

Public Knowledge, Attitudes and Self-Practice towards Diabetes Mellitus in Kangar, Perlis

SOO PP¹, DALI N², SHAKAR NS²

¹Pharmaceutical Services Divisions, State Health Department of Perlis, Malaysia

²Pharmacy Unit, Kangar Health Clinic, Jalan Kolam, 01000 Kangar, Perlis, Malaysia

ABSTRAK

Di Malaysia, Perlis merupakan salah sebuah negeri yang menunjukkan angka tertinggi yang mempunyai pesakit diabetes mellitus (DM). Pencegahan dan pengurusan DM adalah bergantung kepada amalan sendiri dalam kehidupan seharian. Walau bagaimanapun, masih banyak informasi yang tidak diketahui mengenai faktor-faktor yang mempengaruhi penglibatan orang ramai dalam amalan sendiri terhadap DM yang mungkin telah menyumbang kepada prevalensi DM yang tinggi di Perlis. Kajian ini dilakukan untuk menilai pengetahuan, sikap, serta faktor-faktor yang berkaitan dengan amalan sendiri terhadap DM di kalangan masyarakat di Kangar, Perlis. Kajian keratan rentas telah dilakukan bermula pada Jun 2018 selama tiga bulan. Peserta yang layak dijemput untuk melengkapkan soal selidik di kawasan awam di Kangar. Analisis deskriptif mengenai ciri-ciri sosiodemografi, sejarah perubatan, pengetahuan, sikap dan amalan sendiri terhadap DM telah dilakukan. Ujian t-test dan korelasi Spearman telah digunakan untuk menilai hubungan antara sosiodemografi, sejarah perubatan, pengetahuan, dan sikap masyarakat di Kangar dengan amalan sendiri terhadap DM. Regresi linear berganda digunakan untuk menganalisis hubungan di antara pembolehubah dalam kajian ini. Sebanyak 319 responden bersetuju dan mengambil bahagian dalam kajian ini. Kebanyakan responden ialah perempuan (66.5%), Melayu (94%), dan mempunyai pendidikan tinggi (51.7%). Secara keseluruhan, kebanyakan peserta mempunyai skor pengetahuan (80.3%), sikap (98.4%), dan amalan sendiri (97.2%) yang baik terhadap DM. Hubungan positif yang signifikan secara statistik didapati antara usia, tahap pendidikan, dan skor sikap dengan amalan sendiri terhadap DM ($p < 0.05$). Kajian ini menunjukkan bahawa program pendidikan mengenai rawatan sendiri DM harus bermula seawal dari peringkat sekolah untuk menjelaskan tentang pengurusan DM yang betul.

Kata kunci: amalan sendiri, diabetes mellitus, orang awam, pengetahuan, sikap

Address for correspondence and reprint requests: Pei Pei Soo, Pharmaceutical Services Divisions, State Health Department of Perlis, 48C, Jalan Raja Syed Alwi, Kampung Guar Syed Alwi, 01000 Kangar, Perlis, Malaysia. Tel: +6049765033 ext 1104 Email: peipeisoo@hotmail.com

ABSTRACT

In Malaysia, the prevalence of diabetes mellitus (DM) was the second highest in Perlis. Prevention and management of DM are largely dependent on self-care in our daily lives. Nonetheless, we have little information concerning factors influencing public engagement in DM self-practice, which might have contributed to the high prevalence of DM in Perlis. This study was conducted to evaluate knowledge, attitudes, and factors associated with self-practice towards DM among the public in Kangar, Perlis. A cross-sectional study was conducted in June 2018 for three months. Eligible participants were invited to complete a self-administered questionnaire in public areas in Kangar. Descriptive analyses on the sociodemographic, medical backgrounds, knowledge, attitudes, and self-practice towards DM were performed. Independent t-test and Spearman's correlation were performed to assess the association between sociodemographic characteristics, medical history, knowledge, and attitudes with self-practice towards DM. Multiple linear regression was used to adjust for potential confounding variables. A total of 319 respondents consented and participated in this study. Most of the respondents were female (66.5%), Malay (94%), and had tertiary education (51.7%). Overall, most participants had good scores on knowledge (80.3%), attitudes (98.4%), and self-practice (97.2%) towards DM. A statistically significant positive association was found between age, education level, and attitudes score with DM self-practice ($p < 0.05$). This study suggests a well-structured educational program on diabetes self-care should start as early as in school to clarify public misconceptions on DM management.

Keywords: attitudes, diabetes mellitus, knowledge, public, self-practice

INTRODUCTION

Diabetes mellitus (DM) is an illness that occurs when there is a chronic increase in blood glucose concentration or hyperglycaemia (Ministry of Health Malaysia 2015). DM is a silent and progressive disease. During the initial phase of the disease, it could show no symptoms. Some may take many years to develop the symptoms and experience long-term DM complications, such as retinopathy, nephropathy, sexual dysfunction, and

diabetic neuropathy (Fowler 2008). DM is also one of the key risk factors for cardiovascular diseases, which contributes to the leading causes of death in Malaysia (Aniza et al. 2016).

The prevalence of DM has increased globally. In 2000, more than 170 million individuals in the world were diagnosed with DM (Wild et al. 2004). The figure is estimated to increase to 366 million by the year 2030. In Malaysia, DM remains the most prevalent non-communicable disease affecting the public. The prevalence of DM

increased from 11.2% in 2011, 13.4% in 2015, to 18.3% in 2019 for adults above 18 years old, based on the latest National Health and Morbidity Survey (Institute for Public Health 2020b). There was a considerable variation of DM prevalence rate between different states in Malaysia, with the second highest prevalence of DM was found in Perlis (32.6%) (Institute for Public Health 2020b). Perlis is the smallest state located in the north of Peninsular Malaysia. Up to 2015, a total of 33,090 diabetic patients was found in Perlis (Institute for Public Health 2015). The number of adults with DM in Perlis increased to 52,184 in 2019 (Institute for Public Health 2020b).

Conceivable reasons for the steady increment in the prevalence of DM in Asian countries may include poor nutritional habits, physical inactivity, urbanisation, low health literacy, and poor attitudes towards DM management among the overall population and diabetic patients (Bollu et al. 2015). Disease awareness, early diagnosis and patients' active involvement in controlling blood glucose levels are associated with knowledge, attitudes, and self-practice towards DM. Patients with insufficient knowledge regarding their illness frequently have poor self-management skills (Perera et al. 2013). DM self-care activities involve following a diet plan with high fibre, low sugar, and fat intake, staying active, regular blood glucose monitoring, and foot care. These activities could improve glycaemic control, reduce DM complications, and subsequently improve the quality of life among DM patients (Glasgow &

Strycker 2000).

The alarming rise of non-communicable diseases, including DM in Perlis, is of great concern. Although various health promotion programs have been done by health authorities to educate the public about DM through multiple platforms, the impact of these efforts has not been evaluated. Therefore, we have no information on how much the public knows regarding this disease. The objective of the current study was to investigate public knowledge, attitude and factors associated with self-practice towards DM among the public in Kangar, Perlis.

MATERIALS AND METHODS

This cross-sectional study was carried out in Kangar, Perlis, starting from June 2018 for three months. The study targeted the public aged 18 years old and above residing in Kangar. The sample size calculation for this study was based on the population proportion (Lemeshow et al. 1990). The prevalence of DM in Perlis was 0.206 (Institute for Public Health 2015), and the population size of Kangar residents was 97,700 (Department of Statistics Malaysia 2017). If the Type I error probability and precision were 0.05, respectively; we needed to study 252 samples. After taking into consideration of a 20% dropout rate, the final sample size was 315. The quota sampling method was used to collect samples from every administrative division in Kangar. There are nine administrative divisions in Kangar, namely Abi, Jejawi, Kechor, Kurong Batang, Seriab, Wang Bintong,

Sena, Kuala Perlis, and Kayang. A total of 35 subjects were selected from each administrative division in public areas such as bus stops, jetty, and markets.

A questionnaire containing 51 questions was adapted from a previous study (Al-Naggar et al. 2017). This self-administered questionnaire was distributed to the public in Kangar who fulfilled the following criteria, i.e., i) Inclusion: Adults aged 18 years old residing in Kangar, Perlis; ii) Exclusion: Unable to read and write in Malay. The questionnaire was divided into four parts measuring sociodemographic characteristics, medical history, knowledge, attitudes, and self-practice towards DM. There were nine questions assessing sociodemographic and medical backgrounds, 13 questions measuring knowledge, nine questions for attitudes, and 20 questions on DM self-practice. Informed consent was obtained before participating in this survey. Then, respondents were given approximately 15 minutes to answer the questionnaire. All responses received from this survey remained confidential.

Data analyses were done in the Statistical Packages for Social Sciences (SPSS) Version 20.0 (IBM Corp., Armonk, NY, USA). Descriptive analyses on the sociodemographic characteristics, medical history, knowledge, attitudes, and self-practice towards DM were performed. The raw scores for knowledge, attitudes, and self-practice towards DM were summed up and transformed into percentage scores. An arbitrary cut-off point of 75% was used for knowledge, while 50% was used for attitudes and self-practice

towards DM, respectively (Al-Naggar et al. 2017). Univariable analyses (Independent t-test and Spearman's correlation) were performed to assess the association between each of the sociodemographic backgrounds, medical history, knowledge, and attitudes of the public in Kangar with their self-practice towards DM. All variables in univariable analysis ($p < 0.10$) were included for the downstream analysis. These variables were tested for multicollinearity before entering multiple linear regression. All statistical tests were performed at a 5% significance level.

RESULTS

Out of the 346 questionnaires distributed during the study period, 319 member of the public responded to this study, providing a response rate of 91.9%. Approximately one-third of the respondents (32.6%) were aged between 18 to 28 years old. Most of our respondents were female (66.5%), Malay (94.0%), married (63.9%). Slightly more than half of them had tertiary education (51.7%), and 31.0% worked in the government sector. More than 80% of them were non-smokers and had no previous medical history of chronic illnesses (DM, hypertension, dyslipidaemia, and ischaemic heart disease). Only 13.8% of the respondents were known case of DM. More than half (57.4%) of the respondents reported they had a family history of DM. The sociodemographic characteristics and medical history of the respondents is shown in Table 1.

Respondents' knowledge about

Table 1: Sociodemographic background of respondents, n=319

Variables	Categories	n (%)
Age (years)	18-28	104 (32.6)
	29-39	93 (29.2)
	40-50	71 (22.3)
	≥51	51 (16.0)
Gender	Male	107 (33.5)
	Female	212 (66.5)
Ethnicity	Malay	300 (94.0)
	Chinese	13 (4.1)
	Indian	3 (0.9)
	Others	3 (0.9)
Educational level	Not school	4 (1.3)
	Primary school	12 (3.8)
	Secondary school	138 (43.3)
	College/ University	165 (51.7)
Marital status	Single	101 (31.7)
	Married	204 (63.9)
	Widowed/widow	14 (4.4)
Jobs status	Government	99 (31.0)
	Private	92 (28.8)
	Self-employed	68 (21.3)
	Unemployed	47 (14.7)
	Pension	13 (4.1)
Smoking status	Not smoking	274 (85.9)
	Smoker	37 (11.6)
	Ex-smoker	8 (2.5)
Hypertension	No	262 (82.1)
	Yes	57 (17.9)
Diabetes mellitus	No	275 (86.2)
	Yes	44 (13.8)
Dyslipidaemia	No	258 (80.9)
	Yes	61 (19.1)
Ischemic Heart disease	No	307 (96.2)
	Yes	12 (3.8)
Family history of diabetes mellitus	No	183 (57.4)
	Yes	136 (42.6)

the disease, symptoms, complication, prevention, and treatment of DM is shown in Table 2. Almost all of the respondents (99.1%) answered DM is a condition in which the blood glucose level is higher than normal. More than 90% of the respondents answered frequent urination, increased thirst, loss of weight, waking up at night to urinate and fatigue as symptoms of DM. Most

respondents answered renal failure, retinopathy, diabetic foot disease and nerve damage as complications of DM. Only about 70% of respondents were aware of heart attack, and stroke were also the complications of DM. Most respondents answered DM is preventable via losing weight, maintaining a healthy and balanced diet, staying physically active, having

Table 2: Knowledge on diabetes mellitus, n= 319

Knowledge		n (%)	
		True	False
Knowledge of disease	Diabetes is a condition in which your blood sugar levels are higher than normal	316 (99.1)	3 (0.9)
	Diabetes is a syndrome or disease as a result of lack or loss of effectiveness of insulin	280 (87.8)	39 (12.2)
	There are 2 types of diabetes mellitus: Type 1 (insulin dependent) and Type 2 (non-insulin dependent)	287 (90.0)	32 (10.0)
Knowledge of symptoms	Frequent urination	288 (90.3)	31 (9.7)
	Increased thirst	287 (90.0)	32 (10.0)
	Loss of weight	294 (92.2)	25 (7.8)
	Wake up at night to urinate	289 (90.6)	30 (9.4)
	Fatigue (easily tired)	304 (95.3)	15 (4.7)
Knowledge of complications	High blood pressure can worsen the diabetes	273 (85.6)	46 (14.4)
	Renal failure	298 (93.4)	21 (6.6)
	Blindness/retinopathy	287 (90.0)	32 (10.0)
	Diabetic foot disease	311 (97.5)	8 (22.5)
	Nerve damage, especially in the legs	296 (92.8)	23 (7.2)
	Heart attack	235 (73.7)	84 (26.3)
	Stroke	229 (71.8)	90 (28.2)
Knowledge of prevention	Losing weight	280 (87.8)	39 (12.2)
	Practice a healthy and balanced diet	313 (98.1)	6 (1.9)
	Stay physically active	309 (96.9)	10 (3.1)
	Quit smoking	283 (88.7)	36 (11.3)
	Reduce stress	267 (83.7)	52 (16.3)
	Have a good and sufficient sleep	272 (85.3)	47 (14.7)
	Keeping blood pressure and cholesterol levels in the normal range	297 (93.1)	22 (6.9)
	Do a routine eye check-up once a year	266 (83.4)	53 (16.6)
Knowledge of treatment	Medication is less beneficial than diet and exercise to control my diabetes	231 (72.4)	88 (27.6)
	Once the sugar level is controlled drugs should be stopped	244 (76.5)	75 (23.5)
	Insulin is the first line treatment for diabetes mellitus	234 (73.4)	85 (26.6)
	Traditional medicine is less effective	190 (59.6)	129 (40.4)
	Regular treatment can delay diabetic retinopathy	296 (92.8)	23 (7.2)
	There is no need for retinopathy treatment afterward if already had the treatment	207 (64.9)	112 (35.1)

Table 3: Attitude towards diabetes mellitus, n= 319

Attitude	n (%)				
	Strongly disagree	Disagree	Do not know	Agree	Strongly agree
Diabetes mellitus is preventable	12 (3.8)	9 (2.8)	9 (2.8)	179 (56.1)	110 (34.5)
Diabetes mellitus is treatable	10 (3.1)	14 (4.4)	13 (4.1)	197 (61.8)	85 (26.6)
Regular exercise helps controlling diabetes	5 (1.6)	19 (6.0)	23 (7.2)	182 (57.1)	90 (8.1)
Following a controlled and planned diet will help in controlling progression of diabetes mellitus	5 (1.6)	5 (1.6)	6 (1.9)	191 (59.9)	112 (35.1)
Regular checking of blood sugar level is important in diabetic patient	5 (1.6)	7 (2.2)	9 (2.8)	175 (54.9)	123 (38.6)
Diabetic patients should keep in touch with their physician	6 (1.9)	11 (3.4)	5 (1.6)	193 (60.5)	104 (32.6)
It is necessary for diabetic patient to take medication properly and regularly	6 (1.9)	3 (0.9)	8 (2.5)	173 (54.2)	129 (40.4)
Missing doses of diabetic medication will have a negative effect on the disease control	8 (2.5)	8 (2.5)	24 (7.5)	174 (54.5)	105 (32.9)
Smoking exacerbates vascular complications due to diabetes	7 (2.2)	12 (3.8)	46 (14.4)	196 (48.9)	58 (18.2)

good and sufficient sleep, controlling the blood pressure and cholesterol levels in the normal range, and following routine eye check-up. This study found that most respondents believed insulin is the first-line treatment for DM (73.4%). About 40% of the respondents believed traditional medicines are useful in the treatment of diabetes. Besides, 64.9% of the respondents believed there is no need for subsequent retinopathy treatment if they already had the treatment.

For attitudes towards DM (Table 3), most respondents (90.6%) agreed that diabetes is preventable. A total

of 88.4% of respondents also agreed that DM is treatable. Besides, they also believed that regular exercise helps to control DM (88.4%). More than 90% of the respondents agreed that it is vital to keep in touch with their physician and take medications appropriately. About 67.1% of respondents agreed that smoking would increase the risk of vascular complications due to DM. Respondents' self-practice towards DM is shown in Table 4. The percentage for those who never check their blood glucose level, cholesterol level, and blood pressure were 18.2%, 24.1%, and 12.9%, respectively. About 80.8%

Table 4: Self-practice towards diabetes mellitus, n= 319

Practice	n (%)			
	Never	Once in 2 years or more	Yearly	Once in 6 months
Regular check-up				
How often do you check your blood sugar levels?	58 (18.2)	52 (16.3)	103 (32.3)	106 (33.2)
How often do you check your cholesterol level?	77 (24.1)	50 (15.7)	104 (32.6)	88 (27.6)
How often do you do a urine test?	68 (21.3)	71 (22.3)	105 (32.9)	75 (23.5)
How often do you check your blood pressure?	41 (12.9)	59 (18.5)	72 (22.6)	147 (46.1)
Exercise	Never	< 1 hour	1-3 hours	>3 hours
Physical exercise such as swimming, jogging, aerobics, football, tennis, working out in the gym etc.	61 (19.1)	151 (47.3)	91 (28.5)	16 (5.0)
Cycling, including cycling to work and free time	178 (55.8)	91 (28.5)	37 (11.6)	13 (4.1)
Walking, including walking to work, walking in the shopping mall and etc.	4 (1.3)	93 (29.2)	107 (33.5)	115 (36.1)
Household chores examples cleaning the house, taking care of children Gardening	19 (6.0)	72 (22.6)	115 (36.1)	113 (35.4)
Diet	Never	Sometimes	1-3 times per week	Everyday
Carbohydrate (White rice, noodle, bread, cereals)	3 (0.9)	33 (10.3)	32 (10.0)	251 (78.7)
Fibre & Fruits	1 (0.3)	62 (19.4)	94 (29.5)	162 (50.8)
Vegetables	2 (0.6)	37 (11.6)	56 (17.6)	224 (70.2)
Protein (chicken/meat/eggs)	2 (0.6)	26 (8.2)	76 (23.8)	215 (67.4)
Legumes (dhal, tempeh, green bean)	9 (2.8)	161 (50.5)	94 (29.5)	55 (17.2)
Milk and milk products	25 (7.8)	123 (38.6)	85 (26.6)	86 (27.0)
Fats, oil, sugar and salt	6 (1.9)	72 (22.6)	49 (15.4)	192 (60.2)
Fast food (KFC, McDonald's, etc.)	16 (5.0)	258 (80.9)	30 (9.4)	15 (4.7)
Carbonated drinks (Coca cola, Pepsi, 7up, etc.)	105 (32.9)	179 (56.1)	24 (7.5)	11 (3.4)
Sugary drinks/flavoured (syrup, Ribena, Lychee, etc.)	25 (7.8)	196 (61.4)	52 (16.3)	46 (14.4)
Salty food (salted fish, salted eggs)	27 (8.5)	209 (65.5)	59 (18.5)	24 (7.5)

Table 5: Scale to measure knowledge, attitudes and self-practice towards diabetes mellitus, n= 319

KAP	n	%
Percentage knowledge		
≤75 %	63	19.7
>75%	256	80.3
Median ± IQR		89.66 ± 17.24
Percentage attitudes		
≤50 %	5	1.6
>50%	314	98.4
Median ± IQR		75.56 ± 8.88
Percentage self-practice		
≤50 %	9	2.8
>50%	310	97.2
Mean ± SD		71.76 ± 8.73

KAP=knowledge, attitudes and practice; n=frequency; %=percentage; IQR=interquartile range; SD=standard deviation

of the respondents reported they had physical exercise daily. Less than half of the respondents cycled to work or during free time. There were 78.7% of respondents consumed carbohydrates in their diet every day. Only 50.8% of the respondents had fibre and fruits intake daily. This study found an overall good knowledge, attitudes, and self-practice towards DM among the respondents, with the percentage of 80.3%, 98.4% and 97.2%, respectively (Table 5).

Table 6 shows the descriptive association between sociodemographic, medical backgrounds, knowledge and attitudes towards self-practice on DM among in this study. Univariate analyses revealed nine factors were significantly associated with self-practice on DM ($p < 0.05$). The factors included age, marital status, education level, history of hypertension, DM, dyslipidaemia, family history of DM, as well as knowledge and attitudes towards DM. Only age (Adjusted $\beta = 0.151$),

education level (Adjusted $\beta = 2.445$), and level of attitudes (Adjusted $\beta = 0.150$) were significantly associated with self-practice on DM ($p < 0.05$) in multiple linear regression after accounting for other variables (Table 7).

DISCUSSION

This cross-sectional study identified only a small proportion of respondents were diagnosed with DM. The prevalence of DM among the public in Kangar was lower than the prevalence of DM in Perlis's population as reported in the National Health and Morbidity Survey in 2015 (Institute for Public Health 2015) and 2019 (Institute for Public Health 2020a). One possible explanation was that the settings in this study were mostly resided by well-educated respondents who were more aware of DM self-care. Additionally, most respondents reported a healthy lifestyle by eating a well-balanced diet, exercising regularly, and following

Table 6: Univariate analyses for factors associated with public self-care practice on diabetes mellitus, n=319

Variable	Category	self-care practice, Mean \pm SD	test statistic t (df) / ρ	p-value
Age (years) ¹		35.00 \pm 19.00	$\rho = 0.364$	<0.001*
Gender	Male	70.96 \pm 9.40	t (192.17) = -1.161	0.266
	Female	72.16 \pm 8.36		
Ethnic	Malay	71.95 \pm 8.67	t (317) = 1.552	0.122
	Non-Malay	68.75 \pm 9.32		
Marital status	Married	73.39 \pm 8.49	t (317) = -4.609	<0.001*
	Not married	68.85 \pm 8.41		
Education level	\leq Secondary school	70.66 \pm 8.46	t (317) = -2.184	0.030*
	College or tertiary education	72.78 \pm 8.87		
Employment status	Employed	71.33 \pm 8.96	t (317) = -1.828	0.068
	Unemployed	73.60 \pm 7.43		
Smoking status	Smoking	71.69 \pm 9.88	t (317) = 0.051	0.960
	Non-smoking	71.77 \pm 8.54		
History of hypertension	Yes	76.91 \pm 7.31	t (317) = -5.110	<0.001*
	No	70.63 \pm 8.62		
Family history of diabetes mellitus	Yes	76.62 \pm 8.08	t (317) = 0.764	<0.001*
	No	70.98 \pm 8.58		
History of dyslipidemia	Yes	75.51 \pm 7.61	t (317) = 0.411	<0.001*
	No	70.87 \pm 8.75		
History of ischemic heart disease	Yes	73.54 \pm 8.48	t (317) = 0.802	0.471
	No	71.69 \pm 8.74		
Family history of diabetes mellitus	Yes	73.35 \pm 8.15	t (317) = 0.366	0.005*
	No	70.57 \pm 8.97		
Attitudes score ¹		75.56 \pm 8.88	$\rho = 0.189$	0.001*
Knowledge score ¹		89.66 \pm 17.24	$\rho = 0.178$	0.001*

¹= Median \pm IQR; ρ = Spearman ranked test correlation coefficient; t=t-test; *=p-value<0.05; All variables with p-value < 0.10 were included in the multivariable analysis.

Table 7: Multivariable analysis on factors associated with public self-practice on diabetes mellitus using multiple linear regression with Enter method, n=319

Variable	Adjusted β (95% CI)	t	p-value
Age	0.151 (0.054, 0.248)	3.071	0.002*
Education level	2.445 (0.679, 4.210)	2.724	0.007*
Marital status	1.969 (-0.178, 4.117)	1.805	0.072
Employment status	2.089 (-0.222, 4.399)	1.779	0.076
History of diabetes mellitus	0.002 (-3.755, 3.758)	0.001	0.999
History of hypertension	2.289 (-1.375, 5.953)	1.229	0.220
History of dyslipidaemia	-0.134 (-3.240, 2.973)	-0.085	0.933
Family history of diabetes mellitus	1.621 (-0.191, 3.432)	1.760	0.079
Attitudes score	0.150 (0.061, 0.238)	3.338	0.001*
Knowledge score	0.044 (-0.028, 0.116)	1.204	0.229

adjusted R²=0.195, *=p<0.05

routine check-ups.

Consistent with the findings from a previous study conducted in Selangor, Malaysia (Al-Naggar et al. 2017), most of the respondents in this study had good knowledge about DM. Nevertheless, there were some misconceptions about the knowledge of DM treatment. Like the previous study (Al-Naggar et al. 2017), some of the respondents believed that traditional medicines are effective in DM treatment. Studies showed a high prevalence of traditional medicine use among Malaysians (Siti et al. 2009), with this practice being closely related to our culture (Ikram & Abd Ghani 2015). Furthermore, in the current study, some respondents reported insulin was the first-line treatment for DM, and there is no need for retinopathy treatment afterwards if they already had the treatment. In most newly diagnosed DM cases, the patients will be started with oral anti-diabetic agents and suggested lifestyle modification (Ministry of Health Malaysia 2015). Insulin will be started later if the targeted glycaemic control is not achieved. Besides, every diabetic patient should have an eye examination annually and receive treatment accordingly (Paksin-Hall et al. 2013).

In the current study, most respondents had good attitudes towards DM, which was consistent with two other studies conducted earlier in Malaysia (Al-Naggar et al. 2017; Ng et al. 2012). These findings suggested that the satisfactory levels of attitudes towards DM were attributed to the implementation of current DM educational programs from the health

authorities to the public. Another study conducted in Penang in 2009 showed that patients' blood sugar level was significantly optimised after joining a structured DM educational program (Al-Haddad et al. 2009). Besides, the results from the current study were consistent with the findings from a previous study (Al-Naggar et al. 2017), which found that most respondents had good self-practice toward DM. Majority of the respondents in this study reported having routine check-ups, staying physically active, and following a healthy eating diet, which had contributed to good DM self-practice.

Additionally, the current study demonstrated a clear association between age, education level, and attitudes with self-practice towards DM. As the age of the respondent increases, they tend to have more self-practice towards DM. It was suggested in a study that older adults tend to be more aware of DM and its complications (Chavan et al. 2015). Those with higher education levels and good attitudes towards DM would tend to look for more information in this area and were more confident in DM self-care practice. In contrast, a study conducted in Northwest Ethiopia found education level did not influence DM's self-practice (Feleke et al. 2013). Interestingly, knowledge levels were found to have no association with their self-practice towards DM in this study. The findings suggested that a good knowledge score does not always result in a positive self-practice.

There were a few limitations which should be noted in this study. The

cross-sectional study design of this study measured all independent and dependent variables simultaneously. Therefore, the causality of the studied variables cannot be determined. However, the findings can still be useful as preliminary data for future studies, allowing further research to expand on the results. Moreover, this study's results were limited only to the adults in public areas in Kangar; hence the prevalence rate of DM may be underestimated. Concerns on the generalizability of the results to the whole population may arise.

CONCLUSION

In conclusion, this study highlights most respondents had a good score for knowledge, attitudes, and self-practice towards DM in Kangar, Perlis. DM self-practice may vary by age, education level, and attitudes toward DM. Besides, several misconceptions about DM's treatment were identified in this study. Therefore, more holistic educational programs that tackle the areas of weaknesses identified in this study are recommended, which can be started as early as in school to promote good self-practice towards DM.

ACKNOWLEDGEMENT

The authors would like to thank the Director General of Health for permission to publish this study. The authors would also like to thank Mr Ng Yit Han for his advice on data analysis for this study.

REFERENCES

- Al-Haddad, M., Ibrahim, M., Sulaiman, S., Maarup, N. 2009. The impact of two diabetes educational programs on patients with diabetes in Malaysia. *J Clin Diagnostic Res* 3(4): 1633-40.
- Al-Naggar, R.A., Osman, M.T., Ismail, N., Ismail, Z., Noor, N.A.M., Ruzlin, A.N.M., Selamat, M. I.B. 2017. Diabetes mellitus among selected Malaysian population: a cross-sectional study. *Int J Med Res & Health Sci* 6(4): 1-11.
- Aniza, I., Nurmawati, A., Hanizah, Y., Ahmad Taufik, J. 2016. Modifiable risk factors of cardiovascular disease among adults in rural community of Malaysia: a cross sectional study. *Malaysian J Public Health Med* 16(1): 53-61.
- Bollu, M., Nalluri, K.K., Prakash, A.S., Lohith, M.N., Venkataramarao, N. 2015. Study of knowledge, attitude, and practice of general population of Guntur toward silent killer diseases: hypertension and diabetes. *Asian J Pharm Clin Res* 8(4): 74-8.
- Chavan, G.M., Waghchavare, V.B., Gore, A.D., Chavan, V.M., Dhobale, R.V., Dhumale, G.B. 2015. Knowledge about diabetes and relationship between compliance to the management among the diabetic patients from Rural Area of Sangli District, Maharashtra, India. *J Family Med Prim Care* 4(3): 439-43.
- Department of Statistics Malaysia. 2017. Perlis Population. https://www.dosm.gov.my/v1/index.php?column=cone&menu_id=UDZaUXd2N2k2L2orK2FpdDJ1UjVtZz09 [20 September 2017]
- Feleke, S.A., Alemayehu, C.M., Adane, H.T., Onigbinde, A., Akindoyi, O., Faremi, F. 2013. Assessment of the level and associated factors with knowledge and practice of diabetes mellitus among diabetic patients attending at FelegeHiwot hospital, Northwest Ethiopia. *Clin Med Res* 2(6): 110-20.
- Fowler, M.J. 2008. Microvascular and macrovascular complications of diabetes. *Clin Diabetes* 26(2): 77-82.
- Glasgow, R.E., Strycker, L.A. 2000. Preventive care practices for diabetes management in two primary care samples. *Am J Prev Med* 19(1): 9-14.
- Ikram, R.R.R., Abd Ghani, M.K. 2015. An overview of traditional Malay medicine in the Malaysian healthcare system. *J Appl Sci* 15(5): 723.
- Institute for Public Health. 2015. National Health and Morbidity Survey 2015 (NHMS 2015). Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems.
- Institute for Public Health. 2020a. National Health and Morbidity Survey (NHMS) 2019: Non-communicable diseases, healthcare demand, and health literacy-Key Findings.

- Institute for Public Health. 2020b. National Health and Morbidity Survey (NHMS) 2019: Vol. 1: NCDs-Non-Communicable Diseases: Risk Factors and other Health Problems.
- Lemeshow, S., Hosmer, D.W., Klar, J., Lwanga, S.K., WHO. 1990. *Adequacy of sample size in health studies*: Chichester: Wiley.
- Ministry of Health Malaysia. 2015. *Clinical practice guidelines: management of type 2 diabetes mellitus 5th edition*. Malaysia.
- Ng, S.H., Chan, K.H., Lian, Z.Y., Chuah, Y.H., Waseem, A.N., Kadirvelu, A. 2012. Reality vs illusion: knowledge, attitude and practice among diabetic patients. *Int J Collab Res Internal Med* 4(5): 723.
- Paksin-Hall, A., Dent, M.L., Dong, F., Ablah, E. 2013. Factors contributing to diabetes patients not receiving annual dilated eye examinations. *Ophthalmic Epidemiology* 20(5): 281-7.
- Perera, D., De Silva, R., Perera, W. 2013. Knowledge of diabetes among type 2 diabetes patients attending a primary health care clinic in Sri Lanka. *East Mediter Health J* 19(7): 644-8.
- Siti, Z., Tahir, A., Farah, A.I., Fazlin, S.A., Sondi, S., Azman, A., Maimunah, A., Haniza, M., Haslinda, M.S., Zulkarnain, A. 2009. Use of traditional and complementary medicine in Malaysia: a baseline study. *Complement Ther Med* 17(5-6): 292-9.
- Wild, S., Roglic, G., Green, A., Sicree, R., King, H. 2004. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care* 27(5): 1047-53.

Received: 03 Nov 2020

Accepted: 19 Feb 2021