A Diabetes and Obesity Crisis: Preliminary Study of Lifestyle, Diet, Knowledge and Attitude of Malaysian Pharmacy Undergraduates Towards Type-2 Diabetes

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Abstract: *Background*: Patient education and self-care are important not only for diabetes prevention but also chronic disease management. Community pharmacists are an ideal position to play a role in providing medicines management, lifestyle and preventative advice specific to type-2 diabetes care, Malaysian pharmacists must be ready and willing to firmly establish such clear roles and as such, undergraduate pharmacy students need to be equipped with the skills and mind-set to accept such a challenge

Objective: To explore knowledge and awareness of pharmacy undergraduate students at Universiti Technology MARA (UiTM) towards diabetes risk factors. To identify potential diabetes risk factors by evaluating dietary intake and to determine students' attitude towards their future roles as health care providers.

Method: 159 Malaysian third-year undergraduate pharmacy students were provided a questionnaire and a two-day food diary. The questionnaire consisted of four sections to examine demographics, lifestyle and diet, together with knowledge of diabetes and the perception of pharmacists' role.

Results: A total of 113 completed questionnaires were received. 20% of the respondents were overweight or obese and 21% had elevated blood pressure. 95% of students consumed only 50% of the recommend daily calorie intake for adults. Students however possessed good knowledge of diabetes with a positive attitude towards pharmacist roles in healthcare.

Conclusion: Overall, the health status of Malaysian pharmacy students is very similar to the general population, displaying similar risk factors and dietary habits despite their status as future healthcare professionals. Students do however display a good knowledge of diabetes and appear positive towards their roles as future pharmacists.

Keywords: Diabetes, Obesity, Community Pharmacy.

INTRODUCTION

Diabetes mellitus remains a significant global health problem [1] and is associated with abnormalities in protein, carbohydrate and fat metabolism [2], all of which can lead to devastating complications for a patient, reducing life expectancy and quality of life. The Western Pacific (WP) region, as classified by the International Diabetes Federation is home to just over a third of the total number of people with diabetes in the world. Including countries such as Australia, China, Indonesia and Malaysia, approximately 138 million people have diabetes; within this region overall prevalence stands at 8.6%. Many countries within the WP are experiencing a rapid rise in diabetes, with China leading the way. Within the next two decades, the number of people with diabetes in the WP is expected to rise by 46% percent. The number of Malaysian citizens with diabetes has almost tripled over the past fourteen years from 6.3% in 1986 [3] to 17.5% in 2015 [4]. The current prevalence of diabetes is estimated at over 3.5 million Malaysians, including both diagnosed and undiagnosed cases. These figures do not consider individuals most at risk from developing type-2 diabetes, those with pre-diabetes, a condition in which blood glucose levels are higher than normal but are not high enough for a diagnosis of diabetes. Diabetes has thus become one of the top-ten major diseases that weighs a significant burden on the Malaysian healthcare system, holding 6th place among men and 5th place among women [5].

The global epidemic of obesity points towards the dramatic increase in the incidence and prevalence of type 2 diabetes [6]. Indeed there is a close link between the risk of developing type-2 diabetes and Body Mass Index (BMI). The distribution of fat is important and abdominal obesity in the form of central or visceral adipose, indicated by waist circumference is an established risk factor for the development of type-2 diabetes. 75% of Malaysians with type 2 diabetes were found to be obese (BMI > 30kg/m^2) [7], and abdominal obesity, indicated by an undesirable waist circumference among diabetics standing at 90% in women (> 80cm) and 74% in men (> 90cm) [1]. Ethnicity also appears to play a significant role as those

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ISSN: 2223-3806 / E-ISSN: 1927-5951/17

of Asian ancestry appear to be at greater risk of developing type-2 diabetes compared to Caucasians, possibly due to variation in fat distribution and the associated implications to insulin resistance. In addition, the prevalence of prediabetes has also been shown to be highest among overweight and obese individuals [8]. It is important to note however not all patients who are overweight or obese develop type-2 diabetes. The precise mechanisms linking obesity and type-2 diabetes currently remains unclear [8].

The role of community pharmacists has changed considerably over the years from a more traditional product-oriented and technical role to one that is patient-oriented, with a focus on disease prevention, responding to symptoms and the provision of healthcare related advice [9]. For diabetes prevention, pharmacists have been shown as valuable in provide screening services to the general public, providing dietary and lifestyle advice and suggesting better approaches to self-management [10]. Community pharmacists are an ideal position within primary healthcare, to play a crucial role in providing tailored management, lifestyle and preventative advice not only specific to diabetes care, but also generally in order to produce a better informed and educated general public. Consumers in Malaysia have yet to realize the potential of Malaysian community pharmacists. With reference to screening services for instance, a relatively small 11.2 % of Malaysian patients [11] would consider visiting a pharmacy for screening purposes, 76.7% would much rather attend a physician led clinic and 56% would prefer to visit a hospital for screening tests.

The importance of patient education and promoting self-care is an important component of not only disease prevention but also chronic disease management and improving patient outcomes [12]. One component of self-care is adherence to often complicated medication regimes; this is particularly of concern in diabetic patients who often present with co-morbidities. Good adherence is associated with reduced risk of diabetes complications, reduced mortality [13] and reduced economic burden [14]. However, a substantial proportion of people with type-2 diabetes do not take medication as prescribed, with only 67–85% of oral medication doses taken, and approximately 60% of insulin doses used [12]. The Malaysian Ministry of Health has made considerable effort towards this in the form of multidisciplinary diabetes medication therapy adherence clinics (D-MTAC), introduced in 2004, which offer diabetes self-management education, and lifestyle support in the form of nutrition advice and encouragement of physical activity, together with smoking cessation counselling. Strict control of type-2 diabetes, in relation to blood glucose levels, Hb1Ac, diet exercise and lifestyle intervention could and should delay the onset of the myriad of diabetes complications. A 2008 diabetic care study, conducted in Malaysia [3] revealed the prevalence of combined microvascular complications of diabetes (retinopathy, nephropathy, and neuropathy) standing at 75% and combined macrovascular complications (angina pectoris, myocardial infarction, angioplasty/coronary artery bypass graft, and stroke) to be 29%. Worryingly, these prevalence figures have remained relatively unchanged as illustrated by a similar study conducted in 2013 [1]. Thus despite evidence of improved access to diabetes care, in the form of medication therapy adherence clinics, it seems the prevalence of many diabetes related complications remains relatively unchanged. Only 27.6% of Malaysian patents achieved target fasting blood glucose levels of <6.0mmol/L. In addition, only 37% of patients achieved a Hb1Ac of <7.5% and 12% of patients achieved the target Hb1Ac of <6.5%. In comparison, similar audits of type-2 diabetic care conducted in the UK in 2013 revealed 64.8% of patients achieving Hb1Ac levels of <7.5% and 26.4% achieving levels less than 6.5% [15]. Adherence levels among Malaysian patients have revealed worryingly low levels in type-2 diabetic patients, currently standing at 43% [16]. There are 660 Ministry of health facilities which offer diabetic adherence (D-MTAC) services to the estimated 1.7 million diabetic patients in Malaysia. Thus it is crucial to ensure maximum recruitment of the diabetic population in order to redress the long term complications and poor adherence among patients.

The aims of the current preliminary study are two-fold. Firstly, to determine and identify potential diabetes risk factors among UiTM Pharmacy students by evaluating lifestyle and dietary intake. Since pharmacy undergraduate students may be considered relatively informed regarding health care issues, does this assumed knowledge exert an impact on personal lifestyle? Secondly, the study attempts to assess the level of diabetes knowledge among students. Are pharmacy students ready to take on future roles within the pharmacy? Community pharmacists in Malaysia must take action to prepare themselves for expanded roles within primary healthcare, actively promoting themselves, the profession and taking steps towards addressing the primary healthcare issues related to type-2 diabetes.

METHODOLOGY

The student population consisted of a total of 159 third-year UiTM Pharmacy students (27 male and 132 female) and all were provided a questionnaire and short two-day food diary. 113 students participated in this study by returning completed questionnaires. The questionnaire consisted of four sections. The first section identified demographics including gender, age, study year, height, weight, BMI and health status. The second section focused on attitudes towards dietary intake and lifestyle. The third section deals with lifestyle issues and contained the food diary. The fourth section is related to knowledge about diabetes. The food diary allowed students to record food intake over 48 hours, where students provided details of the food eaten with an estimate of portion size. To assist, students were provided typical examples of portion sizes before the study. Sample sizes for both studies were calculated using the Raosoft sample size calculator. The inclusion criterion was UiTM pharmacy students, male and female from the third year. The exclusion criterion was students with pre-existing diabetes mellitus and pregnancy.

The questionnaire was validated using Cronbach alpha test within SPSS within a test group of subjects, and then subsequently modified to achieve the desired level of difficulty and understanding. The questionnaires were designed with respondents in mind and for ease of use a 'three-response system' was utilized, with yes, no and 'not sure' response variables in sections 2, 3 and 4. The 'not sure' response ensured all answers were considered by respondents. In order to assess the responses to the questionnaires, a scoring system was used in which correct/positive answers were allocated 2 marks each, 0 mark for negative answers and 1 mark for 'not sure'. The total score of all three sections were then used to calculate percentage scores. Section 3 of the student questionnaire consisted of a food diary where the respondents were asked to record their dietary intake for two consecutive days. The recommended daily calorie intake was calculated from height (cm), weight (kg), gender, age and level of activity (sedentary, lightly active, moderately active, very active, extra active), based on the Mifflin-St Jeor equation [17]. The calculated calories were compared to the total daily calories from the food diary as higher caloric values may indicate dietary imbalance. For physical activity the scoring system for frequency of exercise and physical activity (light, moderate, vigorous) are as follows; 5 to 7 times per week (5 marks), 3 to 4 times per week (4 marks), 1 to 2 times per week (3 marks), 1 to 3 times per months (2 marks) and none (1 mark). For the time spent in sedentary activity the scoring system is as follows; < 4 hours (4 marks), 5 to 8 hours (3 marks), 9 to 12 hours (2 marks) and > 12 hours (1 mark). A higher score indicates a good physical activity. The mean score for each section, together with a total score was calculated using a classification based on the scale used by Hoo and Navaratnam [18] (Table **1**), utilized for its simplicity.

Table 1: Hoo and Navaratnam Classification Scale for Mean Scoring of Questionnaire

Score	Achievement
> 75%	Good
66-75%	Average
56- 65%	Below average
≤ 55%	Weak

RESULTS

Demographics (Table **2**) reveal rather alarming statistics concerning the overall health and well being of respondents within the study. Just over 20% of the students were overweight or obese, with over 21% with seemingly elevated blood pressure, though not clinically significant. This is important considering the average age of respondents was 23 years. 35% of the participants revealed to have a family member with diabetes.

Lifestyle data proved to be of particular interest (Table **3**). Recent studies have revealed approximately 61% of Malaysians are physically inactive [19] and it is clear that physical activity among respondents in the current study is not a particular priority, with only 16% of all respondents exercising three times a week or more. Female students being much less inclined to be physically active, with only 11% active 3 times or week or more, compared with 50% of males. Recent Malaysia wide studies have revealed 43.7% of adults did not adopt a 'physically active lifestyle [20]. None of the respondents smoked and slightly over half purchased ready-made food on a regular basis. This is an interesting observation as 3rd-year students tend to reside off campus compared to 1st-year pharmacy students who generally stay within halls of residence on campus. Campus rules dictate students are not permitted to cook their own food and so food is usually purchased from the various vendors distributed on site. This severely limits food choices, and ultimately may impact long-term eating habits.

Table 2: Demographics

Characteristics	Number of respondents	Percentage of respondents
Gender		
Male	14	12.39
Female	99	87.61
Age		
22-24 years old	110	97.34
More than 25 years old	3	2.65
Family member with diabetes		
Yes	40	35.40
No	73	64.60
BMI category		
Underweight	18	15.93
Ideal	72	63.72
Overweight	14	12.39
Obese	9	7.96
Blood pressure		
Hypotension	1	0.90
Normal	88	77.88
Pre-hypertension	23	20.35
Hypertension	1	0.90

Table 3: Respondents Lifestyle. Percentage Response

Lifestyle items	All (%)	Male (%)	Female (%)
Exercise frequency			
5-7 times per week	6.20	35.70	2.00
3-4 times per week	9.70	14.30	9.10
1-2 times per week	24.80	28.60	24.20
1-3 times per months	43.40	14.30	47.50
None	15.90	7.10	17.20
Smoking	0.00	0.00	0.00
Eat while watching television	77.90	78.60	77.80
Regularly buy ready-made food	52.20	64.30	50.50
Estimated/Calculated Mean daily calorie intake	1057.60	1190.93	1038.75
Calorie intake in comparison with body requirement			
More	3.50	0.00	4.00
Equal	0.90	0.00	1.00
Less	95.60	100.00	94.90
Lifestyle mean score	54.15	66.66	52.38

The estimated calorific intake of students, calculated from the information provided within the 2-day food diary paints a picture of students who seem to be consuming much less than the Recommended

Table 4: Student Attitude Towards Diet and Lifestyle. Percentage Response

Attitude items	All (%)	Male (%)	Female (%)
My BMI is normal	40.71	35.71	41.41
My diet is healthy	26.55	21.43	27.27
I am trying to eat healthily	93.70	92.30	93.90
I have a healthy lifestyle	27.43	50.00	24.24
My friends influence me to exercise	59.30	57.14	59.60
Respondent think that smoking is unhealthy	99.00	100.00	99.01
Attitude mean score	70.43	70.55	70.41

Nutrient Intake (RNI) of 2000 kcal for men and 1500 kcal women, with median daily calorie intake of 1060 kcal. Admittedly, the food diary provides a very brief snapshot of the students food intake, however in general it seems over 95% of students within the study were consuming less calories than recommended. These numbers are very similar to the Malaysian Adult Nutrition Survey [21] where the majority of the 3000 respondents in the study had calorie intake less than the RNI, with a median daily calorie intake of 1489 kcal for men and 1445 kcal for women. It is important to note however that often individuals may not provide accurate information of food intake and an underestimation of consumption can vary from 10-45% and can depend upon age, sex, body composition and socioeconomic status [22].

The respondent's attitude towards diet and lifestyle (Table **4**) show that Malaysian pharmacy students within the study to be relatively realistic about their current health status, with less than 41% believing their BMI was normal. Calculations reveal more than 62% of respondents possess an ideal BMI. Only 26.6% believe that have a healthy diet and over 90% are attempting to eat more healthily.

Not surprisingly, students scored very highly with regard to their overall knowledge of diabetes, its risk factors and complications (Table **5**). Years 3 and 4 of the Malaysian pharmacy undergraduate program is very clinically oriented which is reflected in the generally high knowledge scores in most questions with the exception of pre-diabetes. Over half of participants were unsure of the definition for prediabetes. It is important to note however that prediabetes is not a clinical term recognized by the WHO, and only the American Diabetes association uses the term, defined as a blood glucose measurement of HbA1C 5.7%.

Pharmacy students generally feel confident with regard to service provision, displaying a positive outlook with an overwhelming response to pharmacist's roles in healthcare advice and medicines management (Table **6**). A small minority were unsure of the use of screening services in a community setting, which may possibly be due to lack of exposure.

DISCUSSION

The objectives of this preliminary study were two-fold. Firstly to determine the risk factors of diabetes that may present among pharmacy undergraduate students at UiTM and compare with national health statistics, and secondly, examine student knowledge and attitude towards diabetes and diabetes care. Questionnaires were distributed to 159 students and their lifestyle and basic health; both blood pressure and BMI were evaluated. No healthcare advice was provided and all data collected was anonymous.

Among the 113 respondents, 35.40% had a close family health history of diabetes (Table **2**), presenting either parents or siblings. 12.39% of respondents were calculated as being overweight (BMI > 25 < 30 kg/m2) and 7.96% obese (BMI > 30 kg/m2). Surprisingly, 20.35% of the respondents were also found to have elevated blood pressure above the normal population average and 0.90% have what could be considered clinically defined hypertension. None of the respondents were smokers. Generally, the respondents appeared to practice an unhealthy lifestyle, indicated by a mean lifestyle score of 54%, which can be considered weak (Table **3**). Female respondents displayed a more sedentary lifestyle with a significant difference to male participants. Generally, female students seem much less inclined to be physically active, with only 11% taking part in regular exercise up to 3 times or week or more, compared with 50% of males. These results are consistent with previous studies where most university students were found to practice an unhealthy lifestyle where females were less likely to participate in physical activity compared to

Table 5: Student Knowledge of Diabetes. Percentage Response

Questions	All (%)	Male (%)	Female (%)
Definition of Diabetes			
Right answer	87.60	92.90	86.90
Not sure	0.90	0.00	0.01
Definition of Pre-diabetes			
Right answer	49.60	28.60	52.50
Not sure	46.90	71.40	43.40
Normal fasting blood glucose levels			
Right answer	59.30	78.60	56.60
Not sure	23.90	21.40	24.20
Is diabetes preventable?			
Right answer	92.00	85.70	92.90
Not sure	2.70	7.10	2.00
Risk factors: Pre-diabetes			
Right answer	98.20	85.70	100.00
Not sure	0.00	0.00	0.00
Risk factors: Diet			
Right answer	96.50	78.60	99.00
Not sure	0.00	7.10	1.00
Risk factors: Physical inactivity			
Right answer	87.60	85.70	87.90
Not sure	4.40	7.10	4.00
Risk factors: Vitamin D			
Right answer	41.60	42.90	41.40
Not sure	57.50	57.10	57.60
Complications: Cardiovascular disease			
Right answer	65.50	71.40	64.60
Not sure	26.50	21.40	27.30
Complications: retinopathy			
Right answer	55.80	42.90	57.60
Not sure	31.90	21.40	33.30
Complications: foot ulcers			
Right answer	71.70	71.40	71.70
Not sure	17.70	21.40	17.20
Knowledge mean score	79.78	81.28	79.57

males [23]. 77.90% of respondents ate meals while watching television and individuals tend to consume more food in such circumstances [24]. Just over half of respondents regularly purchase packaged foods such as instant noodles, soups and frozen foods. The reasons given for such purchase decisions were the busy schedules with little to no free time, and for students who live in student hostels cooking not being a permitted activity. Most respondents however admitted that eating ready-made food was an unhealthy choice, brought on by necessity. For daily calorie intake, it appears the majority, 95% of respondents were consuming less calories than the Recommended Nutrient Intake (RNI) for men and

Table 6: Student Attitude Towards Pharmacist Roles. Percentage Response

Questions	All (%)	Male (%)	Female (%)
Pharmacists possess the skills required to provide blood testing and screening services			
Yes	92.00	100.00	90.90
Not sure	7.10	0.00	8.10
Pharmacists are qualified to provide preventative healthcare advice			
Yes	100.00	100.00	100.00
Not sure	0.00	0.00	0.00
Pharmacists are qualified to provide medicines management services			
Yes	100.00	100.00	100.00
Not sure	0.00	0.00	0.00
Pharmacists can diagnose medical conditions such as diabetes			
Yes	31.00	35.70	30.30
Not sure	9.70	0.00	11.10
Overall mean score	86.44	88.11	86.20

women, 2000 kcal for men and 1500 kcal for women which is in line with the Malaysian Adult Nutrition Survey [21]. These figures need to be further explored as they possibly raise the issue of underreporting of intake by respondents taking part in such studies [22], which may be exacerbated by the age and social status of respondents.

All students within the study were Malay, a consequence of education system within UiTM which is set up to cater for Malay and indigenous members of the population. Thus as expected, the diet of the respondents consisted of predominantly Malay food, which includes white rice, fried chicken or fish, stewed vegetables, and fried noodles. Breakfast for the majority consisted of traditional fried pastries such as 'curry puffs', doughnuts or the traditional meal of 'Nasi Lemak', rice cooked in coconut milk, served with fried anchovies, half a boiled egg or a piece of fried chicken. Most students also regularly consumed sweetened drinks such as Milo, Nescafe and tea whether hot or cold. Based on their recorded food diaries none the respondents consumed fruit or any significant quantities of fresh vegetables. Chicken appeared to be more popular than fish; however in general, most foods were fried. Male respondents were calculated to have a significantly higher calorie intake compared to females, however despite this; the majority of respondents have a daily calorie intake less than their body requirements.

The trend in obesity and overweight levels in this small study among these undergraduate students is reflected in the Malaysian National Health and Morbidity Survey [1], where obesity levels in the country are almost 18%, while 30% of Malaysians are categorised as being overweight. The Malaysia Nutrition Society has stressed the importance of education to address the rising levels of obesity within the country, with a focus on the younger generation of 10 to 11 year olds. With regard to added sugar intake for instance, varying recommendations exist; the World Health Organisation (WHO) recommendations in 2015 state that the intake of free sugars should not exceed 10% of total energy in order to prevent chronic disease. On a 2000 kcal diet, this translates into 50 grams added sugar per day. The American Heart Association recommends the intake of added sugars not to exceed 100 calories per day for women and 150 calories per day for men [25]. The 2013 Malaysian Dietary Guidelines include the statement "Consume foods and beverages low in sugar" with general dietary advice on how to achieve this goal, however no specific limits are set. Sugar is the second most frequently consumed food item consumed by Malaysians [21], with an estimated mean intake of 22.21 g. However this figure only accounts for whole added sugar consumption and does not include hidden sugars found in foods and beverages. Recent studies suggest the intake of added sugar among Malaysian adults and children cannot be accurately determined however it appears to exceed the 10% of total calories limit recommended by the WHO [26], a possible contributing factor to the rising obesity levels in the country [27]. Considering most Malaysians consuming calories below the recommended RNI, it seems therefore most of these calories may be 'empty-calories' in the form of sugar and processed foods.

Respondents within the study generally score average for attitude towards dietary intake and lifestyle (Table **4**). There is no significant difference between the attitude of male and female respondents towards dietary intake and lifestyle, and both sexes also scored average. Interestingly, many students seem to hold no illusion regarding the state of their health and in fact, only 40.7% consider themselves with a healthy BMI, much lower than the actual figure of almost 64%. The thought processes behind this lower than actual perception in BMI is revealed in statements made by students including "I eat too much food" and "I rarely eat healthy food". Respondents are fully aware of and appreciate the impact of their poor diets on overall health. With reference to exercise, peer pressure holds a significant motivational influence on individuals when it comes to undertaking regular physical activity [28] and half of respondents in the survey feel the same, where friends hold greater influence compared with family. All respondents considered smoking as unhealthy which is similar among individuals with a higher level of education [29].

The numerous risk factors that may potentially lead to pre-diabetes or diabetes include an unhealthy diet, sedentary lifestyle, obesity and smoking. Diet can become a potentially serious risk factor for diabetes, even when it seems relatively innocuous as demonstrated by the increasing consumption of rice by Malaysians [21] which can increase the risk of diabetes if consumed in large quantities [30]. Physical inactivity and a sedentary lifestyle as demonstrated in the respondents and also common among Malaysians [31] plays a significant role. Physical activity can help in proper functioning of liver enzymes and reduce the fat deposition in the liver [32]. Obesity is a potentially common risk factor the among students with very similar prevalence figures reported by the Malaysian National Health and Morbidity Survey, where 20.7% of adults are overweight and 5.8% were obese, leading to fatty liver and insulin resistance. Though no students in the study were smokers, a risk factor for diabetes [33] significant smoking numbers have been demonstrated among the general student population in Malaysia. Overall smoker levels among male students being 31.6% and 30% for cigarettes and shisha respectively [23].

Respondents generally have good diabetes knowledge score; with an overall score of almost 80%. This is indeed expected as Malaysian 3rd-year pharmacy students are exposed to intensive clinical training during the final two years. There is however some variability in the answers to some questions. Half of respondents were unsure of term pre-diabetes. Though this is not totally unexpected, considering only the American Diabetes association uses the term in a clinical, context, defined as a HbA1C of 5.7%. It may reflect however on the nature of pharmacy education with respect to diabetes, which focuses on management within a clinical setting, more so than prevention in a community setting. For knowledge about normal blood glucose level, Almost 60% of students correctly provided normal fasting blood glucose levels and almost 24% were unsure. Although overall diabetes knowledge is good, there is no relationship among the respondents between diabetes knowledge, attitude and lifestyle. Generally it has been shown that individuals with greater diabetes knowledge tend to be more physically active and with a carefully considered diet [34]. Students seem clear on the roles and responsibilities of pharmacist (Table **5**) in diabetes prevention and management; the respondent seems to have awareness of the role of pharmacists and the provision of screening and medicines management services. However a small number, 31.00% seem to believe pharmacists can provide a clinical diagnose for diabetes. This is an important issue that needs to be clarified in order to ensure pharmacy students and new graduates fully understand their roles in primary healthcare.

The prevalence of Type-2 diabetes in Malaysia has increased from 15.2% in 2006 to an estimated 17.5% in 2015, affecting over 3.5 million Malaysians [1]. Worryingly, 1.8 million of these individuals remain undiagnosed. In addition, a significant proportion of the population may also be within the prediabetes stage, where blood glucose levels are elevated or impaired, but not to an extent that results in a clinical diagnosis of diabetes. Estimates of the prevalence of prediabetes in Malaysia stand at 22.1% [1]. The prevalence of type 2 diabetes among young adults and children is now approaching alarming levels, driven by the increase in obesity [35] with calls for opportunistic screening programs and aggressive intervention [36]. The key in reducing the prevalence of diabetes and diabetes complications is the inclusion of community pharmacists in health campaigns, patient education initiatives and ultimately medicines management clinics. Pharmacy students must be prepared to meet such a future challenge since Malaysia is fast approaching the WHO pharmacist to population ratio; however there is still a dire shortage of community pharmacy services, especially within rural areas. In

2011, the Pharmaceutical Service Division recorded a total of only 1,854 operational community pharmacies serving a population of almost 30 million. The potential of community pharmacy in Malaysia is thus severely under-utilised; there are several reasons can be attributed to this, a discussion of which is beyond the scope of the present study.

CONCLUSION

The risk factors identified within this relatively small group of 3rd-year Malaysian pharmacy students include family health history, high BMI, obesity, hypertension, sedentary lifestyle and an unhealthy diet. 35.40% of the students have a family history of diabetes, 20.35% of them have a high BMI, with 12.39% overweight and 7.96% obese. 20.35% of the respondents have blood pressure above normal expected range and 0.90% could be considered clinically hypertensive if their blood pressure remains elevated. 61.90% were categorised as having an unhealthy lifestyle and female respondents had a more sedentary lifestyle compared to male students. These figures are very similar to those revealed by the numerous national surveys on diet and health. It is clear that diet and lifestyle choices within this group of pharmacy undergraduates are very similar to national trends and do not seem to be overly influenced by age or education. Despite being relatively young, the respondents show remarkably poor lifestyle and dietary habits, highlighted by the fact that most are consuming much less than the daily recommended calories for Malaysian adults, and their diets consisted mostly of rice and fried food, with very little fresh fruit and vegetables. With regard to education, one would expect the pharmacy students to be knowledgeable, considering they have just entered the clinical years of the pharmacy undergraduate program, and indeed most display considerable knowledge with respect to diabetes and its management. It is clear however that such knowledge does not appear to have motivated the students sufficiently to influence or modify their lifestyles. The respondents generally demonstrated good diabetes knowledge, with a positive attitude towards the role of pharmacists in diabetes care, prevention and management. The pharmacy students appear confident and ready to accept future challenges in healthcare. As future community pharmacist these students must play an active role in providing clinical and non-clinical advice in order to produce a better informed and educated population, and ultimately moving towards reducing the healthcare burden imposed by diabetes. What is required is the willingness of community pharmacists to reach out and collaborate with hospital colleagues and to commission services with the Ministry of health in order to develop diabetic medicines management services within the community. The benefits are numerous. In the first instance, the 1.7 million diabetic patients will have easier access to D-MTAC services, providing the crucial intervention needed to improve long term outcomes. Secondly, community pharmacists can expect greater footfall of customers into their pharmacies, and the added commercial benefits this brings. Thirdly and more crucially, pharmacists will be seen as important sources of information within the community, collaborating with other health care professionals, both in primary and secondary care, in order to improve long term patient outcomes, and establish a clear direction for Malaysian community pharmacy.

LIMITATIONS

A serious limitation of this preliminary study was the use of a two-day diary to assess student dietary intake. To provide a more comprehensive picture of eating habits, this needs to be conducted over a much longer time frame. In addition, the small sample size needs to be addressed as only third-year pharmacy students were chosen as they were deemed to possess a relatively accurate balance between education levels and social and peer influence. The next study will require the inclusion of students from all levels, first to final year, and also undergraduates from other health disciplines to provide a more detailed and accurate picture of dietary and lifestyle status among healthcare students.

ACKNOWLEDGEMENTS

The authors would like to thank the Institute of Research Management and Innovation, UiTM. 600-IRMI/DANA 5/3/ARAS (0005/2016) for financial support.

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Received on 28-03-2017 Accepted on 14-09-2017 Published on 06-11-2017

DOI: https://doi.org/10.6000/1927-5951.2017.07.04.4