's alpha 0.564); lifestyle modification domain (Cronbach's alpha 0.502); diet and monitoring (Cronbach's alpha 0.432); general knowledge (Cronbach's alpha 0.426) and preventive screening (Cronbach's alpha 0.370). The first component (awareness domain) consists of four items on importance of follow up visit including the

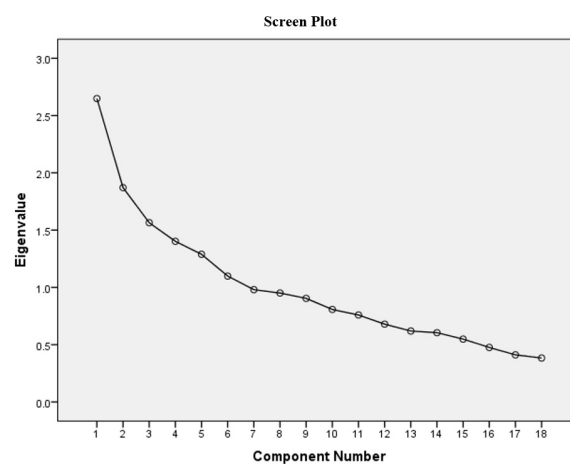
**Table III: Reliability Analysis before deleting items no. 19 and 20**

Items	Median (N=120)	Standard Deviation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
1-Diabetic diet	0.89	0.3110	0.584	
2-Glycosylated haemoglobin	0.24	0.4309	0.539	
3-Carbohydrate content	0.82	0.3929	0.569	
4-Fat content	0.48	0.5060	0.549	
5-Urine and blood tests	0.23	0.4309	0.551	
6-Unsweetened juice	0.45	0.5039	0.602	
7-Diet soda for hypoglycemia	0.53	0.5060	0.551	
8-Olive oil	0.82	0.3929	0.530	
9-Exercise and BP	0.82	0.3929	0.569	
10-Exercise and glucose	0.71	0.4596	0.527	0.581
11-Infection causing high glucose	0.55	0.5039	0.587	
12-Shoes larger	0.37	0.4890	0.556	
13-Low fat diet and heart	0.87	0.3426	0.564	
14-Numbness and tingling	0.84	0.3695	0.556	
15-Diabetes and lung problems	0.26	0.4882	0.558	
16-Checking glucose if having flu	0.50	0.5015	0.517	
17-Follow ups can detect complications	1.00	0.0001	0.563	
18-Follow ups can avoid complications	0.13	0.3426	0.565	
19-High sugar because high insulin	0.82	0.3929	0.516	
20-Insulin morning and hypoglycaemia	0.79	0.4132	0.574	

needs for urine and blood test monitoring, especially on conditions related with hyperglycemia (lung infection and influenza like illness). The second component (lifestyle and modification) consist of six items on types of food, exercise, foot care and numbness. The third component (diet and monitoring) covers four items on diet and HbA1c monitoring. The fourth component covers general knowledge on diabetes that include two items on drink and infection. The last component meanwhile covers three preventive and screening items related to diabetes.

By taking the eigenvalue of factor of 1.0 on the screen plot (Figure 1), the graph levels off at the component number 7. Thus, at least six domains must be retained, and this was supported by the five domains identified from the factor analysis. This was also supported by Kaiser's criterion whereby the number of retain factors with eigenvalues >1.0 was also six. Nevertheless, based on parallel analysis using Monte Carlo principal component analysis, the number of factors or domains was only one. Furthermore, if six domains were retained,

the number of items per domain would be ranged from two to four with very low reliability. In view of these, the factor analysis has been rerun further by manually setting the number of factors in a manner suggested by Costello and Osborne (40). All the numbers from one to



**Figure 1: Screen Plot**



**Table IV: Factor loading of each item based on Factor Analysis**

Items	Domains				
	Awareness	Lifestyle & Modification	Diet & monitoring	General knowledge	Preventive screening
1-Diabetic diet	-.281	.038	.089	-.090	.699
2-Glycosylated haemoglobin	.390	.155	.479	-.254	.064
3-Carbohydrate content	.081	.004	.369	-.053	.084
4-Fat content	.183	.593	-.226	.061	.163
5-Urine and blood tests	.657	.061	.008	.124	-.161
6-Unsweetened juice	.077	-.263	.106	.590	-.168
7-Diet soda for hypoglycemia	.267	.482	-.047	-.244	-.167
8-Olive oil	.115	.304	.533	.382	.216
9-Exercise and BP	-.212	.500	.121	.131	-.296
10-Exercise and glucose	.240	.594	.169	-.050	-.020
11-Shoes larger	.063	.474	-.097	-.295	.212
12-Diabetes and lung problems	.608	-.036	.254	-.113	-.050
13 - Infection causing high glucose	-.088	.124	-.130	.807	.139
14-Low fat diet and heart	.008	-.070	.737	.122	-.010
15-Numbness and tingling	-.339	.521	.339	.231	.067
16-Follow ups can detect complications	.164	-.011	.136	.107	.773
17-Checking glucose if having flu	.647	.247	.155	-.106	.202
18-Follow ups can avoid complications	.482	.186	-.404	.151	.104

Extraction Method: Principal Component Analysis.

a. 5 components extracted.

Rotation Method: Varimax with Kaiser Normalization, 6.106 % variance, cumulative 54.858

six have been arranged. Nevertheless, we found out that the justifiable number of factors for this questionnaire to be set, to produce structured items with the highest reliability score managed to be achieved through rerunning of the factor analysis is five factors as shown in Table IV.

## DISCUSSION

The objective of this study was to translate and validate the Simplified Diabetes Knowledge Test (Simplified DKT). This Simplified DKT is proven to reduce the difficulty of the previous multiple-choice response of the DKT questionnaire, making it a simpler tool to be used in a different range of population (7). With the literacy level and the age range of diabetic patients in Malaysia were kept in mind, a simple and valid test is needed to measure the success of diabetes campaigns to the public and training programs conducted for health care providers in Malaysia.

Regarding the demographic characteristics of the respondents, the median age of diabetic patients in

Klinik Kesihatan Beserah was 60 years old which is younger than the peak age of our national diabetic population which is above 70 years old (2). Almost all the respondents were Malays, in accordance with the distribution of the population in Beserah, which has 84% Malays compared to other races. Out of 120 respondents, 37.5 % of them had well-controlled diabetes with HbA1c level less than 6.5%. This is better than the 30% target of good diabetes control for primary care which was set as the clinical audit indicators for quality assessment based on the clinical practice guideline (1).

Even though it has been proposed that good knowledge does not readily translate into good behavioral change among patients, many studies have highlighted the needs for measuring the knowledge of patients regarding their illness (3, 23). This general assessment is useful to identify the level of effectiveness of the education program in the community especially for patients with chronic illnesses (3, 23). An acceptable level of knowledge is crucial to empower patients with diabetes self-monitoring and prevent diabetes related complications (13).

The Malaysian version of the simplified Diabetes Knowledge Test is simple in its true/false/don't know answer format which is useful for elderly patients and for those who do not receive any formal education. The questionnaire also is feasible and practical to be answered by any background of patients as it does not contain sub question items or multiple statements per item which are otherwise relatively more complex and require critical thinking (27, 28). It is also a very brief questionnaire making it suitable to be used in a busy and hectic clinical setting common in Malaysia, with an average of 30 to 40 diabetic patients to be consulted per session. With the additional demographic and diabetes characteristics questions, the whole questionnaire only took five to 15 minutes to be completed.

This study modified and translated the brief questionnaire and identified six meaningful domains based on the exploratory factor analysis. The five domains were awareness related items; lifestyle modification related items; diet and monitoring related items; general knowledge items and preventive screening items. Theoretically, these five domains represent the common issues regarding diabetes and its management which are discussed by the diabetes educators during the diabetes education program in Malaysia. They are among the basic topics that should be assessed by the health care providers and indirectly reflect the understanding of the patients towards diabetes and its issues.

Despite several numbers of domain can be retained, which ranges from one to six factors based on the assessment of the combination of screen plot, Kaiser's criterion and parallel analysis (using Monte Carlo principal component analysis); we agreed to retain five meaningful domains after the factor analysis has been rerun by setting the number of factors manually. This is because the final set of items categorized on the five domains is able to produce the acceptable Cronbach's alpha value for each domain, in comparison to the results that we observed if the factors are being set to other numbers (two, three or four factors). Even though two items per domain is too minimum to measure the outcome or magnitude of the domain, it is still reasonable and useful in view of its important contribution to the overall objectives of the questionnaire and enable it to fulfill the conceptual framework leading to the domains. Furthermore, it has been verified with the expert of the contents (family medicine specialists, public health specialist and internal physicians) in which the items are acceptable and able to measure the domains' objective. Moreover, there is no clear-cut rule of the minimum number of items required per domain, in which single item domain also has shown good validity in comparison to equivalent full-scale version (41, 42). A larger number of items per domain will have a benefit to capture the richness of multidimensional variables in respective domains (41,42). However, it still has a risk of causing the questionnaire to be complex, in which it must be

balanced against the need for scale brevity to maximize response rates (41,42). The idea of less items per domain is somehow also more user friendly as respondents no need to respond to similar items of one domain. This is supported by few researchers in which they stated that participants might view the items as repetitive and therefore burden their time which will lead to reduced response rate (43,44).

Based on our analysis, several items were identified as difficult to be answered correctly by the respondents. This includes item no. 2 (mean score of 0.29) which enquired the role and frequency of performing glycosylated hemoglobin (HbA1c). This signifies that most patients are not aware regarding the difference between common sugar monitoring using capillary blood sugar and HbA1c. They probably had a confusion between the two tests (24). Another difficult item was item no. 5 which enquired the appropriate test to choose between blood and urine for monitoring glucose level. Most of the patients were not sure of the answer since both tests were regularly done concomitantly in the clinic. Item no. 18 also obtained a low mean score of only 0.08. The respondents answered that they could avoid the complications of diabetes solely by attending regular follow ups, which is a common misconception in the Malaysian population (39).

A limitation that needs to be highlighted is that the respondents' number is relatively small as compared to other validation studies. However, the sample size is adequate for the factor analysis, where a minimum of 100 respondents is needed (41). Furthermore, by applying a general rule of five to ten respondents per item of the questionnaire, a minimum of 100 respondents is needed to compute the correlations in the factor analysis (42). It is also important to note that this version may only be suitable for the Malaysian population, particularly the Malay race as some modifications have been made from the original version, by considering the local guideline on diabetes management. The use of this questionnaire for other populations might require some modification and pre-testing to ensure the validity.

In the era of the persistent changes in diabetes care guidelines locally and internationally, the Malaysian version of simplified DKT may require regular revision and further improvement to include other components suitable to the current diabetes education program. This is to sustain the content veracity and re-validation may be required if changes are needed and made (7). Therefore, further measurement for the questionnaire's reproducibility and impartiality to evolve through an education program is really required (29). The tests can be performed on patient pre- and post-diabetes education after they have been first diagnosed with diabetes mellitus, and subsequently after several years of diagnosis to assess the success of the ongoing diabetes training campaign and program in Malaysia.

## CONCLUSION

The Malaysian version of the simplified Diabetes Knowledge Test is shown to be valid and reliable as a quick assessment of knowledge among our local diabetic patients. It is a brief and respondent friendly questionnaire that can be answered easily via self-administered method and can be used for clinical practice for the Malaysian population as a tool to assess the success of the ongoing diabetes training campaign and program in Malaysia.

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