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The Diabetes Knowledge Assessment in Type 2 Diabetic Patients: A Survey in West Coast Division of Sabah

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ABSTRACT

The main concern in Type 2 Diabetes Mellitus (T2DM) management is to control the glycaemic level and thus prevent complications by behavioural modifications as a part of the government's national strategic plan. The patient should know about the disease for behavioural modification to be implemented. Thus, this study evaluated the level of knowledge among T2DM patients in primary healthcare in the West Coast Division of Sabah. This is a cross-sectional study conducted in 2015 involving 15 primary healthcare clinics. A validated Malaysian version of the Michigan Diabetes Knowledge Test (MDKT) questionnaire was used to assess patients' diabetes knowledge. The mean age of 369 patients is 54.9 years old (SD = 11.04). The means of knowledge scores were significantly different among the age group, education level, and employment status. No significant differences in knowledge were found in the group regarding the duration of diabetes and glycaemic control. Of 369 diabetic patients, 26.3% had poor knowledge, 65.0% had adequate knowledge, and only 8.7% had good knowledge. Overall, patients with T2DM in primary healthcare clinics have adequate knowledge regarding diabetes. Our study's findings indicate that patients' knowledge is associated with age group, level of education, and employment status. Healthcare providers should plan a good strategy to educate their patients based on these differences.

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a disease that causes a high glucose level in the blood. T2DM prevalence is increasing worldwide and

continues to pose as a global burden disease. According to the fourth Malaysia National Health and Morbidity Survey (NHMS), the national prevalence of diabetes increased from 15.2% to 17.5% in adults (>18 years) in 5 years (Institute for Public Health, 2020).

There has been a remarkable increase in overall diabetes prevalence in Sabah from 9.0% in 2011 to 14.2% in 2015 (Institute for Public Health, 2020). T2DM is primarily due to insulin resistance as well as deficiency. No known cure is available for the disease, but it can be controlled to improve the individual's quality of life. Despite the availability of pharmacological anti-diabetic agents in controlling the disease, lifestyle interventions by increasing physical activity, a healthy diet, and weight loss play a crucial role in improving patient outcomes. Thus, it is essential to educate the patients about diabetes to make healthy choices.

A previous study showed that being knowledgeable about their disease is associated with good glycaemic control (Al-Qazaz et al., 2011). Good control of blood glucose can eventually decrease the risk of diabetes complications. In addition, behavioural modifications through information and education have been part of the government's national strategic plan for managing non-communicable diseases. The latest national guideline is available to be utilized by healthcare professionals in T2DM management (Ministry of Health Malaysia, 2020). Hence, evaluating the patient knowledge can give a glimpse into the effectiveness of our healthcare practice in educating the patient about the disease.

To date, there are many studies conducted on the assessment of diabetes knowledge among diabetic patients in Malaysia (Al-Qazaz et al., 2011; Badariah et al., 2013; Mohd Nadzri et al., 2014). Therefore, to plan for diabetic patient education, they need to assess their knowledge about the disease. This triggered the research question; what are the knowledge levels on diabetes among patients in our setting and the factor associated with their understanding? Hence, in this study, we want to evaluate diabetes knowledge among the type 2 diabetic patients in primary healthcare in Sabah and the factors associated with the patients' knowledge.

MATERIALS AND METHODS

Setting and Population

This is a cross-sectional study conducted from March 2015 until August 2015. The target population was patients with type 2 diabetes mellitus attending government primary healthcare clinics in the West Coast Division of Sabah, which covers the districts of Ranau, Kota Belud, Tuaran, Penampang, Papar, and the state capital Kota Kinabalu. The region of interest had 22 government clinics at the point of study commencement, and cluster sampling was applied to select 15 clinics where study participants were recruited randomly. At the respondent level, convenience sampling was used during the study recruitment.

The list of clinics (Klinik Kesihatan [KK]) selected for our study include: KK Inanam, KK Luyang, KK Menggatal, KK Telipok, KK Likas, KK Penampang, KK Putatan, KK Kiulu, KK Tamparuli, KK Tenghilan, KK Jawi-jawi, KK Kinarut, KK Kundasang, KK Paginatan and KK Timbua. We conveniently collect at least 25 respondents from each clinic; if the clinic has less than the targeted number of samples, the other clinic respondent data is used to fulfil the sample size.

The sample size calculation was based on estimating the prevalence of a good level of knowledge in diabetes using the measurement tool (described below) in this study. An educated guess of 20% was made based on a previous local (Al-Qazaz et al., 2010). With 5% precision, the minimum sample size required was 246 participants (Naing et al., 2006). Considering the implementation of

cluster sampling in this study, the sample size was multiplied by the design effect of 1.5 to obtain the final sample size requirement of 369 participants.

Measurement Tool and Procedure

Evaluation of diabetes knowledge among subjects in this study was performed using Michigan Diabetes Knowledge Test (MDKT), the Malay version, validated in Diabetes Clinic, Hospital Pulau Pinang (Al-Qazaz et al., 2010). This is the first study using this tool in Sabah. Permission to use this questionnaire was obtained. The questionnaire contained 14 questions on general knowledge of diabetes mellitus. Each question had multiple choices of possible answers but only one correct answer.

Patients' level of knowledge was graded based on the total score from the 14 questions answered adapted from the original study (Al-Qazaz et al., 2010). The total score was also categorized into the following categories: Poor (<7 correct answers), Acceptable (7 – 10 correct answers), and Good (>10 correct answers). In addition, for glycaemic control, patients' last HbA1c levels were considered: good glycaemic control was defined as ≤6.5%, according to the Malaysian Clinical Practice Guidelines on Type 2 Diabetes Mellitus (Ministry of Health Malaysia, 2015)toxic chemical products formed as secondary metabolites by a few fungal species that readily colonise crops and contaminate them with toxins in the field or after harvest. Ochratoxins and Aflatoxins are mycotoxins of major significance and hence there has been significant research on broad range of analytical and detection techniques that could be useful and practical. Due to the variety of structures of these toxins, it is impossible to use one standard technique for analysis and/or detection. Practical requirements for high-sensitivity analysis and the need for a specialist laboratory setting create challenges for routine analysis. Several existing analytical techniques, which offer flexible and broad-based methods of analysis and in some cases detection, have been discussed in this manuscript. There are a number of methods used, of which many are lab-based, but to our knowledge there seems to be no single technique that stands out above the rest, although analytical liquid chromatography, commonly linked with mass spectroscopy is likely to be popular. This review manuscript discusses (a.

In each participating health clinic, to be recruited into the study, patients had to be diagnosed with type 2 diabetes mellitus for at least 1 year, be over 18 years of age, and understand the Malay language to answer the questions in the questionnaire. Type 1 diabetes mellitus patients and gestational diabetes mellitus patients (GDM) were excluded from this study. Only type 2 diabetes mellitus patients were selected after considering the knowledge gained when diagnosed with diabetes would be the same. The knowledge gained about the disease could be different if we included Type 1 diabetes mellitus, which can be diagnosed early. As for GDM patients, the knowledge about the disease can be temporary as they may have the condition only when they are pregnant. After identifying potential subjects using the criteria above, written informed consent was elicited from each participating subject before the questionnaire was self-administered. At the same visit, demographic data including gender, age, ethnicity, level of education, and employment status were collected, and patients' weight and height measurements were recorded. Investigators also retrieved information on patients' disease duration and last HbA1c levels from their medical records. No personal information or patient identifiers were collected or maintained during any part of this study.

Statistical Analysis

Patients' demographic data, clinical information, and their diabetes knowledge score were described using appropriate descriptive statistics: percentages and

frequencies for categorical variables and mean (standard deviation) or median (interquartile range) for continuous variables. The data distribution was checked to compare patient demographics and clinical variables with knowledge scores. An independent t-test or one-way analysis of variance (ANOVA) test was used. Scheffe's post-hoc procedure was applied if significant differences were found in the one-way ANOVA test. In addition, a chi-square test was employed to compare the level of knowledge categories with the glycaemic control level. The level of significance was set at a *p*-value <0.05. All analyses were done using IBM SPSS version 20.0 (IBM Corporation, Armonk, NY, USA).

Ethical and Site Approval

This study received ethical approval from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia (NMRR-16-1328-23061). In addition, permission to conduct the study in local government health clinics was granted from the Sabah Public Health Department.

RESULTS

The final analysis included 369 patients from the 15 participating health clinics. About 400 patients were approached during the study, making a 92.3% response rate. Most patients were female, comprising 60.2% of the entire cohort. Our study patients' mean age was 54.9 years old (SD 11.04), with almost two-thirds the above 50 years of age. The remaining demographic data were summarized in Table 1.

Table 1 Demographic and disease characteristics of patients with diabetes (n = 369), total and according to levels of knowledge

Characteristics	Total sample	Level of knowledge		
	n = 369 (%)	Low (<7) n = 97 (%)	Acceptable (7 – 10) n = 240 (%)	Good (>10) n = 32 (%)
Age group				
≤ 50 years	126 (34.1)	27 (27.8)	81 (33.8)	18 (56.3)
> 50 years	243 (65.9)	70 (72.2)	159 (66.3)	14 (43.8)
Gender				
Male	147 (39.8)	41 (42.3)	96 (40.0)	10 (31.3)
Female	222 (60.2)	56 (57.7)	144 (60.0)	22 (68.8)
Ethnicity				
Dusun/Kadazan	229 (62.1)	55 (56.7)	155 (64.6)	19 (59.4)
Bajau	55 (14.9)	20 (20.6)	31 (12.9)	4 (12.5)
Malay	20 (5.4)	7 (7.2)	11 (4.6)	2 (6.3)
Chinese	12 (3.3)	1 (1.0)	9 (3.8)	2 (6.3)
Others	53 (14.4)	14 (14.4)	34 (14.2)	5 (15.6)
Education level				
No formal education	73 (19.8)	27 (27.8)	43 (17.9)	3 (9.4)
Primary education	74 (20.1)	22 (22.7)	48 (20.0)	4 (12.5)

Secondary education	193 (52.3)	45 (46.4)	131 (54.6)	17 (53.1)
Tertiary education	29 (7.9)	3 (3.1)	18 (7.5)	8 (25.0)
Employment status				
Not employed	177 (48.0)	58 (59.8)	113 (47.1)	6 (18.8)
Private sector	71 (19.2)	13 (13.4)	49 (20.4)	9 (28.1)
Government sector	74 (20.1)	10 (10.3)	50 (20.8)	14 (43.8)
Retired	47 (12.7)	16 (16.5)	28 (11.7)	3 (9.4)
BMI of patients*, mean (SD)	28.1 (5.41)	27.9 (5.24)	28.1 (5.52)	28.2 (5.16)
DM duration in years, median (IQR)	3.0 (5.00)	3.0 (5.00)	3.0 (5.00)	3 (5.10)
HbA1c (%), mean (SD)	7.5 (1.72)	7.3 (1.44)	7.5 (1.81)	7.5 (1.86)
14-item MDKT score, mean (SD)	7.7 (2.11)	5.0 (1.14)	8.3 (1.06)	11.4 (0.67)

* BMI refers to body mass index, derived from body mass of patient (kg) divided by the square of body height (m), expressed in units of kg/m^2

Our study cohort's mean diabetes knowledge score was 7.7 (SD 2.11). When graded into categories of knowledge, only 32 patients, 8.8%, had a good level of knowledge (scoring above 10 for total knowledge score). The majority of the patients only achieved an acceptable level of knowledge (total score between 7 to 10, comprising 65.0% of the entire cohort). In comparison, the remaining 26.3% of the patients had poor knowledge levels, scoring below 7 (out of 14).

The mean age for each category of knowledge was 57.4 years old (SD 10.67) for a low level of knowledge, 54.6 years old (SD 10.75) for an acceptable level of knowledge, and 49.8 years old (SD 12.45) for a good level of knowledge group respectively.

The diabetes knowledge scores did not differ between patients of different gender but were significantly different across other age groups, education levels, and employment statuses (Table 2 and Table 3). Patients who were 50 years old or below, had at least secondary education, and who were in active employment (private or government sector) had higher MDKT knowledge scor

es (p <0.05).

Table 2 Comparison of 14-item MDKT scores among patient characteristics

Variable	n	MDKT score Mean (SD)	Mean difference (95% CI)	*p*-value[a]
Age group				
≤ 50 years	126	8.1 (2.15)	0.6 (0.1, 1.0)	**0.012**
> 50 years	243	7.5 (2.07)		
Gender				
Male	147	7.7 (2.01)	-0.1 (-0.5, 0.3)	0.529
Female	222	7.8 (2.18)		
Glycaemic control (HbA1c)				
HbA1c ≤ 6.5%	128	7.8 (2.03)	0.2 (-0.2, 0.7)	0.331
HbA1c > 6.5%	241	7.6 (2.15)		

[an] Independent t-test

For educational level, post-hoc analysis using Scheffe's procedure showed that patients having at least a secondary level of education scored significantly higher than those with primary education ($p = 0.010$) and no formal education ($p = 0.002$). Similarly, for employment status, patients who were actively employed (private or government) scored significantly higher than those who were retired ($p = 0.042$) and those who were not employed ($p < 0.001$).

Table 3 Comparison of 14-item MDKT scores among patient characteristics

Variable	n	MDKT score Mean (SD)	*p*-value[a]
Education level			
Secondary or higher	222	8.1 (2.03)	**<0.001**
Primary education	74	7.2 (2.00)	
No formal education	73	7.1 (2.26)	
Employment status			
Employed (private or government)	145	8.4 (1.93)	**<0.001**
Retired	47	7.5 (2.38)	
Not employed	177	7.2 (2.04)	

[a] One-way ANOVA test

The glycaemic control of our study cohort, assessed by using their latest HbA1c levels, showed that over one-third ($n = 128$, 34.7%) of the patients had good control, defined as having HbA1c ≤ 6.5%. Mean knowledge scores did not differ between patients with good and poor glycaemic control (Table 2). Table 4 shows the distribution of patients in different levels of knowledge scores in both good and poor glycaemic control groups, which did not show significant differences.

Table 4 Relationship between levels of knowledge (14-item MDKT) and glycaemic control groups (n = 369)

Glycaemic control group	n (%)	Level of knowledge			*p*-value[a]
		Low (< 7) n = 97	Acceptable (7 – 10) n = 240	Good (> 10) n = 32	
Good glycaemic control (HbA1c ≤ 6.5%)	128 (34.7)	28 (28.9)	89 (37.1)	11 (34.4)	0.357
Poor glycaemic control (HbA1c > 6.5%)	241 (65.3)	69 (71.1)	151 (62.9)	21 (65.6)	

[a] Chi-square test

DISCUSSION

Most of the patients had an acceptable level of knowledge; this is consistent with other Malaysian study findings (Al-Qazaz et al., 2011; Qamar et al., 2017)the prevalence of diabetes is enormously increasing and 50% of the Malaysian adults with diabetes are still unaware of their disease status. Therefore, this study aimed to assess the awareness of diabetes mellitus (DM. In contrast, Badariah et al. (2013) reported a poor level of diabetes knowledge amongst the indigenous population in Peninsular Malaysia. The difference in demographic in terms of cultural differences might explain this contradictory finding (Sachdeva et al., 2015). Indigenous people tend to try home remedies for their condition. Thus, this may lead to a low level of knowledge as they are not seeking diabetic care from the healthcare. This study recruited respondents who attended the clinic for diabetic care, thus explaining the adequate diabetes knowledge acquired by most patients. Our findings also revealed that knowledge level is associated with age, education level, and employment status; this is similarly reported by Mohd Nadzri et al. (2014) and Al-Qazaz et al. (2011). Those in the less than 50 years old group with higher education levels and were employed have higher scores, as these groups are more accessible and exposed to disease information. Nowadays, most information is available online; thus, these groups are more likely to utilize the internet to obtain knowledge. However, the study above also reported that higher knowledge of diabetes predicts good glycaemic control (Al-Qazaz et al., 2011); it is found nonsignificant in our research. This result suggests that even though most patients have acceptable knowledge about their disease, they need to assess patients' dietary patterns and medication adherence that may influence their glycaemic control.

Because of the increasing number of non-communicable diseases (NCD) in Malaysia, the existing NCD care needs to be efficient and effective at a lower cost. Thus, there is an urgent need to empower the patient to understand their disease and promote self-care to prevent further complications related to NCD. The healthcare provider can work with diabetes educators to create and provide the self-care diabetes programme and standard treatment. One systematic review on group diabetes self-management education revealed a significant reduction of HbA1c and fasting blood glucose after the intervention (Steinsbekk et al., 2015). In addition, the study showed significant improvement in patient self-efficacy. Based on our findings, it is suggested that the module for the programme should cater to these demographic differences. For those in the older age group, a detailed explanation with an infographic can be introduced during face-to-face consultation to understand the disease better.

The study is limited in evaluating the general knowledge of diabetes, and no specific domain is emphasized. Thus, we cannot assess the specific gap in patient knowledge. In future research, it is recommended to assess a multidisciplinary approach for assessing

the patient knowledge gap in diabetes, either within the self-care, lifestyle behaviour, dietary pattern, or medication adherence. Assessment of these knowledge gaps can help develop appropriate modules for diabetes programmes to cater to the needs and characteristics of the patient (Alhaik et al., 2019).

CONCLUSION

Patients with a low level of knowledge should be targeted to receive intervention and diabetes education programmes. Healthcare providers and diabetes educators should plan a well-structured educational programme to educate their patients based on these differences to deliver diabetes education effectively.

CONFLICT OF INTEREST

The authors declare that they have no competing interests in publishing this article.

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