

**THE RELATIONSHIP BETWEEN HEALTH LITERACY AND SELF-
MANAGEMENT BEHAVIOUR IN TYPE 2 DIABETES MELLITUS
ADULTS**

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ADULTS**

BY

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ABSTRACT

THE RELATIONSHIP BETWEEN HEALTH LITERACY AND SELF- MANAGEMENT BEHAVIOUR IN TYPE 2 DIABETES MELLITUS ADULTS

WONG XIAO-VEE

The prevalence of Type 2 Diabetes Mellitus (T2DM) is increasing and the prevalence of health literacy among Malaysian is low. T2DM is a condition that requires the diagnosed adults to practise self-management behaviour as appropriate management of their condition which will lead to approximate normal life. However, the variables affecting the self-management behaviour of T2DM adults are not well understood. Hence, this study aims to determine the relationship between health literacy and self-management behaviour of T2DM adults. A cross-sectional study was done on 112 T2DM adults across Malaysia. The data were collected using the questionnaire that consists of three sections, which were sociodemographic, Health Literacy Survey Malaysian Questionnaire¹⁸ (HLS-M-Q18) and Diabetes Self-Management Questionnaire (DSMQ). Data were analysed using descriptive statistics, One way analysis of

variance (ANOVA) and Independent T-Test. Results indicated that 75.9% of the T2DM adults have limited health literacy. The self-management behaviour mean score of 4.94 ± 1.54 (poor) was found. Health care use was the most practised (Mean = 7.78 ± 1.94) among the four subscales while physical activity is the least practised (Mean = 2.50 ± 3.12) by T2DM adults. A significant relationship was found between health literacy and self-management ($p < 0.001$) of the T2DM adults whereby the lower the health literacy, the poorer the self-management behaviour of T2DM adults. Sociodemographic variables of age ($p = 0.002$), education level ($p < 0.001$) and duration diagnosed with T2DM ($p < 0.001$) showed a significant relationship with self-management behaviour of T2DM adults. Therefore, it was concluded that a significant relationship was found between health literacy and self-management behaviour. Appropriate strategies should be planned to increase the health literacy of T2DM adults as it will lead to better self-management behaviour. Future studies should explore on the factors that affect the self-management behaviour of T2DM adults.

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Lastly, I would also like to thank my family and friends for their continuous support and motivation throughout the final year project journey.

DECLARATION

I hereby declare that this final year project report is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UTAR or other institutions.



WONG XIAO-VEE

APPROVAL SHEET

This final year project report entitled “**THE RELATIONSHIP BETWEEN HEALTH LITERACY AND SELF-MANAGEMENT BEHAVIOUR IN TYPE 2 DIABETES MELLITUS ADULTS**” was prepared by WONG XIAO-VEE and submitted as partial fulfilment of the requirements for the degree of Bachelor of Science (Hons) Dietetics at Universiti Tunku Abdul Rahman.

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PERMISSION SHEET

It is hereby certified that WONG XIAO-VEE (ID No:19ADB06833) has completed this final year project thesis entitled “THE RELATIONSHIP OF HEALTH LITERACY AND SELF-MANAGEMENT BEHAVIOUR IN TYPE 2 DIABETES MELLITUS ADULTS” under the supervision of Dr. SHARMELA a/p SAHATHEVAN (Supervisor) from the Department of Allied Health Science, Faculty of Science.

I hereby give permission to the University to upload the softcopy of my final year project thesis in pdf format into the UTAR Institutional Repository, which may be made accessible to the UTAR community and public.

Yours truly,



(WONG XIAO-VEE)

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LIST OF ABBREVIATIONS

T2DM	Type 2 Diabetes Mellitus
NHMS	National Health and Morbidity Survey
WHO	World Health Organization
DSMQ	Diabetes Self-Management Questionnaire
HbA1c	Haemoglobin A1c
SDSCA	Summary of Diabetes Self-Care Activities
HLS-M-Q18	Health Literacy Survey Malaysian Questionnaire18
ANOVA	One way analysis of variance

CHAPTER 1

INTRODUCTION

1.1 Research Background

Type 2 Diabetes Mellitus (T2DM) also known as hyperglycemia is the condition whereby the body is unable to adequately utilise the insulin that is produced and causes the rise in blood glucose level. Insulin is a hormone that is produced by the pancreas, which regulates blood glucose levels. Insulin is released when blood glucose level rises and will aid in breaking down the glucose to provide energy to the cell in the body (Centers for Disease Control and Prevention, 2019a). According to World Health Organization (WHO), T2DM affects the vast majority of individuals diagnosed with diabetes. Excess body weight and lack of physical activity is the main factor leading to it (World Health Organisation, 2021). A significant impact on human life and healthcare costs can be seen from T2DM as it is widely recognized as a critical public health issue (Khan et al., 2020). Based on research by Saeedi et al. (2019), T2DM is estimated to affect 9.3% of the global population and will continue to rise to 10.9% by 2045.

T2DM decreases the quality of life of the diagnosed adults and increases sleep-related problems which lead to significant morbidity and premature mortality

(Ramtahal et al., 2015; Abedini et al., 2020). Symptoms of T2DM can develop over a period of years and go unnoticed for a long time (Centers for Disease Control and Prevention, 2019b). Adults should understand the risk of them being diagnosed with T2DM and visit the medical practitioner to determine their blood glucose level by glycated haemoglobin (A1C) test (American Diabetes Association, 2019). Adults that are obese, diagnosed with hyperlipidaemia, hypertension or gestational diabetes have a higher risk of developing T2DM and should be screened for T2DM annually. Each individual should have a sufficient understanding of their health condition which will help them to understand how to practise self-management behaviour which requires an adequate health literacy level.

Health literacy is defined by the Centers for Disease Control and Prevention (CDC) as the ability of the individual to access, analyze, and comprehend fundamental health information and services required to make well-informed health decisions (Centers for Disease Control and Prevention, 2019c). Based on National Health and Morbidity Survey (NHMS) 2019, it has been reported that only 24.3% of Malaysian adults above 18 years old poses an excellent health literacy level. 40.7% of the Malaysian population have sufficient health literacy while 35.0% have limited health literacy. It also shows that as age increases, healthy literacy level decreases. Based on NHMS 2019, the highest prevalence of individuals with overall diabetes is within the age range of sixty-five to sixty-nine with 43.4%. Since most of the T2DM adults in Malaysia are of older age. Therefore, it is predicted that the health literacy level of T2DM adults will be lower.

T2DM will affect the diagnosed adults in many aspects of their life. However, appropriate management of the condition will lead to approximate normal life. This is because T2DM is a condition where the diagnosed adult needs to manage their condition on their own in addition with the help of the medical practitioner. It requires own will and effort in managing their blood glucose level. T2DM adults play an active role in managing their condition while the medical practitioner assists and provide information that were required in managing the T2DM condition to prevent further complications. WHO defined self-management as self-care where the individuals, families, and communities' capacity to promote health, prevent disease, maintain health, and cope with illness and disability, with or without the assistance of a healthcare practitioner (World Health Organisation, 2018).

Self-management behaviour in T2DM adults includes adhering to recommended diet, physical activity, medical and self-glucose monitoring and foot care (Chourdakis et al., 2014). Self-management behaviour is important in controlling blood glucose levels and at the same time reducing the health care burden (Powers et al., 2015). It can also prevent diabetes-related mortality and morbidity (Shrivastava et al., 2013). This is because T2DM can lead to many other complications such as affecting the heart, blood vessels, eyes as well as kidneys (Mayo clinic, 2021). Therefore, self-management behaviour among adults that are diagnosed with T2DM is important in reducing the risk of further damage to other organs.

Since self-management behaviour requires the T2DM adults to perform various health care activities so health literacy of the adults might influence the self-management behaviour. T2DM adults should have sufficient health literacy to understand the importance of self-management behaviour as well as practise self-management behaviour in the appropriate manner.

1.2 Problem Statement

The prevalence of adults that are diagnosed with diabetes increased from 7.2% in 2011 to 8.3% in 2015 and further rises to 9.4% in 2019 according to NHMS in all three years. This shows that the problem of the rising in adults with T2DM cases has been identified. Studies on the prevalence of health literacy and the factors associated with the health literacy level have been done in Malaysia (Azreena et al., 2016; Abdullah, et al., 2020). It has been known that health literacy is crucial in improving the health status of adults. Nevertheless, based on NHMS 2019 it was reported that only 24.3% of Malaysian adults above 18 years old possess an excellent health literacy level regarding overall health literacy. The study is on all Malaysian adults above 18 years old and there is a limited number of studies on the health literacy of T2DM adults in Malaysia.

Self-management behaviour is one of the important factors in controlling the blood glucose level. The level of self-management behaviour in Malaysian adults diagnosed with T2DM was shown to have low self-management

behaviour in a study by Tharek et al. (2018). Self-management behaviour is important in preventing diabetes-related morbidities and mortality (Shrivastava et al., 2013). A study by Idzwan Mustapha et al. (2017) shows the annual cost that was used to treat diabetes is as high as RM2.04 billion per year. This shows that diabetes-related morbidities and mortality not only affect the T2DM adult but also increase the healthcare burden of the country. Self-management behaviour among T2DM adults is an important approach to reduce diabetes-related complications.

In addition, a decrease in quality of life, a reduction in productivity and working capacity are also experienced by T2DM adults (Aljunid et al., 2019). This leads to a significant impact on the growth and economy of the country. Besides, a study conducted in Malaysia by Chew et al. (2016), shows that T2DM adults are experiencing psychological problems which include Diabetes-Related Distress, Depression and Distress-Depression. This leads to the importance of determining the relationship between health literacy and self-management behaviour in adults above eighteen years old with T2DM. Hence, the health literacy and self-management behaviour of T2DM adults can be improved with suitable intervention implementations.

Malaysia is categorized as one of the countries with the highest diabetes rates in Asia (Ganasegeran et al., 2020). However, little is known about the relationship between health literacy and self-management behaviour in T2DM. This is because there is currently limited study being done to determine the

relationship between health literacy and self-management behaviour among T2DM adults in Malaysia. Therefore, to fill in the research gap, this study is crucial.

1.3 Research Objective

1.3.1 General Objective

To determine the relationship between health literacy and self-management behaviour in Type 2 Diabetes Mellitus adults.

1.3.2 Specific Objectives

- 1) To determine the health literacy status in T2DM adults.
- 2) To determine the level of self-management behaviour in T2DM adults.
- 3) To determine the significant difference between the level of self-management behaviour among T2DM adults with selected sociodemographic variables such as age, education level and duration diagnosed with T2DM.
- 4) To determine the significant difference between the level of self-management behaviour among T2DM with selected sociodemographic variables such as gender and marital status.
- 5) To determine the relationship between health literacy and self-management behaviour in T2DM adults.

1.4 Research Questions

- 1) What is the health literacy level in T2DM adults?
- 2) What is the level of self-management behaviour in T2DM adults?
- 3) Does a significant difference exist between the self-management behaviour among T2DM adults with selected sociodemographic variables of age, education level and duration diagnosed with T2DM present?
- 4) Does a significant difference exist between the self-management behaviour among T2DM adults with selected sociodemographic variables of gender and marital status present?
- 5) Is there a relationship between health literacy and self-management behaviour among T2DM adults?

1.5 Research Hypothesis

1.5.1 Null Hypothesis

H₀ : There is no relationship between health literacy and self-management behaviour in Type 2 Diabetes Mellitus adults.

1.5.2 Alternative Hypothesis

H_A : There is a relationship between health literacy and self-management behaviour in Type 2 Diabetes Mellitus adults.

1.6 Operational Definition

1.6.1 Conceptual Definitions

1.6.1.1 Health Literacy

The ability of the individual to access, analyze, and comprehend fundamental health information and services is required to make well-informed health decisions (Centers for Disease Control and Prevention, 2019b).

1.6.1.2 Relationship

The significance between two or more objects.

1.6.1.3 Self-management

The act of addressing a medical issue on our own.

1.6.1.4 Behaviour

The manner in which someone acts.

1.6.1.5 Type 2 Diabetes Mellitus (T2DM)

The body fails to produce adequate insulin or insulin resistance occurs (World Health Organisation, 2021).

1.6.1.6 Adults

A matured adult who fully has legal responsibility for their actions (≥ 18 years old).

1.6.2 Operational Definitions

1.6.2.1 Health Literacy

Health literacy can be categorized as subjects with limited health literacy, sufficient health literacy and excellent health literacy level by using the Health Literacy Survey Malaysian Questionnaire18 (HLS-M-Q18) which was used in the National Health Morbidity Survey 2019 in Malaysia (Jaafar et al., 2021).

1.6.2.2 Relationship

Correlation of the variables of interest.

1.6.2.3 Self-Management Behaviour

Self-management behaviour is determined using the Diabetes Self-Management Questionnaire (DSMQ) which measures adherence to recommended diet, physical activity, glucose management and health care use (Schmitt et al., 2013).

1.6.2.4 Type 2 Diabetes Mellitus (T2DM)

Fasting plasma glucose is ≥ 7.0 mmol/L, Oral glucose tolerance test with the result of 2-hour plasma glucose of ≥ 11.1 mmol/L or haemoglobin A1c (HbA1c) which is ≥ 45 mmol/mol (Clinical Practise Guidelines Management of Type 2 Diabetes Mellitus, 2020).

1.6.2.5 Adult

Adults that are above 18 years old that fit the criteria are potential subjects of the study.

1.7 Significance of the Study

The study will be able to provide a better understanding of health literacy and its relationship with self-management behaviour among T2DM adults in Malaysia. The findings of this study may be used as evidence-based information for future research on a related topic. T2DM adults, related family members and Malaysian society may utilise the results from this study to raise awareness of the importance of having sufficient health literacy to practise self-management behaviour efficiently. Besides, it can be also used to encourage adults diagnosed with T2DM to engage in self-management behaviour.

In addition, the related authorities may use the information as a guideline in implementing suitable interventions to improve the health literacy of T2DM adults which may correlate with self-management behaviour to manage their condition. The study will also be able to show the importance of having sufficient health literacy among T2DM adults. Lastly, the findings may emphasize the importance of identifying self-management behaviour among adults with T2DM to prevent further complications and continuation of a normal life. Therefore, with sufficient health literacy among T2DM adults, it is expected that self-management behaviour will be enhanced. Thus, a reduction in the healthcare cost and burden on diabetes-related morbidities and mortalities will be expected among T2DM adults.

CHAPTER 2

LITERATURE REVIEW

2.1 Search Strategy

In December 2021, several electronic databases were used to look for research papers for literature review. For the literature search, the databases that were used are ScienceDirect, PubMed and Google Scholar. Keywords including health literacy, self-management behaviour, self-care, Type 2 Diabetes Mellitus and adults were used using BOOLEAN operators which are “AND” as well as “OR” to obtain relevant research papers. All the articles were filtered from the latest five years which are from 2016 to 2021. Besides that, only English language articles were used.

A total of 2158 articles were available from ScienceDirect, twelve articles were available from PubMed and 17200 articles were available from Google Scholar.

2.2 Literature Review

Health literacy is one of the major problems that is faced globally, as WHO found health literacy to be poor in both developed and developing nations (Qi et al., 2021). The NHMS 2019 reported that only 24.3% of the Malaysian adults above 18 years old have an excellent health literacy level. However, 24.3% includes all populations in Malaysia which does not apply only to T2DM adults.

2.2.1 Health Literacy among Type 2 Diabetes Mellitus Adults

A few studies have been carried out regarding the relationship between health literacy and self-management behaviour among T2DM adults in other countries. However, to date based on the researcher's knowledge, no study has been done to investigate health literacy and its relationship with self-management behaviour in T2DM adults in Malaysia.

A study by Abdullah et al. (2019) reported on the health literacy level in middle to high-income countries such as USA, Canada, Brazil, Switzerland, Netherlands, South Korea and Taiwan among T2DM adults are limited. Taiwan is among the studied countries that have the highest prevalence of limited health literacy level (82%) based on a study conducted on 467 T2DM adults using the Mandarin Health Literacy Scale (MHLS) (Abdullah et al., 2019). On the other hand, Switzerland is the country with the lowest prevalence of limited

health literacy level at 7.3% based on a study conducted using the Chew's Brief Health Literacy Screener. In addition, in the meta-analysis by Pashaki et al. (2019), it is reported that most of the T2DM adults in Iran have limited health literacy levels. Therefore, this shows that there are a number of T2DM adults with limited health literacy.

Studies on health literacy among T2DM adults have been done in Malaysia (Azreena et al., 2016; Abdullah et al., 2020). Study by Azreena et al. (2016) on 288 T2DM adults using the Malaysian Version of Newest Vital Signs, shows that most of the subjects (85.8%) have limited health literacy levels. In addition, study by Abdullah et al. (2020) on 428 T2DM adults in Perak using European Health Literacy Survey Questionnaire (HLS-EU-Q47) reported that 65.3% of the subjects have limited health literacy. This shows that T2DM adults in Malaysia have low health literacy levels in both studies.

Besides that, Abdullah et al. (2020) also reported target glucose control was not achieved by 68.9% of the subjects. This further shows that the health literacy level of T2DM adults has the possibility to be one of the important factors in controlling blood glucose. Therefore, the study is important in determining the relationship between health literacy and self-management behaviour among T2DM adults. This is to ensure that suitable intervention for the T2DM adults can be implemented to achieve the target blood glucose level goal of the T2DM adults. The results can also be used to explain the fundamental cause of certain

T2DM adults that are not practising self-management behaviour and determine suitable methods to increase self-management behaviour among T2DM adults.

2.2.2 Self-Management Behaviour in Type 2 Diabetes Mellitus Adults

Several studies have been conducted to study on the self-management behaviour in T2DM adults. Bukhsh et al. (2019) indicated that T2DM adults have a high level of self-management behaviour, whereas Bezo et al. (2020) found that T2DM adults achieved a moderate level of self-management behaviour. Bukhsh et al. (2019) were carried out on 218 Pakistani T2DM adults using Diabetes Self-Management Questionnaire (DSMQ) while Bezo et al. (2020) were carried out in Solomon Island on 140 T2DM adults using the Diabetes self-management instrument (DSMI). Both studies reported that self-management behaviour was associated with diabetes knowledge (Bukhsh et al., 2019; Bezo et al., 2020). The authors reported that there is a positive correlation between self-management behaviour the diabetes knowledge (Bukhsh et al., 2019) but the relation with functional health literacy was not accessed. Therefore, the study on the relationship between health literacy and self-management behaviour among T2DM adults is crucial.

Reisi et al. (2016) reported that the subjects adhere to self-management behaviour for around four days in a week as the mean score was 3.8 ± 1.6 . Among the different types of self-care behaviour, the blood glucose monitoring practice was the least performed self-care behaviour whereas diet adherence

was one of the most frequent self-management behaviours carried out by T2DM adults (Reisi et al., 2016; Jannoo and Mamode Khan, 2019).

2.2.2.1 Glucose Management

Glucose management includes blood glucose monitoring and medication adherence. Self-blood glucose monitoring can improve HbA1c levels in T2DM adults (Zhu et al., 2016). The blood glucose monitoring adherence of T2DM adults was poor (Wambui Charity et al., 2016; Bonger et al., 2018). Studies found approximately 78% to 83.5% of the subjects did not monitor their blood glucose level (Wambui Charity et al., 2016; Bonger et al., 2018). The poor adherence was mainly among male subjects, who have primary education, age above thirty and those living in the city (Wambui Charity et al., 2016; Bonger et al., 2018).

In addition, self-blood glucose monitoring was the self-management behaviour that was least practised by T2DM adults (Mogre et al., 2017; Bezo et al., 2020). It was reported that the lack of capability for self-blood glucose monitoring was one of the factors that contribute to the low practice (Bezo et al., 2020). Besides that, self-blood glucose monitoring is usually not recommended for T2DM adults unless they are using insulin which might further lead to low utilization among T2DM adults.

Following a similar pattern, in a study done in Malaysia on 497 T2DM adults using Summary of Diabetes Self-Care Activities to determine the self-management behaviour of T2DM adults, the self-blood glucose monitoring was the self-management behaviour that was least practised. This was because it obtains a mean score of the subject practising self-blood glucose monitoring in 2.13 ± 2.34 days per week (Jannoo and Mamode Khan, 2019).

Therefore, the adherence to self-blood glucose monitoring most likely depends on the awareness of the reading's indication of their condition. Health literacy might be one of the factors that lead to self-blood glucose monitoring practice. T2DM adults should have sufficient health literacy to ensure that they understand the readings and realise the importance of self-blood glucose monitoring. Self-blood glucose monitoring is one of the factors that should be practised by all T2DM adults as it is able to act as a positive reinforcement to encourage better adherence to other self-management behaviour based on the achievement of daily target blood glucose levels. This is because other self-management behaviour such as physical activity and dietary control is able to be reflected in the daily blood glucose level.

Medical adherence is one of the self-management behaviour that T2DM adults should be practise to manage their condition. It is to determine the commitment to medication or insulin as prescribed to them. Few studies have investigated medical adherence amongst T2DM adults and the factors that lead to non-adherence to medication (Fan et al., 2016; Elsous et al., 2017; Gu et al., 2017;

Lee et al., 2017). T2DM adults were observed to have low medical adherence as indicated by Lee et al. (2017) which was conducted in Singapore whereby 57.1% of the sample had low medical adherence. Whereas Gu et al. (2017) that was conducted in China reported that 72.8% of the sample had low medical adherence. In addition, the study by Fan et al. (2016) on African American population reported that 55.3% of the subjects show unintentional non-medical adherence while 39.9% of the subjects show intentional non-medical adherence.

Study by Jannoo and Mamode Khan (2019) on 497 Malaysian T2DM adults using Morisky Medication Adherence Scale reported a moderate level of medication adherence among Malaysia T2DM adults. It was also reported that adults that have better adherence to their medication are more conscious of their condition and are worried that poor adherence would exacerbate their condition which causes them to take their medication regularly. Therefore, health literacy might play a role in ensuring better medication adherence among T2DM adults (Jannoo and Mamode Khan, 2019).

However, high adherence to medication was reported in 369 T2DM Palestine adults from the study by Elsous et al. (2017) as 58% of the subjects were highly adherent to medication as indicated by Morisky Medications Adherence Scale (MMAS) score equivalent to zero. It was reported that the subjects had high medication adherence due to the health care settings and the socioeconomic status where the study was conducted.

The contradicting results in the prevalence of medication adherence in T2DM adults indicate that health literacy may affect medical adherence thus further studies should be conducted to investigate the impact of health literacy on medication adherence in T2DM adults. This is because medical adherence requires T2DM adults to realise the importance of taking the medication regularly and understand the prescription of the medication which is related to health literacy.

2.2.2.2 Dietary Control

Diet is effective in reducing the occurrence of complications caused by diabetes in addition to controlling the blood glucose level (Sami W et al., 2017). Dietary control is whereby the T2DM adults should consume the recommended amount of carbohydrates, protein and fats daily. They should observe their carbohydrate intake without excess intake which will cause a rise in blood glucose level. The T2DM adults should also limit their intake of sugar and sugar-sweetened beverages. Several studies on dietary control levels among T2DM adults.

Reisi et al. (2016) found the highest adherence to diet as compared to other self-management behaviour with a mean subscale score of 4.0 ± 1.3 that was determined using the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire. In contrast, other studies reported dietary control as low in

T2DM adults (Ayele et al., 2018; Bonger et al., 2018). Based on study by Bonger et al. (2018) on 419 T2DM adults it was reported that 75.9 % of the subjects did not adhere to the diet as recommended. The difficulty to differentiate high-carbohydrate index and low-carbohydrate index food items as well as dining away from home contribute to the non-adherence to diet (Bonger et al., 2018).

In another study by Ayele et al. (2018) on 320 subjects using the Perceived Dietary Control Questionnaire, it was reported that 74.3% of the subjects did not follow diet management. It was reported that the greatest obstacle that prevents dietary control among T2DM adults was due to insufficiency in knowledge. It was also reported that the subjects have a low intake of Omega-3 fatty acids, fruits and vegetables. Therefore, this further shows that health literacy might affect dietary control among T2DM adults. Dietary control by T2DM adults was significantly correlated to health literacy (Mehrtak, Hemmati, and Bakhshzade, 2018). Based on all the studies, diet control among T2DM adults is inconclusive. Therefore, more studies in this related field should be done.

In contrast, Yeh et al. (2018) reported that health literacy does not affect the dietary control of T2DM adults as it was reported that the subjects over sixty years old from the study have higher dietary control but lower health literacy level. It was reported that due to the increasing age, sensory impairment such as chewing and swallowing difficulties occur which may lead to better dietary

control as the food choice becomes limited. Based on all the studies, diet control among T2DM adults is inconclusive. Therefore, more studies in this related field should be done.

2.2.2.3 Physical Activity

Physical activity is able to manage blood glucose levels, improve overall health and prevent further comorbidities among those that are diagnosed with T2DM (Colberg et al., 2016). This is because physical activity is able to improve insulin sensitivity.

Among the several self-management behaviours, study by Mogre et al. (2017) on 187 T2DM adults using SDSCA it was reported that physical activity for at least 30 minutes each day obtains the highest adherence of a mean of 4.37 days weekly. However, it was reported that the high physical activity by the subjects might be due to transportation problems as most of the subjects need to walk. This is because less than 35% of the subjects engaged in physical activity for 30 minutes or engaged in a particular physical activity session every day in the previous week (Mogre et al., 2017). On the other hand, study by Juul et al. (2018) on 194 T2DM adults using the same questionnaire reported a slightly lower mean for physical activity adherence at 3.7 days weekly.

Besides that, study by Ahmad et al. (2021) reported that the median physical activity level of T2DM adults was lower compared to the normal adults with a median of 282.5 METs^{min.wk¹} and T2DM adults also perform less vigorous exercise. Study by Nolan et al. (2016) on 481 T2DM adults using International Physical Activity Questionnaire (IPAQ) found that 57% of the subjects with T2DM adhere to the physical activity recommendation of 150 minutes weekly. It was also found that the most preferred activity by T2DM subjects is walking (Nolan et al., 2016).

However, study by Bukhsh et al. (2019) using Diabetes Self-Management Questionnaire (DSMQ) reported that physical activity was the least practised by T2DM adults among self-management behaviour. However, the relationship between health literacy and physical activity behaviour was not studied. Therefore, the study is needed to determine a suitable intervention to increase physical activity among T2DM adults.

2.2.2.4 Health Care Use

Health care use refers to the visit and adherence to medical appointments. High adherence to health care use leads to better glucose management and adherence to other treatments such as medication, blood glucose monitoring, and diet to improve their T2DM condition (Pulgarón et al., 2015; Adegbola et al., 2016; Alvarez et al., 2018). Alvarez et al. (2018) found that T2DM adults will have

higher adherence to doctor appointments as compared to nurses or nutritionists. However, there are currently limited studies on the health care use for T2DM adults. Besides that, limited health literacy might also be one of the contributing factors that lead to poor health care use among T2DM adults. This is because T2DM adults that have limited health literacy are not able to understand and practise proper health care.

2.2.3 The Relationship between Health Literacy and Self-Management Behaviour in Type 2 Diabetes Mellitus Adults

Based on researcher's knowledge, there is a limited number of studies that have investigated the relationship between health literacy and self-management behaviour among T2DM adults (Lee et al., 2016; Reisi et al., 2016; Chahardah-Cherik et al., 2018; Ji et al., 2020). Study by Chahardah-Cherik et al. (2018) was done among the Iran population while Lee et al. (2016) was done among the Korean population. Both studies found a significant relationship between health literacy and self-management behaviour. Findings from Chahardah-Cherik et al. (2018) indicated a mean score of 100.45 ± 19.82 suggesting good health-promoting behaviour which includes spiritual growth, responsibility for health, stress management, interpersonal relationships, physical activity, nutrition, blood sugar control and foot control.

In contrast, Reisi et al. (2016) which was also done in Iran population found no relationship between health literacy and self-management behaviour among T2DM adults. It was reported that instead of health literacy of the T2DM adults, subjects that obtained diabetic education had better self-management behaviour. Besides, study by Ji et al. (2020) also reported the subjects have limited health literacy level but shows no significant relationship between health literacy and self-management behaviour among T2DM adults was found. Self-efficacy shows a significant correlation with the self-management behaviour of T2DM adults (Ji et al., 2020). Study by Ji et al. (2020) stated that the difference in the results might be due to the low education and health literacy level of the subjects that misinterpret the meaning of the questionnaire.

The contradicting results on the relationship between health literacy and self-management behaviour of T2DM adults show that further studies are needed. Besides, no such study has been carried out in Malaysia to date. Therefore, this justifies a need to carry out a study that aims to determine the relationship between health literacy and self-management behaviour among T2DM adults in Malaysia.

2.2.4 Sociodemographic Variables of T2DM Adults

Sociodemographic variables such as education level, gender, marital status and duration diagnosed with T2DM were significantly different from the level of self-management behaviour among T2DM adults. Higher education level was associated with better self-management among T2DM adults (Yao et al., 2019; İlhan et al., 2021). Mogre et al. (2017) reported that males have better adherence to blood glucose monitoring. Besides that, T2DM adults that were married showed a higher self-management behaviour (Gunggu et al., 2016; Reisi et al., 2016). In addition, the longer the duration diagnosed with T2DM was reported to have a better practise of self-management behaviour (Yao et al., 2019). In contrast, a study done in Malaysia found age, gender, education level and duration diagnosed with diabetes had no significant difference with the self-management behaviour among T2DM adults (Gunggu et al., 2016). However, this study only included subjects in Sarawak and was not representative of the overall Malaysian population. Therefore, further study is needed to determine the true difference of sociodemographic variables with self-management behaviour among T2DM adults.

CHAPTER 3

METHODOLOGY

3.1 Research Design

The research design that was used by the researcher in this study was cross sectional study. Cross-sectional research is the research that examines the current condition of the population of interest at a specific point in time (Bethlehem, J., 1999) Since it is survey-based, the questionnaire will be answered by adults with T2DM.

3.1.1 Setting of the Study

The study was conducted across Malaysia on T2DM adults. It was conducted at the two medical clinic and two nursing homes to obtain relevant subjects. The medical clinic used was the clinic where the researcher was working during the weekends and a few nursing homes that agreed to participate were used to acquire pertinent subjects.

3.1.2 Target Population

The targeted population of this research were adults that are above eighteen years old and are diagnosed with T2DM in Malaysia.

3.2 Variables

In research, the variables are the terms used to measure something that varies (Kaur, 2013). The types of variables that were used in the research are the dependent, independent and demographic variables. The dependent variable was the self-management behaviour among T2DM adults when measuring the relationship between health literacy and self-management behaviour in Malaysian adults with T2DM while the independent variable was health literacy. On the other hand, sociodemographic variables in this research include the age, gender, marital status, education level and duration diagnosed with T2DM. The sociodemographic variables were the independent variables when determining the significant difference between the self-management behaviour among T2DM adults with selected sociodemographic variables while the level of self-management behaviour is the dependent variable.

3.3 Sampling

3.3.1 Sample Size

The sample size was calculated using the formula from Daniel (1999). The formula is as shown below:

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

Where n = sample size,

Z = Z statistic for a level of confidence, of 1.96

P = expected prevalence or proportion of 0.183 based on NHMS, 2019 and

d = precision of 0.08

Based on NHMS 2019, the prevalence of overall diabetes was 18.3%. In addition, based on the National Diabetes Registry Report 2013-2019, the prevalence of T2DM among all that were diagnosed with diabetes was 99.29%. Therefore, the prevalence of T2DM was assumed to be 18.3% due to the high prevalence of diabetes individuals that were diagnosed with T2DM. The d of 0.08 was used instead of the recommended 0.05 (Naing et al., 2006). This is due to the limitation in obtaining subjects that meet the criteria of T2DM patients within the allocated time. Besides that, Based on NHMS 2019, the highest prevalence of individuals with overall diabetes is within the age range of 65-69 with 43.4%. Since this questionnaire would be distributed through online platforms. Some of the subjects might also face difficulties in answering

the questionnaire. This was because the high prevalence of individuals with T2DM was among those of older age and they may have a problem answering the questionnaire through the online method.

Therefore,

$$n = \frac{(1.96)^2(0.183)(1 - 0.183)}{(0.08)^2}$$
$$= 89.74$$

The larger d of 0.08 was used and the sample size obtained must be calculated with the both the formula from Daniel (1999):

$$nP \text{ and } n(1 - P)$$

The value obtained must be greater than five to show that the sample size meets the assumption of normal approximation (Naing et al., 2006).

Hence,

$$89.74 (0.183) = 16.42$$

and

$$89.74 (1-0.183) = 73.32$$

Since both the value obtained which was 16.42 and 73.32 and are greater than five. Therefore, the d of 0.08 is suitable to be used as the assumption of normal approximation is met (Naing et al., 2006).

A 20% was accounted for the non-response from the subjects.

$$n = 89.74 \times \frac{120}{100}$$

$$= 107.7$$

$$\approx 110$$

Therefore, the final sample size was 110 subjects.

3.3.2 Sampling Design

This research was cross-sectional research that will include adults above eighteen years old that are diagnosed with T2DM. The samples were selected using non-probability sampling. Convenience sampling and snowball sampling were used to select T2DM adults. The samples were obtained from family members, relatives or any other acquaintances that are diagnosed with T2DM. The samples were obtained by sending the link of the questionnaire to those that are diagnosed with T2DM and those that are diagnosed with T2DM also forwarded the link to their acquaintances that are also diagnosed with T2DM.

In addition, the subjects that are diagnosed with T2DM in the nursing homes were also approached. The subjects were assisted by the nurses in the nursing home in answering the questionnaire as the study was carried out during the Covid-19 pandemic period and restrictions on visitation were imposed by the nursing homes. Besides that, convenience sampling was carried out in the medical clinics whereby the researchers were employed. The researcher approached all the T2DM adults to invite the T2DM adults to participate in the study.

The subjects were contacted through phone calls or WhatsApp messages and the researcher explained all the study details to them and obtain their consent to participate in the study. Once the selected adult agrees to participate, a link to the questionnaire via Google form was sent to them and they were required to answer the questionnaire. Subjects can also contact the researcher if they have any inquiries regarding the questionnaire.

3.3.3 Inclusion and Exclusion Criteria

The inclusion criteria for study subjects include adults that are above 18 years old. Adults diagnosed with T2DM by a medical doctor previously whereby their fasting plasma glucose is ≥ 7.0 mmol/L, Oral glucose tolerance test with the result of 2-hour plasma glucose of ≥ 11.1 mmol/L or HbA1c which is ≥ 45 mmol/mol. The standard range on the diagnosis of T2DM is based on Clinical Practise Guidelines Management of Type 2 Diabetes Mellitus (6th edition).

T2DM adults that are able to read and understand English were also the inclusion in this study.

The exclusion criteria are adults who are diagnosed with Type 1 Diabetes Mellitus, prediabetes or gestational diabetes. Adults that are not on diabetic medication or insulin therapy will also be excluded from the study.

3.4 Research Instrument

As soon as the subjects agree to participate, the link to the questionnaire was sent to them via their contact number on Whatsapp, email depending and other platforms depending on the platform of their convenience. Each subject answered the questionnaire which is divided into three parts where they answer demographic questions first followed by questions to determine their health literacy and self-management behaviours.

3.4.1 Sociodemographic Questionnaire

Sociodemographic variables which include age, gender, education level, marital status and duration diagnosed with T2DM were collected using a standard questionnaire. The questionnaire will be in a close-ended format

whereby the subjects are required to select a choice of their sociodemographic characteristics.

3.4.2 Health Literacy Questionnaire

The health literacy of every selected subject was tested using the Health Literacy Survey Malaysian Questionnaire¹⁸ (HLS-M-Q18) as shown in Appendix B. This instrument was used to determine the health literacy in National Health Morbidity Survey 2019 in Malaysia. The HLS-M-Q18 encompasses three components which are deciding on health care, disease prevention and health promotion. The HLS-M-Q18 was adapted and compressed from the Health Literacy Survey European Questionnaire 47 (HLS-EU-Q47) (Jaafar et al., 2021) which was validated and suitable to be used for the identification of the health literacy of adults with T2DM in Malaysia (Finbråten et al., 2017).

HLS-M-Q18 is based on the perceived difficulty of each item on a four-point Likert scale whereby '*very difficult*' will be rated as 0, '*fairly difficult*' will be rated as 1, '*fairly easy*' will be rated as 2 and '*very easy*' will be rated as 3. The scores will be summed up. The total score of 0 is the lowest possible score while the total score of fifty is the highest possible score with a score 0-33 equivalent to '*limited health literacy*', a score > 33-42 indicates '*sufficient health literacy*' and a score > 42-50 represent excellent '*health literacy level*'

(Jaafar et al., 2021). Table 3.4.2 below shows the Health literacy level according to sum of score.

Table 3.4.2: Health literacy level according to sum of score

Sum of Health literacy score	0-33	> 33-42	> 42-50
Health literacy level	Limited	Sufficient	Excellent

(Jaafar et al., 2021)

The HLS-M-Q18 obtains Cronbach's alpha value of 0.91 (Mohamad et al., 2020) for the overall instrument while DSMQ obtains Cronbach's alpha value of 0.80 for adults with T2DM (Schmitt et al., 2013). This indicates that both the instruments used are reliable. HLS-M-Q18 was valid as it was used during the NHMS 2019 survey on the Malaysian population.

3.4.3 Self-Management Behaviour Questionnaire

The last section of the questionnaire was on self-management behaviour which comprises sixteen items. Self-management behaviour of the subjects was determined using the Diabetes Self-Management Questionnaire (DSMQ) as shown in Appendix C. The questionnaire was divided into four subscales, which includes

- (i) glucose management (questions 1, 4, 6, 10, 12),
- (ii) dietary control (questions 2, 5, 9, 13),
- (iii) physical activity (questions 8, 11, 15) and
- (iv) health care use (questions 3, 7, 14).

(Schmitt et al., 2013)

The questionnaire uses a four-point Likert scale to determine the adherence to recommended diet, physical activity, medication, medical appointments and self-glucose monitoring (Schmitt et al., 2013). A score of three indicates ‘*applies to me very much*’, a score of two indicates ‘*applies to me a considerable degree*’, a score of one indicates ‘*applies to me to some degree*’ while a score of zero indicates ‘*does not apply to me*’.

There were nine items that were coded reversely which include items no, 5,7,10,11,12,13,14,15 and 16 (Bukhsh et al., 2019). The scores were then added up to determine the sum scale and a higher score indicates better self-management behaviour. In addition, the score for each subscale were determined by adding item scores together and then converting to a scale of zero to ten by using the formula as shown below:

$$\frac{\text{Raw Score}}{\text{Theoretical Maximum Score}} \times 10$$

(Schmitt et al., 2013)

The greatest self-rating of the tested behaviour was thus a converted score of ten (Schmitt et al., 2013). A score of less than or equal to six was categorised as poor self-management behaviour while a score of more than six was categorised as good self-management behaviour (Schmitt et al., 2014).

DSMQ has been widely used in determining the self-management behaviour of T2DM adults. The DSMQ questionnaire was also used in the study by Chahardah-Cherik et al. (2018) in Pakistan on similar populations and variables. Not only that, it was also used in Malaysian T2DM adults in the study by Ang et al. (2018).

3.5 Data Collection

After obtaining ethical approval from UTAR ethical board, data collection was conducted from 15 February 2022 to 5 June 2022. Informed consent was obtained from all subjects before answering the questionnaire as shown in Appendix D. The questionnaire was completed by the subjects with assistance from the researcher if required.

3.6 Ethical Consideration and Consent Information

Ethical approval from UTAR ethical board was obtained by the researcher prior to the commencement of the research. The ethical approval letter (Re: U/SERC/01/2022) was as attached in Appendix E. Besides that, consent was also obtained from all the subjects before filling up the questionnaire. All the subjects were informed that their confidentiality and anonymity would be protected and they are free to withdraw from the study at any time. The subjects were also assured that their withdrawal from the research would not affect the relationship between the researcher and the subjects. In addition, all the data obtained from the questionnaire will be protected in accordance with Personal Data Protection Act 2010 (“PDPA”) which came into force on 15 November 2013, Universiti Tunku Abdul Rahman (“UTAR”) as attached in Appendix D. It will be explained and agreed upon by all the subjects before the study.

3.7 Flow Chart of Research Activity

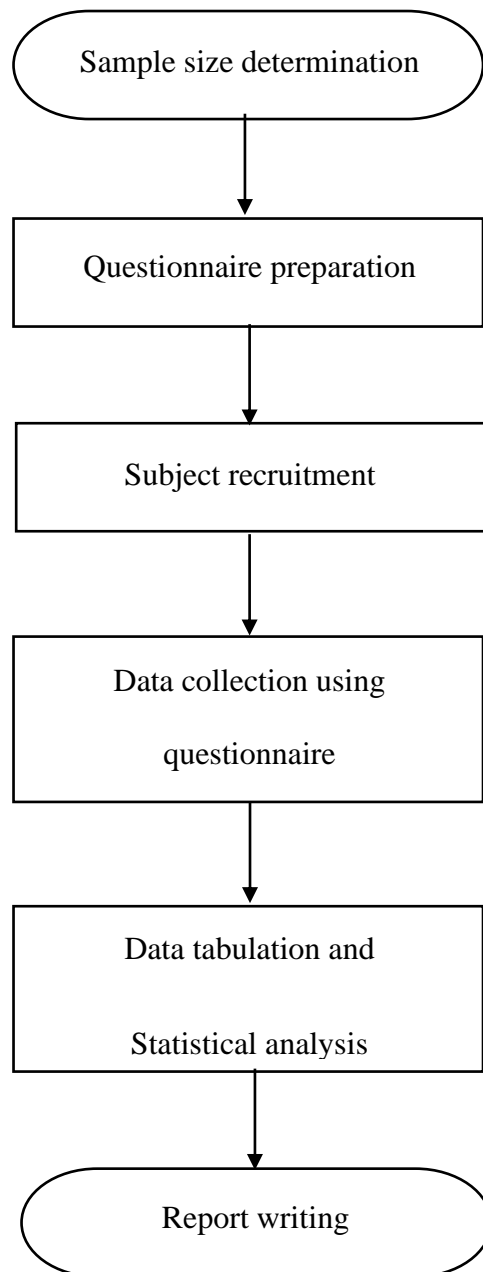


Figure 3.7: Flow Chart of Research Activity

3.8 Normality Test

All the data obtained were tested with skewness and kurtosis of the distribution to determine the distribution of the data. Skewness was used as an indicator for asymmetrical distribution. On the other hand, the peakiness of distribution was measured using kurtosis (Kim, 2013). The skewness and kurtosis test were used as it is one of the suitable methods to determine the normality of continuous data when the sample size is more than fifty (Ghasemi and Zahediasl, 2012; Mishra et al., 2019). The absolute skew value between -2 to 2 indicates normal distribution. The absolute kurtosis value of -7 to 7 also indicates normal distribution (West et al., 1996).

3.8.1 Normality Test on Self-Management Behaviour

Table 3.8.1: Skewness and kurtosis of the distribution of self-management behaviour

Self-management Behaviour	Skewness	SE	Kurtosis	SE
		skewness		Kurtosis
Overall Self-management behaviour	0.573	0.228	-0.112	0.453
a) Glucose Management	0.711	0.228	0.318	0.453
b) Dietary control				
c) Physical activity	0.166	0.228	-0.290	0.453
d) Health care use	0.989	0.228	-0.277	0.453
	-0.787	0.228	-0.004	0.453

Skewness and Kurtosis test was performed, SE indicates standard error

The skewness and kurtosis of the distribution of self-management behaviour are shown in Table 3.8.1. For the overall self-management behaviour, the absolute skewed value of 0.573 which is less than two and the absolute kurtosis value of -0.112 which is less than seven were obtained. Next, for the self-management subscale of glucose management, the absolute skewed value of 0.711 which is less than two and the absolute kurtosis value of 0.318 which is less than seven were obtained. For the self-management subscale of dietary control, the absolute skewed value of 0.166 which is less than two and the absolute kurtosis value of -0.290 which is less than seven were obtained. Moving on to the self-management subscale of physical activity, the absolute skewed value of 0.989 which is less than two and the absolute kurtosis value of

-0.277 which is less than seven was obtained. Finally, for the self-management behaviour subscale of health care use, the absolute skewed value of -0.787 which is less than two and the absolute kurtosis value of -0.004 which is less than seven were obtained. This indicates that all the data follows a normal distribution. Therefore, Independent T-Test and ANOVA were used for analysis as all the data for the self-management behaviour and each self-management behaviour subscale were normally distributed.

3.9 Statistical Analysis

Data that were collected during the study were tabulated and analysed using IBM Statistical Product and Service Solutions (SPSS) version 26.

Descriptive data, which includes categorical data such as sociodemographic information and the degree of health literacy were presented as frequency and percentages. The mean and the standard deviation of the score for the overall level of health literacy and self-management behaviour of all the studied subjects were determined. The subscale of the health behaviour that obtains better adherence was determined by comparing the means and standard deviation of each subscale score.

Independent T-Test and ANOVA were used for data analysis. For the Independent T-Test and ANOVA the p -value < 0.05 indicated statistically

significant difference results. The Independent T-Test was used to compare the means of two different groups. On the other hand, ANOVA was used during the comparison of more than two group means. In addition, if significant results were obtained whereby the p -value < 0.05 then the post hoc test was used to compare the significant difference within groups. Tukey's Honest Significant Difference test is preferred when the test of homogeneity of variances based on the mean reported a p -value ≥ 0.05 which indicates no significant result and thus the group variance is homogenous. On the other hand, if the group variances are not homogenous then Welch and Games-Howell tests are preferred (Kim, 2014).

The objective of determining the health literacy status among T2DM adults was reported using mean and standard deviation. The next objective of determining the level of self-management behaviour among T2DM adults was also determined using mean and standard deviation. The objective of determining the relationship between the level of health literacy and the overall level of self-management behaviour was determined using One-way analysis of variance (ANOVA). The next objective which is regarding the significant difference between the sociodemographic variables namely gender and marital status with self-management behaviour was analysed using Independent T-Test while ANOVA was used to determine another objective of the relationship between sociodemographic variables (age, education level and duration diagnosed with T2DM) with self-management behaviour as it contains more than two categories among the sociodemographic variables.

Chapter 4

RESULTS

4.0 Results

A total of 115 responses were obtained. Data of 112 subjects were analysed after excluding three responses that do not fit the exclusion criteria which includes T2DM adults that are on medication or insulin therapy (n=2) as well as incomplete questionnaires (n=1). Figure 4.1 shows the flow diagram of respondents.

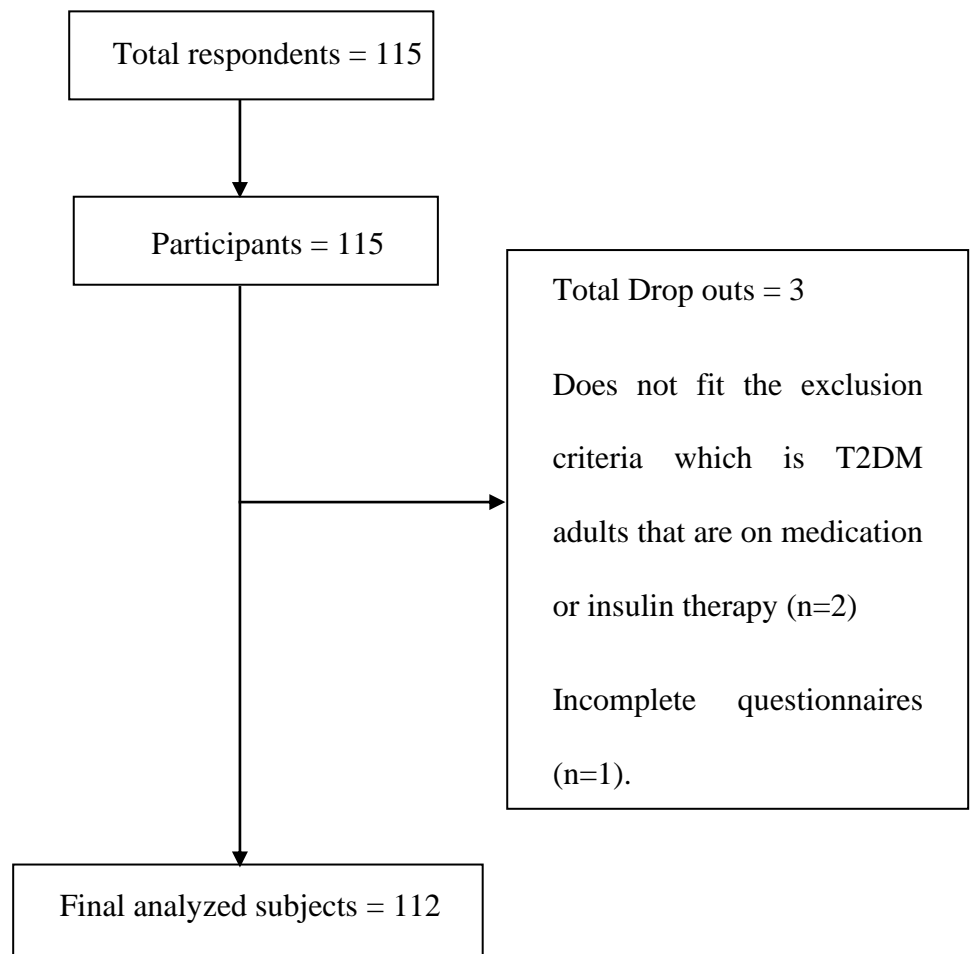


Figure 4.1: Flow Diagram of Respondents

The respondent rate was 97.39% as shown in the below calculation whereby

$$\frac{112}{115} \times 100\% = 97.39\%$$

4.1 Sociodemographic Data

Table 4.1: Sociodemographic data of the T2DM adults (n=112).

Sociodemographic variables	n (%)
Age	
18-30 years old	6 (5.4)
31-40 years old	4 (3.6)
41-50 years old	13 (11.6)
51-60 years old	24 (21.4)
60 and above	65 (58)
Gender	
Male	41 (36.6)
Female	71 (63.4)
Education	
None	39 (34.8)
Primary	29 (25.9)
Secondary/ SPM/ IGCSE	25 (22.3)
Tertiary education (College/ University)	19 (17.0)
Marital status	
Single	90 (80.4)
Married	22 (19.6)

Table 4.1 continued: Sociodemographic data of the T2DM adults (n=112).

Sociodemographic variables	n (%)
Duration diagnosed with T2DM	
< 2 years	15 (13.4)
2-5 years	28 (25.0)
5-10 years	48 (42.9)
> 10 years	21 (18.8)

n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage

Table 4.1 shows the sociodemographic data of the total number of 112 subjects that participated in this study. As shown in the table, most of the subjects that participated in the study were aged 60 and above (n= 65) which is equivalent to 58% of the total subjects. It is then followed by the age group between 51-60 which is equivalent to 21.4 % (n=24) of the total subjects, 41-50 (n=13) which is equivalent to 11.6% of the total subjects and 18-30 (n=6) which is equivalent to 5.4% of the total subjects. The least number of subjects falls in the age group of 31-40 (n=4) which is equivalent to 3.6 % of the total subjects.

According to gender, most of the subjects were female (n= 71) which contributed to 63.4% of the subjects as compared to male (n=41), which contributed to 36.6% of the total population. For the education level, the number of subjects without any education (n=39) was the highest at 34.8%, followed by primary education (n=29) with 25.9% and subjects with secondary

or SPM or IGCSE education level (n=25) with 22.3%. Approximately 17.0% of the subjects had tertiary level of education (n=19).

Based on marital status, majority of the subjects are single at 80.4% (n=90) as compared to only 19.6% (n=22) were married. The duration of patients diagnosed with T2DM was categorized into four categories less than two years, two to five years, five to ten years and more than ten years. Most of the subjects in this study have been diagnosed with T2DM for five to ten years 42.9% (n=48) followed by two to five years 25% (n=28), ten years 18.8% (n=21). Approximately, 13.4% (n= 15) of subjects were diagnosed with T2DM for less than two years.

4.2. Health Literacy of T2DM Adults

Table 4.2: Health Literacy level of the T2DM adults (n=112).

Health literacy category	n (%)
Limited (0-33)	85 (75.9)
Sufficient (> 33–42)	18 (16.1)
Excellent (> 42-50)	9 (8.0)
Mean ± S.D. of the Overall Health Literacy	27.24 ± 9.06

level of all the studied subjects

n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage, S.D. = standard deviation

The results were obtained by summing up all the scores for the 18 questions to determine the health literacy of the subjects. The total score of 0-33 indicates “*limited health literacy*” level, the total score of > 33–42 indicates “*sufficient health literacy*” level while the total score of > 42–50 indicates “*excellent health literacy*” level.

Table 4.2 shows the health literacy of 112 subjects that were measured using the HLS-M-Q18. Majority of the subjects have “*limited health literacy*” level (n=85) at 75.9% while 16.1% (n=18) had “*sufficient health literacy*” level. Only 8.0% (n=9) had “*excellent health literacy*” level.

Furthermore, the mean score for health literacy for total subjects was 27.24 ± 9.06 as shown in Table 4.2. This indicated health literacy of the studied population is categorized as having a “*limited health literacy*” level (score of 0-33).

4.3. Self-Management Behaviour of T2DM Adults

Table 4.3: Self-management behaviour of the T2DM adults (n=112)

Self-management behaviour	Mean \pm S.D.
Subscale score	
a) Glucose management	4.58 ± 1.87
b) Dietary control	5.45 ± 1.99
c) Physical activity	2.50 ± 3.12
d) Health care use	7.78 ± 1.94
Sum scale of self-management behaviour	23.62 ± 7.40
Sum scale of self-management behaviour out of 10 score	$4.94 \pm 1.54^*$

n = total sample size, S.D. = standard deviation, * score of < 6 indicates poor self-management behaviour, score of ≥ 6 indicates good self-management behaviour (Schmitt et al., 2014)

The mean score and the standard deviation of the self-management behaviour of 112 subjects using the DSMQ questionnaire were presented in Table 4.3. The DSMQ questionnaire contains four subscales score namely glucose management, dietary control, physical activity and health care use. Among the four subscales, health care use recorded the highest adherence to self-management behaviour by 112 of the subjects with a mean of 7.78 ± 1.94 . Then, it is followed by dietary control recorded with a mean score of 5.45 ± 1.99 and glucose management with a mean score of 4.58 ± 1.87 . Physical activity shows the least practised self-management behaviour by the subjects with a mean score of 2.5 ± 3.11 . For the sum scale of the self-management behaviour, a mean of 23.62 ± 7.40 was obtained. This score was further converted to a score out of 10. The mean sum scale of self-management behaviour is 4.92 ± 1.54 . Overall, the self-management behaviour of the study population is categorized as “poor” (score under 6) (Schmitt et al., 2014).

4.4 Difference between Sociodemographic Variable with Self-Management Behaviour

4.4.1 Difference between Age and Self-Management Behaviour

Table 4.4.1: Difference between age and self-management behaviour (n=112)

Sociodemographic variables	n (%)	Self-management behaviour score Mean ± S.D.	<i>p</i> -value
Age			
18-30 years old	6 (5.4)	6.11 ± 1.93	
31-40 years old	4 (3.6)	6.77 ± 0.81 ^a	0.002
41-50 years old	13 (11.6)	5.45 ± 1.66	
51-60 years old	24 (21.4)	5.16 ± 1.55	
60 and above	65 (58.0)	4.51 ± 1.35 ^a	

Data were tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage, S.D.= standard deviation, Means for groups in homogenous subsets are performed, and the same superscript indicates significant difference at $p < 0.05$.

The result shows that self-management behaviour is significantly different by age with a p -value of 0.002. The significant difference was between 31-40 years old and 60 years old and above with a p -value of 0.025. As shown in the same superscript, the age group of 60 years old and above have significantly lower self-management behaviour with means of 4.51 ± 1.35 than those in 31-40 years old with means of 6.77 ± 0.81 .

4.4.2 Difference between Education Level and Self-Management Behaviour

Table 4.4.2: Difference between education level and self-management behaviour (n=112)

Sociodemographic variables	n (%)	Self-management behaviour score Mean \pm S.D.	<i>p</i> -value
Education level			
None	39 (34.8)	4.24 \pm 0.99 ^{a,b}	< 0.001
Primary	29 (25.9)	4.31 \pm 1.30 ^{c,d}	
Secondary/SPM/ IGCSE	25 (22.3)	5.67 \pm 1.54 ^{a,c}	
Tertiary Education (College/University)	19 (17.0)	6.27 \pm 1.55 ^{b,d}	

Data were tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage, S.D.= standard deviation, Means for groups in homogenous subsets are performed, and the same superscript indicates significant difference at $p < 0.05$.

Based on Table 4.4.2, the difference between sociodemographic data on education level and self-management behaviour of T2DM adults was determined using the ANOVA test. As shown in the table, shows a significant difference between the education level of T2DM adults and self-management behaviour at the p -value < 0.001 .

The Post hoc test of Tukey's Honest Significant Difference test was performed to determine the difference between education level with self-management behaviour. The results show significant difference between no education level with Secondary/SPM/IGCSE (p -value < 0.001) and Tertiary education (College/ University) (p -value < 0.001) as well as Primary education level with Secondary/SPM/IGCSE (p -value < 0.001) and Tertiary education (College/ University) (p -value < 0.001). Besides that, there is also significant difference between Secondary/SPM/IGCSE with Tertiary education (College/ University) (p -value = 0.0432). However, there is no significant difference between no education level and primary education level (p -value = 0.997).

As shown in the same superscript, it can be concluded that T2DM adults with no education level (Mean = 4.24 ± 0.99) have poorer self-management behaviour than Secondary/SPM/ IGCSE (Mean = 5.67 ± 1.54) and Tertiary education (College/ University) (Mean = 6.27 ± 1.55) respectively. In addition, T2DM adults with primary education level (Mean = 4.31 ± 1.30) also have poorer self-management behaviour that T2DM adults with higher education level which are Secondary/SPM/ IGCSE (Mean = 5.67 ± 1.54) and Tertiary education (College/ University) (Mean = 6.27 ± 1.55) respectively. Overall, it can be concluded that T2DM adults with lower education levels have a poorer practice of self-management behaviour as compared to T2DM adults with higher education levels.

4.4.3 Difference between Duration Diagnosed with T2DM and Self-Management Behaviour

Table 4.4.3: Difference between duration diagnosed with T2DM and self-management behaviour (n=112)

Sociodemographic variables	n (%)	Self-management behaviour score Mean \pm S.D.	<i>p</i> -value
Duration diagnosed with T2DM			
< 2 years	15 (13.4)	6.24 \pm 1.29 ^{a,b}	< 0.001
2-5 years	28 (25.0)	5.17 \pm 1.79	
5-10 years	48 (42.9)	4.35 \pm 1.19 ^a	
> 10 years	21 (18.8)	4.95 \pm 1.49 ^b	

Data was tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage, S.D.= standard deviation, Means for groups in homogenous subsets are performed, the same superscript indicates significant difference at $p < 0.05$.

ANOVA was performed to determine the difference between sociodemographic data of duration diagnosed with T2DM and self-management behaviour of T2DM adults as shown in Table 4.4.3. The result shows a significant difference in self-management behaviour among five groups of duration diagnosed with T2DM whereby p -value $p < 0.001$ which is $p < 0.05$.

Post hoc Tukey's Honest Significant Difference test indicated that there were significant differences between T2DM adults with less than two years and five to ten years diagnosed with a p -value < 0.001 . A similar pattern of significant difference was also seen between T2DM adults with less than two years with those diagnosed with more than ten with the p -value = 0.0437.

As shown in the same superscript, it can be concluded that T2DM adults with a shorter duration of T2DM diagnosis of less than two years (Mean = 6.24 ± 1.29) have a better self-management behaviour than T2DM adults that are diagnosed with diabetes for a longer duration such as those adults that are diagnosed for diabetes for five to ten years (Mean = 4.35 ± 1.19). Following the same trend, T2DM adults diagnosed with T2DM for less than two years (Mean = 6.24 ± 1.29) have better self-management behaviour than T2DM adults that are diagnosed with diabetes for more than ten years (Mean = 4.95 ± 1.49). Overall, it can be concluded that T2DM adults that are diagnosed with T2DM for a shorter duration of time have better self-management behaviour than T2DM adults diagnosed for a longer period.

4.4 4 Difference between Gender and Self-Management Behaviour

Table 4.4.4: Difference between gender and self-management behaviour (n=112)

Sociodemographic variables	n (%)	Self-management behaviour score Mean ± S.D.	p-value
Gender			
Male	41 (36.6)	4.92 ± 1.43	0.992
Female	71 (63.4)	4.92 ± 1.61	

Data was tested using Independent T-Test with significance at $p < 0.05$, n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage, S.D.= standard deviation

As shown in Table 4.4.4, there is no significant difference between gender and self-management behaviour in T2DM adults who participated in this study with the p -value of 0.992.

4.4.5 Difference between Marital Status and Self-Management Behaviour

Table 4.4.5: Difference between marital status and self-management behaviour (n=112)

Sociodemographic variables	n (%)	Self-management behaviour score Mean ± S.D.	p-value
Marital status			
Single	90 (80.4)	4.90 ± 1.54	0.719
Married	22 (19.6)	5.03 ± 1.57	

Data was tested using Independent T-Test with significance at $p < 0.05$, n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage, S.D.= standard deviation

Table 4.4.5 indicates the difference between the sociodemographic variables on marital status and self-management behaviour. Results indicated that there is no significant difference between the marital status of the T2DM adults with self-management behaviour as the p -value is more than 0.05 ($p = 0.719$).

4.5 Relationship between Health Literacy and Self-Management Behaviour

Table 4.5: Relationship between health literacy and self-management behaviour (n=112)

Health literacy	n(%)	Self-management behaviour Mean ± S.D.	p-value
Limited	85 (75.9)	4.39 ± 1.14 ^{a,b}	< 0.001
Sufficient	18 (16.1)	6.44 ± 1.62 ^a	
Excellent	9 (8.0)	6.92 ± 0.94 ^b	

Data was tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, (%) = Subjects' responses in percentage, S.D. = standard deviation, Means for groups in homogenous subsets are performed, the same superscript indicates significant difference at $p < 0.05$.

Based on the ANOVA test, there is a significant difference between health literacy of three levels with the self-management behaviour in the studied T2DM adults. Based on post hoc test, it is indicated that significant difference between “*limited health literacy*” level and “*sufficient health literacy*” level with p -value < 0.001 whereby $p < 0.05$. Besides that, a significant difference also presents between “*limited health literacy*” level and “*excellent health literacy*” with a p -value < 0.001 whereby $p < 0.05$. However, there is no significant difference between “*sufficient health literacy*” level and “*excellent health literacy*” level with a p -value of 0.594.

As shown in the same superscript, it was indicated that T2DM adults with “*sufficient health literacy*” level and “*excellent health literacy*” level have the same level of self-management behaviour. However, those with “*limited health literacy*” level (Mean = 4.39 ± 1.14) have poorer self-management behaviour than T2DM adults with “*sufficient health literacy*” level (Mean = 6.44 ± 1.62) and “*excellent health literacy*” level (Mean = 6.92 ± 0.94) respectively. In conclusion, it can be concluded that those with lower health literacy level has poorer self-management behaviour and those with excellent health literacy level have better self-management behaviour.

4.5.1 Relationship between Health Literacy and Self-Management Behaviour Subscales

4.5.1 Relationship between Health Literacy and Glucose Management

Table 4.5.1: Relationship between health literacy and glucose management (n=112)

Health Literacy	n (%)	Glucose management Mean ± S.D.	p-value
Limited health literacy	85 (75.9)	4.29 ± 1.76 ^a	
Sufficient health literacy	18 (16.1)	5.56 ± 2.06 ^a	0.014
Excellent health literacy	9 (8.0)	5.33 ± 1.76	

Data was tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, S.D. = standard deviation, Means for groups in homogenous subsets are performed, the same superscript indicates significant difference at $p < 0.05$.

Based on Table 4.5.1, the results presented a significant relationship between health literacy and self-management behaviour subscale of glucose management (p -value = 0.014). The post hoc test of Tukey's Honest Significant Difference test shows a significant difference between “*limited health literacy*” level with “*sufficient health literacy*” level ($p = 0.022$) but not with “*excellent health literacy*” level (p -value = 0.232). Therefore, T2DM adults with “*limited health literacy*” level (Mean = 4.29 ± 1.76) have a poorer self-management behaviour subscale of glucose management than T2DM adults with “*sufficient health literacy*” level (Mean = 5.56 ± 2.06).

4.5.2 Relationship between Health Literacy and Dietary Control

Table 4.5.2: Relationship between health literacy and dietary control (n=112)

Health Literacy	n (%)	Dietary control	p-value
		Mean ± S.D.	
Limited health literacy	85 (75.9)	4.82 ± 1.71 ^{a,b}	
Sufficient health literacy	18 (16.1)	7.36 ± 1.57 ^a	< 0.001
Excellent health literacy	9 (8.0)	7.50 ± 1.31 ^b	

Data were tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, S.D. = standard deviation, Means for groups in homogenous subsets are performed, and the same superscript indicates significant difference at $p < 0.05$.

The results obtained indicated that there is a significant difference between health literacy and self-management behaviour subscale of dietary control with a p -value < 0.001 . Following that, a post hoc test of Tukey's Honest Significant Difference test was performed to determine the relationship between different health literacy groups and the self-management behaviour subscale of dietary control. The results show significant differences between “*limited health literacy*” level and “*sufficient health literacy*” level but not with “*excellent health literacy*” level for the self-management behaviour subscale of dietary control of the studied population.

It can be concluded as T2DM adults with “*limited health literacy*” level (Mean= 4.82 ± 1.71) have poorer self-management behaviour subscale of dietary control than T2DM adults with “*sufficient health literacy*” level (Mean= 7.36 ± 1.57). The same trend was also seen on T2DM adults with “*limited health literacy*” level (Mean= 4.82 ± 1.71) with poorer self-management behaviour subscale of dietary control as compared to “*excellent health literacy*” level (Mean= 7.50 ± 1.31). Therefore, it can be concluded as T2DM adults with lower health literacy level has poorer self-management behaviour subscale of dietary control.

4.5.3 Relationship between Health Literacy and Physical Activity

Table 4.5.3: Relationship between health literacy and physical activity (n=112)

Health Literacy	n (%)	Physical activity	p-value
		Mean ± S.D.	
Limited health literacy	85 (75.9)	1.33 ± 2.11 ^{a,b}	
Sufficient health literacy	18 (16.1)	5.86 ± 3.45 ^a	< 0.001
Excellent health literacy	9 (8.0)	6.79 ± 1.51 ^b	

Data were tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, S.D. = standard deviation, Means for groups in homogenous subsets are performed, and the same superscript indicates significant difference at $p < 0.05$.

Table 4.5.3 shows a significant relationship between the two tested variables with a p -value < 0.001 . In addition, the relationship between different health literacy groups and the self-management behaviour subscale of physical activity was also determined using Tukey's Honest Significant Difference test. A significant difference was found between “*limited health literacy*” level compared to “*sufficient health literacy*” level (p -value < 0.001) as well as “*limited health literacy*” level and “*excellent health literacy*” level (p -value < 0.001).

It is shown that shows that those with “*limited health literacy*” level (Mean = 1.33 ± 2.11) performed lesser physical activity than those with “*sufficient*

health literacy” level (Mean = 5.86 ± 3.45) with $p < 0.001$ and “*excellent health literacy*” level (Mean = 6.79 ± 1.51) with $p < 0.001$ respectively. However, there is no difference in physical activity between T2DM adults with “*sufficient health literacy*” level and “*excellent health literacy*” level ($p = 0.596$). Therefore, it can be concluded as T2DM adults with lower health literacy levels performed less physical activity compared to T2DM adults with higher health literacy levels.

4.5.4 Relationship between Health Literacy and Health Care Use

Table 4.5.4: Relationship between health literacy and health care use (n=112)

Self-management behaviour subscale	Mean ± S.D.	<i>p</i>-value
Health care use	7.78 ± 1.94	0.127

Data were tested using ANOVA with significance at $p < 0.05$, n = total sample size, n = number of subjects, S.D. = standard deviation

Based on the results obtained, there is no significant relationship between health literacy and self-management behaviour subscale of health care use with and p -value = 0.127.

CHAPTER 5

DISCUSSION

5.1 Health Literacy Level among Type 2 Diabetes Mellitus Adults

The findings of the studies show that the prevalence of T2DM adults has a “*limited health literacy*” level of 75.9%. This shows that most of the T2DM adults have “*limited health literacy*” level and the findings are consistent with previous findings that have been done in Malaysia (Abdullah et al., 2020; Tan and Ismail M, 2020; Azreena et al., 2016). Based on previous studies, the “*limited health literacy*” level of T2DM adults is due to the limited education level of the T2DM adults (Nacanabo et al., 2021; Finbråten et al., 2020; Hashim et al., 2020; Kim et al., 2020; Azreena et al., 2016). This is consistent with the findings of this study as the majority of the subjects have no education level (34.8%) followed by primary education level (25.9%).

In addition, the study by Azreena et al. (2016) also reported that T2DM adults that have lower education levels are T2DM adults of older age. It is also supported by the findings of this study that the majority of the subjects are sixty years old and above (58%) which may lead to the high prevalence of “*limited health literacy*” level. Since T2DM is a chronic disease that develops over a longer period of time so most of T2DM adults are usually older age. However, the finding of this study is in contrast with the study by Shaharudin et al.

(2020) in Malaysian T2DM adults with 85% of the subjects having adequate health literacy levels. The difference in results may be due to the difference in the instrument used whereby the study by Shaharudin et al. (2020) used MY-TOFHLA to determine the subjects' ability to read and understand medical information to measure their health literacy level. However, this study applies the HLS-M-Q18 which determined the health literacy of the subjects by stating the perceived difficulty in performing the item as stated in the questionnaire.

Health literacy is crucial for T2DM adults in order to adequately understand the information and communicate with the medical practitioner on their condition for effective management. T2DM adults require certain abilities to comprehend printed material, effective verbal communication and practice self-management behaviour T2DM adults require sufficient education which is linked to sufficient health literacy among T2DM adults (Hashim et al., 2020).

Moving on, a study by Finbråten et al. (2020) suggested that the health literacy of the individual should be enforced in education during primary and secondary school. They should be enriched with the ability to read and write, awareness of health concerns, and health determinants, skills to evaluate various sources of health information and the ability to seek evidence-based health information. This is because individuals with higher health literacy will have better overall health (Finbråten et al., 2020).

Besides that, the study by Abdullah, et al. (2020) reported that high prevalence of “*limited health literacy*” level is due to the lacked social support from friends, family and partners and did not join diabetes education sessions. In addition, the study by Gaffari-fam et al. (2020) also stated that marital status will lead to higher health literacy levels as it may be able to increase social communication and support networks to look for information regarding health. This is consistent with this study as the majority of the T2DM adults were single (80.4%) which may also contribute to the high prevalence of “*limited health literacy*” level. A portion of the subjects from this study is living in nursing homes which may have inadequate social communication and support networks and contribute to a lower health literacy level.

5.2 Self-Management Behaviour among Type 2 Diabetes Mellitus Adults

The findings of the study show that the 112 T2DM adults have a sum scale of self-management behaviour with a mean of 4.94 ± 1.54 out of the score of ten. The study by Ang et al. (2018) done in Malaysia reported self-management behaviour among T2DM adults with a higher mean score of 7.48 ± 1.32 using a similar DSMQ questionnaire. The higher health literacy score as reported by the study by Ang et al. (2018) done in Malaysia might be due to the difference in the setting of the sample that was obtained whereby the subjects from the study by Ang et al. (2018) were from Raja Permaisuri Bainun Hospital while the subjects from this study was obtained from medical clinics, nursing homes

and other acquaintances of the researcher. The subjects that were obtained from hospital will generally have higher health literacy level as compared to the free livings subjects that the researchers obtained.

Besides, the study by Ang et al. (2018) was carried out in 2018 which was before the Covid-19 pandemic and might further lead to the difference in results. On the other hand, a study by Al-Qahtani (2020) in Saudi Arabic reported poor self-management behaviour with a mean score of 5.04 ± 0.68 out of ten by using the same questionnaire. Furthermore, the study by Bukhsh et al. (2019) in Pakistani reported a lower self-management behaviour with a median score of 3.96 and interquartile range of 2.71 to 6.88 using DSMQ as compared to this study. One of the factors that lead to poor self-management behaviour among T2DM adults was reported to be due to the Covid-19 pandemic as this study was also done during the Covid-19 pandemic period (Utli and Vural Dođru, 2021). This may be due to the T2DM have restricted resources to improve their self-management behaviour during the pandemic period.

Among the studied self-management behaviour, physical activity was least practised by the 112 subjects with a mean score of 2.50 and ± 3.12 while health care use was the most practised self-management behaviour among the four studied self-management behaviour with a mean score of 7.78 ± 1.94 . The same trend was reported in previous studies (Utli and Vural Dođru, 2021; Al-Qahtani, 2020; Ang et al., 2018).

Physical activity was the least practised by 112 subjects. The result was similar to the study by Yee et al. (2017). The author observed that the low availability of culturally appropriate physical activity facilities leads to low participation in physical activity by T2DM adults. Another study by Gunggu et al. (2016) which was done in Malaysia reported the low physical activity practised by T2DM adults due to the bad weather, lack of facilities and busy schedules. Besides, age might also lead to low physical activity practised by T2DM adults which is similar to our study as 58% of the studied T2DM adults were aged sixty and above (Gunggu et al., 2016). Some of the old-aged adults may be physically immobile which may also lead to the low physical activity practised among the studied T2DM adults. T2DM adults of older age normally practised low-intensity exercises such as walking and many may not perceive them as a form of exercise (Yeh et al., 2018). Furthermore, Utli and Vural Doğru (2021) also revealed that the Covid-19 pandemic has further reduced the ability of T2DM adults to practise physical activity due to the restrictions imposed.

Health care use was the most practised self-management behaviour among the four studied self-management behaviour by the 112 studied T2DM adults. The high adherence by the T2DM adults may be due to the most of the subjects were obtained from the medical clinics that mostly will seek health care according to the appointment given. Besides, the subjects were also obtained from nursing homes whereby the T2DM adults will be provided with medical assistance by the workers from the nursing homes which also lead to the high adherence to health care use by the studied T2DM adults.

Health care use was the most practised (Mean = 7.78 ± 1.94) followed by dietary control (Mean = 5.45 ± 1.99), glucose management (Mean = 4.58 ± 1.87) and physical activity (Mean = 2.50 ± 3.12). Among the four subscales, the self-management behaviours that were most practised and least practised were consistent with the study by Ang et al. (2018) done in Malaysia whereby health care use had the highest score (Mean = 8.36 ± 1.99), followed by glucose management (Mean = 7.61 ± 2.56), dietary control (Mean = 7.49 ± 1.89), and physical activity (Mean = 6.82 ± 2.56).

Dietary control was the second most practised self-management behaviour among the four studied subscales. Dietary control may be influenced by cultural factors and requires to be practised on a daily basis which causes dietary control to be more challenging for T2DM adults (Friis et al., 2016). This leads to moderate adherence by the T2DM subjects of this study. In this study, diet obtains the second most practised as a portion of the subjects were living in nursing homes and their meals are prepared according to their health conditions.

Self-management behaviour subscale of glucose management is the second least practised by the studied subjects. This may be due to the fact that self-monitoring of blood glucose is not widely practised among T2DM adults in Malaysia as most of the T2DM adults are treated with oral medication to manage their condition (Gunggu et al., 2016; Jannoo and Mamode Khan, 2019).

5.3 Sociodemographic Variables with Self-management Behaviour among Type 2 Diabetes Mellitus Adults

Based on the results obtained from the previous chapter, the sociodemographic of the marital status of the T2DM adults shows no difference with the self-management behaviour of the T2DM adults. The results obtained were consistent with the previous research (Luciani et al., 2021; Boakye et al., 2018; Saad et al., 2018). However, the findings from this study contradict with the findings from the study by Reisi et al. (2016) regarding the relationship between self-management behaviour and sociodemographic variables of marital status. The results whereby no difference between marital status with self-management behaviour may be due to the difference in recruited subjects. The majority of the subjects in this study were not married as the questionnaire was mostly distributed among the nursing homes whereby most of the residents were not married.

Next, the sociodemographic variables of the gender of the T2DM also show no difference with the self-management behaviour of the T2DM adults. The results are consistent with previous studies (Luciani et al., 2021; Boakye et al., 2018; Saad et al., 2018). This shows that there is no difference in practising self-management behaviour between T2DM of a different gender.

Moving on, the sociodemographic of age shows a difference with self-management behaviour of T2DM adults whereby the age group of 60 years old

and above have significantly lower self-management behaviour than those in thirty-one to forty years old. The result was consistent with the previous study whereby older adults have poorer self-management behaviour (Ausili et al., 2018; Boakye et al., 2018). The poor self-management behaviour in adults above 60 years old and as compared to those in 31-40 years old may be due to the fact that those in the age range of 31-40 are just starting to build their career and family and thus need to maintain a good health status to maximize their quality of life and health. In addition, the study by Boakye et al. (2018) claimed that those aged 60 and above might have low health literacy and have a lower ability to access the health system which leads to lower self-management behaviour.

Next, the findings of the study are that T2DM adults with lower education levels have poorer self-management behaviour than T2DM adults with higher education levels. The results are consistent with the previous study by Mogre et al. (2017) as well as the study by Boakye et al. (2018). The study by Mogre et al. (2017) supported that T2DM adults with higher education level are able to understand the information regarding self-management behaviour better which help them to know the advantages of practising self-management behaviour. This leads to higher self-management behaviour by T2DM adults with higher education level.

Furthermore, the comparison between the duration diagnosed with T2DM and self-management behaviour of T2DM adults shows a significant difference whereby adults that are diagnosed with T2DM for less than two years have higher self-management behaviour than those that are diagnosed for five to ten years and more than ten years. The results obtained are inconsistent with the study by Ausili et al. (2018). The difference in results may be due to the difference in the period of diagnosis with T2DM category used as the study by Ausili et al. (2018) reported lower self-management behaviour in adults diagnosed with T2DM less than ten years.

It is observed that adults that are diagnosed with T2DM for a longer period of time have poorer self-management behaviour as they have been diagnosed with T2DM for a longer period of time and might lose their motivation in managing their condition (Boakye et al., 2018). T2DM adults that were diagnosed with T2DM for a shorter period of time were most likely to be younger which may have better access to educational materials and perform self-management behaviour better. Besides, those that are diagnosed with T2DM for a shorter period may also be more motivated to control their blood glucose level and prevent further diabetes-related complications which lead to better self-management behaviour (Ausili et al., 2018).

5.4 Relationship between Health Literacy and Self-Management Behaviour

The findings on the relationship between health literacy and self-management behaviour show a significant difference between the health literacy group with self-management behaviour of T2DM adults. A meta-analysis by Marciano et al. (2019) on 61 studies regarding T2DM adults also showed similar results. The results showed that the T2DM adults with lower health literacy levels have poorer self-management behaviour and T2DM adults with excellent health literacy levels have better self-management behaviour. The results are consistent with previous studies by Luo et al. (2020) in United States, İlhan et al. (2021) in Turkey as well as AlSharit and Alhalal (2022) in Saudi Arabia. The study by Niknami et al. (2018) reported that T2DM adults with higher health literacy will be able to practise self-management behaviour more efficiently. This is because self-management behaviour such as insulin usage and medication adherence require an understanding of the prescription in order to practise them effectively.

Besides that, finding reliable information and understanding the right approach for self-management behaviour that is appropriate for the condition also requires a certain degree of health literacy. It is discussed that T2DM adults with higher health literacy will have more problem-solving solutions in regard to their T2DM condition. They will portray self-management behaviour as a continuous process of learning, adaptation and evaluation (Ayre et al., 2021). This leads to better self-management behaviour by T2DM adults with excellent

health literacy levels. Ayre et al. (2021) also observed that self-management behaviour requires cognitive abilities which may lead to the difference in the practice of self-management behaviour between those with “*excellent health literacy*” level as compared to T2DM adults with “*adequate health literacy*” level and “*limited health literacy*” level.

5.4.1 Relationship between Health Literacy and Self-Management Behaviour Subscale of Glucose Management

The findings obtained are that there was a significant difference between health literacy with the self-management behaviour subscale of glucose management. The results from this study indicate that T2DM adults with “*limited health literacy*” level have a poorer self-management behaviour subscale of glucose management than T2DM adults with “*sufficient health literacy*” level. The studied criteria for glucose management include the self-monitoring of blood glucose and adherence to medication prescribed by the subjects. Based on the researcher’s knowledge, there is currently no study specifically on the relationship between health literacy and self-management behaviour subscale of glucose management.

Inconsistent with our results one of the studies by Shin and Lee (2018) in Korean population it was found that there is no relationship between health literacy and the self-monitoring of blood glucose. On the other hand, the study

by Ueno et al. (2019) in Tokyo T2DM population found a significant relationship between health literacy and medication intake adherence which was consistent with our study. However, the study by Huang et al. (2018) in the United States of America reported a contradicting result. It was also reported that self-efficacy is one of the factors that lead to better medication adherence (Huang et al., 2018).

The disparities in results from our findings with previous studies may be due to the difference in the questionnaire used. Besides, the setting of this study whereby T2DM adults in nursing homes are often reminded to take their medication which leads to the T2DM adults in this study had better adherence to medication. In addition, the monthly visit to the medical clinic also improves the medication adherence of T2DM adults. This leads to the result obtained whereby T2DM adults with “*limited health literacy*” level have poorer self-management behaviour subscale of glucose management than T2DM adults with “*sufficient health literacy*” level but no difference between T2DM adults with “*excellent health literacy*” level and “*limited health literacy*” level as well as T2DM adults with “*sufficient health literacy*” level.

5.4.2 Relationship between Health Literacy and Self-Management Behaviour Subscale of Dietary Control

The results in the previous chapter indicate that a significant relationship was found between health literacy with self-management behaviour subscale of dietary control whereby T2DM adults with “*limited health literacy*” level have poorer self-management behaviour subscale of dietary control than T2DM adults with “*sufficient health literacy*” level as well as T2DM adult with “*excellent health literacy*” level. Previous research also observed the similar trend (Friis et al., 2016; Juul et al., 2018).

The study by Juul et al. (2018) mentioned that the recommendation of following a suitable diet according to their condition may be difficult for them and thus requires a higher health literacy level. This is because they need to understand the distribution and exchange of carbohydrates in order to control their blood glucose level. T2DM adults with “*limited health literacy*” level may have a hard time understanding the dietary guidelines given which leads to lower adherence (Friis et al., 2016). Not only that, most of the subjects are above 60 which may lead to a decrease in cognitive and contribute to lower health literacy and impact the dietary control of the subjects. This is because most of the T2DM adults above sixty years old may have impairment in sensory and causes dietary changes and thus leading to a lower dietary adherence (Yeh et al., 2018).

5.4.3 Relationship between Health Literacy and Self-Management Behaviour Subscale of Physical Activity

Findings show that T2DM adults with “*limited health literacy*” level and “*sufficient health literacy*” level performed less physical activity than T2DM adults with “*excellent health literacy*” level. The results obtained were consistent with the study by Lee et al. (2016) in South Korea. However, the study by Juul et al. (2018) in Turkey observed otherwise. The difference in result might be due to the difference in the setting of the study whereby the study by Lee et al. (2016) was conducted in an outpatient clinic while the study by Juul et al. (2018) was conducted on T2DM adults that participate in peer-led support groups. The studied subject setting was more similar to the study by Lee et al. (2016) which is at medical clinics.

The study by Ahmad et al. (2021) supported that physical activity requires professional guidance and awareness of the technique to perform exercises. This may lead to T2DM with low health literacy participating in lesser physical activity. Besides, T2DM adults require sufficient health literacy to understand guidance on practising physical activities that are suitable for their condition. This is because T2DM adults may be worried about the increase in the heartbeat during physical activity which leads to avoidance of physical activity participation (Ahmad et al., 2021).

5.4.4 Relationship between Health Literacy and Self-Management Behaviour Subscale of Health Care Use

The results obtained are that there was no significant relationship between health literacy and self-management behaviour subscale of health care use. The results were contradicting with the discussion by Sharon Watts et al. (2017) was observed. This may be due to the subjects of this study were selected from the clinical setting and nursing homes which have better health care use regardless of their health literacy level.

5.5 Strengths of the Study

This study was done by directly approaching the T2DM adults to explain the purpose of the study to them. In addition, an ideal response rate was obtained whereby the targeted sample size is met. This study was able to provide a foundation for the relationship between health literacy and self-management behaviour in T2DM adults in Malaysia. This study is also the first study that was done in Malaysia on investigating the relationship between health literacy and self-management behaviour in T2DM adults. Therefore, the data of this study can be used as preliminary data to know the health literacy level and self-management behaviour level in a subscale of T2DM adults

5.6 Limitation of the Study

There are several limitations that were acknowledged by the researcher in this study which include that the research was done whereby the subjects of this study are obtained from convenience sampling which may not be homogenous in representing the T2DM in the population. Besides that, this study was only carried out in the medical clinics and nursing homes in the urban area and does not involve rural areas and this caused the T2DM sample obtained not to be representative of the T2DM adults across the nation. In addition, the population used in this study was not homogenous as it involves free-living T2DM adults from medical clinics and non-free living T2DM adults from nursing homes. Furthermore, the data was obtained using a self-reported questionnaire which may be subjected to bias by the subjects when answering the questionnaire. Not only that, the study might not include T2DM adults with very low health literacy as they are not able to participate due to the nature of the questionnaire which requires a certain level of understanding to give suitable responses. Not only that, the questionnaire is only available in English language whereby language barrier might occur.

5.7 Implications of the Study

The findings of this study will be able to provide a better image of the relationship between health literacy and self-management behaviour of T2DM adults in Malaysia. The results can be utilized by family doctors, nurses, healthcare workers and health policymakers to raise awareness of the importance of health literacy in self-management behaviour of T2DM adults. Strategic measures can also be planned accordingly to decrease the burden of T2DM.

The results also show that the high prevalence of T2DM adults in Malaysia has limited health literacy which prompts strategies that should be a plan to increase the health literacy of T2DM adults. The methods for increasing the health literacy of T2DM adults should be revised and improved. Health promotion activities to increase the health literacy of T2DM adults should be done regularly and ensure participation by including various attractions. This can further assist T2DM adults in practising self-management behaviour better.

The healthcare provider can utilize visual aids in delivering messages to increase their understanding which leads to better health literacy levels. Besides that, simple language should be used when delivering messages and medical terms used should be explained clearly. This can ensure that T2DM adults realize the importance of self-management behaviour and practise them consistently. The health literacy of T2DM adults should be one of the factors to

be taken into consideration when promoting self-management behaviour to empower a healthy lifestyle and increase the quality of life of T2DM adults.

Besides that, T2DM adults should also be screened to determine their health literacy level in order to recommend suitable self-management behaviour accordingly. The self-management behaviour based on T2DM adults' capabilities will obtain better adherence. A systemic review by Ganasegeran et al. (2020) revealed that the annual national cost for managing T2DM was estimated to be USD 600 million. The better practice of self-management behaviour through adequate health literacy can not only reduce the complications of T2DM but also reduce the healthcare burden.

5.8 Implications for Future Research

The relationship between health literacy and self-management behaviour of T2DM adults was determined in this study and it can be used as evidence-based information for future research in the related field. Besides that, it can also be used to determine other factors of the relationship between health literacy and self-management behaviour of T2DM adults. Not only that, it can also be used to develop strategic plans to increase the health literacy and self-management behaviour of T2DM adults.

5.9 Recommendation

For future studies, it is recommended to use simple random sampling in order to obtain homogenous results that represent the population of T2DM adults in Malaysia. Besides, it is recommended to use a cohort study to follow up and evaluate the health literacy of T2DM adults and the effect on self-management behaviour. Further studies on various settings by including T2DM adults in the urban and rural areas so that it accounts for all T2DM adults across the nation and increases the sample size should be implemented.

In addition, the latest HbA1c or fasting blood glucose value should be asked for confirmation of the diagnosis of T2DM. Finally, the stage of change from the transtheoretical model of the T2DM adults can also be included as a confounding factor in the analysis of self-management behaviour of T2DM adults in future research. Not only that, the questionnaire should be translated into other languages such as Malay and Chinese in order to facilitate better and more accurate responses from T2DM adults that are not fluent in English.

The health literacy of the T2DM adults can also be improved by providing a booklet that contains all the necessary information to be given to all T2DM adults. The booklet can act as a source of information and also record other necessary information such as blood glucose levels for better monitoring. The booklet should contain information in the form of visual aids to enhance their understanding. It is also encouraged to bring along their family members or friends during the consultation session to further increase the health literacy of

the T2DM adults, especially among the elderly. Besides that, the health literacy of T2DM adults can be increased by relating the information to their situation and providing examples that are familiar to them. Explanation of the information using layman's terms should be practised to improve the understanding of the T2DM adults with low health literacy levels and at the same time further improve their health literacy level.

CHAPTER 6

CONCLUSION

Findings of this study indicated that majority of the participants (75.9%) had “*limited health literacy*” level. It was found that the sum scale of self-management behaviour out of ten scores has a mean of 4.94 ± 1.54 which is categorized as *poor*. Health care use was the most practised (Mean = 7.78 ± 1.94) self-management behaviour among the four subscales while physical activity was the least practised (Mean = 2.50 ± 3.12) self-management behaviour among the four subscales of self-management behaviour.

Sociodemographic variables of age (p -value = 0.002), education level (p -value < 0.001) and duration diagnosed with T2DM (p -value < 0.001) show a significant difference with self-management behaviour. However, no significant difference was found between the sociodemographic variables of gender (p -value = 0.992) and marital status (p -value = 0.719) with self-management behaviour among T2DM adults.

Furthermore, a significant relationship was found between health literacy and self-management behaviour (p -value < 0.001) whereby T2DM adults with lower health literacy have poorer self-management behaviour. A significant

relationship was also found between health literacy with the subscales of self-management behaviour of glucose management (p -value = 0.014), dietary control (p -value < 0.001) and physical activity (p -value < 0.001). However, no significant relationship was found between health literacy and the subscale of self-management behaviour of health care use (p -value = 0.127).

Therefore, the effect of health literacy on the self-management behaviour of T2DM adults should be emphasised to further increase the self-management behaviour of T2DM adults in Malaysia.

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APPENDICES

Appendix A

Sociodemographic Questionnaire

Sociodemographic Data

1. Age *

Mark only one oval.

- 18-30 years old
- 31-40 years old
- 41-50 years old
- 51-60 years old
- 60 and above

2. Gender *

Mark only one oval.

- Female
- Male

3. Education level *

Mark only one oval.

- None
- Primary
- Secondary/ SPM/ IGCSE
- Tertiary education (College/ University)

4. Martial status *

Mark only one oval.

- Single
- Married
- Other: _____

5. Number of years diagnosed with diabetes *

Mark only one oval.

- <2 years
- 2-5 years
- 5-10 years
- >10 years

Appendix B

Health Literacy Questionnaire

Domain	On a Scale from "Very Difficult" to "Very Easy", How Easy Would You Say It is to:	Very Difficult	Fairly Difficult	Fairly Easy	Very Easy
Health Care	Q 1 ... understand the medication guides that come with your medicine?				
	Q 2 ... understand what to do in a medical emergency?				
	Q 3 ... judge how information from your doctor applies to you?				
	Q 4 ... judge when you may need to get a second opinion from another doctor?				
	Q 5 ... call an ambulance in an emergency?				
	Q 6 ... follow instructions from your doctor or pharmacist?				
Disease Prevention	Q 7 ... find information on how to manage mental health problems like stress or depression?				
	Q 8 ... understand health warnings about behavior such as smoking, insufficient physical activity, unhealthy eating and drinking too much alcohol?				
	Q 9 ... find information about vaccinations/immunization and health screenings (such as breast exam, blood sugar test, blood pressure, cholesterol level) that you should have?				
	Q 10 ... understand why you need health screenings (such as breast exam, blood sugar test, blood pressure, cholesterol level)?				
	Q 11 ... judge which health screenings (such as breast exam, blood sugar test, blood pressure, cholesterol level) you should have? (<i>Appraise/Evaluate</i>)				
	Q 12 ... judge when you need to go to a doctor for a check-up?				
Health Promotion	Q 13 ... understand advice on health from family members or friends?				
	Q 14 ... understand information in the media (such as Internet, newspaper, magazines) on how to get healthier?				
	Q 15 ... judge how where you live (such as your community, neighborhood) affects your health and well-being?				
	Q 16 ... judge how your housing conditions help you to stay healthy?				
	Q 17 ... make decisions to improve your health? (<i>Apply</i>)				
	Q 18 ... take part in activities that improve health and well-being in your community? (<i>Apply</i>)				

(Jaafar et al., 2021)

Appendix C

Diabetes Self-Management Questionnaire (DSMQ)

The following statements describe self-care activities related to your diabetes. Thinking about your self-care over the last 8 weeks, please specify the extent to which each statement applies to you.	Applies to me very much	Applies to me to a considerable degree	Applies to me to some degree	Does not apply to me
1. I check my blood sugar levels with care and attention. <input type="checkbox"/> Blood sugar measurement is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
2. The food I choose to eat makes it easy to achieve optimal blood sugar levels.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
3. I keep all doctors' appointments recommended for my diabetes treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
4. I take my diabetes medication (e. g. insulin, tablets) as prescribed. <input type="checkbox"/> Diabetes medication / insulin is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
5. Occasionally I eat lots of sweets or other foods rich in carbohydrates.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
6. I record my blood sugar levels regularly (or analyse the value chart with my blood glucose meter). <input type="checkbox"/> Blood sugar measurement is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
7. I tend to avoid diabetes-related doctors' appointments.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
8. I do regular physical activity to achieve optimal blood sugar levels.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
9. I strictly follow the dietary recommendations given by my doctor or diabetes specialist.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
10. I do not check my blood sugar levels frequently enough as would be required for achieving good blood glucose control. <input type="checkbox"/> Blood sugar measurement is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
11. I avoid physical activity, although it would improve my diabetes.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
12. I tend to forget to take or skip my diabetes medication (e. g. insulin, tablets). <input type="checkbox"/> Diabetes medication / insulin is not required as a part of my treatment.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
13. Sometimes I have real 'food binges' (not triggered by hypoglycaemia).	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
14. Regarding my diabetes care, I should see my medical practitioner(s) more often.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
15. I tend to skip planned physical activity.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0
16. My diabetes self-care is poor.	<input type="checkbox"/> 3	<input type="checkbox"/> 2	<input type="checkbox"/> 1	<input type="checkbox"/> 0

(Schmitt et al., 2014)

Appendix D

Consent Form

Personal Data Protection Statement

Please be informed that in accordance with Personal Data Protection Act 2010 ("PDPA") which came into force on 15 November 2013, Universiti Tunku Abdul Rahman ("UTAR") is hereby bound to make notice and require consent in relation to collection, recording, storage, usage and retention of personal information.

1. Personal data refers to any information which may directly or indirectly identify a person which could include sensitive personal data and expression of opinion. Among others it includes:

- a) Name
- b) Identity card
- c) Place of Birth
- d) Address
- e) Education History
- f) Employment History
- g) Medical History
- h) Blood type
- i) Race
- j) Religion
- k) Photo
- l) Personal Information and Associated Research Data

2. The purposes for which your personal data may be used are inclusive but not limited to:

- a) For assessment of any application to UTAR
- b) For processing any benefits and services
- c) For communication purposes
- d) For advertorial and news
- e) For general administration and record purposes
- f) For enhancing the value of education
- g) For educational and related purposes consequential to UTAR
- h) For replying any responds to complaints and enquiries
- i) For the purpose of our corporate governance
- j) For the purposes of conducting research/ collaboration

3. Your personal data may be transferred and/or disclosed to third party and/or UTAR collaborative partners including but not limited to the respective and appointed outsourcing agents for purpose of fulfilling our obligations to you in respect of the purposes and all such other purposes that are related to the purposes and also in providing integrated services, maintaining and storing records. Your data may be shared when required by laws and when disclosure is necessary to comply with applicable laws.

4. Any personal information retained by UTAR shall be destroyed and/or deleted in accordance with our retention policy applicable for us in the event such information is no longer required.

5. UTAR is committed in ensuring the confidentiality, protection, security and accuracy of your personal information made available to us and it has been our ongoing strict policy to ensure that your personal information is accurate, complete, not misleading and updated. UTAR would also ensure that your personal data shall not be used for political and commercial purposes.

Consent:

6. By submitting or providing your personal data to UTAR, you had consented and agreed for your personal data to be used in accordance to the terms and conditions in the Notice and our relevant policy.

7. If you do not consent or subsequently withdraw your consent to the processing and disclosure of your personal data, UTAR will not be able to fulfill our obligations or to contact you or to assist you in respect of the purposes and/or for any other purposes related to the purpose.

8. You may access and update your personal data by writing to me at:
xiaovee.xv@utar.my

1. Acknowledgment of Notice *

Mark only one oval.

- I have been notified and that I hereby understood, consented and agreed per UTAR above notice.
- I disagree, my personal data will not be processed.

Appendix E

Ethical Approval Letter



UNIVERSITI TUNKU ABDUL RAHMAN
Wholly Owned by UTAR Education Foundation (Company No. 578227-M)

Re: U/SERC/01/2022

11 January 2022

Dr Tan Gim Cheong
Head, Department of Allied Health Sciences
Faculty of Science
Universiti Tunku Abdul Rahman
Jalan Universiti, Bandar Baru Barat
31900 Kampar, Perak.

Dear Dr Tan,

Ethical Approval For Research Project/Protocol

We refer to the application for ethical approval for your students' research projects from Bachelor of Science (Hons) Dietetics programme enrolled in course UDDN3108. We are pleased to inform you that the application has been approved under Expedited Review.

The details of the research projects are as follows:

No	Research Title	Student's Name	Supervisor's Name	Approval Validity
1.	The association between health literacy and physical activity level among UTAR Kampar undergraduate students	Chong Fang Lin	Dr Sharnela a/p Sahathevan	11 January 2022 – 10 January 2023
2.	The relationship between health literacy and healthy lifestyle behavior among UTAR Kampar undergraduate students	Callista Yeap Liwen		
3.	The association between health literacy level, self-monitoring blood glucose frequency and fasting blood glucose levels in Type 2 Diabetes Mellitus adults	Taarani a/p Elangohvan		
4.	The relationship of health literacy and self-management behavior in Type 2 Diabetes Mellitus adults	Wong Xiao-Vee		
5.	The association of health literacy and diabetes medication adherence in Malaysian adults with Type 2 Diabetes Mellitus	Chai Pei Qing		

The conduct of this research is subject to the following:

- (1) The participants' informed consent be obtained prior to the commencement of the research;
- (2) Confidentiality of participants' personal data must be maintained; and
- (3) Compliance with procedures set out in related policies of UTAR such as the UTAR Research Ethics and Code of Conduct, Code of Practice for Research Involving Humans and other related policies/guidelines.
- (4) Written consent be obtained from the institution(s)/company(ies) in which the physical or/and online survey will be carried out, prior to the commencement of the research.

Kampar Campus : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
Tel: (605) 468 8888 Fax: (605) 466 1313
Sungai Long Campus : Jalan Sungai Long, Bandar Sungai Long, Cheras, 43000 Kajang, Selangor Darul Ehsan, Malaysia
Tel: (603) 9086 0288 Fax: (603) 9019 8868
Website: www.utar.edu.my



Should the students collect personal data of participants in their studies, please have the participants sign the attached Personal Data Protection Statement for records.

Thank you.

Yours sincerely,



Professor Ts Dr Faiz bin Abd Rahman
Chairman
UTAR Scientific and Ethical Review Committee

c.c Dean, Faculty of Science
 Director, Institute of Postgraduate Studies and Research

Kampar Campus : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
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Universiti Tunku Abdul Rahman			
Form Title : Supervisor's Comments on Originality Report Generated by Turnitin for Submission of Final Year Project Report (for Undergraduate Programmes)			
Form Number: FM-IAD-005	Rev No.: 0	Effective Date: 01/10/2013	Page No.: 1 of 1



FACULTY OF SCIENCE

Full Name(s) of Candidate(s)	WONG XIAO-VEE
ID Number(s)	19ADB06833
Programme / Course	BACHELOR OF SCIENCE (HONOURS) DIETETICS
Title of Final Year Project	THE RELATIONSHIP BETWEEN HEALTH LITERACY AND SELF-MANAGEMENT BEHAVIOUR IN TYPE 2 DIABETES MELLITUS ADULTS

Similarity	Supervisor's Comments (Compulsory if parameters of originality exceeds the limits approved by UTAR)
Overall similarity index: <u>14</u> % Similarity by source Internet Sources: <u>8</u> % Publications: <u>10</u> % Student Papers: <u>3</u> %	
Number of individual sources listed of more than 3% similarity: <u>0</u>	
Parameters of originality required and limits approved by UTAR are as follows: (i) Overall similarity index is 20% and below, and (ii) Matching of individual sources listed must be less than 3% each, and (iii) Matching texts in continuous block must not exceed 8 words <i>Note: Parameters (i) – (ii) shall exclude quotes, bibliography and text matches which are less than 8 words.</i>	

Note Supervisor/Candidate(s) is/are required to provide softcopy of full set of the originality report to Faculty/Institute

Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

Signature of Supervisor

Name: Dr Sharmela A/P Sahathevan

Date: 01/09/2022

Signature of Co-Supervisor

Name: _____

Date: _____

WXV THESIS DRAFT 28 AUG

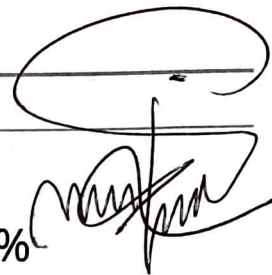
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2 Xiu-mei Guo, Xia Zhai, Bo-ru Hou. "Adequacy of health literacy and its effect on diabetes self-management: a meta-analysis", Australian Journal of Primary Health, 2020
Publication **1%**

3 Seyed Hossein Mohaqeqi Kamal, Mehdi Basakha, Homeira Sajjadi. "The Prevalence and Risk factors of Limited Health Literacy in Iran: a Systematic Review and Meta-regression Analysis", Journal of Advances in Medical and Biomedical Research, 2018
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