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ASSESSING KNOWLEDGE, ATTITUDE, PRACTICE TOWARDS TYPE II DIABETES MELLITUS AND THEIR BLOOD GLUCOSE LEVEL AMONG PUBLIC IN SELECTED AREAS OF BACHOK DISTRICT, KELANTAN

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ABSTRACT

Diabetes is a major health problem in Malaysia particularly in Kelantan state. This cross-sectional study was designed to determine the knowledge, attitude and perceive practice towards type II diabetes among the public residants of Kelantan in relation towards their blood glucose level. About 68 respondents aged from 18 to 59 years old, were approached personally to participate in this study. Data collection was done through face-to-face interview using a questionnaire consisted of four sections; knowledge, attitude, and perceive practice (KAP) questionnaire including recent fasting blood glucose (FBG) readings. The results showed that most of the respondents had a moderate level of knowledge (54.4%, n=37), positive attitude (72%, n=49), and good perceive practice level (51.5%, n=35) towards diabetes mellitus. There was no significant relationship between knowledge, attitude, and perceive practice level towards diabetes mellitus at $p<0.05$. KAP level towards diabetes mellitus showed no significant relationship with blood glucose level at $p<0.05$. Findings indicate that most respondents had normal BMI (18.5 – 24.9) (64.7%, n=44) and normal FBG reading (< 6.1 mmol/L) (92.6%, n=63). As conclusion, respondents with higher educational level were more likely to have a higher level of knowledge about diabetes mellitus; however, this did not influence attitude, perceive practice and fasting blood glucose of respondents.

Key words: Knowledge, attitude, practice, type II diabetes, Kelantan

INTRODUCTION

Diabetes mellitus is defined as a group of metabolic diseases that is characterized by hyperglycaemia caused by either defection insulin secretion, insulin action or both (American Diabetes Association [ADA], 2006). It is a common chronic non-communicable disease (NCD) that causes high morbidity and mortality and the rates are gradually increasing in Malaysia (Noor Hasimah *et al*., 2010). The prevalence of diabetes mellitus incidence in Kelantan has been reported to be high at 10.5% (Mafauzy *et al*., 1999) and increased to 11.7% in 2010 (Sukminingrum & Radjeni, 2013). In 2011, Kelantan recorded the highest number of diabetic patients as compared to other states throughout Malaysia (Najib *et al*., 2014). The high diabetes cases reported in Kelantan might be due to the local food and delicacies as most of the dishes are sweet and contain high sugar levels (Letchuman *et al*., 2010). It is estimated that 20 out of 100 residents aged 19 and above are likely to be diagnosed with diabetes (Najib *et al*., 2014).

Knowledge is the utmost weapon in fighting against diabetes mellitus (Maina *et al*., 2010). Poor knowledge towards diabetes will increase the prevalence of diabetes mellitus (Letchuman *et al*., 2010) and increase the risk for diabetes complications (Hamoudi *et al*., 2012). Knowledge is a critical component of the behavioural changes (Al-Mahrooqui *et al*., 2013) and it will lead to awareness. Once awareness is created, people are more likely to participate in prevention and control measures of diabetes mellitus through their attitude and practice changes (Tuomilehto *et al*., 2001).

There are four criteria to diagnose diabetes such as Hb1Ac, fasting blood glucose (FBG), 2-h plasma glucose (PG) in an oral glucose tolerance (OGTT),

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and random plasma glucose (ADA, 2006). However, the oldest and traditional test for diabetes is based on measuring the FBG (Wang *et al*., 2013). Fasting glucose is directly proportional to the severity of the diabetes mellitus. The FBG test is widely available, inexpensive and preferred due to its convenience in clinical setting (Ekpenyong *et al*., 2012; Wang *et al*., 2013). Based on Sacks (2011), fasting plasma glucose is fast and easy, only needs single sample and can predict microvascular complications. Studies such as that conducted by Awalekar *et al*. (2016) and Ozcelik *et al*. (2010) have shown that there was a negative correlation found between FBG and knowledge among the diabetes patients.

However, few studies have been reported on the current knowledge, attitude and practice towards type II diabetes among the public residents at Kelantan related to their blood glucose level. A study conducted by Najib *et al*. (2014) on "Knowledge and Attitude on Diabetes among Public in Kota Bharu Kelantan, Malaysia" does not take account of the 'practice' component, nor does he examine the relationship with blood glucose level. However, this study attempted to determine the relationship between knowledge, attitude and perceive practice towards type II diabetes among the public residents in Kelantan related to their blood glucose level.

MATERIALS AND METHODS

Research design and sample selection

This was a cross-sectional study carried out at district of Bachok, Kelantan, Peninsular Malaysia, which is a rural area located along South China Sea, for a duration of two months from July to September 2017. Bachok was selected through purposive sampling from ten districts in Kelantan. This sampling technique is where the researcher relies on his or her own judgment when choosing members of population to participate in the study (Dudovskiy, 2017).

Respondent's sampling was categorized as a form of convenience sampling in which respondents from Bukit Marak and Beris Kubor Besar were selected. Convenience sampling is known as an accidental sampling where members of the target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time, or the willingness to participate are included for the purpose of the study (Dörnyei, 2007). Convenience sampling technique can be applicable to both qualitative and quantitative studies, however it is more frequently used in quantitative studies.

This study was done from house-to-house census to represent adult population in Kelantan. The minimum sample size was determined through Cochran formula. In order to calculate the sample size, 95% confidence interval and precision of 0.08 were assumed. The expected proportion in the population for the overall prevalence of diabetes in Kelantan was 10.5% (Zaini, 2000). The minimum sample size calculation of this study was 56 respondents. However, to avoid a low response rate, the percentage of sample size were increased up to 20%. Therefore, a total sample of 68 respondents were recruited in this study. The inclusion criteria of respondents was a voluntary non-diabetic patient, who had taken a recent fasting blood glucose (FBG) test, and were aged between 18 to 59 years, regardless of their gender, religion or socioeconomic status. Participants who met the study criteria were invited to enrol in this study and were required to sign the informed consent prior to data collection. Ethical approval was obtained from the Human Ethics Board of Committees of Universiti Malaysia Terengganu with reference number: UMT/JKEPM/2017/13.

Measurement of variables

The research instrument used in the present study was a face-to-face interview using knowledge, attitude, and perceive practice (KAP) questionnaire constructed and modified after referring to literature review. The questionnaire was divided into four sections.

Socio-demographic and clinical characteristics

The first section consisted of 11 questions about socio-demographic data that included gender, age, occupation, marital status, educational level, income, clinical and anthropometric data such as body mass index (BMI), recent fasting blood glucose (FBG) readings, medical history such as smoking status, and family history of diabetes. Both BMI and FBG readings were obtained from the respondent's medical reports. The BMI was classified into either underweight (< 18.5), normal (18.5 – 24.9), overweight (25.0 – 29.9) or obese (> 30) based on the BMI calculation (weight in kilograms divided by height in meters squared). FBG test is whereby the blood is drawn from a vein in the patient's arm after the patient has not eaten for at least eight hours, usually in the morning before breakfast. Then, the red blood cells are separated from the sample and the amount of glucose is measured in the remaining plasma (Lawrence & Amadeo, 1996). However, no blood was drawn during this study as their readings were obtained from the medical reports. Those respondents indicated that they had diabetes when the readings

was ≥ 7.0 mmol/L, 6.1 to < 7.0 mmol/L meant at high risk of diabetes and the person does not indicate diabetes when the reading of fasting plasma glucose was < 6.1mmol/L (WHO, 2006).

Assessment on public knowledge towards diabetes

The second section consisted of questions about the public knowledge towards diabetes. The questionnaire had 25 items which represented a test of general knowledge of diabetes. All 25-items were adapted and modified from previous studies (Fitzgerald *et al*., 1998; Najib *et al*., 2014; Al-Naggar *et al*., 2017; Chinnappan *et al*., 2017; Kassahun & Mekonen, 2017). Answers were provided with three categorical responses "yes", "no" and "don't know" followed by correct and incorrect responses to further evaluate the responses. One point was offered for each correct response and the total score was calculated, with a maximum score of 25. Score ranges of 0–13, 14–18 and 19–26 were considered as poor, moderate and good knowledge, respectively (Herath *et al*., 2017).

Assessment on public attitude towards diabetes

The third section concerned on the attitudes of the public towards diabetes. The questionnaire consisted of 15 items constructed from previous related studies (Sugathan *et al*., 2013; Al-Naggar *et al*., 2017; Kassahun & Mekonen, 2017). Respondents were asked to select Likert type attitudes items that include statements along a five-point scale which indicates the respondents' degree of agreement or disagreement with the statements. Each of these 15 items was in ordinal measurements. In this Likert scale the scoring system was as follows: 5-strongly agree, 4-agree, 3-neutral, 2-disagree, and 1-strongly disagree (Gautam *et al*., 2015). The total score was computed by summing the scores from all 15 items. Score ranges from 15 to 75 and higher score indicated higher level of attitude. A score above 70 points indicate an outstanding positive attitude towards diabetes (Sugathan, 2013).

Assessment on public perceive practices towards prevention of diabetes

The fourth section was about a perceive practices towards the prevention of diabetes. This section consisted of 14 items modified from a structured questionnaire from previous studies (Sharoni *et al*., 2015; Al-Naggar *et al*., 2017; Kassahun & Mekonen, 2017). Each scale measured frequency of a perceived self-care activity in the last 7 days for aspects of a diabetes regimen such as general diet and exercises. The questionnaire measured the perceive self-care activities using a seven-point Likert scale that ranged from 0 for will be never done to 7 for will be done 7 days a week with higher scores indicating better performance of perceive self-care activities (Sharoni *et al*., 2015). The score was presented in terms of mean scores and the overall mean score was calculated using summation of the mean score for diet and exercise, divided by the sum of number of questions under each scale. After calculating an overall mean score, perceive good self-care behaviour was assigned for scores ≥3 and perceive poor self-care behaviour was assigned for scores <3 (Kassahun & Mekonen, 2017). The reliability of the questionnaire was tested through a pilot test to measure a set scale items internal consistency and Cronbach's alpha which is the best inter-item reliability measure.

Data analysis

Data were analysed using SPSS version 2.0. Data was not normally distributed, therefore, descriptive statistics were computed in the form of frequency and percentage for categorical data. Continuous data was presented in the form of measures of central tendency (median) and measures of dispersion (inter-quartile range "IQR"). Correlations of non-parametric data was analysed with the Spearman correlation to evaluate knowledge, attitude, practices and blood glucose levels.

RESULTS AND DISCUSSION

Socio-demographic, clinical characteristics and medical history of the respondents

Table 1 shows the socio demographic characteristics of the 68 respondents. Most of them were female, Malay, and aged from 18 to 30 years. For the distribution of age, a majority of respondents were 18 to 30 years old because those above 31 years old did not go for medical check-up because they believed that they were healthy, while some of them were busy with work. This was supported by Najib *et al*. (2014) who revealed that 33.30% of the public in Kelantan never check their blood glucose for diabetes screening due to busy schedules. A majority of the respondents had no income since most of them were students.

Most respondents had a normal BMI (18.5 – 24.9). Majority of the respondents were none smokers. Over half of respondents indicated that they did not have family history of diabetes. 92.6% of the respondents had normal blood glucose readings (< 6.1mmol/L). Most respondents had normal blood glucose levels, as majority of participants were in the range of 18-30 years old. 7.4% of the respondents were shown to have pre-diabetes that also called as impaired fasting glucose (IFG), a condition that occurs when the blood

Table 1. Socio-Demographic, anthropometric charac-teristics and medical history of respondent (n = 68)

Variable	n (%)	Median (IQR)
Gender		
Male	27 (39.7)	
Female	41 (60.3)	
Race		
Malay	68 (100)	
Age	–	26.0 (19.8)
18 – 30 years	40 (58.8)	
31 – 50 years	18 (26.5)	
≥ 51 years	10 (14.7)	
Marital Status		
Single	39 (57.4)	
Married	29 (42.6)	
Education Level		
Primary level	2 (2.9)	
Secondary level	16 (23.5)	
STPM/Diploma	27 (39.7)	
Degree/Master/PhD	17 (25.0)	
Others	6 (8.9)	
Occupation		
Employed	24 (35.3)	
Unemployed	13 (19.1)	
Student (university, polytechnic, college)	27 (39.7)	
Retired	4 (5.9)	
Household monthly income		
No income	39 (57.4)	
Less than RM 1000	4 (5.9)	
RM 1000 – RM 1999	12 (17.6)	
RM 2000 – RM 2999	13 (19.1)	
BMI	–	22.2 (5.6)
Underweight (below 18.5)	6 (8.9)	
Normal (18.5 – 24.9)	44 (64.7)	
Overweight (25.0 – 29.9)	16 (23.5)	
Obese (30.0 & above)	2 (2.9)	
Diabetes History		
Yes	28 (41.2)	
No	40 (58.8)	
Smoking Status		
Yes	18 (26.5)	
No	50 (73.5)	
Fasting blood glucose reading	–	5.1 (0.6)
Normal (< 6.1 mmol/l)	63 (92.6)	
Pre-diabetes (6.1 – 6.9 mmol/l)	5 (7.4)	
Diabetes (≥ 7.0 mmol/l)	–	

glucose levels are higher than normal but not high enough to be diagnosed as diabetes. Hence, they are at high risk of developing diabetes and other complications (Punthakee *et al*., 2018).

Distribution of respondents' response to knowledge, attitude and practice towards type II diabetes mellitus

Table 2 shows the respondents knowledge towards diabetes. From the 25-knowledge items, 3-items indicated the poorest score as compared to the others. Less than 30% answered it correctly since most of them did not know that lack of exercise, smoking, and getting infection may pose risk of diabetes, while more than 70% answered incorrectly. About 40 to 60% respondents answered yes for 5- of the 25-items involving item 2, 4, 5, 8 and 16.

Interestingly, 54% of respondents did not know that high blood pressure can exacerbate diabetes. High blood pressure can increase the risk of diabetes complications such as diabetic eye and kidney problems. Only 57% of the respondents had been exposed to diabetes education, while the remaining were never exposed to diabetes education. Diabetes education is an important element to improve patient outcomes (Kosti & Kanakari, 2012). So knowledge towards diabetes mellitus is importance

Table 2. Distribution of respondent response to knowledge towards type II diabetes mellitus (n = 68)

No	Knowledge towards diabetes	YES	NO	DON'T KNOW
		n (%)	n (%)	n (%)
1	Do you know what diabetes is?	63 (92.6)	3 (4.4)	2 (2.9)
2	Have you ever been exposed to diabetes education?	39 (57.4)	7 (10.3)	22 (32.4)
3	Diabetes is a disease which blood sugar higher than normal.	66 (97.1)	–	2 (2.9)
4	Diabetes is a syndrome or illness due to lack or loss of insulin efficacy.	34 (50.0)	–	34 (50.0)
5	There are two type of diabetes which is type 1 and type 2.	32 (47.1)	–	36 (52.9)
6	Older adults are more likely to get diabetes.	56 (82.4)	12 (17.6)	–
7	Families with genetic history of diabetes affect people to get diabetes.	68 (100)	–	–
8	Pregnancy is one of the factors to get diabetes risk.	31 (45.6)	8 (11.8)	29 (42.6)
9	Not getting enough exercise can affect diabetes.	13 (19.1)	41 (60.3)	14 (20.6)
10	Healing wounds are often associated with diabetes.	53 (77.9)	2 (2.9)	13 (19.1)
11	Insulin injections are provided for diabetes control and management.	57 (83.8)	–	11 (16.2)
12	Tablets and capsules are available for diabetes control and management.	62 (91.2)	1 (1.5)	5 (7.4)
13	Examination and care of the eyes and feet is one of the ways to control and manage diabetes.	43 (63.2)	4 (5.9)	21 (30.9)
14	Stop smoking is one of the ways to control diabetes.	16 (23.5)	22 (32.4)	30 (44.1)
15	Kidney failure, blind/retinopathy, heart failure, stroke and limb dismemberment is a complication of diabetes.	61(89.7)	–	7 (10.3)
16	High blood pressure can exacerbate diabetes.	26(38.2)	5 (7.4)	37 (54.4)
17	Practicing healthy eating plans are important role in maintaining health as well as preventing disease.	68 (100)	–	–
18	Diabetes diet is a healthy diet for most people.	47(69.1)	4 (5.9)	17 (25.0)
19	The high amount of carbohydrate intake such as rice will increase blood glucose level.	68 (100)	–	–
20	Excessive sugar intake in foods can increase blood glucose levels.	64(94.1)	3 (4.4)	1 (1.5)
21	Urine tests and blood tests are both good for measuring blood glucose levels.	67(98.5)	–	1 (1.5)
22	Infection may increase blood sugar levels.	20(29.4)	12(17.6)	36 (52.9)
23	Blood glucose screening is very important in controlling diabetes.	67(98.5)	–	1 (1.5)
24	Type II diabetes is one of the most serious diseases.	58(85.3)	2 (2.9)	8 (11.8)
25	Diabetes is a preventable disease.	68 (100)	–	–

in order to prevent diabetes complications and to reduce the incidence of diabetes. This finding has important implications for developing diabetes education that includes exercise promotion, smoking cessation, blood pressure management, in order to educate the public on diabetes awareness.

Table 3 shows respondent attitudes towards diabetes mellitus. Majority of the respondents responded strongly agree and agree to the positive attitudes (item no. 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, and 15). However, near 50% were not sure whether physical activity can prevent the risk of diabetes mellitus (item no. 7) and about 43% of respondents responded disagree and strongly disagree that diabetes mellitus would not affect daily activity while 35% of them were not sure (item no. 6).

Table 4 shows the perceive practice section towards the prevention of diabetes mellitus. Overall the respondents did not follow a healthy diet plan according to the food pyramid for the whole seven days. According to the National Coordinating Committee on Food and Nutrition, the Malaysian Adult Nutrition Surveys (MANS) assessed dietary intake of Malaysian adults aged 18 to 59 years old and showed that Malaysian adults had poor achievements (below 20%) of the recommended servings for the major food groups in the Malaysian Food Pyramid 2010 for fruits, vegetables, legumes and nuts (Tee & Yap, 2017).

About 61.8% of the respondents claimed they did take carbohydrates, while only 50% of respondents stated that they did take protein every day in their daily diet. Previous studies have

Table 3. Distribution of respondent response to attitude towards type II diabetes mellitus (n = 68)

No	Attitude towards diabetes	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
		n (%)	n (%)	n (%)	n (%)	n (%)
1	Most people need to keep a health check to maintain their health.	–	–	–	2 (2.9)	66 (97.1)
2	Everyone needs for blood screening tests for diabetes mellitus.	–	–	–	12 (17.6)	56 (82.4)
3	Every family member should undergo a blood screening tests for diabetes mellitus if it has a family history of diabetes.	–	–	–	2 (2.9)	66 (97.1)
4	Support from family and friend is important in dealing with diabetes.	–	2 (2.9)	2 (2.9)	23 (33.8)	41 (60.3)
5	We should avoid using sugar not more than 10 teaspoons (50g) in daily life.	–	4 (5.9)	7 (10.3)	14 (20.6)	43 (63.2)
6	Diabetes mellitus will not affect daily activity.	9 (13.2)	20 (29.4)	24 (35.3)	5 (7.4)	10 (14.7)
7	Physical activity can prevent the risk of diabetes mellitus.	–	2 (2.9)	32 (47.1)	26 (38.2)	8 (11.8)
8	Maintaining healthy weight is important in managing diabetes.	–	–	13 (19.1)	35 (51.5)	20 (29.4)
9	Complications of diabetes mellitus may be prevented if blood glucose levels are in good control.	–	–	9 (13.2)	44 (64.7)	15 (22.1)
10	Checking blood sugar regularly is very important in controlling diabetes.	1 (1.5)	–	3 (4.4)	26 (38.2)	28 (55.9)
11	If a person has diabetes they should always follow the doctor's advice and practice a healthy diet.	1 (1.5)	–	–	26 (38.2)	41 (60.3)
12	We need to take more vegetables in the diet to prevent or control diabetes.	1 (1.5)	–	7 (10.3)	16 (23.5)	44 (64.7)
13	We need to take low-carbohydrate diet and fat to prevent or control diabetes.	1 (1.5)	2 (2.9)	7 (10.3)	18 (26.5)	40 (58.8)
14	People with diabetes do not need to worry about long-term complications if they are practicing healthy eating habits.	3 (4.4)	2 (2.9)	16 (23.5)	19 (27.9)	28 (41.2)
15	Diabetics need to learn a lot about this disease so they can control their own diabetes.	1 (1.5)	1 (1.5)	2 (2.9)	26 (52.9)	28 (41.2)

shown that Malaysian adults do not achieve the recommended intake of fruits and vegetables (Tee & Yap, 2017). These findings show that about 26.5% of respondents ate fruits only two days a week while vegetable intake was only four days a week (35.3%). Mostly stated that they did not eat fast foods (30.9%) or carbonated drinks (32.4%) for the whole seven days. A total of 47.1% of the respondents claimed they did eat food that contains oil, sugar and salt for six days a week. Overall the respondents (42.6% and 41.2%) revealed that they will never ate salty foods and beans for the whole seven days. Only 35.3% of the respondents claimed that they ate dairy products three days a week. The NHMS (2015) and MANS (2014) reports determined level of physical activity among Malaysian adults, that showed that the prevalence of physical inactivity was 36.9%. MANS (2014) showed an overall prevalence of 66.5% for physically active adults (NHMS, 2014). The findings for exercise in this study showed that only 27.9% of the respondents participated in physical activity for at least 30 minutes one day a week, while 30.9% of respondents reported of taking part in training sessions only two days a week. It can therefore be assumed that only half of the respondents perceived that they have good practice in term of diet and exercise.

Distribution of knowledge, attitude and perceive practice scores towards type II diabetes among public in Kelantan

Generally, the respondents had moderate knowledge, positive attitude and slightly good perceive practices towards diabetes mellitus as shown in Table 5. This findings was in line with those of Fatema *et al*. (2017) which showed that the overall level of knowledge towards diabetes among Bangladeshi population was average. The

Table 4. Distribution of respondent response to practice towards prevention of type II diabetes mellitus (n = 68)

No	Perceive Practice towards prevention of diabetes	0	1	2	3	4	5	6	7
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
DIET									
1	How many days will you follow a healthy diet plan according to the food pyramid for the whole seven days.	30 (44.1)	18 (26.5)	13 (19.1)	3 (4.4)	2 (2.9)	1 (1.5)	1 (1.5)	–
2	How many days will you take carbohydrates such as white rice, noodles, breads, cereals and others for the whole seven days.	–	–	1 (1.5)	3 (4.4)	3 (4.4)	6 (8.8)	13 (19.1)	42 (61.8)
3	How many days will you take the fruits for the whole seven days.	13 (19.1)	15 (22.1)	18 (26.5)	10 (14.7)	6 (8.8)	4 (5.9)	1 (1.5)	1 (1.5)
4	How many days will you take the vegetables for the whole seven days.	2 (2.9)	2 (2.9)	1 (1.5)	20 (29.4)	24 (35.3)	11 (16.2)	8 (11.8)	–
5	How many days will you take proteins such as chicken, meat, egg and others for the whole seven days.	1 (1.5)	–	–	2 (2.9)	4 (5.9)	6 (8.8)	21 (30.9)	34 (50.0)
6	How many days will you take beans such as beans, *tempe,* green beans and others for the whole seven days.	28 (41.2)	17 (25.0)	15 (22.1)	3 (4.4)	1 (1.5)	3 (4.4)	–	1 (1.5)
7	How many days will you take milk and dairy milk products for the whole seven days.	6 (8.8)	7 (10.3)	18 (26.5)	24 (35.3)	10 (14.7)	2 (2.9)	–	1 (1.5)
8	How many days will you take foods that contain oil, sugar and salt for the whole seven days.	–	–	–	1 (1.5)	2 (2.9)	6 (8.8)	32 (47.1)	27 (39.7)
9	How many days will you eat fast foods such as KFC, McDonald and others for the whole seven days.	21 (30.9)	8 (11.8)	16 (23.5)	10 (14.7)	5 (7.4)	7 (10.3)	1 (1.5)	–
10	How many days will you take carbonated drinks such as Coca Cola, Pepsi, 7-up and so on for the whole seven days.	22 (32.4)	8 (11.8)	12 (17.6)	12 (17.6)	6 (8.8)	7 (10.3)	1 (1.5)	–
11	How many days will you take sugary or flavoured drinks such as Syrup, Ribena, Lychee and others for the whole seven days.	3 (4.4)	1 (1.5)	9 (13.2)	30 (44.1)	19 (27.9)	6 (8.8)	–	–
12	How many days will you take salty foods such as salted fish and salted eggs for the whole seven days.	29 (42.6)	17 (25.0)	14 (20.6)	4 (5.9)	3 (4.4)	–	–	1 (1.5)
EXERCISE									
13	How many times for the whole seven days will you participate in physical activity for at least 30 minutes.	8 (11.8)	19 (27.9)	16 (23.5)	16 (23.5)	6 (8.8)	3 (4.4)	–	–
14	How many times for the whole seven days will you take part in certain training sessions such as swimming, walking, cycling apart from what you did at home or as part of your work.	–	12 (17.6)	21 (30.9)	12(17.6)	17 (25.0)	4 (5.9)	1 (1.5)	1 (1.5)

Table 5. Distribution of knowledge, attitude and perceive practice scores towards type II diabetes among respondents (n = 68)

Characteristics	Distribution (%)
Knowledge score	
Poor (≤ 13 points)	1.5
Moderate (14-18 points)	54.4
Good (> 18 points)	44.1
Attitude	
Negative (< 70 points)	28.0
Positive (≥ 70 points)	72.0
Perceive practice	
Poor (< 3 points)	48.5
Good (≥ 3 points)	51.5

findings of this study were supported by Pongmesa *et al*. (2009) which revealed the knowledge of diabetes among the Thai respondents was fair which was defined as 50 to less than 80%. Meanwhile, a study from southern Sri Lanka among the general public in Galle district showed that a majority of respondents had moderate knowledge towards diabetes (Herath *et al*., 2017). This moderate knowledge may be attributed to the level of education of respondents in this study, as 40% of them had their STPM/Diploma and below. Yun *et al*. (2007) stated that level of education was found to be the predominant predictive factor for knowledge of diabetes mellitus.

A study done in Kota Bharu, capital city of Kelantan, reported similar findings where most of the respondents showed good attitude toward diabetes awareness (Najib *et al*., 2014). This result may be explained by the fact that both studies had more than 40% of respondents aged less than 30 years and Najib *et al*. (2014) showed that the highest percentage of knowledgeable respondent is from the group ranging between 21 to 30 years old. A study by Fatema *et al*. (2017) also showed a good level of positive attitude towards the importance of diabetes care among the Bangladeshi population. A study conducted in Southeast East Ethiopia among non-diabetes community members of Bale Zone administrative towns showed 55.9% had good attitude towards diabetes (Kassahun & Mekonen, 2017).

Respondents had a slightly better perceive practice towards prevention of diabetes than poor practice in this study. This was supported by Al-Naggar *et al*. (2017) who showed that there was a good score of practice towards diabetes mellitus among selected Malaysian population. In addition, Kassahun and Mekonen (2017) also reported that 56.6% of respondents had good practice towards diabetes mellitus in Ethiopia.

Relationship between knowledge, attitude and perceive practice towards types II diabetes among public in Kelantan

Findings show no significant correlation between knowledge and attitude level towards diabetes mellitus (r = - 0.107, p = 0.383). Therefore, it can be concluded that knowledge does not influence attitude towards diabetes mellitus. These findings are in agreement with Tadesse *et al*. (2015) who reported that there was a non-significant correlation between knowledge level and attitude level (r = 0.098, p = 0.293) among respondents in Ethiopia. In contrast, a study conducted in Shah Alam, Malaysia, showed that there was a significantly weak and positive correlation of 0.250 (p = 0.000) between knowledge level and attitude level of participants (Al-Naggar *et al*., 2017). Similar findings also reported by Okonta *et al*. (2014) in South Africa which revealed a significantly weak and positive correlation between knowledge and attitude (r = 0.17, p = 0.012). Moreover, a study conducted in Bangladesh by Fatema *et al*. (2017) reported a significant positive correlation between knowledge and attitude (r = 0.038, p = 0.000).

Correlation between level of knowledge and perceive practice towards prevention of diabetes showed no significant correlation (r = 0.189, p = 0.123). It can be concluded that knowledge does not influence perceive practices towards diabetes. This means that being knowledgeable does not necessarily reflect better practice towards healthy lifestyle habits. It can be seen that most respondents that participated in this study are from age 18 to 30 years old and most have tertiary education such as STPM/Diploma. It was revealed that most Malaysian adults were not practising healthy eating habits or being moderately physically active (Tee & Yap, 2017). This finding is contrary to previous studies which have suggested that there is a positive correlation between knowledge and practice score, which means good knowledge will influence better practice and healthy lifestyle (Al-Maskari *et al*., 2013; Tadesse *et al*., 2015; Fatema *et al*., 2017; Al-Naggar *et al*., 2017).

Correlation between level of attitude and perceive practice towards prevention of diabetes showed no significance (r = -0.182, p = 0.138). It can be concluded that attitude does not have any relationship towards perceive practice in prevention of diabetes mellitus. This may mean that good attitude level towards diabetes mellitus may not influence good practice towards prevention of diabetes mellitus, even though higher knowledge towards diabetes mellitus influences attitude level of respondents. This contradicts a previous study that found a significantly weak and positive

correlation between attitude and practice score (r = 0.115, p = 0.040), as reported by Al-Naggar *et al*. (2017) in Malaysia. Al-Maskari *et al*. (2013) also reported a weak but statistically-significant correlation between attitude and practice (r = 0.270, p = 0.001) in United Arab Emirates. A study in Bangladesh also showed a significant positive correlation between attitude and practice (r = 0.129, p = 0.000) (Fatema *et al*., 2017). Tadesse *et al*. (2015) showed there was a very significant positive correlation (r = 0.517, p = 0.000) between attitude level and practice level in Ethiopia.

Relationship between knowledge level, attitude level, practice level towards prevention of diabetes mellitus and blood glucose level among public in Kelantan

This study findings showed no significant correlation between fasting blood glucose level and knowledge, attitude and perceive practice towards diabetes mellitus (r = 0.020, p = 0.870, r = 0.124, p = 0.315, r = 0.006, p = 0.963 respectively). These study findings were in line with a study conducted in Nepal which found that knowledge and fasting blood glucose levels were not statistically significant (p = 0.078) (Nepal *et al*., 2017). However, Ghannadi *et al*. (2016) reported there was a weak significant negative correlation between fasting plasma glucose (FPG) and knowledge (r = -0.277, p = 0.003). A study conducted in India showed a moderate, significant negative correlation between fasting plasma glucose and knowledge regarding diabetes (r = -0.574, p = 0.000) (Awalekar *et al*., 2016). A study in Iran reported that there was a weak significant negative correlation between fasting plasma glucose and attitude (r = 0.212, p = 0.022) (Ghannadi *et al*., 2016). A study in Turkey reported a significant, strong negative correlation between the knowledge, attitude score and fasting blood glucose (r = –0.6524, p = 0.0001) (Ozcelik *et al*., 2010). Several studies have found no significant correlation between fasting blood glucose level and practice towards prevention of diabetes mellitus. This is in agreement with a previous study conducted in Iran which showed there was no significant correlation between fasting plasma glucose (FPG) and practice (r = -0.118, p = 0.203) (Ghannadi *et al*., 2016).

Even though some previous studies have shown significant relationship between knowledge, attitude, practice and fasting blood glucose, this study was unable to highlight any significant relationship between the variables. Findings in this study also showed that knowledge, attitude, perceive practice (KAP) may not influence the fasting blood glucose. One major possible reason is because the age distribution of the respondents is concentrated on the younger age group which is 18-30 years. This age group has low risk towards high fasting blood glucose, even though this study has moderate knowledge towards type II diabetes mellitus. To bear in mind, the lowest prevalence of diabetes mellitus was observed in the group of 18 to 19 years old at 2.1% according to NHMS 2011 and NHMS 2015 at 5.5% (NHMS, 2015). However, there are other possible explanations. It was proposed that self-efficacy might be a stronger component that lead to better glycaemic control (Kueh & Kuan. 2018; Tharek *et al*., 2018). Findings of Tharek *et al*. (2018) study suggest the need of including self-efficacy measures in managing type II diabetes mellitus. However, with a small sample size, caution must be applied, as the findings might not be generalizable to the whole Malaysian population.

CONCLUSION

This research has shown that there was a moderate level of knowledge, positive attitude and good perceive practice level towards prevention of type II diabetes mellitus among public in Bachok district, Kelantan. Additionally, there was no significant correlation between knowledge level, attitude level and perceive practice level towards diabetes mellitus. Lastly, there was no significant correlation found between fasting blood glucose and knowledge, attitude and perceive practice on preventions levels towards the prevention of diabetes mellitus.

This study is important because the findings on knowledge, attitude and perceive prevention practice of type II diabetes among the public may assist the health authorities in helping the public to monitor blood glucose levels in order to prevent chronic diabetes complications. In addition, blood glucose screening will assist governments in formulating appropriate policies towards reducing the prevalence of diabetes. Moreover, the results from this study may also be useful in implementing community awareness program to promote lifestyle modifications for the prevention and control of non-communicable diseases, particularly diabetes mellitus.

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