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Short Communication

Knowledge, Attitude and Practice Towards Diabetes Mellitus Among Diabetic Patients in Federal Territory of Labuan, Malaysia

Yeow Shiau Hueh[1]*, Zarith Sofia Mohamad Taib[2], Nur Amira Said Udin[2], Tan Sze Ling[3]

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ABSTRACT

Background: In Malaysia, the prevalence of diabetes is highest in Western Pacific region affecting around 1 in every 5 adults. Diabetes management is often complex and diabetes knowledge, attitude and practice (KAP) are vital to make appropriate adjustments in daily lifestyles. **Objective:** The purpose of this study was to determine the level of KAP and its associated socio-demographic and disease-related factors among diabetes patients in Labuan Federal Territory, Malaysia. **Methods:** This cross-sectional study was conducted among 121 Type 2 diabetes mellitus (DM) patients in the Health Clinic of Labuan Federal Territory from November 2021 to January 2022. Patients ≥18 years old who can understand English or Malay and on regular treatment in the clinic were recruited via convenience sampling method to assess their KAP level via a validated self-administered KAP questionnaire. **Results:** On average, the participants have poor knowledge level, attitude level, yet good practice level towards diabetes. Significant moderate correlation was observed between knowledge and attitude ($r=0.454$; $P<0.001$), knowledge and practice ($r=0.463$; $P<0.001$) as well as attitude and practice ($r=0.402$; $P<0.001$). In addition, knowledge, attitude and practice towards DM are significantly associated with other variables such as educational level, monthly income, attended DM program and occupation. **Conclusion:** Diabetes patients in Labuan have poor knowledge towards DM, poor attitude towards DM and good DM practice. As diabetes education is paramount to better self-care among patients, diabetes programs that are suited to the local setting or culture is needed to empower patients with adequate knowledge for its management.

INTRODUCTION

Diabetes mellitus is a pressing global health concern, with its prevalence escalating at an alarming rate, particularly in low and middle-income countries. According to IDF Diabetes Atlas 2021, 540 million people worldwide (10.5% of the adult population) have diabetes and the rate is predicted to increase by 45% to 783 million by 20451. Among these population, more than 90% of people have Type 2 diabetes mellitus (T2DM). This disease has been linked with many complications such as kidney disease, stroke, heart attacks, blindness, and increased risk of all-cause mortality [1, 2].

In the Western Pacific region, Malaysia has the highest rate of diabetes, at a prevalence of 18.3% in 2019. With the cost of about 600 million US dollars per year, it can have a severe impact on the country's economy [3]. Based on National Health and Morbidity Survey 2019, majority of diabetes patients (74.3%) receive their treatment mainly at primary care facilities such as health clinics [4]. The management of diabetes is often complex, which requires a combination of strategies, including

*Correspondence: yshueh10@gmail.com
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[1]Clinical Pharmacist, Ministry of Health, Labuan Health Clinic Outpatient Pharmacy Unit, Labuan State Health Department, 87018 Wilayah Persekutuan Labuan, Malaysia.
[2]Pharmacist, Ministry of Health, Labuan Health Clinic Outpatient Pharmacy Unit, Labuan State Health Department, 87018 Wilayah Persekutuan Labuan, Malaysia.
[3]Clinical Pharmacist, Ministry of Health, Hospital Queen Elizabeth II, 88300 Kota Kinabalu, Sabah, Malaysia.

diet, medications, and exercise to delay or avoid consequences. As such, interdisciplinary collaborative care and patient-centered care approach are important to improve patient's glycemic level and quality of life [2].

Effective diabetes management hinges not only on medical interventions but also on the patient's understanding of the disease and their decision in undertaking self-care and adhering to treatment plan. Patients with poor health literacy are often linked with worse glycaemic control due to poor understanding of disease. Yet, research had found mixed results on its association as glycaemic control is related to heterogenous social and biologic determinants [5]. In Malaysia, patients' knowledge on diabetes has ranged from poor to moderate level across various settings in West Malaysia (Peninsular Malaysia) [6, 7, 8]. This may impede effective communication on many levels, including in interpreting blood glucose self-monitoring results, failure in transferring tailored plan for patient and transmitting behavioral motivation for self-management.

Besides, patients' attitude towards diabetes also plays an important role to influence patients' adherence towards medication therapy, dietary and lifestyle habits. As per theory of Planned Behavior, a person's attitude will form the intention in performing actions based on his/her mental perception, particularly if that behavior brings benefits to his/her life [9]. In diabetes patients, various evidence has shown that education programs improve patient's knowledge and thus their intention to carry out self-care behaviors such as medication taking, weight control, foot care and lifestyle changes [9, 10]. Previous studies have shown that high knowledge level, positive attitude and subsequently self-efficacy increases patient's acceptance towards disease, improves their quality of life and prevents complications [11].

Assessment of knowledge, attitude and practice (KAP) are therefore important to address gaps in health beliefs, education needs and barriers in self-care among diabetes patients. To date, there is no similar study conducted in the primary care clinic at the East Malaysia, specifically the Federal Territory of Labuan. Given that the sociocultural and educational background of the diabetes patients living in Labuan may differ to that of West Malaysia, the current study aims to assess diabetes KAP levels, determine the association between sociodemographic factors and diabetes KAP among T2DM patients in the Labuan Health Clinic.

MATERIAL AND METHOD

Design and setting

This was a cross-sectional observational study of Type 2 diabetes patients, ≥18 years old, conducted between November 2021 and January 2022 in the Labuan Health Clinic. The patient selection criteria were T2DM patients ≥18 years old and above; those who can read or understand Malay or English Language; and those who gave consent for research participation. Incompetent patients were excluded from the study. Incompetent patients are defined as patients who are seriously deficient in reasoning and judgement such as basic intellectual or emotional immaturity, those with high level of stress such as PTSD or severe mental retardation, severe mental illness, intoxication, severe sleep deprivation, Alzheimer's disease or being in a coma (Malaysian Medical Council Guideline: Consent for Treatment of Patients by Registered Medical Practitioners, 2016). Ethical approval for this study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia with the identification code NMRR-21-1800-58555.

Table I: Participants' sociodemographics and disease-related characteristics.

Demographics	Frequency – No. (%)
Gender	
Male	44 (36.4)
Female	77 (63.6)
Age (years)	
18-45	40 (33.1)
46-55	39 (32.2)
56-65	31 (25.6)
>65	11 (9.1)
Marital status	
Single	12 (9.9)
Married	99 (81.8)
Separated/ Divorced	10 (8.3)
Ethnicity	
Malay	65 (53.7)
Chinese	11 (9.1)
Indian	2 (1.7)
Others	43 (35.5)
Educational level	
Non-formal education	7 (5.9)
Primary	18 (15.1)
Secondary	80 (67.2)
Tertiary	14 (11.8)
Occupation	
Government	18 (14.9)
Private	22 (18.2)
Self-employed	10 (8.3)
Unemployed	71 (58.7)
Monthly income	
<RM1000	73 (60.8)
RM1001-2000	19 (15.8)
RM2001-3000	12 (10.0)
>RM3000	16 (13.3)

Sampling and sample size

The sample size was calculated based on Sample Size Calculator for Estimation of Mean to answer objective 1 in estimating the mean KAP scores of T2DM patients [12]. With the precision of 1 and standard deviation of 3.975 based on Abbasi, YF et. al, 2018 study, the sample size required based on the knowledge score was 61. As for attitude score, the

sample size needed was 94, given the standard deviation of 1.236 and precision value of 0.25. Nonetheless, the sample size required was 110 based on practice score from the previous study [7]. Overall, the highest sample size was chosen as the final sample size needed, which was 110. To account for incomplete data from the participants, another 10% was added to the sample size. Therefore, the final sample size was set at 121 participants. All eligible participants were selected via convenience sampling method and a total of 121 complete responses were included in this study.

Study Instrument

The KAP questionnaire was adopted from a previous study, which has undergone validity, reliability and inter-rater variability tests, with Cronbach alpha value of 0.812 and kappa value of 0.8247. Permission was granted by principal authors to use the questionnaire in this study. The questionnaires are available in both English and Malay versions. Pilot testing was carried out among 15 participants to assess the appropriateness, clarity and understandability of the questionnaire. The self-administered questionnaire had a total of 30 questions (sociodemographic-12, knowledge-8, attitude-5, and practice-5). The sociodemographic part included variables such as age, race, sex, marriage status, occupation, educational level and monthly income. With regards to the knowledge section, the statements are answered by a nominal scale of "true, "false" or "don't know" whereas the answers for the attitude and practice sections involve "yes", "no" or "not sure" answers. To calculate the scores for each section, 1 mark is awarded for each correct answer. False answer and "not sure" option is counted as zero mark. Therefore, this questionnaire has a total score of 18, 8 in knowledge section, 5 in attitude section and 5 in practice section.

Data analysis

The analysis was performed using Statistical Package for Social Studies (SPSS), version 18 to calculate the mean KAP scores and correlation of variables where $p<0.05$ was considered as significant. To describe the sociodemographic of participants and mean KAP scores, descriptive statistics of frequencies and percentages, as well as mean ± standard deviation were used. With regards to the KAP levels, it is divided into two categories, namely good (≥60%) and poor (<60%) as per Bloom's original cut-off points [7]. To assess the association between KAP levels, Spearman correlation was used. Nonetheless, the relationship between KAP and demographic variables such as age, education level or sex were analysed using chi-square test and Spearman correlation.

RESULT

A total of 121 diabetes patients with mean age 49.65+12.19 years took part in this study. Table I shows the participants' sociodemographic characteristics while Table II depicts the participants' disease characteristics. From a total of 121 participants, 63.6% of them were female, n=77 while 36.4% of them were male, n=44. Majority of participants were married (81.8%), unemployed (58.7%), had secondary school education (67.2%) with monthly income less than RM1000. Most of them had diabetes for 2 to 4 years (33.3%) and were mainly taking only oral medications as their DM treatment as shown in Table II. Over half of them did not attend DM program (54.6%) and were of the believe that doctors were the best source of information related to diabetes.

Knowledge assessment

Table III shows the participants' sociodemographic and diabetes-related characteristics with knowledge levels, attitude levels and practice levels. Mean Knowledge Score (MKS) of all the participants was 8.82+3.058 (48.99%+16.99%). Highest number of respondents (n=20, 16.5%) obtained a knowledge score of 9 followed by 15.7% participants (n=19) who achieved a score of 10. The third highest number of respondents obtained the knowledge score of 8 (n=16, 13.2%). Majority of the respondents (72.7%) obtained score less than 60% which shows poor knowledge toward DM. Significant association of knowledge level was observed between type of treatment (P=0.027), educational level (P<0.001) and those who attended DM program (P=0.010).

Attitude assessment

Mean attitude score (MAS) was 2.80+1.320 (56.03%+26.41%). Highest number of respondents (28.9%) was found to obtain attitude score of 3, followed by 27 participants (22.3%) who obtained the attitude score of 2 and whereas 23 participants (19.0%) obtained the attitude score of 4. Majority of participants obtained attitude score less than 60% which depicts the poor attitude toward DM. Significant association of attitude score was found with educational level (P=0.007), occupation (P=0.004), monthly income (P=0.005) and satisfaction towards their health status (P=0.016).

Practice assessment

Mean Practice Score (MPS) in this study was 3.16+1.517 (63.14%+30.33%). Majority of the participants (n=34, 28.1%) had a practice score of 4 followed by 28 participants (23.1%) who obtained a practice score of 3 and 20.7% (n=25) of participants got a practice score of 5. Majority of the participants had good practice towards DM which was shown by more than half of the participants who obtained practice score of more than 60%. There are several variables which have significant association with practice score, which include monthly income (P=0.004), educational level (P<0.001) and those who attended DM program (P=0.002).

Table II: Participants' disease-related characteristics

Variables	
Duration of diabetes	
0-1 year	29 (24.2)
2-4 years	40 (33.3)
5-10 years	34 (28.3)
>10 years	17 (14.2)
Type of treatment	
Oral	91 (75.8)
Insulin	0 (0.0)
Oral and insulin	25 (20.8)
Not sure	4 (3.3)
Comorbidities	
Heart disease	0 (0.0)
Hypertension	74 (61.4)
Kidney disease	1 (0.8)
Blurred vision	23 (19.0)
Treatment of choice	
Hospital/clinic	120 (99.2)
Complementary	0 (0.0)
Traditional	1 (0.8)
No treatment	0 (0.0)
Attended DM program	
Yes	54 (45.4)
No	65 (54.6)
Not sure	0 (0.0)
Source of DM info	
Doctor	105 (87.5)
Pharmacist	11 (9.2)
Internet	4 (3.3)
Other people	0 (0.0)
Health status	
Dissatisfied	11 (9.2)
Satisfied	64 (53.8)
Neutral	33 (27.7)
Strongly satisfied	10 (8.4)

Correlation of variables

Table IV shows the correlation of sociodemographic and disease-related variables with KAP levels. Academic qualification and monthly income are moderately correlated with KAP levels at $p<0.05$. Nonetheless, participants who attended diabetes education program had weak correlation with knowledge ($r= 0.224$) and practice ($r=0.310$). Significant moderate correlation was observed between knowledge and attitude ($r=0.454$; $P<0.001$), knowledge and practice ($r=0.463$; $P<0.001$) and attitude and practice ($r=0.402$; $P<0.001$).

DISCUSSION

In this study, there was poor knowledge level among the participants towards diabetes. This finding is consistent with several studies in different parts of the world, such as Nepal [13], India [14] and even in West Malaysia [7, 8]. The component of diabetes knowledge assessment includes the HbA1c test, nutrition content of food choice, lifestyle choice in diabetes management and the complication of diabetes such as numbness. Most of the respondents had difficulties in determining the nutrition content of common food choices such as fat, carbohydrate or protein and the definition of HbA1c test.

Knowledge level showed a significant association ($P<0.05$) with type of treatment, whether they attended diabetes education and their educational level. These data were consistent with the studies conducted by Chinnappan S study in 2017 and Abbasi F study in 2018, which reported the significant effect of education level and treatment type (either monotherapy or in combination therapy) on improving DM knowledge [7, 15]. In contrast, Abbasi F study did not show any significance of diabetes program towards DM knowledge level, which may indicate that the DM education program attended by studied population in this study were more effective.

In this study, poor attitude level towards DM is reported. The attitude scale investigates patients' autonomy and their beliefs in managing diabetes condition. This result is consistent with previous study by Abbasi YF, 2018 which state that the higher knowledge score leads to higher attitude score and vice versa [7]. From the findings, attitude level has significant association ($P<0.05$) with monthly income, occupation, educational level and satisfaction towards health status. Previous study also showed similar association of monthly income and occupation on patients' attitude level, where higher attitude score is seen in upper-income group as compared to low household income [16]. The positive influence of academic qualification on participants' attitude is also consistent with various literatures and may indicate that higher literacy is linked with better attitude towards diabetes [7, 17]. Conversely, the association between attitude level and health status satisfaction in this study is not consistent with previous study [7]. This might show that participants have better acceptance of their diabetes status and are more inclined to have positive attitude towards the disease, thus linked with greater satisfaction of health status.

Good DM practice level was achieved by most participants in this study, which is in accordance with previous study where majority of respondents have good practices toward DM [18, 19]. From the findings, practice level has significant association ($P<0.05$) with diabetes education, monthly income, and educational level. This result is in accordance with previous study where monthly income and educational level highly impacted on participants' practice level [16]. On the other hand, the significant association of DM practice level among participants who attended DM education was in contrary to that of the study conducted by Abbasi YF in 2018. This finding suggests that the studied population in this study was more cooperative with healthcare professionals, leading to a higher practice level towards diabetes.

The results show significant moderate correlations between knowledge and attitude towards DM, DM knowledge and practice towards DM, attitude and practice towards DM in Labuan. In a previous study, significant strong correlation was shown between knowledge and attitude ($r = 0.735$; $P <0.001$),

Table III: Participants' sociodemographic and diabetes-related characteristics with knowledge levels, attitude levels, and practice levels.

Variables		MKS ± SD	Knowledge leve (%)			MAS ± SD	Attitude level (%)			MPS ± SD	Practice level (%)		
			Good	Poor	P		Good	Poor	P		Good	Poor	P
Gender	Male	8.95±3.019	27.27	72.73	0.567[a]	3.05±1.462	61.36	38.64	0.146[a]	3.00±1.712	70.45	29.55	0.587[a]
	Female	8.74±3.097	27.27	72.73		2.66±1.221	58.44	41.56		3.25±1.397	72.73	27.27	
Age	18-45	9.28±3.186	30.00	70.00	0.200	2.55±1.358	52.50	47.50	0.560	3.37±1.409	80.00	20.00	0.095
	46-55	9.15±2.749	30.77	69.23		3.08±1.222	69.23	30.77		3.33±1.475	76.92	23.08	
	56-65	7.74±3.141	19.35	80.65		2.84±1.440	54.84	45.16		2.58±1.587	51.61	48.39	
	>65	9.00±3.058	27.27	72.73		2.64±1.120	63.64	36.36		3.36±1.629	81.82	18.18	
Marital status	Not married	7.83±3.215	16.67	83.33	0.490	2.92±1.379	58.33	41.67	0.846	3.25±0.965	75.00	25.00	0.891
	Married	8.96±3.139	30.30	69.70		2.81±1.360	59.60	40.40		3.12±1.586	71.72	28.28	
	Separated	8.60±1.776	10.00	90.00		2.60±0.843	60.00	40.00		3.40±1.430	70.00	30.00	
Ethnicity	Malay	8.40±2.978	20.00	80.00	0.317	2.66±1.215	52.31	47.69	0.177	3.12±1.505	70.77	29.23	0.253
	Chinese	9.18±3.060	36.36	63.64		3.00±1.414	63.64	36.36		3.91±1.136	90.91	9.09	
	Indian	9.50±0.707	0.00	100.00		4.50±0.707	100.00	0.00		2.50±0.707	50.00	50.00	
	Others	9.33±3.220	37.21)	62.79		2.88±1.434	67.44	32.56		3.05±1.618	69.77	30.23	
Educational level	Non-formal	7.57±1.397	0.00	100.00	0.001*	2.14±1.069	28.57	71.43	0.007*	2.14±1.215	42.86	57.14	0.001*
	Primary	7.78±3.828	16.67	83.33		2.89±1.323	66.67	33.33		2.61±1.577	61.11	38.89	
	Secondary	8.81±2.811	23.75	76.25		2.69±1.298	55.00	45.00		3.21±1.411	75.00	25.00	
	University	11.57±1.828	78.57	21.43		3.86±0.949	92.86	7.14		4.50±0.855	92.86	7.14	
Occupation	Government	9.89±2.139	33.33	66.67	0.315	3.83±1.098	88.89	11.11	0.004*	3.67±1.372	88.89	11.11	0.188
	Private	9.09±3.637	36.36	63.64		2.55±1.438	54.55	45.45		3.27±1.609	72.73	27.27	
	Self-employed	8.90±2.644	20.00	80.00		3.10±1.595	60.00	40.00		3.60±1.174	80.00	20.00	
	Unemployed	8.45±3.097	23.94	76.06		2.58±1.179	53.52	46.48		2.93±1.543	66.20	33.80	
Monthly income	<RM1000	8.45±3.258	26.03	73.97	0.252	2.53±1.226	50.68	49.32	0.005*	2.82±1.503	63.01	36.99	0.004*
	RM1001-2000	8.47±2.932	21.05	78.95		2.58±1.465	52.63	47.37		3.47±1.504	84.21	15.79	
	RM2001-3000	9.83±2.588	25.00	75.00		3.75±1.215	83.33	16.67		3.92±0.996	91.67	8.33	
	>RM3000	10.06±2.294	43.75	56.25		3.44±1.094	87.50	12.50		3.94±1.289	87.50	12.50	
Duration of diabetes	1 years	8.55±3.387	20.69	79.31	0.125	2.83±1.490	58.62	41.38	0.237	3.03±1.569	65.52	34.48	0.814
	2-4 years	9.42±2.678	32.50	67.50		2.82±1.279	62.50	37.50		3.32±1.542	77.50	22.50	
	5-10 years	7.94±3.133	20.59	79.41		2.50±1.212	47.06	52.94		3.15±1.329	73.53	26.47	
	>10 years	9.94±2.487	41.18	58.82		3.29±1.312	76.47	23.53		3.18±1.667	70.59	29.41	
Type of treatment	Oral	8.74±2.973	26.37	73.63	0.027*	2.76±1.302	59.34	40.66	0.113	3.10±1.506	70.33	29.67	0.255
	Insulin	0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00	
	Oral and insulin	9.92±2.613	32.00	68.00		3.12±1.236	64.00	36.00		3.60±1.354	84.00	16.00	
	Not sure	5.25±3.948	25.00	75.00		1.50±1.732	25.00	75.00		2.50±1.915	50.00	50.00	
Comorbidity	Heart disease	0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00	
	Hypertension	8.99±2.787	27.03	72.97		2.80±1.293	60.81	39.19		3.35±1.399	75.68	24.32	
	Kidney disease	10.00±0.000	0.00	100.00		1.00±0.000	0.00	100.00		5.00±0.000	100.00	0.00	
	Blurred vision	9.04±3.022	34.78	65.22		2.74±1.287	56.52	43.48		3.04±1.522	69.57	30.43	
Treatment of choice	Hospital/clinic	8.82±3.071	27.50	72.50	0.966	2.79±1.321	59.17	40.83	0.305	3.14±1.514	71.67	28.33	0.159
	Complementary	0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00	
	Traditional	9.00±0.000	0.00	100.00		4.00±0.000	100.00	0.00		5.00±0.000	100.00	0.00	
	No treatment	0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00	

Table III: Participants' sociodemographic and diabetes-related characteristics with knowledge levels, attitude levels, and practice levels (continued).

Variables		MKS ± SD	Knowledge score (%)			MAS ± SD	Attitude score (%)			MPS ± SD	Practice score (%)		
			Good	Poor	P		Good	Poor	P		Good	Poor	P
Attended DM program	Yes	9.61±2.506	35.19	64.81	0.010*	3.06±1.250	68.52	31.48	0.055	3.65±1.152	85.19	14.81	0.002*
	No	8.26±3.280	21.54	78.46		2.58±1.368	50.77	49.23		2.71±1.656	60.00	40.00	
	Not Sure	0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00	
Source of DM info	Doctor	8.62±3.014	24.7	75.24	0.211	2.72±1.355	56.19	43.81	0.208	3.13±1.569	69.52	30.48	0.839
	Pharmacist	9.73±3.409	36.36	63.64		3.45±1.036	81.82	18.18		3.09±1.136	90.91	9.09	
	Internet	10.75±2.754	50.00	50.00		3.00±0.816	75.00	25.00		3.50±1.000	75.00	25.00	
	Other people	0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00		0.00±0.000	0.00	0.00	
Health status	Dissatisfied	8.18±2.926	18.18	81.82	0.813	2.36±1.027	36.36	63.64	0.016*	2.73±1.009	72.73	27.27	0.230
	Satisfied	8.84±3.334	29.69	70.31		2.61±1.364	53.12	46.88		3.06±1.622	64.06	35.94	
	Neutral	9.15±2.587	24.24	75.76		3.42±1.119	81.82	18.18		3.55±1.252	84.85	15.15	
	Strongly satisfied	8.80±3.360	30.00	70.00		2.70±1.494	60.00	40.00		2.70±2.003	70.00	30.00	

Table IV: Correlation of variables with Knowledge, Attitude and Practice levels.

Variable	Knowledge level		Attitude level		Practice level	
	Correlation coefficient	P	Correlation coefficient	P	Correlation coefficient	P
Age	0.119	0.195	0.040	0.667	0.080	0.383
Gender	0.034	0.712	0.140	0.125	0.079	0.392
Marital status	0.061	0.504	0.050	0.585	0.017	0.854
Ethnicity	0.141	0.124	0.088	0.336	0.034	0.713
Academic qualification	0.309	0.001*	0.213	0.020*	0.362	0.001*
Occupation	0.165	0.071	0.256	0.005*	0.174	0.056
Monthly income	0.197	0.031*	0.298	0.001*	0.305	0.001*
Disease duration	0.040	0.668	0.037	0.689	0.016	0.863
Treatment choice	0.005	0.953	0.083	0.364	0.111	0.224
Attended diabetes program	0.224	0.015*	0.177	0.054	0.310	0.001*
Best source of DM information	0.159	0.083	0.124	0.176	0.029	0.757
Health status satisfaction	0.037	0.688	0.184	0.046	0.098	0.288
Knowledge level			0.454	0.001	0.463	0.001
Attitude level					0.402	0.001

*Correlation is significant at the 0.05 level.

knowledge and practice (r = 0.786; P <0.001), attitude and practice level (r = 0.679; P <0.001) [7]. The results achieved in this study differ from that of the previous study for its moderate correlation. Given the complexity of diabetes disease and human behavior, this may indicate that there could be other factors that influence participants' practice which requires further research.

Limitation of the study

One of the study limitations is that the questionnaire response of the participants may be subjected to recall bias and social desirability bias especially when interviewer reads the questions to participants who have low reading literacy. In addition, the use of convenience sampling technique in patient recruitment may lead to sampling bias; thus, the study findings are not generalisable to the whole population of Labuan.

Implication of the study

Nonetheless, these results can be used to initiate discussion in the profession and with health policy stakeholders about future diabetes care, as well as to propose intervention strategies for awareness raising, prevention of complications and improvement of quality of life and health outcome among diabetes patients in Labuan. Thus, future studies should include the modification of educational approach and diabetes awareness campaign with more emphasis on attitude change to determine its effectiveness in improving the knowledge and health outcomes of diabetes patients.

CONCLUSIONS

In this study, it was found that diabetes patients in Labuan Federal Territory, Malaysia had poor knowledge towards DM, poor attitude towards DM yet good DM practice. Knowledge, attitude, and practice towards DM are significantly correlated with each other. In addition, knowledge, attitude and practice towards DM are significantly associated with other variables such as educational level, monthly income, attended DM program and occupation. Therefore, diabetes education or program that are well- suited to the local setting or culture are crucial to empower diabetes patients with adequate knowledge, adjust their daily practices and subsequently improve their glycaemic control.

CONFLICT OF INTEREST

This study has no conflict of interest. The research did not receive any specific grant from funding agencies in public, commercial or not-for-profit sectors.

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