

AWARENESS OF TYPE 2 DIABETES MELLITUS (T2DM)  
AMONG UNDERGRADUATE STUDENTS IN SCHOOL OF  
HEALTH SCIENCES, UNIVERSITI SAINS MALAYSIA  
(USM)

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(USM)

by

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Dissertation submitted in partial fulfilment of  
the requirements for the degree  
of Bachelor of Nursing (Honours)

June 2021

## CERTIFICATE

This is to certify that the dissertation entitled “The Level of Awareness of T2DM among Undergraduate Students in School of Health Sciences, USM” is the bona fide record of research work done by Ms Nur Amira binti Muhamad Rosdi (138480) during the period from November 2020 to July 2021 under my supervision. I have read this dissertation and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfilment for the degree of Bachelor of Nursing (Honours).

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## DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated and duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research, and promotional purposes.



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## **LIST OF ABBREVIATIONS**

DM – Diabetes Mellitus

T1DM – Type 1 Diabetes Mellitus

T2DM – Type 2 Diabetes Mellitus

GDM – Gestational Diabetes Mellitus

BMI – Body mass index

NHMS – National Health and Morbidity Survey

WHO – World Health Organization

USM – Universiti Sains Malaysia

PPSK – School of Health Sciences

**KESEDARAN TERHADAP *TYPE 2 DIABETES MELLITUS (T2DM)* DALAM  
KALANGAN PELAJAR MAHASISWA DI PUSAT PENGAJIAN SAINS  
KESIHATAN, UNIVERSITI SAINS MALAYSIA (USM)**

**ABSTRAK**

Kebelakangan ini, kejadian Diabetes Mellitus Jenis 2 (T2DM) dalam kalangan populasi yang lebih muda dilaporkan meningkat (Punthakee et al., 2018). Oleh itu, kajian keratan rentas dilakukan untuk mengenal pasti tahap kesedaran dalam kalangan populasi ini. Seramai 93 pelajar sarjana di Kampus Sains Kesihatan USM yang memenuhi kriteria kemasukan dipilih secara rawak dan dimasukkan dalam kajian ini. Data dikumpul menggunakan satu set soal selidik yang dikendalikan sendiri dan disahkan. Data dianalisis secara statistik menggunakan perisian SPSS versi 26. Hasil kajian menunjukkan bahawa majoriti responden mempunyai tahap kesedaran sederhana terhadap T2DM (89.2%). Sebilangan besar responden mempunyai tahap BMI normal (63.4%). Tahap BMI didapati berkaitan secara signifikan dengan tahap kesedaran mengenai DMT2 ( $p < 0.00$ ). Kesimpulannya, usaha untuk meningkatkan kesedaran mengenai risiko diabetes dalam kalangan penduduk yang lebih muda perlu diteruskan dan ditingkatkan lagi untuk membantu mengurangkan jumlah pesakit diabetes dalam kalangan populasi ini pada masa hadapan.

**AWARENESS OF TYPE 2 DIABETES MELLITUS (T2DM) AMONG  
UNDERGRADUATE STUDENTS IN SCHOOL OF HEALTH SCIENCES,  
UNIVERSITI SAINS MALAYSIA (USM)**

**ABSTRACT**

Recently, the incidence of Type 2 Diabetes Mellitus (T2DM) among younger population has been reported to increase (Punthakee et al., 2018). Therefore, a cross-sectional study was carried out to identify the level of awareness among this population. A total of 93 undergraduate students at School of Health Sciences USM who fulfilled the inclusion criteria were randomly selected and included in this study. Data was collected using a set of validated and reliable self-administered questionnaires. The data was statistically analysed using the SPSS software version 26. The findings revealed that majority of the respondents had moderate level of awareness on T2DM (89.2%). Most of the respondents had normal BMI level (63.4%). BMI level was found as significantly associated with level of awareness on T2DM ( $p < 0.00$ ). In conclusion, efforts to raise awareness of the risk of diabetes among younger population need to be continued and further enhanced in order to help reduce the number of diabetics among this population in the future.

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the Study

Diabetes mellitus (DM) is classified as a metabolic disease that can usually be detected by measuring the blood glucose level. The normal range of blood glucose level is between 4.4mmol/L to 7.8mmol/L under fasting plasma glucose (Chinnappan, Sivanandy, Sagarán & Molugulu, 2017; Malaysian Endocrine & Metabolic Society, 2016). Once the blood glucose level is exceeding 11.0mmol/L, it will be diagnosed as diabetes mellitus (Malaysian Endocrine & Metabolic Society, 2016). This disease occurs due to insulin secretion impairment, defective insulin or both that can be detected by the presence of hyperglycaemia (Punthakee, Goldenberg & Katz, 2018). It is a common medical problem that can lead to other health complications if not well treated while expanding the number of death (Nabina & Raj, 2019). Each year the prevalence of this disease continuously increase leading to a remarkable mortality and morbidity rate worldwide (Chinnappan et al., 2017; Premkumar, 2018).

There are two main types of DM, namely Type 1 DM (T1DM) and Type 2 DM (T2DM). The T1DM is an autoimmune destruction of beta cells that cause severe insulin deficiency (Punthakee et al., 2018). This type is commonly due to genetic susceptibility that occurs mostly among younger population above six months of age till 25 years of age but still susceptible to other age group (Punthakee et al., 2018; Thomas, Jones, Weedon, Shields, Oram & Hattersley, 2018; Thomas et al., 2019). Whereas T2DM is commonly occurs among those above 45 years old.

Nevertheless, although T2DM is common in middle age people, the latest findings also reported that increasing incidence of T2DM in younger population, which commonly

associated with obesity and insulin resistance (Punthakee et al., 2018; Thomas et al., 2018). Other than that, there is another type of DM, which is known as gestational diabetes mellitus (GDM). This type of DM refers to a state of glucose intolerance that occurs among pregnant women (Punthakee et al., 2018). However, for the purpose of this study, the researcher mainly focuses on T2DM.

In terms of clinical manifestation, T2DM is indicated by excessive thirst, frequent urination at night, tiredness, distorted vision and tingling or numbness sensation of hands and feet (Al-Thani et al., 2018). Moreover in the long run, T2DM can cause other health complications such as heart disease, renal failure, nerve damage and leg or foot amputation (Asif, 2014), diabetic retinopathy and consequently lead to blindness (Huri, Huey, Mustafa, Mohamad & Kamalden, 2018). Besides these health complications, uncontrolled T2DM can also affect the patients' quality of life (Hermans, Brotons, Elisaf, Michel, Muls & Nobels, 2013). There are many treatment options for T2DM but the disease, however, cannot be completely cured and therefore, efforts to prevent this disease are important to be made among those who are at high risk.

Generally, according to World Health Organization (WHO), it was estimated that 422 million adults aged over 18 years living with DM globally (WHO, 2019, which is around four times higher, from 108 million reported in 1980. Furthermore, this number is expected to increase from 9.3% (463 million people) in 2019 to 10.2% (578 million) by 2030 and to 10.9% (700 million) by 2045 (Saeedi et al., 2019).

The prevalence rate of T2DM is also higher in South East Asia (SEA) countries including Sri Lanka, Bangladesh, India, Bhutan, Mauritius and Maldives. It was estimated about 95% of 73 million DM cases in these countries diagnosed with T2DM (Ramachandran et al., 2014). This trend was also observed in other Asian countries such as Niue, Vanuatu and Malaysia, whereby the rate of T2DM had increased from 7.2% in

1980 to 38.4% in 2012, 12.1% in 1991 to 21.2% 2011 and 11.6% in (2006 to 22.9% in 2013) respectively (Nanditha et al., 2016). It is even more worrying when T2DM is estimated to rise to 150% in 2035 (Nanditha et al., 2016).

Generally, the prevalence of DM has risen from 0.6% in 2011 to 5.3% in 2019 among younger population aged between 18 until 29 years old in Malaysia (National Health and Morbidity Survey, 2019). In addition, a study in Japan discovered 80% of the new diagnosed T2DM was among the young generations instead of older adults (Jaacks, Siegel, Gujral & Narayan, 2016). Similarly, in United States, 30.5% of its young generations had been diagnosed with T2DM, specifically among native Americans (1.20 per 1000 youth) and African Americans (1.06 per 1000 youth) (Jaacks et al., 2016).

In a study by Gopalakrishnan et al. (2012), it was indicated that 14.8% of 290 students at Asian Institute of Medicine, Science and Technology (AIMST) university, Malaysia were overweight based on body mass index (BMI) (BMI 23-24.9 kg/m<sup>2</sup>), 15.9% pre-obese (BMI 25-29kg/m<sup>2</sup>) and 5.2% was obese (BMI > 30 kg/m<sup>2</sup>). This is particularly for those with multigenerational family history with T2DM (Wilmot & Idris, 2014). T2DM is also common in people living in developing countries, where in relating to their dietary intake that mostly in the category of fast and processed foods (Lin et al., 2016; Nanditha et al., 2016). Fast food and processed food are proven to have high calorie-dense, higher saturated fat, high in salt and low in micronutrients. Accordingly, high consumption of these foods will put them at higher risk of obesity (Fraser, Clarke, Cade & Edwards, 2012).

Sedentary lifestyle was also indicated as one of the risk factors of overweight and obesity that can lead to T2DM (Wilmot & Idris, 2014; Tee & Yap, 2017). A research by Nor Shazwani (2010) reported that 33.3% of 132 people were diagnosed with T2DM in Cheras health clinic had a low physical activity level (Nor Shazwani et al., 2010). This



findings indicated that sedentary lifestyle is associated with T2DM (Hussein, Wahyu Taher, Gilcharan Singh & Siew Swee, 2016). Therefore, to remain healthy and free from chronic diseases such as T2DM, one need to practice healthy lifestyle and consume balance diet that consist of adequate amount of nutrient and fibre. This type of food is important in reducing the excess adiposity, along with physical exercises (Ardisson Korat, Willett & Hu, 2014).

The increases rate of T2DM in younger population as reported in the previous studies obviously revealed that adolescent is now at risk for this disease particularly if the risk factors are not well addressed by them. Thus, this study will focus on the awareness of T2DM among the undergraduate students in Health Campus, Universiti Sains Malaysia (USM), Malaysia.

## **1.2 Problem Statement**

The prevalence of T2DM in Malaysia is continuously increase for the past two decades and it is really worrying. According to National Health and Morbidity Survey (NHMS) (2019), one in five adults in Malaysia has a risk of DM. It is even more concerning when the total number of DM among younger population aged 18 and above was reported at 3.9 million (NHMS, 2019). This numbers however, can be controlled by increasing the level of awareness regarding the risk of DM among this population group. It is believed that adequate awareness on the risk of DM can help increase their understanding and eventually encourage as well as motivate them to adopt healthy lifestyle to prevent the disease (Abdullah, Liew, Ambigapathy & Paranthaman, 2020).

It is acknowledged that the young generation have an unfavourable change in their daily lifestyle, especially university students. A study by Deforche, Van Dyck, Deliens & De Bourdeaudhuij (2015) stated that there is an increment in the internet usage

and lower participation in sports that leads to a sedentary life style (Deforche et al., 2015). Moreover, university students were more likely to increase 2.7 kilograms on the average regardless of the gender (Deforche et al., 2015). This statement may relate to USM students as they were proven to have less active lifestyle, as observed by Nurul Syamimi Athirah) (2020). Based on her observation, the students were rarely engaged in physical activity such as jogging and sports. Thus, they were more likely to experience weight gain especially during their second and third year of their study in the university (Nurul Syamimi Athirah, 2020).

Based on a survey regarding dietary intake by The Malaysian Adult Nutrition Surveys (MANS) (2014), Malaysian aged above 18 years old had poor dietary habit which revealed that only 20% followed the Malaysian Food Pyramid servings. This is particularly for the three food groups; fruits, vegetables and legumes (National Coordinating Committee on Food and Nutrition (NCCFN), 2016). Based on MANS 2014, the consumption of the mentioned three food groups dropped to less than 10% especially for the vegetables (*National Coordinating Committee on Food and Nutrition (NCCFN), 2016*). Subconsciously, these dietary habits will cause the major risk of T2DM due to overweight and obesity among the young generation (Tee & Yap, 2017).

Although DM is highly susceptible to young population, the awareness level among this population is still low. This situation is no exemption to university students and the researcher believed that many of them do not know that they are actually at risk for this disease if they do not adopt a healthy lifestyle (D'Souza, Walls, Rojas, Everett & Wentzien, 2015).

During literature search, the researcher found that there is limited literature regarding awareness of DM among younger population, especially in Malaysia (Qamar, Rashid, Ahmad, Shaikh, & Ismail, 2017). Thus, this study will be conducted to fill this

gap and hence, help added new knowledge into this area of care.

### **1.3 Research Questions**

The following are the research questions to guide the researcher to conduct this study:

- i. What is the level of awareness of T2DM among undergraduate students in School of Health Sciences USM?
- ii. What is the BMI level among undergraduate students in School of Health Sciences USM?
- iii. Is there any correlation between BMI level and level of awareness of T2DM among undergraduate students in School of Health Sciences USM?
- iv. Is any there any association between socio-demographic data (age, gender, race and level of education) and the level of awareness of T2DM among undergraduate students in School of Health Sciences USM?

### **1.4 Study Objective**

#### **1.4.1 General Objective**

The main goal of this study is to assess awareness of T2DM among undergraduate students in School of Health Sciences USM.

#### **1.4.2 Specific Objectives**

- i. To assess the level of awareness of T2DM among undergraduate students in School of Health Sciences USM.
- ii. To identify the BMI level among undergraduate students in School of Health Sciences USM.

- iii. To determine the correlation between BMI level and level of awareness of T2DM among undergraduate students in School of Health Sciences USM.
- iv. To examine the association between socio-demographic data (age, gender, race and level of education) and level of awareness of T2DM among undergraduate students in School of Health Sciences USM.

### **1.5 Study Hypothesis**

The study hypothesis for this study are as follows:

- i.  $H_0$ : There is no significant correlation between BMI level and level of awareness of T2DM among undergraduate students in School of Health Sciences USM.
- ii.  $H_A$ : There is significant correlation between BMI level and level of awareness of T2DM among undergraduate students in School of Health Sciences USM.
- iii.  $H_0$ : There is no significant association between socio-demographic data and level of awareness of T2DM among undergraduate students in School of Health Sciences USM.
- iv.  $H_A$ : There is significant association between socio-demographic data and level of awareness of T2DM among undergraduate students in School of Health Sciences USM.

### **1.6 Significance of Study**

Health awareness on DM is very important to be highlighted among Malaysian especially the younger population. This study will provide data on awareness level of university students on the risk of DM. The result of this study can also help the health

authorities to plan effective strategies to further increase awareness and the same time help to reduce the rate of DM among younger population in future.

## 1.7 Conceptual and Operational Definitions

**Table 1.1 Conceptual and operational definitions**

<b>Title</b>	<b>Conceptual definition</b>	<b>Operational definition</b>
<b>Awareness</b>	Knowledge regarding something that exists, or the ability to understand a situation or subject at the present time based on the obtained information or through one's experience (Cambridge Dictionary, 2020).	In this study, students' awareness of T2DM was assessed based on their pre-existing experience and information gained regarding T2DM definition, pathophysiology, sign and symptoms, risk factors, and treatment.
<b>Type 2 Diabetes Mellitus (T2DM)</b>	A relative defect in insulin secretion or in the peripheral action of the hormone that cause resistance against the effects of insulin (Moini, 2019). The occurrence of $\beta$ -cell dysfunction occurs in the pancreas will lead to excess glucose concentration in the blood, that called as hyperglycaemia (Zheng, Ley & Hu, 2018).	In this study, the university students' level of awareness and risk of developing T2DM were evaluated.
<b>Undergraduate students</b>	A student who is studying for the first at a college or university (Cambridge Dictionary, 2020).	In this study, undergraduate students mean those who are studying at undergraduate level in School of Health Sciences, USM during the study period.
<b>Body mass index (BMI)</b>	The scales used to determine the value of weight relative to height (D'Souza et al., 2015).	In this study, the undergraduate students' level of BMI was identified by measuring their weight and height and evaluated its association with level of awareness on T2DM.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction of the chapter**

Literature review is a review of some past and existing literature that is used for the purpose of creating new knowledge or improvise it (Torraco, 2016). The past literature should be expanded or updated following the current or the subject interest of the study. Thus, this review explores more details regarding the level of awareness regarding Type 2 Diabetes Mellitus (T2DM), body mass index (BMI) level among undergraduate students, the association between BMI and level of awareness of T2DM and the association between socio-demographic data and level of awareness of T2DM. This chapter also elaborates on the theoretical and conceptual framework used in this study.

#### **2.2 Level of awareness regarding T2DM**

According to Al-Hussaini & Mustafa (2016), awareness refers to in depth conscience or knowledge of T2DM and this help to elevate the perception of the need to prevent T2DM and can further minimize the risk of developing T2DM. Several studies have investigated the issue of awareness regarding T2DM. The occurrence of T2DM is common in adults but the occurrences in younger population is began to increase currently (Wilmot & Idris, 2014). However, the researcher only managed to find mainly two studies looking at awareness of DM among undergraduate students (Khamaiseh & Alshloul, 2019; Premkumar, D. 2018). Therefore, with this deficiency, articles on awareness of DM among other population were also included in this review (Table 2.1).

In a study by Qamar, e al. (2017) with the objective to assess the awareness of DM among 350 respondents of general population in Shah Alam, Malaysia (Table 2.1). Most of the respondents were between 27 to 35 years old (Qamar, e al. 2017). The study states that 112 respondents (32%) were categorized as poor knowledge level, 146 respondents (41.7%) had moderate knowledge level and 92 respondents (23.6%) had good knowledge level. This indicates that most of the respondents belong to moderate level of knowledge regarding DM.

Contrarily, in another study conducted in a Diabetes Clinic at Hidalgo, Mexico found that only 5% (N=16) out of 310 respondents had adequate knowledge level of T2DM with the cut-off point consensus at 8.5 on a scale of 0 to 10. However, the mean ( $\pm$ SD) age of the respondents is  $59 \pm 11.3$  and only 7.1% of 310 respondents with university education level (Carrillo Alarcon, 2015).

Besides that, a study had been done in Saudi Arabia and Jordan by Khamaiseh & Alshloul (2019) to report the difference level of knowledge on DM among the Health Sciences undergraduate students instead of general undergraduate students. Generally, their knowledge was adequate as they were Health Sciences students. The findings showed that Saudi undergraduate students had significantly higher total of DM knowledge score (mean = 21.64) compared to the Jordanian undergraduate students (mean = 20.29). The significant difference of knowledge score between the two groups of students revealed that they had lack of knowledge in certain parts of DM. These include the complication and controls of DM (Khamaiseh & Alshloul, 2019). For example, almost half of the students did not recognize that DM has negative effect on the kidney (Khamaiseh & Alshloul, 2019).

A study regarding the level of awareness and knowledge on T2DM among undergraduate and foundation students at Asian Institute of Medical, Science and Technology (AIMST) University also had the same result (Premkumar, 2018). The finding shows that 50% out of 200 students answered correctly that T2DM can lead to kidney failure. Whereas the other half answered it wrongly (Premkumar, 2018). This showed while some of the medical students had good level of knowledge and awareness towards T2DM, some of them still had limited understanding that need to be polished as future health professionals (Table 2.1).

**Table 2.1: Studies on Level of Awareness regarding T2DM**

Author	Objective	Population	Sample	Country	Findings
<b>Qamar et al., (2017)</b>	Assess the awareness of diabetes mellitus (DM) among the general public of Shah Alam, Malaysia	General public	Convenience sampling of 350 respondents 27 to 35 years old (DKQ)	Shah Alam, Malaysia	Level of diabetes knowledge:  Poor: 112 (32%) Moderate: 146 (41.7%) Good: 92 (26.3%)  Overall: moderate level of knowledge
<b>Khamaiseh &amp; Alshloul (2019)</b>	Assess the knowledge and to identify knowledge deficits that are associated with diabetes mellitus among undergraduate students in Saudi Arabia and Jordan	Health Sciences undergraduate students	Convenience sampling of 982 respondents 18 to 45 years old	Saudi Arabia and Jordan	DM knowledge score (mean):  Saudi students: 21.64 Jordan students: 20.29  Range of limited knowledge: Complication and controls of DM among Health Sciences undergraduate students  (Khamaiseh & Alshloul, 2019)
<b>Premkumar (2018)</b>	Assess the level of awareness and knowledge on type 2 diabetes (T2DM) mellitus among university students	Undergraduate and Foundation students of Asian Institute of Medical, Science and Technology (AIMST) University	Random sample selection of 200 respondents 18 to 25 years old	Kedah, Malaysia	60% of the total students had correct answers:  Aware sugar cause diabetes: 70.5% Diabetes is controllable: 62.5%



					Frequent urination and thirst due to hyperkalemia: 80.5% Affect body parts: 73.5% Lead to kidney failure: 50%
<b>Carrillo Alarcon (2015)</b>	Identify the level of knowledge of T2DM among patients assigned to diabetes clinics	Patients at diabetes clinics of the Health Services	Cross-sectional study of 310 patients diagnosed with T2DM (DKQ)	Hidalgo, Mexico	7.1% of 310 patients have university level education.  Mean age of patients: 59 ± 11.3.  Result level of knowledge: Less than 20% of the patients had adequate level of T2DM knowledge and understanding the disease.

### 2.3 Body mass index (BMI) level among Undergraduate Students

World Health Organization (WHO) defined BMI as a measurement of weight relative to height and used to identify the optimum weight for a healthy body (WHO, 2020). Table 2.2 shows the result of a study by D'Souza et al. (2015) at Wesley College. The study was done on 300 students to analyse BMI trends. The students' height and weight were measured, and the findings revealed that 29.5% of the respondents were overweight and 19.8% were obese. However, in other study in India, a slightly lower percentage of obesity was indicated (4.4%) among undergraduate students in a medical college in Delhi (Anand, Grover, Tanwar, Kumar, Meena & Ingle, 2015).

The percentage of overweight respondents was higher (30.4%) in a study by Mani (2014) conducted among undergraduate students at a medical college in Tamil Nadu, India. Mani (2014) further concluded that 24% of the respondents (N=36) were overweight and 9.3% (N=14) were in obese category. In this finding, Mani (2014) emphasized that BMI level is associated with factors such as duration of physical activity and sedentary behaviour. Anand et al. (2015) emphasized that the rise of obesity among

medical students will lead to negative impact in that can distorted their body image and public perceptions towards them as they are the future healthcare providers.

**Table 2.2: Studies on BMI among Undergraduate Students**

No.	Author	Objective	Population	Sample	Findings
1.	D'Souza et al. (2015)	Analyse current BMI trends in a sample of Wesley College's student population	Undergraduate students at Wesley College.	300 respondents	BMI frequency:  Obese: 19.8% Overweight: 29.5%  The mean BMI of students living in-campus was higher than those living off-campus
2.	Anand et al. (2015)	Assess self-perceptions of body mass index (BMI) and physical activity among medical undergraduate students	Undergraduate students in a medical college in Delhi, India.	161 respondents	BMI frequency:  Obese: 4.4% Overweight: 30.4%  Only one-third of the overweight and obese students were physically active
3.	Mani (2014)	Assess the nutritional status among undergraduate medical students	Undergraduate students at a medical college in Tamil Nadu, India.	150 respondents	BMI frequency:  Overweight: 24% (36 students) Obese: 9.3% (14 students)  Factors such as duration of physical activity and sedentary behaviour had significant association with the BMI status

#### 2.4 Association between BMI and level of awareness of T2DM

There was a recent study comparing between BMI and knowledge of T2DM among patients diagnosed with T2DM (Aravinthan, 2018). The study found that 50 respondents (28.1%) were obese. Out of this number, 43 respondents (22.4%) were female with significant p value of 0.047 (Aravinthan, 2018). Aravinthan (2018) further concluded that female with higher BMI level had higher risk of developing T2DM compared to male. Whereas in Wilmot & Idris (2014), they assessed the association between BMI and the onset age of T2DM. They summarized that the higher weight gain

among those aged under 40 years old, the higher risk they will have T2DM (Wilmot & Idris, 2014). Wilmot & Idris (2014) also emphasized that 80-92% of those who are obese in younger age is more likely to have early onset of T2DM (Wilmot & Idris, 2014).

## **2.5 The association between socio-demographics data and level of awareness of T2DM**

Altogether, there were thirteen studies looking at the association between socio-demographic characteristics and level of awareness towards T2DM (Abdullah et al., 2019; Baynest, 2015; Bell et al., 2014; Bjerregaard et al., 2018; Chinnappan et al., 2017; Deforche et al., 2015; Ekpenyong, 2012; Qamar et al., 2017; Jaacks et al., 2016; Kaiser et al., 2012; Logue et al., 2011; Nanditha et al., 2016; Wilmot & Idris, 2014). Of the many variables under socio-demographics under reviewed, the current study however, focuses mainly on age, gender, race, BMI and levels of education. Information on the selected socio-demographics are explained as the following.

### **2.5.1 Age**

A study by Chinnappan et al. (2017) reported a significant difference in the knowledge level on DM among different age groups with the highest level belongs to the young generations (Chinnappan et al., 2017). They also concluded that the younger the respondents, the higher level of knowledge regarding DM compared to the older age groups with mean value ( $\mu$ : 58.92) (Chinnappan et al., 2017). This finding was in line with another study by Qamar et al., (2017). This study assessed the awareness of DM among the general public of Shah Alam, Malaysia and found that 41.7% of 146

respondents had moderate and only 26.3% (N=92) of the rest respondents had good level of awareness of DM (Qamar et al., 2017).

### **2.5.2 Gender**

In terms of gender, females were reported to have higher prevalence of T2DM compared male in a study conducted by Ekpenyong, (2012). This study revealed that the prevalence of T2DM among female is higher 11.2% compared to male 9.6% (Ekpenyong, 2012). However, a slightly different result was indicated in another study by Tee & Yap (2017) when they indicated a small difference in the prevalence of DM between males (16.7, 9.1%) and females (18.3, 9.2%) respectively. A similar result was indicated in a study by Jaacks et al., (2016) that reported the prevalence of DM among men is higher 9.0% compared to female 7.9%. This is in line with other study conducted by Kaiser, Vollenweider, Waeber & Marques-Vidal, (2012) when they reported the prevalence of DM among men is higher 6.3% rather than women 4.2%. The high prevalence of DM among men according to Logue et al., (2011), is related to the fact that men are less insulin sensitive than women, greater volume of visceral and hepatic fat, and generally have higher level of fasting blood glucose.

### **2.5.3 Race**

A significant association between T2DM and ethnicity was reported in a study by National Health and Morbidity Survey (NHMS) (2015) conducted in Malaysia. The result showed highest prevalence of T2DM among Indian students (22.1%), followed by Malays (14.6%) and Chinese (12.0%). The NHMS (2015) also indicated that Indians students had highest prevalence for undiagnosed T2DM (11.9%) and followed by Malays

(9.8%). On the contrary, the findings reported that Chinese students had the lowest prevalence of undiagnosed T2DM (7.7%) (NHMS, 2015). This shows that different ethnicity gave different probability risk of developing T2DM. Similar results also found in a study conducted in Singapore by Nanditha et al., (2016) when they reported the prevalence of T2DM was higher among Indians students (17.2%).

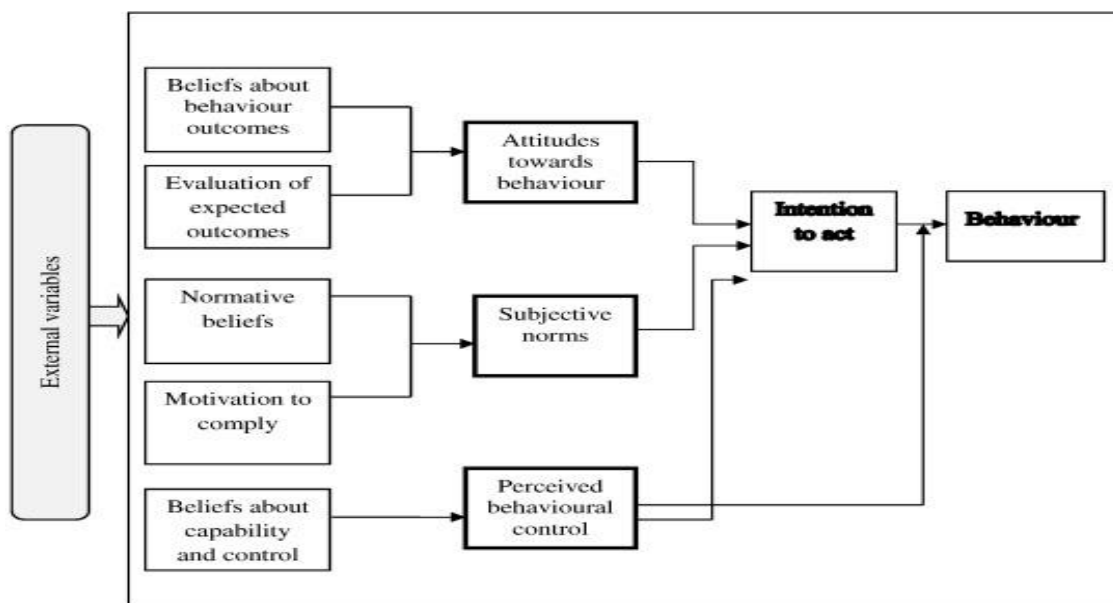
#### **2.5.4 Levels of education**

A previous study by Kaiser et al. (2012) reported no significant difference regarding the prevalence, awareness and treatment of T2DM and educational levels (Kaiser et al., 2012). In contrast, a study among low, middle and high educational level in 2012 by Sacerdote, Allebeck, Hallqvist, Moradi & Sidorchuk. Proved that lower educational level associated with higher risk of T2DM among respondents in Western European countries. Sacerdote et al. (2012) reported that a higher educational level will improve the ability to practice a positive health behaviour since it had direct impact on factors related to T2DM such as the BMI (Sacerdote et al., 2012). In line with the previous study, a study conducted by Agardh, Allebeck, Hallqvist, Moradi & Sidorchuk, (2011) stated that the skills and knowledge acquired through higher education may impact the acceptance to health information and knowledge (Agardh et al., 2011). It can be concluded that the higher the level of education, the higher motivation and compliance to involve in a positive health behaviour (Agardh et al., 2011).

#### **2.6 Theoretical and conceptual framework of the study**

This study utilized Theory of Planned Behavior (TPB) by Icek Ajzen in 1985. This theory is designed to enhance understanding, predicting, and change human behavior as well as explain the association between one's belief and their action (Lee, Bowen,

Mosley & Turner, 2017). The TPB main focus is to analyze one's ability to achieve goal by focusing on the three main components of TPB which are attitude, subjective norms and perceived behavior control as shown in Figure 2.1 (Lee et al., 2017). According to this theory, there are a few specific beliefs that can act as the indirect predictors that can be formed according to a person's demographic factors and able to change or adapted based on the individual's beliefs (Akbar, Anderson & Gallegos 2015).



**Figure 2.1: Theory of Planned behavior by Icek Aizen (1985)**

Based on this theory, attitude is defined as a situation where it evaluates an overall individual behaviour either it is favourable or unfavourable (Fila & Smith, 2006). Subjective norms composed of one's belief the importance of individual participation to engage in a certain behaviour. This norms will help an individual to assess the most appropriate behaviour when encounter with particular situation to avoid social pressures (*Handbook of Sport Psychology*, 2020). Hereby, perceived behavioural control (PBC) describe as the perceived extent to which a behaviour of one's is under the influences and control of behaviours and intentions (Akbar et al., 2015).

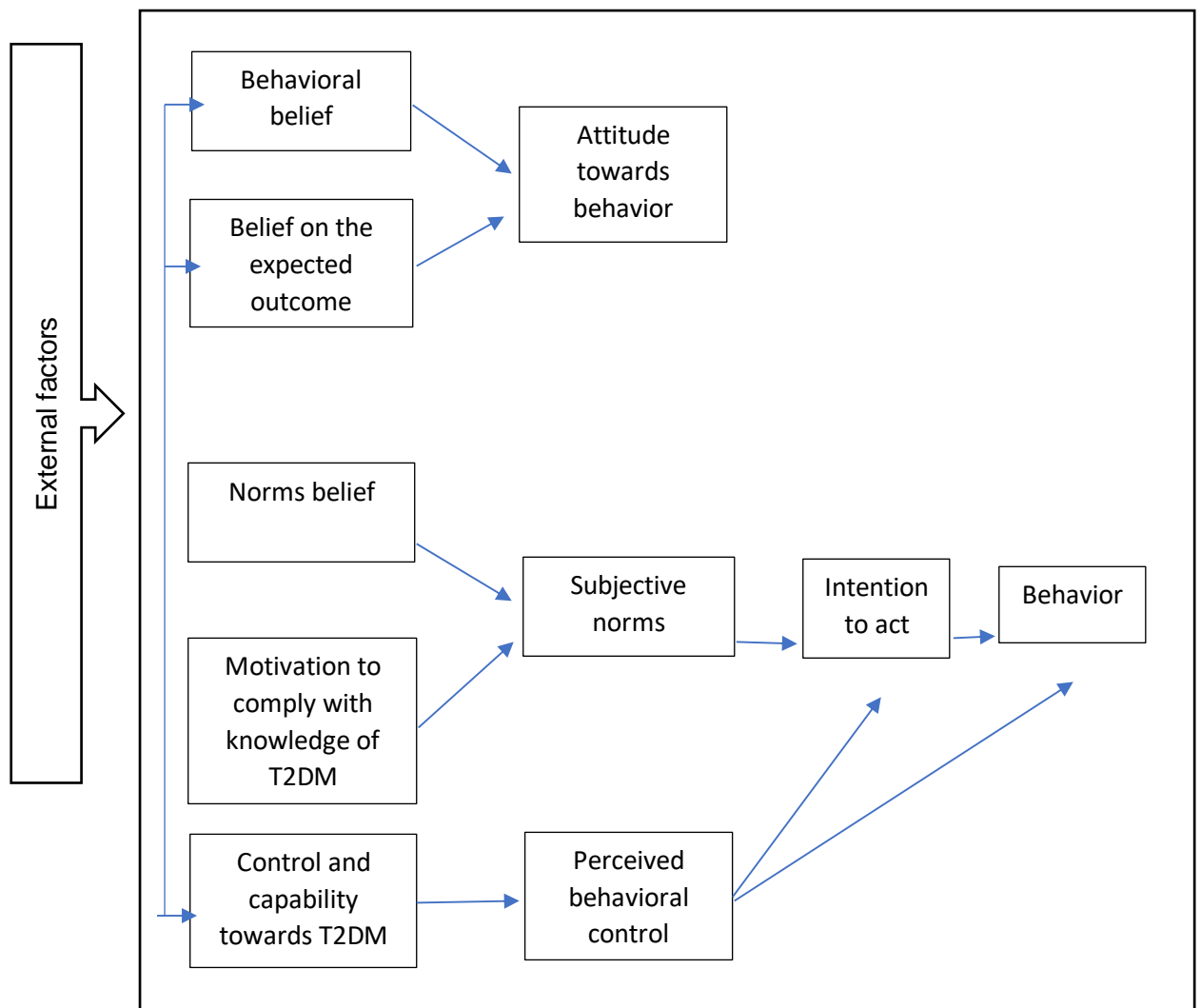
## **Conceptual framework of the study**

In this proposed study, the three main components will be used to explain the relations between behavioural, norms belief and perceived behavioural control with the awareness of T2DM as shown in Figure 2.2. Based on TPB theory, an individual's behaviour will be evaluated based on the attitude and intention. Hereby, the individual is free to have a specific behavioural belief on the expected outcome of a certain behaviour. In this study, the pre-existing knowledge regarding T2DM will lead the individual either to have positive or negative behavioural belief. Positive belief means the individual is confident with the contained knowledge that it will bring a good outcome. In contrast, if the individual lacks confidence or denies the knowledge of T2DM, thus the individual might refuse to comply with the knowledge with if the change in attitude and behavioural did not bring the risk of T2DM towards itself.

The intention also can be affected by PBC. In this matter, PBC will have effects on the individual who believes that they neither have the opportunity nor resources of knowledge on T2DM. This belief will lead the individual to refuse to place high expectations or outcomes even though the individual practices a favourable attitude or subjective norms. Besides, the behaviour also can be influenced directly by the PBC. By having the insufficient, inaccurate or changes in the knowledge of T2DM because of the environment or socio-demographic, the individual is more likely to face an inaccurate prediction of PBC.

Based on Figure 2.2, the modified TPB also will be affected by the individual's norms belief. Everyone has different perceptions on each action and condition. For an example, an exposure to a certain risk of T2DM will convince the individual to engage in the action of countermeasure. However, the norms belief of the individual makes the

individual has a few favourable options to comply with the knowledge of T2DM. In this matter, the individual is more likely to engage in the most appropriate action that will do more than harms on itself. To summarize, the behavioural of an individual can be affected by one's intention that linked with behavioural attitude, norms belief and PBC. For this study, these three main components are depending on the external factors which is the demo-graphic data (age, gender, ethnicity, BMI and level of education).



**Figure 2.2: Modified Theory of Plan Behaviour by Nur Amira (2020)**



## **CHAPTER 3**

### **METHODOLOGY AND METHOD**

#### **3.1 Introduction**

This chapter elaborates the details regarding study design that was applied in this study. It also addresses the study setting, population, respondent selection criteria, sampling method, sampling size estimation and variables involved. Then, the instrument that was utilized in this study also included.

#### **3.2 Research design**

The research design selected for this study was a cross sectional survey with the aim to assess the level of awareness of T2DM among undergraduate students in School of Health Sciences USM. Through this design, the researcher measured the exposures and outcome among the respondents at the same time (Setia, 2016).

#### **3.3 Research setting and population**

This study was carried out at School of Health Sciences in Health Campus, Universiti Sains Malaysia (USM), Kubang Kerian, Kelantan. The campus consists of three main faculties which are School of Health Sciences (PPSK), School of Medicine Sciences (PPSP) and School of Dental Sciences (PPSG). However, for the purpose of this study, the researcher had focused on undergraduate students in the School of Health Sciences only. Based on the data obtained from the Academic Office of the School of Health Sciences, the total number of current undergraduate students were 1146, from eleven undergraduate programmes include Audiology, Biomedicine, Dietetic, Health

Environment and Workplace, Forensic sciences, Sport sciences, Medical radiation, Speech pathology, Nursing (Undergraduate and Diploma) and Nutrition.

### **3.4 Sampling plan**

Sampling is the process of selecting individual from the population of interest so that the results obtained will be able to generalized back into the population (Chua, 2016). Effective sampling data is by using the most suitable method to improve the validity and reliability of the study. This study was conducted in eight months duration from November 2020 to June of 2021. The details regarding sampling method and sample size will be explained further as follows:

#### **3.4.1 Sample criteria – Inclusion and exclusion criteria**

The inclusion and exclusion criteria of respondent for this study are as follows:

##### **Inclusion criteria**

- Male and female undergraduate students studying at School of Health Sciences.
- Aged above 18 years old.
- Able to read and understand Malay language.

##### **Exclusion criteria**

Respondents omitted from this study if they are:

- Suspected with cognitive and/or psychiatric health problem.

### 3.4.2 Sampling size estimation

The number of sample size for each objective are as follows:

For objective one, the sample size estimation is calculated by using the sample size calculator (Naing, 2003). In this estimation, the sample size is determined by the standard deviation obtained from Qamar et al. (2017) with value of 6.09. Thus, the single mean estimation formula is applied along with precision value 2 and significance level ( $\alpha$ ) 0.05. The total sample size estimation result for this objective is 36 respondents.

For objective two, the level of BMI among the undergraduate students of PPSK is identified by implemented the same calculation method as objective one. The standard deviation used to determine the sample size estimation is 2.55 (Mani, 2014), significance level ( $\alpha$ ) 0.05 and the precision is 1. The total sample size estimation is 25 respondents.

The sample size for the third objective, which is the correlation between BMI and the level of awareness towards T2DM is calculated by using software G-Power 3.1.9.7 as shown in Figure 3.1. For this objective, r value 0.3 (Anand et al., 2015),  $\alpha$  0.05 and power 0.8 will be used to calculate the estimation sample size. The essential sample size is 84 respondents.

