

**PREDICTING SELF-CARE PRACTICES AND
GLYCAEMIC CONTROL USING HEALTH BELIEF
MODEL (HBM) IN PATIENTS WITH INSULIN-
TREATED DIABETES IN MALAYSIA**

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ABSTRACT

Background: The practice of diabetes self-care plays an important role in glycaemic control. However, not all patients with insulin-treated diabetes engage in their self-care activities. Although there is evidence that self-care practices in patients with insulin-treated diabetes can be understood and predicted by health beliefs proposed by Health Belief Model (HBM), little is known about adult patients due to several methodological weaknesses of previous studies. Furthermore, knowledge is lacking about adults with insulin-treated diabetes in Malaysia.

Aim: To examine whether health beliefs suggested by the HBM can predict self-care practices in patients with insulin-treated diabetes in Malaysia.

Methods: A longitudinal design was chosen to conduct this study for a six month period at three endocrinology clinics in Malaysia. Data for self-care practices (diet, insulin intake, exercise and SMBG) and health beliefs were measured using a self-reported questionnaire. In addition, participants' glycaemic control was also examined as the objective measure for the self-care practices. These data were measured based on the participants' glycated hemoglobin (HbA1c) results. All data were collected twice: at baseline (Time 1) and at six months follow up (Time 2). Differences in all study variables between Time 1 and Time 2 were tested using paired t-test and McNemar's. Multiple linear regression and multiple logistic regression were used to predict the dependent variables at different points of time. Age, gender, race and diabetes-related knowledge were statistically controlled in the regression analyses. In addition, a qualitative evaluation was carried out to explore the context of the self-care practices by interviewing diabetes educators in the study setting about their diabetes education practice.

Results: A total of 159 patients with insulin-treated diabetes (aged 18-40 years) participated in this study. Of these, only 108 (67.9%) completed the study. The participants were more likely to adhere to their insulin injection than to engage in good dietary habits, regular exercise and testing SMBG \geq 3 times per day. The mean value of HbA1c was 9.8% (SD 2.61). The self-care practices and HbA1c as well as the participants' health beliefs remained consistent at six (6) months follow up ($p > .05$). The HBM significantly predicted dietary self-care, insulin intake practice and HbA1c. Of the HBM constructs, perceived benefits significantly predictive of good dietary habits at Time 1 (OR 1.92) and Time 2 (OR .23) and adherence to insulin injection at Time 1 (OR 3.17) and Time 1-2 (OR 2.68). Meanwhile, except perceived severity, all other HBM constructs were predictive of HbA1c [perceived susceptibility (β .169), perceived barriers (β -.206), perceived benefits (β -.397) and cues to action (β -.233)]. The findings of the qualitative data indicate that some participants might not have been provided with diabetes education while those who did might have received inconsistent and inaccurate information regarding their self-care activities. These data were provided by 27 diabetes educators in the study settings.

Conclusion: Self-care practices and glycaemic control in this study were related to health beliefs and also could be a result of limitations in the diabetes education that they had received. These findings should be given attention by diabetes educators in their efforts to improve diabetes self-care in patients with insulin-treated diabetes aged 18-40 years in Malaysia. More studies on health beliefs in diabetes self-care are needed for Malaysian patients.

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CHAPTER 1: INTRODUCTION AND OVERVIEW OF THE STUDY

1.1. Significance of the study

Diabetes is a chronic disease that is largely managed by individuals with the disease. This includes self-care of medication, diet, exercise and self-blood glucose monitoring (SMBG) which need to be undertaken on a daily basis and are often lifelong (Holcomb, 2008; Fowler, 2010; American Diabetes Association (ADA), 2012b). In this regard, patients' engagement in self-care activities is vital to diabetes management. Evidence has long demonstrated that those who follow their diabetes self-care regimens achieve better glycaemic control (Diabetes Control and Complication Trial Group (DCCT), 1993; UK Prospective Diabetes Study (UKPDS), 1998), whereas those who do not exhibit a deterioration of glycaemic levels (Murata, Shah, Hoffman et al., 2003; Blaha and Elasy, 2006). Despite the known positive outcomes of self-care practices for glycaemic control, not all patients with diabetes, in particular, those who are treated with insulin therapy, follow their self-care regimens or perform their self-care activities as recommended (Beléndez and Hernández-Mijares, 2009; Campbell, Khan, Cone et al., 2011; Peyrot, Rubin, Kruger et al., 2010; Brod, Rana and Barnett, 2012; Angamo, Melese and Ayen, 2013; Hendricks, Monaghan, Soutor et al., 2013).

Health beliefs have been recognised as one of the factors that influence whether patients engage in their diabetes self-care activities (Gherman, Schnur, Montgomery et al., 2011). Many researchers in diabetes studies for insulin-treated patients have investigated the health beliefs using Health Belief Model (HBM) for many decades in order to explain and predict patients' self-care practices as reported by patients and

as indicated by their glycaemic control (Cerkoney and Hart, 1980; Brownlee-Duffeck, Peterson, Simonds et al., 1987; Bond, Aiken and Sommerville, 1992; Aalto and Uutela, 1997; Coates and Boore, 1998; Wdowick, Kendall, Harris et al., 2001; Patino, Sanchez, Eidson et al., 2005; Gillbrand and Stevenson, 2006). The model proposes that the likelihood for an individual to follow the recommended health-related actions is influenced by perceived severity, perceived susceptibility, perceived benefits, perceived barriers and cues to action (Stretcher and Rosenstock, 1997) (see Chapter 2 for details). In particular, an individual is more likely to adopt a particular behaviour when perceived susceptibility and perceived severity are high, and when perceived benefits of the behaviour in question outweigh any barriers, as well as when a stimulus or cue to action is present (Stretcher and Rosenstock, 1997). Studies have shown that self-care practices are related to the HBM and its constructs (Cerkoney and Hart, 1980; Brownlee-Duffeck et al., 1987; Bond et al., 1992; Aalto and Uutela, 1997; Wdowick et al., 2001; Gillbrand and Stevenson, 2006).

Although there is evidence showing that self-care practices in patients with insulin-treated diabetes can be explained and predicted by health beliefs proposed by the HBM, this knowledge, however, remains inconclusive. Only a small number of the previous studies measured or tested the HBM as a whole theory (Cerkoney and Hart, 1980; Bond et al., 1992; Patino et al., 2005) or tested the theory on each component of diabetes self-care practices (Cerkoney and Hart, 1980). Thus, little is known and discovered about the ability of the health beliefs proposed by the HBM to predict self-care practices in insulin-treated patients with diabetes. In addition, the ability of the HBM and each of its constructs to predict self-care practices is uncertain because almost all studies previously were cross-sectional. This is due to the fact that health

beliefs would change after particular behaviours are adopted (Rosenstock, 1966) or over time (Lewis and Bradley, 1994). Also, health beliefs sometimes do not emerge at a single moment in time (Polit and Hungler, 1997). It has been highlighted that this type of research may not be appropriate to examine health beliefs as it may lead to inaccurate results (Rosenstock, 1966) or weaker relationship between health beliefs and behaviours (Janz and Becker, 1984).

Furthermore, the study samples are limited to adolescents (Bond et al., 1992; Patino et al., 2005) or in some cases, a combination of adolescents and adults in one study (Gillbrand and Stevenson, 2006). The knowledge generated from these studies cannot be directly linked and transferred to adult populations as there is evidence to suggest that health beliefs may differ between adolescents and adults (Harvey and Lawson, 2009). Although there is one study conducted on insulin-treated patients for adult populations (Cerkoney and Hart, 1980), the study has become obsolete after already more than thirty years old due to the dynamic changes of some of the diabetes management. Moreover, the knowledge regarding the association between self-care practices and those health beliefs is lacking for Malaysian people as none of the studies has been conducted in Malaysia. The findings of studies from other countries are inappropriate to be generalised and applied to Malaysian population with diabetes as self-care practices and health beliefs can be influenced by the culture of a particular society.

The need to identify health beliefs influencing patients' decisions on whether to engage in their self-care activities is paramount because health beliefs are amenable. Diabetes educators can target health beliefs through their diabetes education

programmes. As diabetes prevalence in Malaysia continues to grow, diabetes educators need the effective tools to help patients adhere to their diabetes care regimen will be critical. Therefore, based on the HBM, the present study was conducted to examine the predictors of self-care practices both as reported by patients (insulin intake, diet self-care, exercise self-care and SMBG) and as indicated by their glycaemic control using a longitudinal approach in Malaysia. The study also examined the types of HBM constructs are the most predictive of each of the self-care practices in insulin-treated patients. In addition, the study measured the stability of health beliefs and self-care practices in insulin-treated patients throughout of study. The study was conducted in three endocrinology clinics in Malaysia with a sample of patients aged 18-40 years. This age group was chosen because of the dynamic lifestyle changes prevalent at this phase which may take precedence over diabetes self-care practices.

Moreover, to obtain a broader understanding of self-care practices in the study, a qualitative evaluation was also conducted to explore how diabetes education is currently practiced in the three study's settings. The purpose was to provide the context to the self-care practice as suggested Hortensius, Kleefstra, Houweling et al. (2012b). The data about diabetes education were obtained from diabetes educators who were involved in the diabetes education programme in the study settings using a semi-structured interview. The focus was on the diabetes education practice itself rather than to evaluate the effectiveness of the diabetes education programme. It was beyond the scope of the study to evaluate the diabetes education practice or to determine how successfully the patients with diabetes attending each setting were being educated by their educators.

The results from this study not only generated the patterns of self-care practices among insulin-treated patients in Malaysia and what beliefs they hold in shaping their self-care practices, but also provided greater insights into the context of the self-care practices. It is hoped that this study can help diabetes educators to target on the particular health beliefs found in this study in order to improve their patients' practice of diabetes self-care activities. Physicians or nurses also can emulate and impart the beliefs found in the study when giving support and care for insulin-treated patients.

1.2. Terminologies used in the study

Self-care in diabetes is defined as an active and cognitive process, in which individuals with diabetes adhere to his/her treatment regimens (Funnell and Haas, 1995). This study focuses on self-care practice of insulin injection, diet, exercise and SMBG.

The term ‘insulin-treated patients’ used in this study refers to patients with either Type 1 or Type 2 diabetes who use insulin injection as the treatment for their diabetes. Insulin injection is the main pharmacological treatment for patients with Type 1 diabetes whilst in Type 2, it is an additional pharmacological treatment to the oral antidiabetic drugs when the oral drugs fail to maintain the glycaemic control near to normal (Nathan, Buse, Davidson et al., 2006).

The term ‘glycaemic control’ refers to the blood glucose measured by glycated haemoglobin (HbA1c) (Jeffcoate, 2004). HbA1c is a form of haemoglobin that reflects the average blood glucose concentration over the past three months (ADA, 2009). The normal HbA1c level is <7% (ADA, 2009) or <53mmol/L of the new

figure and value (Barth, Sally and Watson, 2008). However, in this thesis, only the previous measurement was used when reporting about glycaemic control. The terms of poor glycaemic control or inadequate glycaemic control were used interchangeably in this thesis when describing HbA1c level that is above the normal range.

1.3. Structure of the study

The purpose of this thesis is to present my doctoral work that was set out to investigate the predictive ability of health beliefs, in particular, the HBM to predict self-care practices as well as to explore the context of the self-care practices in patients with insulin-treated diabetes in Malaysia. There are seven chapters in this thesis. The first chapter provides an overview of the thesis. This includes an introduction to the area of the study, some of the terminologies used extensively in the thesis and the sequential composition of the thesis.

Chapter 2 reviews a set of literature relevant to the topics. Firstly, the chapter describes diabetes mellitus which covers the areas of diabetes as a disease and its epidemiology, burdens and management. The chapter then reviews the literature concerning self-care practices in diabetes management which includes about self-care activities and its pre-requisites, their importance in diabetes management and the reality of diabetes self-care practices among patients with insulin-treated diabetes in the real world. These, then, are followed by the review of literature on health beliefs and its roles and significance in self-care practices, as well as health belief theories which include the HBM. Finally, the evidence of the relationships between health beliefs in the HBM and self-care practices is reviewed critically along with

the limitations found in the studies. The chapter ends with a statement of the aims of the study and a summary of the literature review.

Chapter 3 describes the methodology and methods of the study. These include the aim and objectives of the study, the discussion of the rationales for the design of the study and the explanation of the study samples and settings, the measurement method including its instrument, process of data collection and data handling and analysis. For the qualitative evaluation, this chapter explains the selection of the interview's participants, the data collection method and data analysis. Finally, the chapter discusses the ethical considerations made in connection to the implementation of the study. The findings of the study are presented in Chapter 4 and 5. Chapter 4 reports the findings from the longitudinal data while Chapter 5 presents the qualitative findings.

In Chapter 6, the findings of both quantitative and qualitative findings are discussed. The methodological strengths and limitations of the study are also expounded. The last chapter in this thesis (Chapter 7) discusses the implications of the findings on clinical practice and research. Finally, this chapter concludes the research in its entirety.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter presents the literature underpinning the study. The chapter begins with an overview about diabetes which includes a brief explanation about diabetes as a disease, the prevalence of diabetes and the burdens caused by the disease and its management. This is followed by self-care in the diabetes management and health beliefs in diabetes self-care in order to provide readers with the background information about self-care practices and health beliefs. The self-care section (Section 2.3) covers issues regarding the self-care activities in diabetes, the prerequisites of self-care, the implications of self-care on diabetes outcomes and the practice of self-care among patients with insulin-treated diabetes in the real world. The health beliefs section (Section 2.4) explains about health beliefs and its importance in self-care practices as well as health belief theories such as Health Belief Model (HBM). This chapter, then, critically analyses studies that use the HBM to investigate the relationships between self-care and health beliefs in insulin-treated patients with diabetes. Finally, the gaps that are determined in those studies are justified for further research. The chapter ends with the aims of the further study and a summary of this chapter.

The literature review was undertaken using the following databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, MEDLINE, PsycINFO, EMBASE and Cochrane Library. The search strategy employed the terms: ‘self-care or self-management’, health beliefs, Health Belief Model (HBM)’ linked to ‘adult and diabetes mellitus or Type 1 or Type 2 and insulin-treated’.

Subsequently, each of self-care practices was searched separately using ‘adherence or compliance’ linked to ‘diet or nutrition’, ‘medication intake or consumption’, ‘insulin intake or consumption’, ‘exercise or physical activity’ and ‘self or home-monitoring or SMBG’. The articles included in this review were published from 1980 to 2014. Only English language articles were reviewed due to limited translation facilities. This review only includes articles that measure each of the self-care aspects (medications/ insulin, diet, exercise and SMBG) individually. This is because it has been agreed by a substantial number of researchers that each of self-care practice components is not multidimensional in nature (Toobert and Glasgow, 1994; Toobert, Hampson and Glasgow, 2000; Orme and Binik, 1989) and that all self-care (components) should not be combined and measured as a single construct (Glasgow, Wilson, and McCaul, 1985)

2.2. Overview of diabetes mellitus

2.2.1. What is diabetes?

Diabetes mellitus is a chronic disease that is characterised by high blood glucose levels. It occurs due to the inability of the body to produce or properly use insulin, a hormone needed by the body to convert sugar, starches and other food into energy required for daily life. This results in an alteration in the metabolism of carbohydrates, fats and proteins (William and Pickup, 2004). An individual is diagnosed with diabetes mellitus when the blood glucose level is 1) $\geq 6.5\%$ for HbA1c or 2) $\geq 126 \text{ mg/dl}$ (7.0 mmol/l) for fasting plasma glucose (FPG) or 3) 200 mg/dl (11.1 mmol/l) for 2-hour plasma glucose or 4) 200 mg/dl (11.1 mmol/l) for random blood sugar if patients present with hyperglycaemic crisis (American Diabetes Association (ADA), 2012a).

There are two major types of diabetes; Type 1 and Type 2 diabetes. Type 1 diabetes, or formerly known as Insulin Dependent Diabetes Mellitus (IDDM) or juvenile diabetes, is an autoimmune disorder whereby the body destroys its own β cells of the pancreas and causes absolute insulin deficiency (ADA, 2011). Type 2 diabetes, previously known as Non-Insulin Dependent Diabetes Mellitus (NIDDM) or adult onset, is characterised by insulin resistance with relative insulin deficiency where the amount of insulin is insufficient to overcome the resistance (ADA, 2011). In some cases, however, the classification of these two categories cannot be entirely relied upon (ADA, 2012a). The former occurs at any age but commonly strikes children and adolescents whereas the latter typically occurs during adulthood (ADA, 2012a). Although it has been assumed that Type 2 diabetes is rare in adults younger than 30 years of age, many studies have determined the incidence of Type 2 diabetes among adults younger than 30 years (Lamni, Taskinen, Moltchanova et al., 2007; Balasanthiran, O'Shea, Moodambail et al., 2012). In fact, according to a review conducted by The International Diabetes Federation Consensus Workshop (Alberti, Zimmet, Shaw et al., 2004), the incidence of Type 2 diabetes is also evident among children and youth worldwide.

2.2.2. Epidemiology of diabetes mellitus

Diabetes has become a global health problem. The data provided by the World Health Organization (WHO) (2009), Wild, Roglic, Green et al. (2004) and Shaw, Sicree and Zimmet (2010), all indicate that the number of adults with diabetes worldwide was 171 million and 285 million in 2000 and 2010 respectively. The global prevalence of diabetes among adults has been projected to rise up to 380 million in 2025 (International Diabetes Federation (IDF), 2010) and 366 million

(Wild et al., 2004) or 439 million in 2030 (Shaw et al., 2010). In the United Kingdom (UK), there were 2.6 million people who had been diagnosed with diabetes in 2009 and it is estimated that the figure will increase to four millions by 2025 (Diabetes UK, 2010). India, China, and the United States are predicted to remain as the countries with the highest incidence of diabetes in the world by 2030 as in 2010 (Shaw et al., 2010), 2000 (Wild et al., 2004) and 1995 (King, Aubert and Herman, 1998). The majority of the predicted rapid increase is evident in developing countries (IDF, 2010; Shaw et al., 2010; Wild et al., 2004) which involve all age groups (younger, middle-aged and older adults) compared to developed countries, where only middle-aged and older adults will increase whilst younger adults remain the same (Wild et al., 2004).

Malaysia is one of the developing countries. The WHO (2009) and Shaw et al. (2010) have predicted that Malaysia will have about 2.5 million and 3.2 million diabetes cases in 2030 respectively. However, the number of people with diabetes in Malaysia has already reached 3.2 million, which is about 16.6% of the total population in 2014 (IDF Western Pacific, 2015). Nevertheless, a study conducted in Malaysia reveals that the prevalence of diabetes in Malaysia was 22.6% in 2013 (Wan Nazaimoon, Md Isa, Wan Mohamad et al., 2013). This finding indicates that the number of patients with diabetes has doubled since 2006 (Letchuman, Wan Nazaimoon, Wan Mohamad et al., 2010). Malaysia is reported as the 15th and 12th country that has the highest diabetes prevalence in the world and in the Western Pacific Region respectively (IDF, 2014). However, based on the finding in 2013 (Wan Nazaimoon et al., 2013), Malaysia would be among the top 10 countries in the

world as well as in the Pacific region with the highest number of people diagnosed with diabetes.

2.2.3. The burdens of diabetes mellitus

Diabetes is considered a serious disease as it is associated with various microvascular and macrovascular complications such as retinopathy, nephropathy, neuropathy, cardiovascular disease, coronary heart disease and peripheral vascular disease. A study of a 28-country sample (these countries were grouped into seven geographical regions) reveals the prevalence of diabetes complications (Litwak, Goh, Hussein et al., 2013). Russia records the highest number of patients with diabetes who have developed micro- and macrovascular complications and these are followed by countries in Latin America and Middle East (see Table 1). The complications lead to various morbidities such as blindness, renal failure, stroke and amputations (Deshpande, Harris-Hayes and Schootman, 2008; Susan van, Beulens, van der Schouw et al., 2010), all negatively affecting patients' physical functioning (Debono and Cachia, 2007; Hayat, Nayak, Ashiq, 2009) and decreasing patients' quality of life (Brown, Brown, Sharma et al., 2000; Debono and Cachia, 2007; Huang, Brown, Ewigman et al., 2007) as well as individuals' level of productivity (Bolin, Gip, Mörk et al., 2009).

In addition, diabetes is costly both directly and indirectly. About 12% of the global health expenditure, between USD 376.00 billion and USD 672.2 billion, has been allocated for diabetes (Zhang, Zhang, Brown et al., 2010). The cost for treating Type 1 diabetes is higher than Type 2 and it increases dramatically in adults aged 45 years and above (Dall, Mann, Zhang et al., 2009). However, the costs for treating the

complications are higher than the disease treatment (ADA, 2008a; Goldhaber-Fiebert, Li, Ratanawijitrasin et al., 2010; Javanbakht, Baradaran, Mashayekkhi et al., 2011). The indirect costs of diabetes, due to the absence from work, reduced performance at work as well as reduced productivity for those that are not in labour force, are also high (ADA, 2008a; Dall et al, 2009). For example, in the USA, reduced productivity was associated with \$58.2 billion of loss in 2007 (ADA, 2008a). In fact, the indirect cost is higher than the direct cost (Hex, Bartlett, Wright et al., 2012). For instance, the UK's indirect cost of diabetes was £13.9 billion while the direct cost was £9.8 in 2010/2011.

Table 1: Diabetes complications by geographical region from Litwak, Goh, Hussein et al. (2013)

Region	Microvascular complications N (%)	Macrovascular complications N (%)
China	2342 (21.3)	5467 (49.6)
South Asia	4946 (23.3)	8293 (39.0)
East Asia	2685 (26.8)	5615 (56.0)
North Africa	979 (24.2)	2397 (59.4)
Middle East	4293 (28.7)	9847 (65.8)
Latin America	335 (29.4)	715 (62.8)
Russia	2226 (72.4)	2744 (89.3)
All regions	17806 (27.2)	355078 (53.5)

In Malaysia specifically, diabetes complications also are common. According to a study conducted by Aabougalambou, Mohamed, Syed Sulaiman et al. (2010), the

most common diabetes complications in Malaysia are microvascular. About 78% of the patients in the study demonstrated microvascular complications. Among such complications, nephropathy was the most common, which accounted for 91% of the study patients. Macrovascular complications were only found among 17.5% of the total patients which resulted in the same proportion for patients who had both types of complications. Only 4.5% patients did not have any complications. The cost for treating diabetes mellitus in Malaysia is high. It was estimated that about Ringgit Malaysia (RM) 2000 per admission or RM400 per day for inpatients while for outpatients, the cost was about RM800 per year or RM200 per visit (Sharifa Ezat, Azimatun, Amrizal et al., 2009).

In addition, the disease also reduces life expectancy of a person due to premature mortality (Lopez, Mathers, Ezzati et al., 2006; Soedamah-Muthu, Fuller, Mulnier et al., 2006; Deshpande et al., 2008; van Susan et al., 2010). In 2001 and 2002, the number of mortality worldwide due to diabetes such as ketoacidosis or hypoglycaemia was recorded at 959,000 and 987, 000 (1.7% of the total world mortality) respectively (Danaei, Lawes, Hoorn et al., 2006). This was estimated to spike to almost 4 million or 6.8% of global mortality in 2010 (Roglic and Unwin, 2010). Mortality rate due to its complications, however, was higher than the number of mortality contributed by diabetes itself (Roglic, Unwin, Bennett et al., 2005; Danaei et al., 2006). Together with its complications, the number of mortality was 2.9 million; one million in developed countries and 1.9 million in developing countries (Roglic et al., 2005). According to WHO (2014), about 80% of global diabetes death occurs in the low and middle-income countries.

2.2.4. Diabetes management

Diabetes is an incurable disease. However, the progression of the disease and its complications can be prevented or delayed through a strict glycaemic control (The Diabetes Control and Complications Trial (DCCT), 1993; United Kingdom Prospective Study (UKPDS), 1998; Stratton, Adler, Neil et al., 2000). The first notable large-scale trial study in 1993 demonstrated a direct relationship between glycaemic control measured on glycated Haemoglobin (HbA1c), where the higher the HbA1c level, the higher the risk of development of diabetes complications (DCCT, 1993). Later, another study showed a similar finding in illustrating a clear relationship between glycaemic control and worsening retinopathy and nephropathy (Ohkubo, Kishikawa, Araki et al., 1995). Three years later, the UKPDS conducted a similar study and the findings provided a strong support to the relationships (1998). In another UKPDS, Stratton et al. (2000) examined the detailed relationship between high levels of blood glucose and complications, and indicated that for every 1% reduction in glycaemia measured as HbA1c, all-cause mortality, and myocardial infarction, diabetes-related deaths and microvascular diseases have decreased by 14%, 21%, and 37% respectively. The evidence regarding the relationship between glycaemic control is stronger when the DCCT (2005) examined the relationship again and determined the decrease in HbA1c values and its association in with reducing the risk of macrovascular complications. A 10-year follow-up study demonstrated that intensive glucose control persistently reduces the risk of the complications for many years (Holman, Paul, Bethel et al., 2008).

Based on the evidence, the main goal of diabetes care is to normalise the blood glucose level. The HbA1c value <7% has become the target of a normal glycaemic

control required in order to avoid or delay diabetes complications (ADA, 2009; Roberts, 2006). Although some even take it much stringently, as to less than 6% (ADA, 2008c), it is not advisable as it has been demonstrated to cause severe hypoglycaemia (DCCT, 1993). In order to achieve or maintain the target of glycaemic control, patients with diabetes are treated with a combination of both pharmacological and non-pharmacological treatments (Holcomb, 2008; ADA, 2009; Fowler, 2010).

The pharmacological treatment is composed of two categories; 1) insulin injections and 2) oral anti-diabetic drugs. Patients with Type 1 diabetes are treated with insulin therapy while patients with Type 2 diabetes will begin the treatment with insulin as an added therapy when the oral drugs fail to maintain the glycaemic control near to normal (Nathan et al., 2006). However, it has been recommended considering the early initiation of insulin for Type 2 because it is more effective than the oral antidiabetic agents such as sulfonyurea or thiazolidinedione, or is commonly referred to as glitazone (Holcomb, 2008). Although Type 2 is most commonly treated using oral agent, yet most of Type 2 patients who are diagnosed before the age of 45 years require insulin therapy compared to those who are age > 45 years at the time of diagnosis (Hillier and Pedula, 2003). Furthermore, the use of insulin injection for paediatric patients with Type 2 is also common (Alberti et al., 2004). The physician will prescribe which types of insulin that work better to control the glucose level for a particular patient depending on his/her diabetes condition and lifestyle consideration (ADA, 2009; Nathan, Buse, Davidson et al., 2009) and glycaemic profile (Marie and Whitaker, 2004). To date, there are two types of insulin available (human and analogues insulin) with various durations of actions (rapid, short,

intermediate and long acting) and purposes (bolus and basal) for treating diabetes. Patients with Type 1 diabetes mostly are prescribed with multiple daily insulin injections (MDI) with at least three injections per day (ADA, 2009) whilst patients with Type 2 diabetes may first begin with one daily dose of basal insulin (Nathan et al., 2009) or twice daily (Raskin, Allen, Hollander et al., 2005), and finally MDI as in Type 1 if it fails to achieve the glycaemic control (Nathan et al., 2009).

The non-pharmacological treatment includes diet, exercise and self-monitoring blood glucose (SMBG). The diet for patients with diabetes is similar to the healthy diet for individuals without diabetes. The diet regimen for diabetes is developed by a dietitian based on the amount of a total calorie required by a particular patient based on his/her body weight. This comprises of 45%-65% carbohydrate (Sheard, Clark, Brand-Miller et al., 2004), 15-20% protein, <7% saturated fat, 10% polyunsaturated fat or two or three servings of fish (ADA, 2003; ADA 2004; ADA, 2008b) of their total calorie. If a patient wants to include sucrose or sucrose-containing food, this should be substituted for other carbohydrate sources. If added, it should be covered with the insulin (ADA, 2003). In addition, the total cholesterol intake must be < 200mg (ADA, 2003; ADA 2004; ADA, 2008b) and fibre must be between 25-30gm per day (Franz, Powers, Leontos et al., 2010). For patients who consume alcohol, they are required to limit the amount of consumption to one and two drinks (ADA, 2008b) or 10g/day and 20g/day (Mann, Leeuw, Hermansen et al, 2004) for women and men respectively. One drink is equivalent to 12oz for beer, 5oz for wine and 1.5oz for distilled spirits (ADA, 2003; ADA, 2004). Although the amount of carbohydrate intake is the most important (ADA, 2003; ADA, 2004), yet the source of carbohydrate is also important (Sheard et al., 2004). Patients should monitor the

amount of their carbohydrate intake using carbohydrate counting, exchanges or experience-based estimation (ADA, 2008b) and ensure that the carbohydrate intakes are from various sources such as whole grains, fruits, vegetables and low-fat milk (ADA, 2003; ADA, 2004; ADA, 2008b).

In terms of exercise, patients with diabetes are required to engage in a regular exercise for at least 150 min/week of moderate-intensity aerobic physical activity distributed over minimally three days per week (ADA, 2009; Franze et al., 2010), or 90 minutes a week of vigorous aerobic activity which the total minutes are distributed for at least three days a week (Holcomb, 2008). Patients are recommended not to have more than two consecutive days without aerobic physical activity because the duration of increased insulin sensitivity is generally not >72 hour (Holcomb, 2008).

SMBG, in comparison to medication, diet and exercise, is not a treatment. It is a tool for monitoring the day-to-day glucose levels in order to control the glucose level between 90-130mg/dL for pre-meal, between 120-180mg/dL for postprandial and between 110-150mg/dL for bedtime (ADA, 2009). While a balanced diet and exercise are necessary for all patients with diabetes, the SMBG is only more important for insulin-treated patients. The recommendation of SMBG frequency for such patients varies according to the number of insulin injections. Those who are on multiple insulin injections per day are recommended to monitor SMBG at least three or more times per day (ADA, 2012b), while for those with a lower number of insulin injections only need to monitor at least two times per day (Diabetes UK, 2012). Although the frequency and timing of SMBG varies according to the particular needs

and goals of individual patients, for most Type 1 diabetes, SMBG is recommended three or more times per day (Clinical Practice Guideline (CPG), 2009). All the treatments (medications, diet and exercise), sometimes, need to be modified when SMBG values indicates out of normal range (CPG, 2009; ADA, 2012b; Diabetes UK, 2012).

2.3. Self-care in diabetes managements

The management of diabetes involves various types of treatments such as medications (OHA or/and insulin), diet, exercise and SMBG in order to control patients' glycaemic level. The success and effectiveness of the treatments, nevertheless, rely greatly on patients themselves. In this context, healthcare providers only prescribe the medication, develop the meal plan and recommend exercise and SMBG regimens for a particular patient, yet the patient is the person who needs to perform all those activities. In other words, patients are in charge of their disease management; they need to take their medication as prescribed, follow the meal plan, exercise and monitor their blood glucose as recommended as well as adjust the regimen when necessary. Therefore, a high degree of self-care commitment is required to manage diabetes because the treatments are to be carried out by patients themselves.

2.3.1. What is self-care in diabetes?

Self-care is defined as any behaviours performed by individuals for preventing illness (Clark, Becker, Janz et al., 1991), restoring health (Dean, 1989), promoting health (Orem, 1995) or coping with health conditions (Omisakin and Ncama, 2011). The application of self-care varies. According to Haug, Akiyama, Tryban et al.

(1991), self-care is any behaviour that an individual undertakes in response to a perceived symptom without the involvement of any healthcare professionals. For example, taking chicken soup for treating a cold symptom is considered a self-care. In chronic illness such as diabetes, self-care is performed in collaboration with health care professionals. Sometimes referred to as self-management, it is an active and cognitive process in which individuals with diabetes adhere to his/her treatment regimens (Funnell and Haas, 1995). It is the actual performance of self-care activities required in diabetes management to achieve a good glycaemic control (Sousa, Zauszniewski, Musil et al., 2005). Inherent to the self-care concept, patients must actively participate in their care (Dean, 1989) as they are the very ones responsible for carrying out the self-care activities (Anderson and Funnell, 2000).

For diabetes, the essential self-care activities involves taking medication as prescribed, eating healthily, exercising regularly and monitoring blood glucose level frequently (CPG, 2009, Diabetes UK, 2012, ADA, 2013). Those activities need to be performed regularly, on a daily basis or is often lifelong. Except for exercise, other activities may differ from one patient to another depending on their regimens. For example, patients may need to take one, two or more insulin injections per day and those who are prescribed with multiple insulin injections perday may have snacks in between their meals as well as more SMBG performances compared to others (CPG, 2009, Diabetes UK, 2012, ADA, 2013). Although differences may exist, in general, all the activities are regulated as patients get up from their bed until bedtime. For patients who are treated with insulin therapy, they may start their days with checking their blood glucose and then have breakfast, followed by injecting the insulin. For some types of insulin injections, patients are required to wait for several minutes

before eating (Müller, Kloos, Frank et al. 2011). Such activities need to be repeated at lunch and dinner for patients who are treated with more than one insulin injection per day. The type and amount of food to be consumed in each meal and/or snack must be based on the regimens provided by their dietitians (ADA, 2003; ADA 2004; ADA, 2008b; Franz, Boucher, Green-Pastors et al., 2008). In addition, every two days, they must do exercise either a 50-minute moderate-intensity aerobic or a 30-minute vigorous aerobic (Holcomb, 2008). There are times when patients also need to adjust their treatment on their own (based on the SMBG results) in order to achieve to achieve an optimal control (CPG, 2009, Diabetes UK, 2012, ADA, 2013). Overall, the diabetes self-care activities are performed not only at patients' homes, but also at other places such as workplace especially for those who are employees, or in university or college for those who are students, or even when they are on a vacation.

Patients with diabetes need to make considerable changes to their existing lifestyle in order to incorporate the self-care activities into their life. They need to allocate time for exercising, performing the insulin injection and SMBG. They also must alter their eating habits. These include having routine meal times according to their medication intake, changing the amount and types of their food. This necessitates an amendment to their daily activities such as their work schedule. Since the self-care activities take place not only at patients' home but also at other places such as their work or academic settings (university, college and school) or even during holidays or travelling, there are times that patients may struggle at engaging in their self-care activities. Time constraint is the most widely reported challenge for patients to integrate such activities into their lives (Péres, Santos, Zanetti et al., 2007; Daly,

Hartz, Xu et al., 2009; Shultz, Corbett and Allen, 2009; Lundberg and Thrakul, 2011). Often, patients are reported to face a situation where they need to choose between the self-care demands and their existing lifestyles (Lundberg and Thrakul, 2011) or study commitments (Balfe, 2009). Some patients may even forget about their diabetes self-care regimens (Farsaei, Radfar, Heydari et al., 2014).

In addition, self-care activities may pose a significant burden in terms economic consequences for some patients especially those who are without assisted financial such as governmental subsidiary or insurance. For example, many patients with diabetes have reported that the cost for healthy diet is expensive (Galasso, Amend, Melkus et al., 2005; Nagelkerk, Reick and Meengs, 2006; Shultz et al., 2009) and SMBG strips are very costly for them (Hjelm and Nambozi, 2008; Fisher, Kohut, Schachner et al, 2011). The cost of a strip varies according to countries. For instance, the cost for the testing strips was reported between \$0.79 (Yeaw, Lee, Wolden et al., 2012) and \$0.98 (Yeaw, Lee, Aagren et al., 2012) in the United States and Canada respectively. In the United Kingdom, the cost of the strips was GBP135-191 per patient per year (Belsey, Pittard, Rao et al., 2009). Only some countries subsidise the cost of the strips (Sanyal, Graham, Cooke et al., 2008; Gomes, Tannus, Cobas et al., 2013).

Furthermore, activities such as insulin injection and finger pricks for SMBG frequently involve unpleasant tasks. Patients may feel discomfort and inconvenient as the tasks are associated with pain as reported in many studies (Tan and Margarey, 2008; Daly et al., 2009; Rubin, Peyrot, Kruger et al., 2009; Chlebowy, Hood and LaJoie, 2010; Hortensius, Kars, Wierenga et al., 2012a). The insulin injection is also

associated with scarring while the SMBG causes sore fingers (Chlebowy et al., 2010) and callous and hard spot (Hortensius et al., 2012a).

Moreover, insulin injection can be associated with side effects such as mild and severe hypoglycaemia (Rustveld, Pavlik, Jibaja-Weiss et al., 2009). These side effects are common (Hjelm and Nambozi, 2008). The most common is the mild hypoglycaemia which has been reported to occur about two episodes per week per patient (Pedersen-Bjergaard, Pramming, Heller et al., 2004) or most patients had at least one episode of hypoglycaemia, or some had three episodes in a six-month period (Farmer, Balman, Gadsby et al., 2008). Hypoglycaemia, either mild or severe, can happen at anytime and anywhere including during bedtime (Leckie, Graham, Grant et al., 2005). Those who are unaware of hypoglycaemia tend to get severe hypoglycaemia (Smith, Choudhary, Pernet et al, 2009). Given the complexities of diabetes self-care regimen and the fact that it needs to be carried out by patients themselves outside of their clinics or hospitals, it is crucial that healthcare providers ensure that their patients are capable of performing all the self-care activities before the patients leave the clinic especially at the beginning of the diagnosis.

2.3.2. Pre-requisite of self-care

Basically, patients with diabetes need to possess the necessary knowledge and skills prior to engaging in their self-care activities (Funnell, Brown, Childs et al., 2009). These are the basic factors that are required in order to boost patients' ability to execute such activities (Siguroardottir, 2005). Without such knowledge, patients may not be able to engage in the recommended self-care activities (Rustveld et al., 2009). They may seek the knowledge from various resources such as self-information

seeking, health care providers and diabetes peers (Chlebowy et al., 2010; Hortensius et al., 2012a). However, the information provided by their health care providers, especially diabetes educators is considered to be the most appropriate source of knowledge for patients' self-care practices.

Diabetes education, in this respect, has long been central in diabetes care to assist patients with diabetes to manage their disease. In diabetes education, patients are equipped with the knowledge and skills needed for them to self-manage their diabetes. It is an essential first step before expecting patients to execute their diabetes treatments on their own, and thus it should be expected that all patients with diabetes are provided with diabetes education from the beginning of their diagnosis of the disease (ADA, 2012b). The aims of diabetes education are to ensure that patients are able to implement the seven scientific-based diabetes self-care behaviours; being active, eating healthy, monitoring, taking medications, problem-solving, healthy coping and reducing risks (American Association of Diabetes Educators (AADE), 2005). Therefore, in diabetes education, patients are not only taught about knowledge and skills regarding their self-care activities, but also the knowledge on diabetes as a disease as well as its complications (AADE, 2005; Funnell et al., 2009). Specifically, patients are taught about the process of diabetes and its treatment options, the incorporation of nutritional management and physical activities into lifestyle and the safe use of medication(s). For maximum therapeutic effectiveness, they are also equipped with the knowledge of monitoring blood glucose and other parameters, using the results for self-management decision, preventing, detecting and treating chronic complications and developing personal strategies to address psychosocial

issues and concerns, as well as developing personal strategies to promote health and behaviour change (Funnell et al., 2009).

The diabetes education is delivered by qualified diabetes educators such as registered nurses, pharmacists and dietitians (AADE, 2005; Funnell et al., 2009). However, evidence has shown that majority of patients with diabetes received their diabetes education from registered nurses (Peeples and Austin, 2007; van de Sande, Dippenaar and Rutten, 2007; Martin, Lumber and Compton et al., 2008; Malemute, Shultz, Ballejos et al., 2011; Martin, 2012). For a specific type of education, only the respective diabetes educators are eligible to teach. For example, only registered dietitians can provide a special session about diet known as the Medical Nutritional Therapy (MNT). In Malaysia, patients are also taught through a pharmacist-based programme called Diabetes Medication Therapy Adherence Clinic (DMTAC) (Lim and Lim, 2010).

There are various types of diabetes education available to cater for a specific group of patients. For example, in the United Kingdom, there are diabetes education programmes called DAFNE and DESMOND. DAFNE (Dose Adjustment for Normal Eating) is a programme that is specifically developed for teaching patients with intensive insulin injection only (DAFNE, 2002) while DESMOND is for patients who are newly diagnosed with or has established Type 2 diabetes (Davies, Heller, Skinner, et al., 2008). In the Netherlands, the DESMOND program is called PRISMA (PRo-active Interdisciplinary Self-Management) (Leibbrandt, Kiefte-de Jong, Hogenelst et al., 2010). In Germany, there is a diabetes education programme called LINDA (Living – Interactive – New –Distinguished – Activating) (Krakow

and Feulner-Krakow, 2007). This programme is for patients with Type 1 and 2 diabetes. Therefore, every patient may receive different types of diabetes education according to their types of treatment or diabetes.

Mostly, patients are taught in clinical settings such as the outpatient or managed care setting (Martin et al., 2008). However, some patients may also receive diabetes education at other settings such as at their home or worksite, camp setting and school (Wilson and Gyi, 2010). In the clinical settings, in particular, diabetes education for the outpatients is conducted either synchronously or non-synchronously with the patients' clinic appointment (Gold, Yu, Liang et al., 2008). Patients are either taught individually or through group-based education (Duke, Colagiuri and Colagiuri, 2009; Martin, 2012; Peeples and Austin, 2007). However, the AADE (2007) has emphasised that diabetes education should be delivered individually because every patient is unique due to several factors such their culture, health beliefs and lifestyle, as well as their self-care regimen prescribed by their physician. In some countries, patients are also taught through media (Wilson and Gyi, 2010) and web-based education (Potter, Chapman-Novakofski and Scherer, 2009).

Given the fact that patients with diabetes need to manage their disease for a lifetime, diabetes education is not a one-time class (AADE, 2011). Instead, patients should be provided with several sessions of diabetes education. This is particularly needed for patients who are treated with insulin therapy (Rakel, 2009). For instance, in the DMTAC, patients will be given individualised education in every one to two-month interval for eight consecutive visits (Lim and Lim, 2010). The diabetes educator will

evaluate the outcomes of their programme by testing or observing their patients' skills as well as ensuring that the glycaemic control is achieved (ADA, 2013).

2.3.3. Significance of self-care practices in diabetes management

Self-care is certainly one of the critical components in diabetes management. The success of diabetes treatments in controlling glycaemic levels relies greatly on patients' self-care level. Many randomised controlled-trial (RCT) studies of self-management have illustrated that those who adhere to diabetes self-care activities had better glycaemic control and less diabetes complications (DCCT, 1993; UKPDS, 1998; Delahanty, Nathan, Lachin et al., 2009). Similar findings for glycaemic control are also reported in non-trial studies (Donelly, Morris and Evans, 2007; Beléndez and Hernández-Mijares, 2009; Gibson, Song, and Alemayehu et al., 2010). In exercise, insulin-treated patients, who accumulated 30 minutes of moderate physical activity most days of the week, had 0.5% lower HbA1c level than those who did not (Kirk, Mutrie, MacIntyre et al., 2003), and those who regularly exercised had 0.2% lower HbA1c than those who was sedentary (Zoppini, Carlini and Muggeo, 2003). For insulin injection, insulin adherence explained 24% of the variance in HbA1c (Broadbent, Donkin and Stroh, 2011). In addition, patients who adhered to their insulin regimen reported that they were less likely to be absent from work and recorded less hospital admissions (Lerman, 2005; Gibson et al., 2010), as well as having a better quality of life as a result of adequate energy and sleep (Rubin, 2005).

SMBG is the cornerstone of diabetes self-care. The use of SMBG provides patients with their current glucose control and helps patients to understand the ways their diet, exercise and insulin affect their glycaemic control. Its usage not only improves

HbA1c level but also improves other aspects of self-care practices (Özmen and Boyvada, 2003). The SMBG's results guide patients in making decisions regarding the effects of medication, food intake, and exercise (Renda, 2006). Based on the results, patients can assess whether their blood glucose levels are under control and adjust their food intake, physical activity or medication in response to their blood glucose reading when necessary (ADA, 2013). Therefore, studies have shown that the HbA1c level reduced by 0.23% - 2.78% once patients initiated the SMBG (Özmen and Boyvada, 2003; Soumerai, Mah, Zhang et al., 2004; Karter, Parker, Moffet et al., 2006). The more greater of glucose tests performed, the greater the opportunities for better glycaemic control (Ozmen and Boyvada, 2003; Farmer et al., 2008; Sarwat, Ilag, Carey et al., 2010; Hendricks et al., 2013). This is because the relationship between SMBG results and HbA1c is stronger when the SMBG is performed frequently (Sarwat et al., 2010). For every one strip increased per day, HbA1c decreased by 0.12% (Karter et al., 2006). Therefore, patients with Type 1 diabetes who tested SMBG at least three times per day and those with Type 2 diabetes who tested at least once per day improved HbA1c level by 1% and 0.6% respectively than those who monitored less than these levels (Karter, Ackerson, Darbinian et al., 2001). A larger HbA1c improvement could be achieved by monitoring four times a day (Murata et al., 2003). Most importantly, SMBG testing at least three times or more per day not only improves the HbA1c readings, but also could sustain the improvement for a longer period of time (Murata et al., 2003).

However, engaging in diabetes self-care activities as recommended sometimes does not lead to better glycaemic control (Adams, Mah, Soumerai et al., 2003; Wallymahmed, Morgan, Gill et al., 2007; Tengblad, Grodzinsky, Lindström et al.,

2007). For example, Tengblad et al. (2007) determined no differences in HbA1c levels between SMBG users and non-SMBG users. Furthermore, the more frequent patients self-monitor their blood glucose level, the poorer their HbA1c level was (Beluchin, Bäz and Müller et al., 2013; Gomes et al., 2013). There are several explanations for this pattern of relationship. Patients may not know the function of their SMBG results and choose not to modify their medication, diet or exercise based on the results (Daly et al., 2009). Furthermore, glycaemic level is also determined by other factors such as depression (Lustman, Clouse, Ciechanowski et al., 2005).

Although the engagement in self-care activities does not always result in better glycaemic control, poor self-care definitely results in poor glycaemic control (Toljamo and Hentinen, 2001a; Murata et al., 2003; Lancaster, Pfeffer, McElligott et al., 2010). For instance, HbA1c was higher when patients did not adhere to their diet such as consuming higher carbohydrate (Murata et al., 2003). Poor self-care also not only increases the risk of patients getting hyperglycaemic relapse (Blaha and Elasy, 2006), it also increases the risk of getting diabetes complications (Takii, Uchigata, Tokunaga et al., 2008). As the evidence of self-care related to diabetes outcomes is increasingly reported in many studies and is subsequent to the DCCT (1993), the practice of self-care among patients with diabetes seems imperative.

2.3.4. The reality of self-care practices among patients with insulin-treated diabetes

Although the evidence of the significance of self-care practices in diabetes management has long been established, the incidence and prevalence of low practices of diabetes self-care have not changed over the decades. Most patients with

diabetes, in particular those who were treated with insulin therapy, did not completely (Lustman et al., 2005; Peyrot, Rubin, Lauritzen et al., 2005), or only partially follow their self-care regimen (Angamo et al., 2012). The rate of the incidence or prevalence varies between each self-care component, and in some cases, low. Given the differences of the self-care regimen between those who are and are not treated with insulin therapy, this review from hereon only focuses on self-care practices reported by insulin-treated patients.

Research on diabetes medications have demonstrated that not all patients with diabetes requiring insulin injection all the time adhered to their prescribed insulin (Tang, Brown, Funnell et al., 2008; Beléndez and Hernández-Mijares, 2009; Broadbent et al., 2011). In a study on 759 insulin users from a National Health Survey in Taiwan, almost all (91%) patients in the study did not inject their insulin on a regular basis (Chang, Chiou, Lin et al., 2005). The insulin injection was skipped by most patients with varying degrees of frequency, with some of them skipped it sometimes or often although they knew the insulin injection should be taken (Peyrot et al., 2010). In a study by Brod et al. (2012), most patients intentionally omitted their insulin injection. Peyrot, Barnett, Meneghini et al. (2012), who conducted a study about insulin omission in eight countries, found that 35% patients from the countries reported missing their insulin injection about three times in the past month. The highest rate of insulin omission was in Japan with a rate of 44%. Patients with Type 1 diabetes was found to skip their insulin injection occasionally (Partanen and Rissanen, 2000), while patients with Type 2 diabetes was reported to only take their insulin injection three days (Tang et al., 2008) to six days in a week (Al-Khawaldeh, Al-Hassan and Froelicher, 2012).

The average percentage of insulin adherence was only between 50% and 80% (Rajagopalan, Joyce, Smith et al., 2003; Cramer and Pugh, 2005; Lee, Balu, Cobden et al., 2006; Nair, Miller, Saseen et al., 2009; , Baser, Bouchard, DeLuzio et al., 2010; Chang, Liberman, Coulen et al., 2010; Egede, Gebregziabher, Hunt et al., 2011). Only one study, to date, demonstrates insulin adherence of 90% (Pawaskar, Camacho, Anderson et al., 2007). Several studies have used 80% (Cramer and Pugh, 2005; Lee et al., 2006; Donelly et al., 2007; Kleinman, Schaneman, and Lynch, 2008; Nair et al., 2009; Khan, Al-Abdul Lateef, Al Aithan et al., 2012; Kalyango, Owino and Nambuya, 2013) or 90% (Tan and Margarey, 2008) as the cut-off point for insulin adherence. These studies determined that only 21% to 82% patients achieved the adherence levels (Cramer and Pugh, 2005; Lee et al., 2006; Donelly et al., 2007; Tan and Margarey, 2008; Kleinman et al., 2008; Nair et al., 2009; Khan et al., 2012; Kalyango et al., 2013). A recent systematic review also found a similar proportion (43%-86%) of insulin adherence (Davies, Gagliardino, Gray et al., 2013).

Similar to insulin intake, most patients with insulin-treated diabetes also did not have a healthy diet (Peyrot et al., 2010), and often did not follow their dietary recommendation (Lustman et al., 2005; Beléndez et al., 2009). Only 70.8%, 66-67% or 39% patients reported to have been following their diet guidelines (Weijman, Ros, Rutten, et al., 2005a) and eating regularly (Toljamo and Hentinen, 2001a; Weijman et al., 2005a). Many patients did not assess and keep track of their diet and nutrient content daily (Toljamo and Hentinen, 2001a). More than half of patients (n=461) in the Third National Health and Nutrition Examination Survey (NHANES III) by Nelson, Reiber and Boyko (2002) and over two-third of patients in a study conducted

by Hendricks et al. (2013) reported to have been consuming fat more than the recommended amount. Restricted food such as sweet meals and desserts were also consumed frequently (Meeto, 2004). Only 48.2% had vegetable and fruits daily (Angamo et al., 2013) while only 20-40% consumed the amount of vegetables and fruits as recommended daily (Campbell et al., 2011; Nelson et al., 2002). The number of meals per day, including snacks, was reported to be between two to seven with the majority (74%) had four or more meals/snacks per day (Hendricks et al., 2013), which is above the recommended number of meals for insulin users (ADA, 2012b; Diabetes UK, 2010; CPG, 2009).

In terms of self-care practice of exercise, the number of patients who were engaged in regular exercise, either moderate or vigorous activities at the recommended level, was only between 20%-30% (Nelson et al., 2002; Campbell et al., 2011; Hendricks et al., 2013). A higher proportion (60-71%) either did not do any exercise or scarcely did exercise that was below than recommended level (Toljamo and Hentinen, 2001a; Nelson et al., 2002; Peyrot et al., 2010; Campbell et al., 2011). Only one study (Wallymahmed et al., 2007) reported a higher proportion of insulin-treated patients (70%) who were engaged in vigorous activities at the recommended level. In addition, only one study reported Type 1 diabetes patients exercised around 140 minutes in a week (Plotnikoff, Lippke, Courneya, et al., 2010) while Type 2 insulin-treated patients were found to be sedentary (Wisse, Rookhuizen, de Kruif et al., 2010).

The practice of SMBG, although is considered central in diabetes self-care, seems to be given less attention compared to other self-care components. Data from various

sources such as patient self-reports, medical records and pharmacy databases, have shown that about 20-40% patients with diabetes treated with insulin did not monitor their blood glucose level at all (Davis, Bruce and Davis, 2006; Tengblad et al., 2007). A study conducted by Angamo et al. (2013) demonstrates the highest proportion of patients (93.3%) who never tested their blood glucose at home. Only two studies reported that about 80% of those treated with insulin practiced daily SMBG (Centers for Disease Control and Prevention (CDC), 2007; Levine, Allison, Cherrington et al., 2009).

Among those who performed SMBG, nevertheless, the frequency of SMBG tested per day was below the recommended level (Farmer et al., 2008; Polonsky, Fisher, Hessler et al., 2011). Only 34%-70% of patients with Type 1 diabetes and 22%-85% of patients with Type 2 diabetes reported to have been performing SMBG at least three times per day (Lecomte, Romon, Fosse et al., 2008; Beléndez and Hernández-Mijares, 2009) and at least one or two times per day respectively (Davis et al., 2006; Tengblad et al., 2007; Nwasuruba, Khan and Egede, 2007; Lecomte et al., 2008). A five-year longitudinal study demonstrates that the number of patients who monitored at least once per day remains the same even the number of insulin users was double five years later (Davis et al., 2006). The finding from studies that used pharmacy database to investigate SMBG frequency based on the number of glucose strips claimed by patients also revealed that the frequency of tests was below the recommended level which is between two to three strips per day (Sanyal et al., 2008; Belsey et al., 2009; Yeaw et al., 2012). In the USA, the ADA (2013) has recommended SMBG to be performed at least four times a day for patients who are on intensive insulin regimens. However, a study conducted in the country found that

only 31% of such patients met the recommended frequency (Hendricks et al., 2013). Even worse, in a study of 1076 patients with multiple daily insulin injections, 61% of the patients reported to not monitor their blood glucose level daily (Hansen, Pedersen-Bjergaard, Heller et al., 2009).

Studies examining the multiple self-care components have shown that patients were more likely to take insulin injection as prescribed than other self-care activities (Toljamo and Hentinen, 2001a; Peyrot et al., 2005; Weijman et al., 2005a; Riaz, Basit, Fawwad et al., 2013). Weijman et al. (2005a) and Weijman, Ros, Rutten et al. (2005b) investigated diabetes self-care practices in work place among 317 employees aged between 30-60 years from three outpatient clinics. The patients were asked to answer a questionnaire about the frequency of their self-care practices in the workplace. The proportion of employees who injected their insulin according to the recommended frequency and dosage, followed dietary guidelines, ate regularly, monitored blood glucose and adjusted their insulin according to specific circumstances on a daily basis, were 96%, 70.8%, 65.6%, 47.8% and 54.3% respectively. In contrast to Weijman et al. (2005a) and Weijman et al. (2005b), Toljamo and Hentinen (2001b) not only found that more patients (85%) accomplished insulin injection daily than other self-care components, but there were also patients who reported neglecting all aspects of the self-care practices. A study conducted by Hendricks et al. (2013) shows that only 2% (n=1) of the study samples adhered to diet, exercise and SMG recommendations. Most importantly, those who have poor adherence were associated with the non-practice of SMBG (Lerman, Lozana, Villa et al., 2004). In conclusion, all components of diabetes self-care

practices among patients who are treated with insulin therapy remain low and discouraging.

2.4. Health beliefs in self-care practices

Given the importance of diabetes self-care for glycaemic control, there is a need for healthcare providers to understand and manage factors that trigger some patients to engage in diabetes self-care activities while some do not in order to improve patients' self-care practices. Numerous factors have been reported to influence diabetes self-care practices, ranging from patient factors to health care system factors (Delamater, 2006). However, it was found that patient factors are more important than the health care system factors (Vermeire, Hearnshaw, Rätsep et al., 2007). Hence, priority should be given to patients' factors as the decision on whether to carry out such activities is in the patients' hands. For example, healthcare providers can provide the best diabetes education in encouraging and supporting patients to assume such active responsibilities, yet it is the patients' choice whether to implement or ignore the recommendations.

Patients' demographic characteristics such as age, gender, (Moreau, Aroles, Souweine et al., 2009; Gibson et al, 2010; Gomes et al., 2013), ethnicity (Trinacty, Adams and Soumerai et al., 2007), diabetes duration and socioeconomic status, are often reported in the literature as the factors that influence patients to self-manage their diabetes (Hendricks et al., 2013). For example, younger adults were less likely to follow their dietary guidelines and regular eating (Weijman et al., 2005b) as well as reported to exhibit a lower frequency of SMBG (Hansen et al., 2009). However, little can be done to these factors as there are not amenable to change.

Another influential factor is patients' knowledge of diabetes and its treatments. Patients with such knowledge were more likely to engage in their self-care activities (Persell, Keating, Landrum et al., 2004; Lerman et al., 2004; Chlebowy et al., 2010), compared to those who did not have the knowledge (Daly et al., 2009). However, evidence has shown that having the knowledge alone would not necessarily guarantee that patients would engage in their self-care activities (Siguroardottir, 2005) especially in the presence of health beliefs (Nam, Chesla, Stotts et al., 2011). In fact, there is evidence to suggest that knowledge affects patients' self-care practices through health beliefs held by the patients (Xu, Toobert, Savage et al., 2008). Health beliefs have widely been reported in many studies as factors that play an important role in diabetes self-care practices (Nagelkerk et al., 2006; Vermeire et al., 2007; Aikens and Piette., 2009; Mann, Ponieman, Leventhal et al., 2009; Broadbent et al., 2011; Gherman et al., 2011).

2.4.1. What are health beliefs in self-care practices?

Beliefs are defined as things that are accepted as true (Purnell and Paulanka, 1998) and in health, beliefs are “the personal convictions that influence health behaviours” (Anderson, Keith and Novak, 2002, p. 784). Health beliefs stem from one's knowledge (Spikmans, Brug, Doven et al., 2003; Hortensius, et al., 2012a), and vary according to the level of knowledge held by an individual (Tan, 2004), and are influenced by cultures (Hjelm, Bard, Nyberg et al., 2003; Thornton, Kieffer, Salabarria-Pena et al., 2006), religion (Ariff and Beng, 2006; Caban and Walker, 2006; Samuel-Hodge, Watkins, Rowell et al., 2008), race and socioeconomic status (Ford, Havstad, Brooks et al., 2002).

In diabetes, the regimen is complex and requires behaviour and lifestyle change which somehow triggers an individual's beliefs. It is a basis of consideration that patients use to make their decision about whether or not to perform diabetes treatment recommended to them (Audulv, Norbergh, Asplund et al., 2009). There are many types of health beliefs such as illness beliefs, treatment beliefs and adherence beliefs (Vermeire, Royen, Coenen et al., 2003; Vermeire et al., 2007; Gherman et al., 2011; Nam et al., 2011; Hortensius et al., 2012a). The findings from qualitative studies have indicated that patients' beliefs are the foundation upon which their self-care behaviours are formed (Vermiere et al., 2003; Lai, Chie and Lew-Ting, 2007; Nair, Levine, Lohfeld et al., 2007; Ali and Jusoff, 2009). Patients will make the decision to engage in self-care activities based on what they think work for themselves (Nair et al., 2007).

Many quantitative studies have tested the association between various types of health beliefs and diabetes self-care practices, especially beliefs regarding illness and its treatment (Searle, Norman, Thompson et al., 2007; Mann et al., 2009; Gherman et al., 2011). The findings of these studies have demonstrated that health beliefs have significant relationships with patients' diabetes self-care practices. The beliefs can either be facilitator or obstacles to their diabetes self-care activities (Hortensius et al., 2012a). For example, the beliefs that diabetes is a severe disease, adherence has benefits, and their diabetes treatment (insulin/medication, diet, exercise and SMBG) is effective as well as fewer barriers to undertake those treatments were associated with higher self-care practices (Gherman et al., 2011). On the other hand, perceptions such as diabetes has less consequences, they only have diabetes when the blood glucose level is high, they do not need to take medication when the blood glucose

level is normal, they are concerned about the side effects and diabetes medication is difficult to take due to its complexity, were all associated with lower engagement in self-care practices (Mann et al., 2009). Health beliefs held by every patient, nevertheless, differ from one to another depending on the demographic characteristics such age and gender (Searle et al., 2007; Aikens and Piette, 2009).

2.4.2. The importance of targeting on health beliefs

Health beliefs are amenable to change. Evidence has suggested that self-care practices may be improved by altering patients' health beliefs (Speer, Reddy, Lommel et al., 2008). Therefore, there have been increasing emphases placed on health beliefs for behavioural change to enhance adherence (Funnell, Kruger and Spencer, 2004; Delamater, 2006; Moreau et al., 2009). Specifically, health beliefs have been emphasised as one of the important elements that must be taken into account when educating patients with diabetes (Powers, Carstensen, Colón et al., 2006; Funnell et al., 2008; Garvin III, Peragallo-Dittko and Rodgers, 2010; Mensing, Boucher, Cypress et al., 2010). Healthcare providers, in particular diabetes educators, can modify patients' health beliefs that are not conducive to performing diabetes self-care through their diabetes education programme.

Nevertheless, in order to do so, diabetes educators firstly need to understand their patients' health beliefs so that they can develop their educational intervention (e.g. contents and tools) based on the appropriate health beliefs for a particular patient before the education takes place (Funnell et al., 2009; CPG, 2009; Garvin III, Peragallo-Dittko and Rodgers, 2010). By doing so, the message delivered can be tailored to target on the specific beliefs that hinder patients from self-managing their

diabetes. As mentioned in the previous sections, health beliefs are of various types. Therefore, eliciting the types of health beliefs that facilitate and prevent patients from engaging in self-care practices is important to inform diabetes educators (Delamater, 2006).

2.4.3. Theories of health beliefs

There are various health belief theories such as Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Self-regulation Theory and Health Belief Model (HBM), which are often used to elicit patients' health beliefs in relation to diabetes self-care practices. Each of the theories provides a framework to explain, predict and modify a wide variety of health behaviours. The TRA was created by Ajzen and Fishbein (1980; in Clark and Becker 1998). This theory proposes two types of health beliefs; perceptions of social pressure to perform the action (the subjective norm/normative beliefs) (i.e. beliefs held about certain groups or people who think that one should not engage in the behaviour) and beliefs that a particular behaviour leads to certain outcomes (the attitudes). These two beliefs form one's intention whether to perform health behaviours. This theory assumes that individuals' intentions are the strong predictors of behaviour change.

The TPB is an extension of the TRA (Ajzen, 1991; in Clark and Becker, 1998). In this theory, another element of belief, which is called perceived behavioural control, has been added to the original theory. Perceived behavioural control is an individual's belief that they can control a particular behaviour. This theory is more appropriate than the TRA, especially when the probability of success due to a relative lack of control over performance is less than guaranteed. When the

probability of success is guaranteed, both theories are considered appropriate. Nevertheless, these theories predict intentional behaviours and not the actual behaviours.

Leventhal, Meyer and Gutmann (1980; in Clark and Becker, 1998), through his Self-regulatory model of illness focused on the ideas and beliefs that individuals have about illness. The model (also known as the Illness Representation Model, Personal Model of Illness or Common Sense Model) views the individual as a scientist; formulating hypotheses regarding the physiology and causes of illness, establishing goals to cope with the problems and emotions they generate, planning actions and responses to reach his/her goals, and monitoring and appraising one's reactions. This new information is used to adjust one's coping behaviours and set new criteria for evaluating and revising future goals.

In contrast, the HBM provides a framework to predict actual behaviours based on not only the beliefs about an illness but also in its treatments as well. There are five main components inherent to this model (see Figure 1): perceived severity (an individual's assessment of the seriousness of the condition, and its potential consequences), perceived susceptibility (an individual's assessment of their risk of getting the condition and its potential consequences), perceived benefits (an individual's assessment of the positive consequences of adopting the behaviour/prescribed treatment), perceived barriers (an individual's assessment of the influences that facilitates or discourages adoption of the promoted behaviour/prescribed treatment such as inconvenient, unpleasant, painful and expensive) and cues to action which may be internal (e.g. physical symptoms of

health condition) or external (e.g. information provided or sought and reminders by others) to trigger the decision-making process.

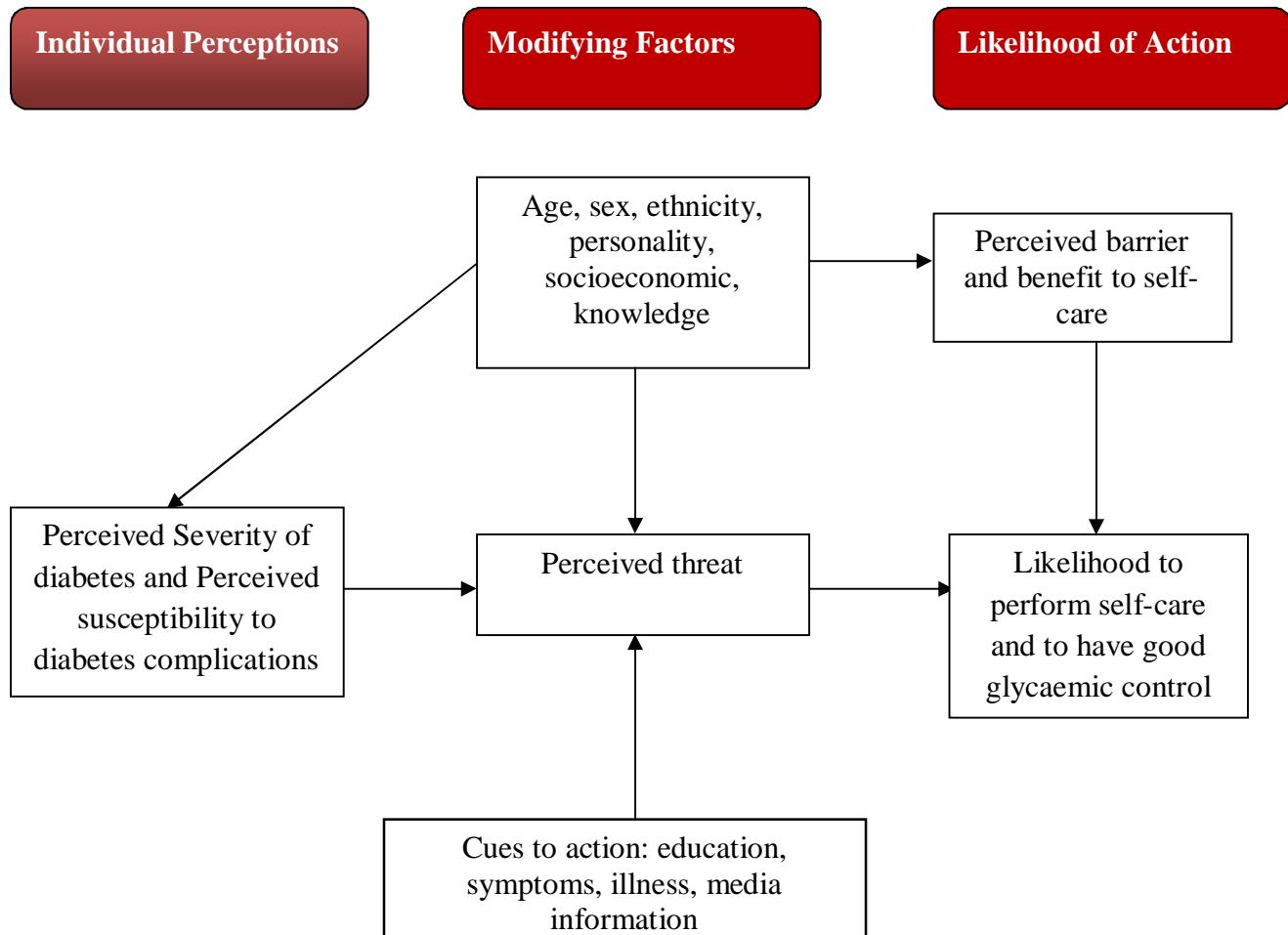


Figure 1. From the Health Belief Model Reprinted with permission of John Wiley and Sons from p. 48 of: Strecher, V. J., and Rosenstock, I. M. (1997).

According to the HBM, an individual is more likely to take recommendation if he/she 1) perceives himself susceptible to the condition 2) perceives a given health problem to be serious 3) perceives the benefits of the health action 4) perceives limited barrier to the action 5) has the stimuli or cues to action in the environment to trigger the decision-making process. More specifically, individuals are most likely to adopt a particular behaviour when perceived susceptibility and perceived severity are

high and when the perceived benefits of the behaviour in question outweigh any barriers. In the HBM, the person makes a subjective judgment about the potential consequences or outcomes by weighing the benefits versus the costs. Costs or barriers can be physical, emotional and socioeconomic, such as fear of side effects of the treatment, discomfort and pain stemming from the action or condition, complexity or difficulty of the regimen, high financial outlay and inconvenience (Janz and Becker, 1984). In a situation where an action is perceived as beneficial and is at the same time perceived as inconvenient, the model speculates that the person may still decide not to take action.

In addition, there are modifying variables that may influence one's health beliefs or decisions to act such as demographic (e.g., age, sex, race, ethnicity), socio-psychological (e.g., social class, peer influence), and structural factors (e.g., knowledge about the disease, prior contact or experience with the disease). These variables may affect a person's perceptions and thus indirectly influence health-related behaviours. Conner and Armitage (2002) assert that the particular health-related action each individual selects to follow is determined by the evaluation of the possible alternatives. In other words, the individual's final decision regarding health care recommendations depends on the demographic variables, social pressure and personal characteristics as well as personal beliefs. Therefore, the HBM maintains that health-related behaviours are determined by whether individuals perceive themselves to be susceptible to a particular health problem, regard this as a serious problem, are convinced that treatment or prevention activities are effective yet not overly costly in terms of money, effort or pain, and are exposed to an incentive to take a health action (Elder, Ayala, and Harris, 1999).

The model originates from the psychosocial theory work, particularly the work of Lewin (Rosenstock, 1974). It was then developed by the United States Public Health researchers to understand and predict the lack of participation in preventive programmes for individuals at risk for developing medical illnesses (Rosenstock, 1960; Rosenstock, 1966; Hochbaum, 1958, as cited in Abraham and Sheeran, 2005). Later, it was used to measure compliance behaviours to medical regimen in acute and chronic diseases (Becker, 1974). The HBM was reported as the most frequently used theory in health behaviour research (Painter, Borba, Hynes et al., 2008). In fact, there is evidence to suggest that HBM is stronger than the TRA in predicting self-care behaviours (Nijhof, Ter Hoeven and De Jong, 2008). Since evidence demonstrates that the HBM is more capable than other health belief theories to predict behaviours, the findings of diabetes self-care studies that are based on the HBM are reviewed in the next section.

2.5. Empirical studies of Health Belief Model (HBM) in diabetes self-care

Health Belief Model (HBM) is a behavioural theory of understanding why individuals do or do not engage in various health-related actions. The model is useful in explaining the behaviour that is in a person's direct control as in self-care. A degree of predictive value is determined for a broad variety of such behaviours (Becker, 1974; Janz and Becker, 1984; Harrison, Mullen, and Green, 1992). Perceived barriers are the most influential constructs for explaining and predicting health-related behaviours. This is followed by perceived susceptibility, perceived benefits and lastly perceived severity (Janz and Becker, 1984). The HBM is increasingly used in diabetes to measure the relationship between self-care practices and health beliefs (Park, Kim, Kim, et al., 2010; Gutierrez and Long,

2011; Pourghaznein, Ghaffar, Hasanzdeh et al., 2013; Adejoh, 2014).

2.5.1. Relationships with self-care practices

As mentioned earlier, diabetes is a severe disease which can lead to many micro- and macrovascular complications. The possibility of a person with diabetes to develop such complications is high especially in the case where they do not engage in recommended diabetes self-care activities. However, the benefits of self-care on diabetes outcomes, such as the glycaemic level and diabetes complications, are not immediate and tangible. Aside from the uncertainty regarding its effectiveness, there are many barriers to diabetes self-care activities that may occur due to the nature of the activities which are complex and aversive. Based on the HBM, it is assumed that patients would engage in their diabetes self-care activities, provided that they perceive diabetes and its complications to be severe, and that they would be susceptible to the diabetes complications if they do not engage in the self-care activities, and perceive the benefits of self-care practices to outweigh its barriers. They also have some internal and/or external cues to action such as symptoms of hypoglycaemia.

The HBM has been utilised to understand or explain self-care behaviours in diabetes for insulin-treated patients for several decades. In 1980, Cerkoney and Hart tested the ability of the HBM to predict self-care practices of insulin adherence, diet and urine testing (instead of blood testing as in the current diabetes management today) in thirty insulin-treated patients with both Type 1 and Type 2 diabetes mellitus of a community hospital in the United States (US). Self-care of exercise was not examined in this study. All participants had attended diabetes education classes for a

duration of 6-12 months before they participated in the study. The patients were interviewed at their homes about their health beliefs and levels of adherence to each of their self-care activities. In addition to the interview, direct observation methods were used to collect data regarding insulin intake practice and urine testing. The investigators found that the HBM was predictive of the insulin intake with 16% of the variance. In addition, a significant correlation was attained for cues to action and insulin intake practice. However, it should be noted that the insulin intake practice was defined as to the extent to which participants complied with the steps of insulin administration, and not the daily intake of insulin injection.

In the following years, another study investigated the effectiveness of the HBM to predict diabetes self-care practices. Unlike the aforementioned study, its participants were adolescents (N=56) and the participants were patients with Type I diabetes only (Bond et al., 1992). The adolescents were recruited from several sources in the US. The researchers measured the adolescents' health beliefs by interviewing them about their health beliefs at their home using a combination of questions from three questionnaires; *Diabetes Health Belief Scale (DHBS)*, *Diabetes Health Belief Questionnaire (DHBQ)* and *Barriers to Adherence Questionnaire (BAQ)*. The researchers then interviewed the adolescents via telephone about their self-care practice of exercise, insulin injection, diet and SMBG frequency. Nevertheless, the diet and the SMBG were combined to be a single variable. Furthermore, four of the HBM constructs were combined into two pairs due to the small sample size; a single construct of perceived severity and perceived susceptibility (became perceived threat) and perceived benefits and perceived barrier (became perceived benefits-barriers). The study yielded similar findings to Cerkoney and Hart (1980) for insulin

intake practice; the HBM as a model and one of its constructs (cues to action) were predictive. However, the variance was only 7%, which is smaller than Cerkoney and Hart (1980). This difference may not be comparable as this study measured patients' adherence to their insulin injection regime whereas the study mentioned earlier assessed patients' adherence to the insulin administration steps. In the study, the model also predicted the variable of a combination of the SMBG and diet. As it is a combination variable, the ability of the HBM to predict these practices is not clear. As mentioned at the beginning of this chapter, each self-care practice needs to be examined separately as they are not multidimensional in nature (Toobert and Glasgow, 1994; Toobert et al., 2000; Orme and Binik, 1989)

Later in 2005, Patino et al. also tested the effectiveness of the HBM to predict regimen adherence in adolescents (N=74, aged 11-18 years) with Type 1 diabetes which was also conducted in the US. The self-care regimen was insulin and dietary adherence, exercise and blood glucose testing. This study, nevertheless, combined the insulin intake practice and diet as a single variable. This study used the DHBQ, one of the questionnaire used in the study by Bond et al. (1992), to measure the HBM. However, neither the HBM nor its individual constructs significantly predicted adherence to the individual self-care regimen component in the study. The adolescents in the study were younger than those involved in Bond et al. (1992) and the study investigators claimed that health beliefs might be less relevant for younger people.

On the other hand, other studies investigated the HBM constructs on diet adherence and the SMBG only (Aalto and Uutela, 1997; Gillbrand and Stevenson, 2006). The

former study, (Aalto and Uutela, 1997), was conducted on insulin-treated patients with Type 1 diabetes (N=270) aged 20-64 years from three district hospitals in Finland. The latter (Gillbrand and Stevenson, 2006) was also conducted on patients with Type 1 diabetes but were younger than the above study (aged 16-25 years) from four hospitals in the United Kingdom. In both studies, perceived severity was multiplied by perceived susceptibility, while perceived barriers were subtracted from perceived benefit (perceived net benefits) and cues to action were measured on both external and internal cues to actions separately. The studies determined that the perceived net benefits were significantly predictive of both of the self-care behaviours, while the external cues to action predicted diet adherence and internal cues to action predicted the SMBG. The results are contrary to previous studies which found that those constructs were not predictive for diet (Cerkoney and Hart, 1980) and the SMBG (Patino et al., 2005). However, the findings could not be compared to the previous studies as perceived benefits and perceived barriers were tested individually while the external and internal cues to action were combined as single cues to action construct (Cerkoney and Hart, 1980; Patino et al., 2005). Furthermore, Patino et al. (2005) investigated adolescents, and not adults. There is evidence to suggest that adolescents were not able to act based on benefits (Brownlee-Duffeck et al., 1987).

The relations between the SMBG and perceived benefits and barriers were supported by the findings in a study by Wdowick et al. (2001). In this study, the researchers have examined the HBM constructs as part of their theoretical framework to develop a scale in their study on college students. Eighty-four college students diagnosed with Type 1 diabetes from 22 colleges in the US participated in the study. Perceived

benefits and barriers were tested as in Aalto and Uutela (1997) and Gillbrand and Stevenson (2006). Although the study participants were adults, the predictive ability of the constructs was only found for blood sugar testing but did not support the relationship for diet as well as for insulin intake practice.

In other studies, although the model and/ or its constructs were predictive, their findings were uncertain due to several reasons. For example, Brownlee-Duffeck et al. (1987) did not test the model on each of the self-care practices separately, but rather combined all the self-care components into a single score. As aforementioned, self-care practice is not multidimensional variables, and that different health beliefs may predict different components of self-care. On the other hand, other researchers included both insulin and non-insulin treated patients in their study; nonetheless, they did not do separate analyses of medication adherence (Aljasem, Peyrot, Wissow et al., 2001; Koch, 2002; Park et al., 2010; Gutierrez and Long, 2011; Pourghaznein et al., 2013), diet (Park et al., 2010; Gutierrez and Long, 2011; Pourghaznein et al., 2013) and exercise (Aljasem et al., 2001; Koch, 2002) for insulin-treated patients. Self-care regimen for patients who are treated with insulin therapy is different than those who are non-insulin treated patients. This might affect their health beliefs.

Moreover, based on the literature reviewed, it can be concluded that there is no evidence to suggest that health beliefs proposed by the HBM are important influential factors for the exercise self-care practice among patients with insulin-treated diabetes. However, the evidence is only based on two studies which only investigated exercise behaviours in adolescents (Bond et al., 1992 and Patino et al., 2005), and that only one study was conducted in adults (Wdowick et al., 2001). As

mentioned earlier, health beliefs in adolescents and adults are different. Therefore, it is difficult to rely on these three studies in postulating that the exercise self-care practice was not related to the health beliefs proposed by the HBM. Based on the studies investigating non-insulin dependent patients, the model and each of its constructs were predictive of or related to the exercise self-care practice in adults. For example, Pham, Fortinand and Thibaudeau (1996) determined that there were relationships between the HBM constructs and the exercise self-care practice in 76 non-insulin treated patients. Specifically, perceived barriers were related to adherence to the practice of exercise in correlation analysis and multiple regression analysis. Another example is found in a study by Koch (2002) who carried out an investigation on a high-risk population of African-American females with Type 2 diabetes aged 50 years and above who engaged in exercises regularly versus the non-exercisers. The researcher found that those who exercised regularly perceived fewer barriers to exercise and perceived greater benefits from exercising compared to non-exercisers.

2.5.2. Relationships with glycaemic control

The utilisation of the HBM in diabetes self-care studies has gone beyond its initial purpose. The model is not only used to predict behaviours, but also glycaemic control regarded as a physiological measure for self-care practices. Glycaemic control, which is often measured based on patients' HbA1c level, has been well-recognised as an indicator of patients' self-care practices, although there has been a controversial issue that HbA1c does not always reflect patients' self-care practices in the case when self-care activities are well-practiced as recommended. Many researchers have tested the HBM on patients' glycaemic control either as an

additional measure to patients' behaviours of self-care (Brownlee-Duffeck et al., 1987; Bond et al., 1992; Wooldridge, Wallston, Graber et al., 1992; Wdowick et al., 2001; Patino et al., 2005) or as a standalone measure (Coates and Boore, 1998).

Of the above studies, the findings from Brownlee-Duffeck et al. (1987) reveal that the HBM significantly predicted glycaemic control. The study consisted of 143 patients with Type 1 diabetes from a teaching hospital, clinics, private practice clinics and a research centre, whose age ranged from 13-64 years. Specifically, the data were first analysed for two groups: the younger (13-26 years old) and older group (13-64 years old). The amount of glycaemic control variance accounted for by the HBM was 20%, 19% and 16% for the younger, older and the combination group respectively. In the younger group, the glycaemic control was predicted by perceived severity and susceptibility. The glycaemic control in the older group, however, was predicted by perceived barriers and benefits. When the two groups were combined, perceived susceptibility, perceived barriers and perceived benefits were predictive of glycaemic control. However, the relation between perceived susceptibility and glycaemic control in the younger group was contrary to the HBM. The researchers suggested two explanations for the two conflicting findings; 1) the participants might realise that they were more susceptible to diabetes complications as they had poorer glycaemic control. 2) The younger patients might react to their susceptibility with denial. The study, nevertheless, has suggested that a further study is warranted to clarify the conflicting relationship.

In addition, there is evidence to suggest that health beliefs proposed by the HBM were more powerful in predicting glycaemic control than behaviours (Harris and

Linn, 1985; Daniel and Messer, 2002). The variance of the HBM in predicting HbA1c was also higher than self-care practice (Brownlee-Duffeck, et al., 1987). Nevertheless, this evidence is scarce as other studies did not include glycaemic control (Aalto and Uutela, 1997; Gillbrand and Stevenson, 2006). It seems like a trend in diabetes studies that examine the HBM and self-care practices not to include glycaemic control as the additional measure of self-care behaviours (Morovati and Rouhani, 2009; Park et al., 2010; Gutierrez and Long, 2011; Ayele, Tesfa, Abebe, et al., 2012; Pourghaznein et al., 2013).

2.5.3. Limitations in previous studies and directions for future research

The HBM has been used for decades to explain and predict the roles of health beliefs in self-care practices among insulin-treated patients. Nevertheless, the findings are inconclusive due to some limitations in the studies reviewed. This includes the applicability of the HBM in the studies, the study design, the samples and the setting as well as its context. These are explained in the following subsections:

2.5.3.1. The applicability of the HBM and self-care measures

According to Harisson et al. (1992), a theory must be used in its entirety in order to be useful. Nevertheless, very few studies have fully investigated the HBM when explaining or predicting self-care behaviours in patients with insulin-treated diabetes (Cerkoney et al., 1980; Brownlee-Duffeck et al., 1987; Bond et al., 1992; Patino et al., 2005), while some did not measure the entire constructs of the HBM especially the cues to action (Coates and Boore, 1998). In addition, most studies that tested the whole of the HBM did not test for each of the self-care components. For instance, the diet and the SMBG were combined in Bond et al. (1992), whilst in Patino et al.

(2005), the study combined the insulin and the diet to become a single variable. Therefore, little is known about the ability of the HBM to predict self-care components especially the diet and the SMBG.

2.5.3.2. Methodological weaknesses

The findings with regard to the relations between the HBM constructs and the self-care practices in diabetes for insulin-treated patients in previous studies are inconsistent. Some studies determined that the self-care practices or glycaemic control can be predicted by the HBM and/or some of its constructs (Cerkoney and Hart, 1980; Brownlee-Duffeck et al., 1987; Bond et al., 1992; Aalto and Uutela, 1997; Wdowick et al., 2001) while others found no evidence in relation to this knowledge (Wooldridge et al., 1992; Coates and Boore, 1998; Patino et al., 2005). In addition, the direction of relationships between some of the HBM constructs and glycaemic control are also conflicting because what some studies have demonstrated are in contrast to what have been proposed by the HBM (Brownlee-Duffeck et al., 1987). One possible explanation for the inconsistent findings could be due to the methodological approach used in the studies where all those studies were conducted cross-sectionally.

The original developer of the HBM has emphasised the need of using a longitudinal approach when studying one's perceptions due to the reason that health beliefs would change after the particular behaviours are adopted (Rosenstock, 1966). Lewis and Bradley (1994) also support the fact that health beliefs would change over time and/or the course of the disease while Polit and Hungler (1997) highlight that health beliefs sometimes do not occur at a single moment in time, hence investigating the

model using the cross-sectional approach would lead to inaccurate results. This was demonstrated when the relationships between health beliefs and HbA1c were only found at the follow-up and not at the baseline in a longitudinal study by Daniel and Messer (2002). The study was conducted on 34 patients with diabetes for an 18-month period. The HBM constructs significantly predicted HbA1ct 18 months later. The baseline findings show that all the HBM constructs did not correlate with HbA1C.

Furthermore, Janz and Becker (1984) argue that some cross-sectional relationships are weaker than the relationships in longitudinal studies. The use of a cross-sectional approach when studying health beliefs could lead to the opposite pattern of results. It has been suggested that the length of time can influence the relationship between health beliefs measured at time one and behaviours at time two, in which the longer the length of measurement between these two variables, the weaker the relationship. This is because health beliefs might change after it was measured but before the behaviour was chosen (Carpenter, 2010). These could explain the reason why there was an opposite direction in the relationship between health beliefs suggested by the HBM and HbA1c (Brownlee-Duffeck et al., 1987).

Moreover, the relationships found in a cross-sectional study cannot be inferred. Since most of the studies reviewed were cross-sectional in nature, their findings only show the nature of the association between beliefs and self-care practices, and not a causal relationship. Thus, it is not known whether the beliefs are a consequence of the practice of self-care or whether the self-care practices as a consequence of the health beliefs. Therefore, many researchers have suggested future studies, which examine

the relationship between health beliefs and self-care behaviours, should conduct a longitudinal study to elucidate the nature of the relationship (Gherman et al., 2011).

However, until now researchers in diabetes self-care studies continue utilising the HBM using the cross-sectional design. A review done by Carpenter (2010) to examine longitudinal studies on the effectiveness of the HBM constructs in predicting behaviours, demonstrates that between 1982 to 2007, no study was published in regards to diabetes self-care practices. This indicates that a longitudinal study is lacking and highly needed to address this gap. This research approach enables a study on the same issue to be replicated on the same study sample over a study period (Leedy and Ormrod, 2001; Creswell, 2002). Data collected using this approach can be compared between one period and another (Carter, 2000), thus it can ensure whether health beliefs in this study remain stable or change after self-care practices have been adopted. The data can also be tested at any or each point of the study period (Murphy-Black, 2002) so that the ability of the health beliefs to predict self-care practices can be examined at different points to ensure the stability of the predictive ability over time. In addition, by using the longitudinal approach, the fact that self-care practices may be difficult to initiate or maintain, was taken into account.

2.5.3.3. Study samples and settings

The usefulness of the HBM to predict self-care practices is still questionable for adults with insulin-treated diabetes mellitus because there is less evidence supporting its use for this population. For example, most studies that tested the model for exercise self-care practice were performed on adolescents only (Bond et

al., 1992; Patino et al., 2005). Similarly, the evidence about the predictive ability of the model for glycaemic control is mainly based on adolescents (Bond et al., 1992; Patino et al., 2005), or integrated adolescents and adults in a single study (Brownlee-Duffeck et al., 1987). The findings involving adolescents may not be appropriate to generalise to adult patients as there is evidence to suggest that adolescents and adults may hold different health beliefs about their self-care (Brownlee-Duffeck et al. 1987; Harvey and Lawson, 2009). Their self-care practices may also differ because during the adolescence period, patients share the responsibilities of diabetes self-care with their parents (Schilling, Knafl and Grey, 2006; Anderson, Svoren and Laffel, 2007; Karlsson Arman and Wikblad, 2008; Anderson, Holmbeck, Iannotti et al., 2009). Although there is one study that has been conducted on insulin-treated patients for adult populations (Cerkoney and Hart, 1980), the study is now already more than thirty years old and since then diabetes management has changed.

Moreover, despite the increased prevalence of insulin users among Type 2 diabetes (Lerman et al., 2004; Mulnier, Seaman, Lovell et al., 2005; Müller et al., 2011; Tiv, Viel, Mauny et al., 2012), the knowledge of health beliefs, as proposed by the HBM for self-care practices in this population, is lacking because almost all studies only focused on Type 1 diabetes and excluded such patients. The findings from self-care practice studies have demonstrated that patients with Type 2 insulin-treated diabetes have higher non-adherence to their insulin injections compared to patients with Type 1 diabetes (Peyrot et al., 2005; Peyrot et al., 2012). Therefore, an investigation involving such patients is needed in order to understand their health beliefs on self-care practices.

Furthermore, all studies were conducted in Western countries. To date, the knowledge of the relationship between the HBM and the self-care practices in patients with insulin-treated diabetes is lacking in Malaysian context. The previous study that was conducted in Malaysia only provides the descriptive findings of health beliefs possessed by Malaysians treated with insulin therapy and did not test the model for its relationship with self-care practices (Tan, 2004). The self-care practices also were totaled into a single score which is not appropriate as self-care is multidimensional in nature (Toobert and Glasgow, 1994; Toobert et al., 2000; Orme and Binik, 1989). Therefore, although the study does show that the HBM constructs are related to adherence to self-care regimen, the ability of the model to predict self-care practices in insulin-treated patients for insulin intake practice, diet, exercise and SMBG is still not ascertained. Furthermore, the study only focuses on patients with Type 2 diabetes with a small number of patients who were with insulin therapy (< 20% of the study samples). Moreover, the study only examines Chinese population. Since Malaysia is a multiracial country, the study is regarded not representative of the country as the relationship between the health beliefs and self-care practices in other ethnic groups is unknown. Moreover, the health beliefs may have some influences from the culture of a person with. For example, in Malaysia, diabetes is often thought as ‘sweet urine’ or ‘*kencing manis*’ due to high blood sugar level not thought to be associated with other illnesses (Ariff and Beng, 2006). Therefore, the evidence generated from the existing studies cannot be directly transferred and generalised to the Malaysian context of self-care practices. Given the evidence that the diabetes population in Malaysia is escalating, there is a vital need to study their health beliefs.

2.5.3.4. The context of self-care practices

As mentioned in Section 2.3.2., patients with diabetes can only be expected to start self-care of their disease once they have been equipped with the knowledge and skills through the diabetes education. The evidence has suggested that the investigation into self-care practices should be understood from this context (Hortensius et al., 2012b). Firstly, there is a need to ensure that patients have received the diabetes education as the main source of knowledge and skills of their recommended self-care activities. This is because the level of self-care practices can vary due to their prior diabetes education. For instance, a study by Atak (2008) demonstrated that a substantial number of patients who have received the diabetes education are engaged in self-care practices compared to those who have not received the diabetes education. Other studies reported that the self-care practice is higher in those who receive the education compared to those who do not receive it (Gagliardino, Aschner, Baik et al., 2012; Gumbs, 2012), and all patients may be able to engage in their self-care if they are provided with such programmes especially the one that are conducted intensively. Therefore, the investigation into their self-care practices without identifying the level of the education possessed and received by the patients could lead to bias.

In addition, in the case where the diabetes education has been given, there is a need to know whether the information given is in accordance to the guidelines of diabetes self-management. There is a study determining the inconsistencies of the diabetes education given to patients due to changes in guidelines, albeit correct, this could lead to confusion in practice among the patients (Venters, Hunts, Pope et al., 2004), which in turn could result in improper self-care practices. Other studies

found that healthcare provider recommendations of the SMBG frequency to patients, as reported by healthcare providers and patients, differ than the guideline recommendation of the country (Polonsky et al. 2011; Yi-Frazier, Hood, Case et al., 2012; Hortensius et al., 2012b). Therefore, an investigation into the self-care practices, especially the SMBG, should explore what have been taught to patients rather than a mere identification of whether patients do receive the diabetes education.

However, among the HBM studies reviewed, only one study reported that their participants had attended the diabetes education classes 6-12 months prior to involving in their studies (Cerkoney and Hart, 1980). Despite having received the diabetes education before participating in the study, they did not completely adhere to their insulin therapy, diet and glucose monitoring (this was done based on urine). These behaviours, except insulin intake, were not related to any types of health beliefs in the HBM. Information regarding the diabetes education given to participants are not provided by the authors, thus it is unclear whether their non-adherence is due to inappropriate messages.

In other studies, it is not known whether their participants had ever received the diabetes education (Brownlee-Duffeck et al., 1987; Bond et al., 1992; Aalto and Uutela, 1997; Coates and Boore, 1998; Wdowicks et al., 2001; Patino et al., 2005; Gillbrand and Stevenson, 2006). This is because, despite the great necessity for the diabetes education, many studies from various countries have shown that not all patients with diabetes received the diabetes education (Shahpurwala, Sani, Shah et al., 2006; van de Sande et al., 2007; Strock and Mazze, 2009; Sadowski, Devlin,

and Hussain, 2012). For example, Strock and Mazze (2009) reported that only 56%, 46%, 72% and 69% patients with diabetes participated in the diabetes education in Brazil, China, India and Mexico respectively. A study conducted in the USA also reported that only 60% of the study participants had prior diabetes education (Aikens and Piette, 2009). Taub (2006) revealed that 29% and 34% of the participants in the study had never received any advice from their healthcare providers regarding the appropriate diet and exercise respectively. Even worse, a study by Shamsi, Shehab, AlNahash et al. (2013) found that most patients in their study had never been referred either to a dietitian or a health educator for dietary advice. Therefore, in order to have a broader understanding of self-care practices, it is important to explore how the diabetes education is practiced. By exploring this, it can promote a reinforced understanding of why health beliefs might or might not predict self-care practices in the study, as it has been emphasised that the HBM may not be able to make prediction if the behaviours are not related to health beliefs.

In conclusion, the review has identified three key foci for further research into health beliefs and self-care practices among insulin-treated patients:

1. There is a need to study health beliefs in self-care practices using the HBM among adults with insulin-treated diabetes, particularly in Malaysia
2. There remains a pressing need to utilise a longitudinal design when studying health beliefs
3. It is important to explore the educational context of the self-care practices

2.6. Aim of the study

Using the HBM, the study aimed to examine whether self-care practices in insulin-treated patients in Malaysia could be predicted by their health beliefs. More specifically, the objectives of the study were:

- To determine the self-care practices and health beliefs which are derived from the HBM in insulin-treated patients in Malaysia
- To examine whether the self-care practices could be predicted using the health beliefs
- To examine which of the health beliefs are the best predictor to explain the self-care practices
- To examine the influence of knowledge and demographic characteristics on the self-care practices
- To explore how diabetes education, the basic support for patients' self-care, is currently practiced in the study settings.

2.7. Summary

Diabetes mellitus is a serious disease due to its concomitant complications, which leads to physical disabilities, mortality and economic burdens worldwide. Previous trial studies have established the importance of glycaemic control in order to control the disease and its complications. The disease treatment, which includes medications (insulin injection and/or oral antidiabetic drug), diet, exercise and SMBG, are required for the glycaemic control. The treatments, however, require a high degree of self-care. Those who are engaged in diabetes self-care practices have a better glycaemic control while those who do not have poorer glycaemic control. Although the benefits of self-care practices on glycaemic control have been widely reported,

the level of self-care practices among insulin-treated patients remains considerably problematic and has not changed since over the decades ago.

Health beliefs have been known to influence patients' decision whether to engage in diabetes self-care activities. Health beliefs, as proposed by the HBM, have long been used to predict self-care practices in insulin-treated patients with diabetes. However, the findings are inconclusive. Little is known about the predictive ability of the HBM in diabetes self-care practices as most studies only tested its individual constructs while some studies combined the self-care components. In addition, the predictive ability of the individual constructs was not consistent. This may be due to the use of cross-sectional approach in all studies. It has been emphasised that a longitudinal approach is more appropriate than a cross-sectional approach when studying health beliefs. Moreover, little is known about the model and its constructs for self-care practices in adult patients because most studies have examined the HBM in adolescents or adolescents combined with adults in a single study. The findings generated from these studies cannot be directly transferred and generalised to adult patients because their health beliefs may be different. Furthermore, none of the study has been conducted in Malaysia, thus the knowledge of health beliefs proposed by the HBM in relation to self-care practices in insulin-treated patients with diabetes in Malaysia is currently lacking. The findings of studies from other countries may not be appropriate to be generalised to Malaysian context as health beliefs and diabetes self-care practices may have some influences from the respective cultures.

Given the limited number of studies examining the HBM as a whole model and the inconsistent findings obtained in the previous studies as well as the inappropriateness

of the existing knowledge for adult patients and for Malaysian patients, there is a definite need for conducting another study to provide empirical evidence whether or not the HBM is useful in predicting the self-care practices in adults with insulin-treated diabetes. In addition, there is also a necessity to explore the context in which the self-care practices occur for such study. This particular study attempts to address these gaps in the existing knowledge. The next chapter provides a set-up of how the study was conducted.

CHAPTER 3: RESEARCH METHODS

3.1. Introduction

This chapter explains how the study was carried out. This study was a longitudinal study to examine the predictors of self-care practices in patients with insulin-treated diabetes in Malaysia based on Health Belief Model (HBM). In addition, a qualitative evaluation was also conducted to explore the diabetes education provided to patients attending the study settings. The chapter begins with the study design which includes both the quantitative and qualitative investigations. Then, the chapter explains how the quantitative investigation – the longitudinal approach, was carried out. This includes the study design, the samples and settings, the measurement method including its instrument, the process of data collection and data analysis. After that, the chapter describes how the qualitative evaluation was conducted. This includes the cases selection, the data collection process from the protocol until the data collection in the field and the data analysis. Lastly, this chapter discusses the ethical considerations made in connection to the implementation of the study. A summary of this chapter is provided at the end of the chapter.

3.2. Study design

The aim of the study was to examine the ability of health beliefs which was derived from the HBM to predict the diabetes self-care practices in insulin-treated patients in Malaysia. This study was conducted longitudinally over a six-month period. As indicated in the previous chapter, this research approach was deemed to be more appropriate when studying health beliefs and self-care practices. The study variables

(self-care practices and health beliefs) were measured twice: at the beginning of the study (Time 1) and at six months of the follow-up (Time 2). In addition, a qualitative evaluation was also included to explore how the diabetes education is currently practiced in the study settings in order to provide a context to the self-care practices. The qualitative evaluation explored the structure, process and outcomes of the diabetes education provided to patients attending the study settings.

It has been debated that quantitative and qualitative research methodologies and methods cannot be combined due to their different paradigms (Bazeley, 2004). The former, which is quantitative in nature, belongs in the positivist paradigm. This paradigm is based on rigid rules of logic and measurement, truths, absolute principles and predictions (Halcomb and Andrew, 2005; Cole, 2006; Weaver and Olson, 2006). On the other hand, the qualitative method of inquiry, which lies in the inductive paradigm, is naturalistic or constructive which enables the researcher to holistically explore the phenomenon being studied (Polit and Hungler, 1997, pg.14).

However, in this study, it was not possible to stay within one paradigm because none of the paradigms could satisfactorily deal with all of the study's objectives. The positivist paradigm is only appropriate for a research where issues are known and can be counted as facts, objects or other measurable and quantifiable entities (Smith 1983; Onwuegbuzie 2002), which is only suited to test the predictive ability of health beliefs in self-care practices. It does not have the capacity to explore the diabetes education practice. The interpretive paradigm is more suited than the positivist paradigm to examine the third objective of the study because it is concerned with picturing the actual world of investigated phenomena rather than providing statistical

details about the cause-effect relationships between variables within the examined phenomena. Therefore, the use of both the quantitative and qualitative method was necessary in this study to examine the different study's objectives.

According to the pragmatist paradigm, a researcher can carry out mixing research methods across the paradigms, provided that any methods chosen must match the specific questions and purposes of the research (Burnard and Hannigan, 2000). This is particularly suitable for a study that seeks to research different phenomena as in this study. It has become commonplace to combine the different paradigms in nursing studies (Halcomb and Andrew, 2005; Jones and Bugge, 2006). Therefore, this study utilised the quantitative method to investigate the roles of health belief as predictors of self-care practices and the qualitative evaluation to explore the diabetes education practice, the context of self-care practices.

3.3. Study settings and samples

The study took place in three endocrinology clinics of three hospitals in Malaysia; National University of Malaysia Medical Centre (Site A), Putrajaya Hospital (Site B) and Melaka Hospital (Site C). In Malaysia, the health care system encompasses a two-tier system: the public and private sector. The public sector provides health care needs for all citizens whereas the private sector caters for the urban population especially for those with greater financial affordance. All the study settings are public hospitals. Of the study settings, Site A and C offer tertiary care whilst Site B provides secondary care. The endocrinology clinic runs every Monday, Wednesday and Friday in Site A, every Thursday only in Site B and every Monday only in Site C. Site C, however, runs the clinic session for Type 1 and 2 separately; the morning

session for Type 2 and the afternoon session for Type 1 diabetes. All of the hospitals involved are located in the urban area in the Peninsular Malaysia; Site A is located in Kuala Lumpur, the capital city of Malaysia whilst Site B is situated 25km to the south of Kuala Lumpur. Site C, on the other hand, is located in the southern region of Peninsular Malaysia which is about 148km from Kuala Lumpur (see Figure 2).

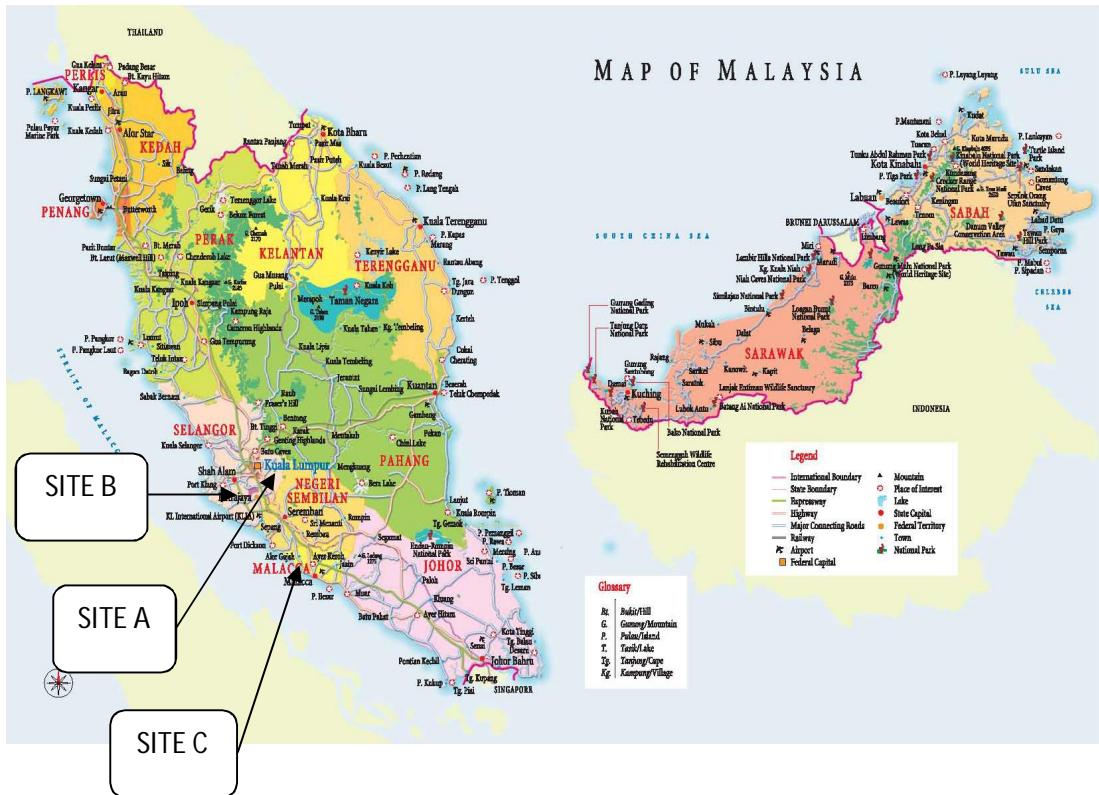


Figure 2: The map of Malaysia and the locations of the study settings

A multicentre study was chosen because the total number of population of interest was estimated to be limited based on the number of appointments in every clinic session in each hospital. The exact number of population of interest was unknown due to the non-existence of a database (s) for diabetes in the healthcare system where the study was carried out.

The participants for this study were sampled from a diabetes population who were at young adulthood phase and were treated with insulin injection attending the aforementioned clinics. According to Bee (1996), the age during young adulthood phase is between 18-40 years. In diabetes research, the researchers often use the term young adults or younger adults when studying patients at young adulthood phase, and the age distinction used varies across studies, such as between 16-25 (Dovey-Pearce, Doherty and May, 2007), 18-25 (Paucad, Crawford, Stephure et al., 2007), 18-30 (Van Walleghem, Macdonald and Dean, 2006) and 18-35 years old (Coates and Boore, 1998). However, this study emulated the age distinction as defined by Bee (1996) in order to ensure that the sample was as fully representative of the young adulthood phases as possible. This age group was chosen as the focus of the study because usually there are many lifestyle changes occurring at this phase which may take precedence over diabetes self-care practices, such as graduating from high school, moving away from home to begin higher education at university or college or working, beginning to be self-financed and leading an independent life, settling down and involving in marital/intimate relationships

3.3.1. Inclusion and exclusion criteria

The eligibility criteria for inclusion in the study were as follows: the participants had to be clinically diagnosed with Type 1 or Type 2 diabetes for longer than 1 year since they may need some time to learn about self-care practices after the diagnosis. They were required to have been on insulin injections for more than six months. Any patients who met the inclusion criteria were excluded from participating if they were pregnant during the study because their diabetes self-care practices may change during pregnancy. The study further excluded patients who had already had major

diabetes complications such as blindness, amputations and renal failure because they may have altered health beliefs and also health beliefs have been found to be different between those with different types of diabetes complications (Searle, Wetherell, Campbell et al., 2008).

3.3.2. Sample size

The next important element in a quantitative study is determining the sample size in order to ensure that the research findings can be generalised beyond the study sample (Burns and Grove, 2005; Polit and Hungler, 1997). While samples that are too small may lead to inaccurate results and limit the generalisability of the findings, samples that are too large may be too time-consuming, and also cost resources and money wastage (Polit and Beck, 2004). The required sample size for this study was calculated based on the previous study of the HBM in diabetes self-care practices (Tan, 2004); the power was set at .8, alpha level at 0.05 and medium effect size 0.25. It was determined that 126 participants needed to be sampled to complete this study.

However, a longitudinal study is well known to be at risk of diminishing the number of participants at follow-up due to attrition (Murphy-Black, 2002). This may occur due to several reasons; participants cannot be located, death, illness or withdrawal due to time constraints, or they are no longer interested in continuing the study (Young, Powers and Bell, 2006). Drop-out or attrition reduces the original sample size of a study and may cause loss of study power and violation to some statistical test assumptions that require a certain number of sample sizes, which can affect the validity of the statistical conclusion (Burns and Grove, 2005). If the attrition bias presents, the findings cannot be generalised to the wider population and that defies

one of the key objectives of a quantitative study (Burns and Grove, 2005). Therefore, the sample size in a longitudinal study must be calculated and determined based on the number of samples required to complete the study, and not solely the number of the recruitment (Burns and Grove, 2005). This is of significance so as to avoid a poor representation of the population from which it was drawn due to attrition (Murphy-Black, 2000).

Since the evidence shows that a study involving younger adults had about 32% attrition rate (Young et al, 2006), it was estimated that a minimum number of 190 participants were needed at the outset of this study in order to allow for the estimated attrition levels. Nevertheless, since the total population of interest, albeit unknown, was likely to be limited, this study targeted the entire population that fulfilled the inclusion and exclusion criteria as the study sample. Targeting the entire of research population has been widely adopted in many epidemiology studies (Burns and Grove, 2005).

3.4. Measurement method

In a quantitative research, there are four major measurement strategies; questionnaire, interview, observation and physiological measurement (Burns and Grove, 2005). Of these strategies, questionnaire is widely adopted as the method of data collection in self-care practice and health belief studies. In fact, it has been regarded as the most suitable means of gathering data on people's behaviours and beliefs (Polit and Beck, 2004) compared to interview, because it can ensure complete anonymity and confidentiality (Polit and Hungler, 1997), as well as minimising interviewer's bias in the interview method (de Vaus, 1996). On the other hand,

although observation is an appropriate method for measuring behaviour, this method is not suitable for measuring behaviour of self-care practices in this study. Diabetes self-care practices occur throughout the day - from morning when the participants check blood glucose, take the insulin injection, has breakfast, exercise etc. until bedtime. In this context, the researcher is required to live with the research participants in order to closely observe such activities, which is really time-consuming and impractical. Hence, questionnaire was chosen as the method of data collection for this study.

Nevertheless, the validity of answers given by respondents in self-reporting, is often criticized (de Vaus, 1996). Therefore, another method of data collection is recommended to be used together with self-reporting in order to enhance the validity of data collected (Polit and Beck, 2004). Most researchers of diabetes self-care practice use glycaemic control based on the HbA1c values as the objective measure or indicators of self-care practices. Therefore, this method was also utilised in the study. The HbA1c values for this study were obtained from the laboratory test results. According to Burns and Grove (2005), physiological data is more meaningful and appropriate if it is obtained from laboratory test. In the study settings, HbA1c was part of the routine diabetes care for every three months. The laboratory test results were available electronically in the clinic OMS system in Site A and B and available manually in participants' medical records in Site C. Participants' HbA1c values in this study were obtained through the aforementioned sources.

3.4.1. Study Instrument

The study instrument (see Appendix 1) consisted of three existing questionnaires, measured with established reliability and validity; Diabetes Self-Care Activity Questionnaire (Tan and Margarey, 2008), Diabetes Health Belief Questionnaire (Brownlee-Duffeck et al., 1987) and Diabetes Knowledge Test (Fitzgerald, Funnell, Hess et al., 1998). A brief description of each of the selected questionnaires is as follows.

3.4.1.1. Diabetes Self-Care Activity Questionnaire (DSCAQ)

The Diabetes Self-Care Activity Questionnaire (DSCAQ) has been developed by Tan and Margarey (2008) to measure the practice of self-care activities of diet, medication, physical activities and SMBG in the preceding seven (7) days specifically for Malaysians with sub-optimal diabetes control. The dietary self-care section has 11 items that measure the average number of main meal including snacks and the quantity of carbohydrate consumed in each meal and snack in the past week using a number from ‘0’ or ‘1’ to ‘7’ and a 5-point Likert scale. A score of ‘3 to 4’ for Item 1 is an acceptable number of meals per day, which indicates good dietary habits. Scores of ‘3 to 5’ for Items 2 to 4 and ‘0 to 2’ for Items 5 to 10 reflect good dietary habits. The score on Item 10 is reversed. Item 11 assesses whether the reported diet of self-care practice for the past seven days resemble their usual behaviour. The description of the diet items is presented in Table 2.

Meanwhile, the medication intake section has nine (9) items measuring both insulin and oral hypoglycaemic agent (OHA). Item 2-7 measure the medication intake in term of the dosage and frequency of insulin and OHA that have been prescribed by

patients' physicians and the actual intake by the patients. The number of doses taken is then divided with the number of doses prescribed and converted to a percentage for each type of the medication. The medication intake practice for each of type of the medication is defined as adherence if patients adhere to 90% or more of the daily prescribed medication. The physical activity section consists of 14 items of two categories of physical activities; leisure (seven items) and non-leisure (seven items) measured using a 5-point Likert scale and minutes of activity. Scores of each category and the total for both categories are summed up and divided into three levels; 1) least active, 2) moderately active, and 3) most active (see Table 3). The SMBG section has three items that enquire whether research participants practice SMBG and if so, how often they perform it and modify their treatment plan based on the SMBG results.

The DSCAQ is available in two languages; English and Bahasa Malaysia. It had been reviewed by a panel of experts (diabetologists, clinical nurse specialists, dieticians and adults with diabetes) and pilot tested. The internal reliability of the questionnaire was reported with the coefficient alphas of 0.76, 0.69, 0.71 and 0.70 for diet self-care, medication intake practices, physical activity self-care and self-monitoring of blood glucose practices respectively. It should be noted that each of the self-care practice section also has questions regarding the recognition of the importance of self-care practices and advice received regarding self-management questions.

Table 2: Descriptions of diet section

Dietary self-care	Description
Number of meal:	
Acceptable	3-4 meals per day
Not acceptable	< 3 or > 5 meals per day
Carbohydrate intake:	
Main meals	
Recommended	3-5 carbohydrate exchange in each meal
Not recommended	< 3 carbohydrate exchange or > 5 carbohydrate exchange in each meal
Drink	
Recommended	Consume 2 or less carbohydrate drink each day with 2 or less carbohydrate exchange in each drink
Excessive	Consume > 2 carbohydrate drinks each day with > 2 carbohydrate exchange in each drink
Fruit	
Recommended	2 or less portions per day
Excessive	> 2 portions per day
Sweetened food or drink	
Recommended	2 days or less intake per week
Excessive	> 2 days intake per week
Diet modification	
Recommended	Always reduced carbohydrate intake when each time consume sweetened food or drink
Not recommended	Sometimes to never reduced the carbohydrate intake each time consumed sweetened food or drink

Table 3: Description of physical activity section

Types	Definition of category physical activity	Activity score
Non-leisure activity		
Least active	Almost all the time sitting, less than half of the time standing or walking, seldom carrying heavy things and traveling by car or motorbike	6-13
Moderately active	Sitting, standing and walking about half of the time. Sometimes carrying heavy things. Using public transport during non-leisure hours	14-21
Most active	Almost none of the time sitting, almost all the time standing or walking, most of the time carrying heavy thing, using public transport or cycling or walking in between home and other activities	22-29
Leisure activity		
Least active	Never or seldom walking around the house, sometimes sitting down, no gardening or regular exercise program	3-9
Moderately active	Sometimes gardening, walking around the house, sitting down to watch TV. Inconsistent exercise program with minimum intensity	10-20
Most active	Most of the time walking around the house, gardening, seldom sitting down, exercise regularly with moderate intensity on 5 or more days a week with more than 30 min each day	21-31
Total physical activity		
Least active	Least active in both non-leisure and leisure activities as defined	9-23
Moderately active	Moderately active in both non-leisure and leisure activities as defined	24-42
Most active	Most active in both non-leisure and leisure activities as defined	43-60

3.4.1.2. Diabetes Health Belief Questionnaire (DHBQ)

The Diabetes Health Belief Questionnaire (DHBQ) has been developed based on the HBM by Brownlee-Duffeck et al. (1987). It comprises 27 items to assess: 1)

perceived severity of diabetes and its complications (4 items); 2) perceived susceptibility to diabetic complications (4 items); 3) perceived benefits of adherence to diabetic regimen (7 items); 4) perceived barriers of adherence (8 items); and 5) cues to action (4 items). All items use the 5-point Likert scale, ranging from “not serious” (1) to “extremely serious (5) on the severity subscale; “1-19% chance” (1) to “80-99% chance” (5) on the susceptibility subscale; “minor inconvenience” (1) to “terrible me” (5) on the barriers subscale; “has no effect” (1) to “extremely helpful” (5) on the benefits subscale; and “can never tell” (1) to “can always tell” (5) on cues to action subscale. A composite score is then created for each of the HBM constructs. The internal reliability for the DHBQ was reported α 0.66-0.78 for each subscale, except α 0.10 for cues to action subscale. The instrument developer has highlighted that the questionnaire was conceptually, rather than empirically, constructed.

3.4.1.3. Diabetes Knowledge Test (DKT)

Diabetes Knowledge Test (DKT) has been designed by Fitzgerald et al. (1998) to measure patients’ knowledge in the basic physiology of diabetes, food choices, general diabetes care, and sick day management. The DKT has been widely used in many diabetes studies. According to Fitzgerald et al. (1998), this tool is valid for insulin users. It has 23 items of general diabetes knowledge with multiple-choice answers with only one correct answer for each question, where a maximum possible score of 23. A score of 1 is given for a correct answer or 0 for an incorrect or unknown answer. The total score ranges from 0-23, with a higher score indicating higher level of diabetes knowledge. The internal reliability of this measure as reported by the developer of the DKT was coefficient alpha 0.87. The tool is applicable for this study as some minor changes to suit the Malaysian population as

opposed to American which has been undertaken by previous researchers (Tan and Magarey, 2008).

Except for the DHBQ and DKT, several amendments have been made to the DSFAQ in order to suit the current study. Firstly, the questions regarding the recognition of the importance of self-care practices and advice received regarding self-management questions in each section were eliminated as these questions were not relevant to the current study. Secondly, questions of Item 2, 3 and 4 in the diet section were reworded. An example of the original question was, ‘Last week, on average, what did you take for breakfast? (Assessment is based on carbohydrate serving(s) only)’. The item was re-worded to ‘Last week, on average, how many carbohydrate serving (s) did you take for breakfast?’. In the medication section, the word ‘medicine’ in Item 8 and 9 were replaced to insulin injection since the researcher was only interested to examine adherence to insulin injection. Lastly, the response for Item 2 and 3 in the SMBG section were changed from categorical to numerical format; by asking the study participants to provide their own numbers for the frequency of SMBG and the treatment modifications.

On the other hand, the DHBQ and DKT were first translated into Bahasa Malaysia by a professional translator who is an endocrinologist in Malaysia in order to be used for Malaysian population. Then, the study instrument which consisted of all the aforementioned questionnaires (DSFAQ, DHBQ and DKT) in both languages was examined by a panel of diabetes experts which consisted of three endocrinologists and one diabetes nurse educator for content validity and ease of use. Prior to its use, the study instrument was pilot tested on 15 patients with diabetes who were treated with

insulin injection and were not involved the actual study. They were asked to comment on all aspects of the questionnaire: time it had taken to complete, ease of format and the ambiguity or clarity issue in any questions. Following the pilot testing, items in perceived susceptibility subscale (1b, 1c, 2b, 2c, 3b, 3c, 4b, 4c) were modified to improve the clarity. The questionnaires took approximately 30 to 45 minutes to complete. The internal reliability of each of the questionnaires were retested: SCAQ: 0.73 (dietary self-care), 0.68 (medication intake practices), 0.66 (physical activity self-care) and 0.64 (self-monitoring of blood glucose practices); DHBQ: 0.64, 0.92, 0.73, 0.75 and 0.25 for perceived severity, perceived susceptibility, perceived barriers, perceived benefits and cues to action respectively; DKT: α 0.60.

In addition to the questionnaires, the study instrument also included questions about demographic data: age, duration of diabetes, gender, race, marital status, level of education, current job status and living arrangements. The question for HbA1c result was included at the end of the questionnaire and this, however, was completed by the researcher.

3.5. Data collection

The data collection at Time 1 took place during the regularly scheduled endocrinology clinic visit. It was conducted by the researcher over a 3-4 month period in order to ensure that every individual had a chance of being included, since each patient came to see the doctor every 3 months. The potential participants for this study were identified through different processes due to different systems in each study setting. At Site A, the researcher was given a printed version of computerised

appointment schedule. The patients' age was provided in the appointment schedule. However, patients' type of treatment was not included and the researcher had to seek for this information electronically in the *Order Management System* (OMS) on the clinic's computer by using patients' medical registration number (MRN) given in the appointment list. To ensure patients' confidentiality, only patients aged between 18-40 years old were highlighted for reviewing in the OMS system.

At Site B, patients' appointment schedules were recorded manually in an appointment book. However, neither their age nor the type of treatment was provided in the appointment book. The potential participants were only identified on the clinic day when they came for their appointment because those who were on insulin brought along a green book with them or a clinic appointment card which had a stamp of 'insulin' by the pharmacy department. The green book and clinic appointment card both had the patients' age written on it. In order to maximise recruitment potential, the registration staff were made aware of the study. Similar to Site B, Site C also used a manual system for the clinic's appointments. However, patients' age was provided in the book. Those patients who attended Type 1 clinic were identified as insulin users whilst for Type 2, their folder was reviewed by the researcher to confirm that they were currently taking insulin injection.

All patients aged between 18-40 years old that had been identified as insulin users were approached personally by the researcher while they waited to see their doctor in the waiting area. Those who met the inclusion and exclusion criteria were briefed about the study and given the study information sheet (Appendix 2) and an informed consent (Appendix 3) in the language of their choice for them to read. They were

then left to make their decision whether to participate in the study during the clinic. It was not possible to allow the patients longer time to make their decision due to time constraint. They were alerted that the participation is voluntary and would not affect their care if they chose not to participate. Those who were willing to participate signed and completed the informed consent and returned it to the researcher. They were then given the study questionnaire for them to complete. The participants at Site A and C were given a room to answer the questionnaire whilst the participants at Site B answered the questionnaire in the waiting area. All the participants were given a brief instruction by the researcher before starting to answer the questionnaire. In addition, they were also explained about the types of food that contain carbohydrate. The participants were emphasised to use the size of servings that have been taught by their physician, registered nurse, dietician or diabetes educators.

Once the participants had completed the questionnaire, they were given a date for completing the same set of questionnaire at a six-month follow-up (Time 2). The questionnaire was sent out to the participants by the researcher either by mail or via email depending on their stated preference. A short instruction regarding the procedures for returning the questionnaire was attached with the questionnaire. In addition, a stamped envelope with the researcher's address was also attached in the mailed questionnaire. The mailed questionnaire was sent out to the participants five days prior to their appointment to ensure that it reached the participants one or two days prior to their appointment, whilst the questionnaire sent via email was sent two days in advance by the researcher.

Having known that attrition is a threat to the statistical conclusion, efforts were undertaken to retain the study samples. Previous longitudinal researchers have made a number of recommendations and suggestions in order to retain the study sample or to reduce sample attrition such as having detailed contact, offering incentives (Scott, Sonis, Creamer et al., 2006) and sending reminders through email, mail and telephone (Vincent, Kasperski, Caldeira et al., 2012). Reminding study participants using telephone has been found successful in reducing dropout rate in longitudinal studies (Brown, Bryson, Byles et al., 1998). Therefore, a short phone text message and reminder phone calls to participants' mobile numbers as provided in the consent form were employed in this study to help minimise attrition at Time 2. The participants had given their consent for the researcher to contact them this way.

One week prior to the appointments, the text message was sent by the researcher to notify about their study appointment and that they would receive the questionnaire in one or two days prior to the appointment date. The study participants, however, were informed that they were not required to respond to the message as it was an information message and would not incur any costs to the patients. A phone call was made to every participant on their appointment date to ensure that they had received the questionnaire. Those who did not receive it were sent the second set of the questionnaire. The participants not returning the questionnaire within two weeks after the appointment date received the first phone call as the first reminder. If they still did not return the questionnaire, two more reminders would follow at every two-week interval. The two-week duration was chosen because the researcher believed that if a longer time was given, the attrition rate would be higher.

Finally, the study participants' HbA1c results for both study phases were collected by the researcher from their medical records at the end of the study. The data collection followed a flow chart described in Figure 2 and Figure 3 to ensure that it remained consistent in all study settings.

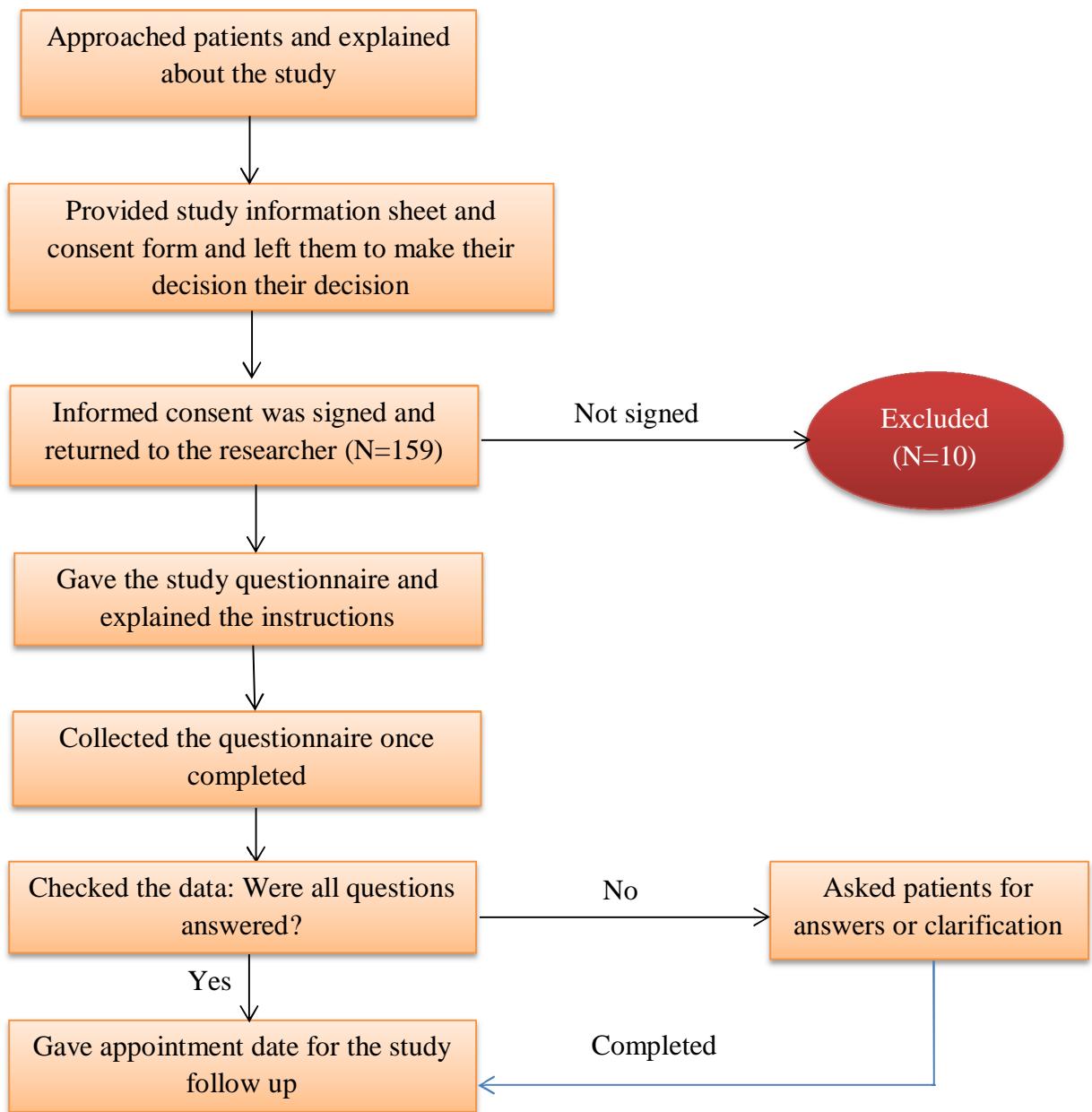


Figure 3: Data collection process at Time 1

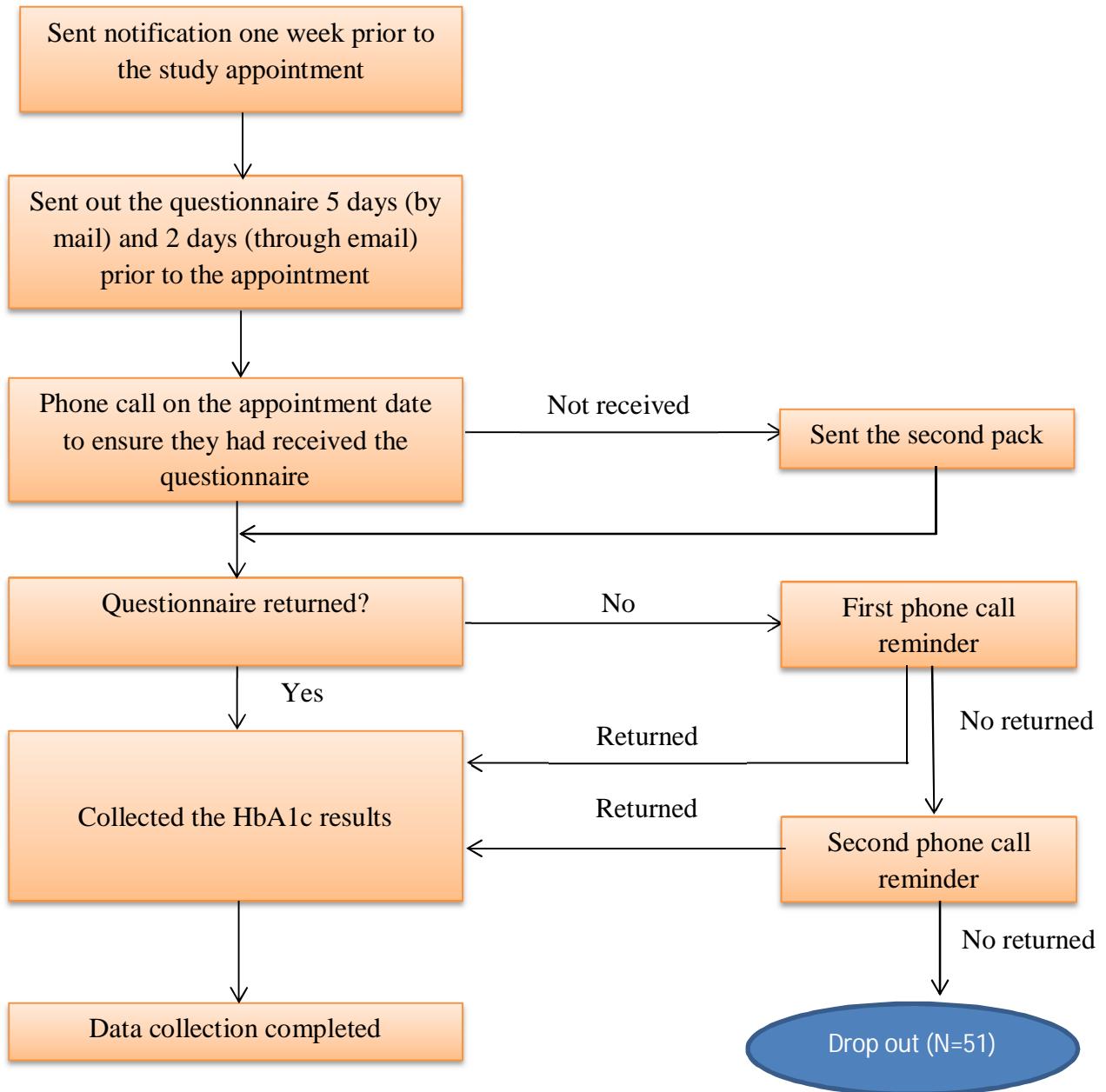


Figure 4: The data collection process at Time 2

3.6. Data handling and analysis

The data collected were analysed using the *Social Package Sciences System* (SPSS) version 19.0 for Windows.

3.6.1. Preparation for the data analysis

To begin the analysis, a codebook was developed where each response in the questionnaire was defined and given a numerical code. Then, the codebook was used to assist in creating a file for the study data in the SPSS. The data file was created using wide format in which each study participants had multiple variables in one row. The file created was first retrieved and printed out to compare the information in SPSS and the codebook. None of the variable names, label characters or values, numeric or character values were incorrectly typed or entered and the information in both the codebook and the dataset were the same.

3.6.2. Checking the accuracy of the data file

After ensuring that all the information in the data file was correct against the codebook, the collected data were then entered and coded directly into the SPSS data file. When it was completed, the dataset were printed and cross-checked against the original data in the questionnaires. The data for certain items (diet 3, diet 8), which had been wrongly coded, were detected and corrected. After a manual checking, the data were re-checked for any values that fell outside the range of possible values for each item and variables using SPSS. SPSS Descriptive was performed to check the accuracy of all numerical data and SPSS Frequency was used to check the accuracy of all categorical data. All continuous data were in range and the coding of

categorical data and missing data were in range numbers. The proportion of each categorical variable was in an appropriate total number for each study phase.

3.6.3. Missing data

As expected, there were missing values in this study due to attrition at Time 2. Furthermore, HbA1c, perceived barriers, perceived benefits and insulin intake practices also had missing values at either or both study phases. The total of the missing values differed: attrition 33%, HbA1c 1.9% and 13.8% at Time 1 and 2 respectively, perceived barriers (item 6), perceived benefits (item 5) and insulin intake practice items (item 2 to item 6) had 1.8%, 1.8% and 3.1% respectively. The missing values were defined in three categories: system missing for attrition (no numeric value was assigned), user missing coded as 999 (not available) for HbA1c and 888 (no response) for all items missing. Before performing the analysis, all missing values except the attrition, which were excluded from the analysis altogether, were first analysed through the SPSS Missing Data Analysis (MDA) and the analyses confirmed that the missing data were missing completely at random (MCAR) (Little's MCAR $p > .05$). Since the missing data were confirmed to be MCAR, any methods for replacing the missing data were considered safe (Tabachnick and Fidell, 2007). The SPSS EM imputation was chosen to impute the missing values in this study.

3.6.4. Calculating new variables

After imputing the missing values, thirteen new variables were created from the raw data using SPSS compute; diet self-care, insulin intake practice, non-leisure activity, leisure activity, all physical activities, SMBG practices, HbA1c category, perceived

severity, perceived susceptibility, perceived barriers, perceived benefits, cues to action and diabetes knowledge. The diet self-care and the five HBM constructs were calculated after their items that were negatively scored had been reversed.

The diet self-care, insulin intake practice and SMBG variables were categorised into two groups; good dietary habits vs poor dietary habits for diet self-care, insulin adherence vs non-insulin adherence for insulin intake practice and at least three times per day vs < 3 times per day for SMBG practice. Good dietary habits reflect the participants who reported having the acceptable number of main meals per day and consuming the recommended amount of quantity of carbohydrate for each meal, drink, fruit and sweetened food and drink as well as always reducing their carbohydrate intake each time they consumed sweetened food or drink. For the insulin intake, the study was initially planned that those who reported taking their insulin injection >90% of their prescribed insulin as ‘adherence’ while those reported taking their insulin injection <90% as ‘non-adherence’ (see Section 3.4.1.1). However, since the data from this study reveals that there were participants who also reported taking a higher dosage of their insulin injection than was prescribed on a regular basis, the terms used were changed. These participants were grouped in the non-adherence participants along with those who reported taking their insulin injections less than 90% of their prescription. Therefore, from here on, the definition of adherence to insulin injection was changed to taking 90-100% of the prescribed dosage when reporting the findings on insulin intake practices.

The non-leisure activity, leisure activity, all physical activities were categorised into three; least active, moderate active and most active. Furthermore, the study further

measured the participation in exercise by adding up only exercise items from the leisure activity section. This involved three items; Item 12 (intensity of exercise), Item 13 (frequency of exercise) and Item 14 (duration of each exercise). The exercise participation was considered regular if the research participants chose moderate exercise, at least five days and > 30 minutes for each exercise or strenuous exercise, at least three days and 16-30 minutes for each exercise. Finally, the data for glycaemic control (HbA1c) were collapsed into two categories in order to report how many participants achieved the normal target HbA1c as suggested by the ADA (2013); < 7% and > 7%.

3.6.5. Data analysis

Descriptive statistics were first calculated to determine the final sample size, outline the demographic characteristics of the study sample and to describe the study variables. The means, standard deviations and ranges were calculated for continuous variables while frequencies and percentages for categorical variables.

The characteristics of the study participants were then compared between those who completed the study and those who dropped out from the study before the study ended. The independent t-test was employed for comparing the continuous data whilst the chi-square test was employed for comparing the categorical data. Two exploratory data analyses (EDA) were undertaken on age and diabetes duration variables in order to examine the appropriateness of the data for the tests. In the histogram, the age was seen to be reasonably symmetric, whereas the duration of diabetes was positively skewed. Since t-test is robust to non-normality in a large sample size (Pallant, 2007), the duration of diabetes was not transformed. For the chi

square test, an adequate sample size is important. Having less than 5% in each cell means that the assumption for the test is violated (Pallant, 2007). Among the categorical variables in this study including marital status, job, living arrangement, and education level, did not meet this assumption. These variables, therefore, were collapsed into two categories due to the inadequate sample size in each cell.

The main study variables including the participants' knowledge at Time 1 and Time 2 were compared in order to identify any changes during the study period. McNemar's test was used to compare the diet self-care, insulin intake practice, exercise self-care and the SMBG practice while paired t-test was used to compare the knowledge, glycaemic control and health beliefs. McNemar's test is appropriate for the aforementioned domains because the data were dichotomous and met its assumptions; the data were drawn from two dependent populations through matching repeated measures and none of each cell had an inadequate sample size. On the other hand, paired t-test is appropriate for knowledge, glycaemic control and health beliefs because the data were numerical and did not violate the paired t-test assumptions. Due to attrition, the McNemar's test and paired t-test were performed on 108 participants only for all variables except the glycaemic control. The comparison of glycaemic control between Time 1 and Time 2 was performed on two datasets; 1) all participants ($N=159$) and 2) completers only ($N=108$).

Regression analyses were employed to test the predictive ability of the health beliefs of diet self-care, insulin intake practice, exercise self-care, SMBG practice and glycaemic control. The sequential logistic regression was used to test the diet self-care, insulin intake practice, exercise self-care and SMBG practice because these

data were binary while the sequential multiple regression was used to test the glycaemic control because the data were continuous. The preliminary tests for the logistic regression showed that all data except the SMBG practice met the adequacy of expected frequencies in each cell, and no multicollinearity was indicated. Therefore, SMBG practice was excluded from this analysis as it violated the adequacy of expected frequencies because data with inadequate sample size within each cell can result in extremely high standard errors (Tabachnick and Fidell, 2007). Further examination on the output of the preliminary tests showed that there were outliers high in value detected in all models involving exercise self-care. However, neither this variable nor the outliers was excluded from the analysis because none of the models showed inadequate model fitness.

The multiple regression analysis was appropriate for predicting glycaemic control because its preliminary analysis had confirmed that no violation of the assumptions for multicollinearity; the highest bivariate correlation was -.417, all tolerance values were less than 10 and all VIF values were more than 10. The examination of the scatter plot for each regression test showed that the data met the residual normality, linearity, homoscedasticity and independence of residual assumptions. Overall, the scatter plots showed that the shapes were reasonably rectangular, the residual distributions were reasonably symmetrical from the centre and consistently spread through the distributions. Finally no multivariate outliers were sought through the Mahalanobis distance, Cook's distance and from the case-wise diagnostic tables and scatter plots.

A series of sequential logistic regression and multiples regression analyses were performed to predict the dependant variables at different points of time; at Time 1 (Time 1 health beliefs and Time 1 self-care practices), Time 1-2 (Time 1 health beliefs and Time 2 self-care practices) and at Time 2 (Time 2 health beliefs and Time 2 self-care practices). Due to attrition, the tests were performed on different sample sizes; Time 1 (N=159), Time 1-2 (N=108) and Time 2 (N=108). In each analysis, the demographic factors (age, gender and race) and knowledge were also included as the predictors and were controlled for. The racial groups (Malay, Chinese, Indian and Others) were first collapsed to two categories due to the small number in the Chinese, Indian and Others group; Malays vs non-Malays. The predictors' variables were entered separately. In the sequential logistic regression, the demographic variables were entered in Block 1, knowledge in Block 2 and the five HBM constructs in the final Block (Block 3). Similarly, the predictors were also entered sequentially in the multiple regression analysis; the demographic variables in the first step, the knowledge in the second step and the HBM constructs in the final step. The regression analyses were performed using the sequential approach in order to assess the influence of demographic and knowledge on the dependent variables and the ability of the HBM constructs to predict the dependent variables after controlling for the influence of demographic characteristics and knowledge.

In addition to the above regression analyses, an additional logistic regression test was performed to detect the attrition bias for this study as drop-out often causes attrition bias which is known to affect the external and internal validity of a study (Miller and Hollist, 2007). Attrition bias presents if any of the demographic variables (the

predictors) significantly predicts the dummy variable which is coded as ‘missing/non-missing’ (Miller and Hollist, 2007).

3.7. Qualitative evaluation

It has been suggested that it would be of limited value to know patients’ self-care practices without knowing the diabetes education given to them (Hortensius et al., 2012b). Therefore, in addition to investigating the roles of health beliefs in self-care practices using the quantitative longitudinal approach, a qualitative evaluation was included to provide a contextual background to the self-care practices by exploring how the current diabetes education is given to patients in each setting. The focus of the study was on the diabetes education itself rather than to evaluate the effectiveness of the diabetes education programme. It was hoped that the qualitative evaluation can discover other factors that might have the potential to influence the outcomes from the quantitative data.

The qualitative evaluation was conducted using a case study approach. Through this approach, the researcher can develop as full picture as possible of a setting (Pontin, 2000-pg.237). Although it can be conducted quantitatively (Stake, 1995; Gillham, 2000; Yin, 2003), the qualitative method was chosen for several reasons. Firstly, the researcher was not concerned with the statistical details about the study variables but rather to understand how the diabetes education was implemented in the three study settings. A qualitative method of inquiry enables a phenomenon of interest to explore the personal experiences of humans more deeply and clearly than does the positivist approach (Gummesson, 2003). Thus, the researcher would gain an in-depth information concerning the diabetes education given to patients. In addition, the

diabetes education is a multifaceted process and involves educators with various clinical specialties, interventions, patients and approaches (American Association of Diabetes Educators (AADE), 2011). By getting inside the minds of the person who are involved in providing the programme, it would uncover the complex components of the diabetes education programme which may not be captured using the quantitative method. Moreover, it helps to assist in discovering the data that are not known to exist (Madjar and Walton, 2001). The scarce literature on previous research on diabetes education practice provided the researcher with three scholarly works; all are from the AADE surveys (Peeples and Austin, 2007; Martin et al., 2008; Martin, 2012). All of these studies were only quantitative in nature which provided the numerical value of the structure, process and conduct of diabetes education. If a qualitative methodology is to be employed, the researcher can describe and illuminate the context and conditions under which the research is conducted with a number of possible explanations (Gillham, 2000).

Data for a case study can be gathered from six sources; archival records, interviews, direct observations, participant observations, or physical artefacts (Gillham, 2000; Yin, 2003). The researcher can utilise one or more sources to gather the research data (Yin, 2003). Basically, the data for this study can be collected by observing the programme as it was delivered. However, it would not be sufficient to provide the actual practice of the diabetes education as the programme is usually delivered according to a patient's needs and problems (Funnell et al, 2009). In such circumstances, interviews are considered the most suitable source of data to understand the actual practice of diabetes education in this study as it allows the researcher to carry out investigations into specific situations (Kvale, 1996), for

interviewees to structure their own answers (Britten, 1999) and clarify any ambiguous statements (Kvale, 1996). In fact, it is an indispensable method of obtaining information in a case study research (Hancock and Algozzine, 2011), and it can be used as a single source of data (Perry, 1998).

Any types of interview such as structured, semi-structured or natural can be employed in a case study research (Gillham, 2000; Yin, 2003); however, a semi-structured interview has been suggested as the best form of interview when conducting a case study research (Gillham, 2000; Hancock and Algozzines, 2011). It is also appropriate when the case study has some established general topics to be addressed (Polit and Beck, 2004). Therefore, this type of interview was chosen as this study focused on the structure, process and outcomes of the diabetes programme. Specifically, it was designed to gain a comprehensive picture concerning diabetes education by focusing on the programme organisation and administration, and the conduct of its process and outcome measures. In this interview method, questions used to address the topics were developed beforehand (Polit and Beck, 2004), nonetheless, the participants were not constrained by any pre-determined answers as in structured interviews (Burn and Grove, 2005). They can answer the question openly and freely using their own words and ways (Polit and Beck 2004). From the literature review, the evidence reveals that all diabetes education programmes have some common characteristics such as the target populations, providers, and content areas. However, the approaches and contents covered in each programme differ. The flexibility of semi-structured interviews enables the participants to talk about their diabetes education programme as they practiced and allows the researcher to get the actual practice of diabetes education from each participant.

3.8. Cases selection

Purposive sampling (Creswell, 2003) and the boundary of each case (called the inclusion and exclusion criteria in the quantitative research) are often employed when determining which case/s is to be included in a study (Baxter and Jack, 2008). The individual case can be bound by “time and place” (Creswell, 2003), definition and context (Miles and Huberman, 1994) or time and activity (Stake, 1995). The boundary for individual cases in this study included diabetes education conducted for the patients in the study settings. The case study was a multiple embedded because there were three diabetes education programmes studied in each study site. The diabetes education programme in each setting was provided independently by three different healthcare providers (registered nurses, dietitians and pharmacists). There might be some differences in each of the programmes due to their different professional expertise. By exploring these diabetes education programmes in each setting, a full picture of diabetes education provided to patients attending each of the study setting.

3.9. Qualitative data collection

The interviews were conducted through telephone. Although there is little methodological discussion on qualitative phone interview in research methodology textbooks (Polit and Hungler, 1997; Polit and Beck, 2004), several studies have reported that phone interview is suitable for qualitative studies that employed either semi-structured (Gillham, 2000; Sturges and Kathleen, 2004) or narrative interview (Stephen, 2007; Holt, 2010). The advantages of conducting phone interviews in comparison to face-to-face are: 1) the researcher can take notes without distracting the interviewee (Sturges and Kathleen, 2004); 2) interviewees can remain on “their

own turf" (McCoyd and Kerson, 2006, p.399) and 3) is easy for rescheduling to suit their convenient times (Holt, 2010). Furthermore, in the absence of face-to-face contact, phone interview offers anonymity (Holt, 2010; Sturges and Kathleen, 2004), which have increased the participation rate compared to face-to-face (Carr and Worth 2001; Sturges and Kathleen, 2004), and gained rich data (Carr and Worth, 2001) even in a sensitive and embarrassed topics of study (Chappel, 1999). In addition, the quality of data obtained through phone interviews is equivalent to face-to-face interviews, in terms of the amount, depth (Sturges and Kathleen, 2004) and nature of response (Irvine, 2011).

However, the researcher was aware of several limitations of interviewing through telephone. In telephone interviews, "floor holding" or greater researcher dominance can occur, a situation where the interviewer talks more than the interviewee (Irvine, 2011), thus the researcher only made little comments to avoid such situation. In fact, in an interview, it has been suggested that listening to what they say is more important than talking to them (Hancock and Algozzine, 2011-pg.47). Another concern was the rapport between interviewer and interviewee that may be absent without face-to-face conversation (Novick, 2008). Sturges and Kathleen (2004) suggest conducting a pre-interview or pre-recruitment contact when the interview is conducted via telephone. Therefore, the potential participants were first contacted via their official emails following the ethical approval and prior to the interview to explain about the research purpose and process. Any questions from the participants were answered in the subsequent emails.

The duration of the interview was one of the concerns before interviewing the participants. The researcher was aware that the participants were busy with their work schedules; therefore, the interviews were conducted at a selected date, time and venue that was convenient and suitable for them. This is important to ensure that the participants have enough time to answer the interview questions fully and thoughtfully (Chappel, 1999). Those who agreed and consented to participate were asked to determine the date, time and venue for the interview. These, however, were reconfirmed by emailing a reminder to the participants a few days prior to the interview dates. For those participants who were unable to participate on the previously agreed date and time, the interview appointment was rescheduled.

Venue remains an important issue in an interview even if it is conducted through telephone (Chappel, 1999). According to Hancock and Algozzine (2011, pg.45), “...a private, neutral and distraction-free interview location is needed to increase the comfort of the interviewee and the likelihood of attaining high-quality information”. Therefore, the participants were advised to choose a place with the least distraction for the interview. Most of the participants chose to be interviewed in their own room at their office. The participants were informed that should they be disturbed in the middle of the interview, they would be allowed to ask the researcher to stop for a while before continuing with the interview.

As with other qualitative research, the interviews were recorded using a digital voice recorder Olympus VN-85000PC and the Olympus TP-7 telephone pickup was connected to record the phone conversations. To avoid any technical issues with the recording device, it was first verified before making each phone call in

order to ensure that it is in good working order and was played soon after each interview was completed in order to ensure that it functioned throughout the interview. In addition, technical issues such as unexpected termination in the middle of the conversation may happen in a phone interview (Irvine, 2011). Therefore, the participants were informed that should any technical problems occur during the interview, the interview and recording would be terminated and the researcher would make an additional phone call to continue the interview.

Data collection in a case study research involves two main stages; designing and preparing the interview protocol and followed by the data collection in the field. These stages are explained in the following sub-sections.

3.9.1. Interview protocol

An interview protocol was developed to guide the conversation in the interview (see Appendix 4). It was developed based on the Diabetes Self-Management Education (DSME) Standards (Funnell et al, 2009) and the Standard of Practice for Diabetes Educator (AADE, 2005), and followed steps suggested by Hancock and Algozzine (2011) in order to ensure the questions comprehensively measured the diabetes education practice and reflect the research questions “How is diabetes education currently practiced in each setting?”.

Firstly, the research question was broken into three sub-questions as below to reflect the focal points of the study:

- What is the current diabetes education structure?
- What are the current diabetes education processes?

- What outcomes of diabetes education are being evaluated and how they are evaluated?

Then, the interview items as proposed in the DSME standards (Funnell et al., 2009) were developed for each sub-question. The Standards of Practice for diabetes educator were used to assist in constructing the questions (AADE, 2005). The items involved the associated prompt questions especially to follow the close-ended questions. Most of the questions were structured in an open-ended format, simple, non-threatening and non-leading. Cross-referenced the interview questions with each research question, the DSME standards and the Standards of Practice for diabetes educator were performed in order to validate that the questions were comprehensive enough to capture the focus of the study. In addition, the interview protocol also included questions about the interviewee's experience, qualification and role in diabetes education.

3.9.2. Data collection in the field

The potential participants were first given the explanations about the purpose and the whole process of the study via email by the researcher a few days prior to the data collection. Inform consent was emailed to those who chose to participate (see Appendix 3). Those who agreed to participate were asked to complete and return the consent form along with a date and time for them to be interviewed. Given that the majority of the participants were Malay, they were given an option to be interviewed either in English or in their native language (Malay). All participants were aware that their participation was voluntary and the interview session would be recorded.

However, two participants rescheduled the interview appointment a few days prior to the interview whilst three other participants requested to re-schedule their appointments on the interview day due to their work commitments. None of them declined to proceed with the interview and the recording. Only two participants chose to be interviewed in English while the rest chose Malay language.

On the interview day, the verbal consent to recording was also obtained by the researcher before starting the interview. The purpose, estimated time and procedures of the interview were re-explained to every participant before starting and recording the interviews. In addition, the sixth and seventh principle of interview preparation suggested by McNamara (2009) was applied; asking the participants if they have any questions before the interview begins and telling them to contact the researcher via email later if they want.

The interview, then, began as the recorder was turned on. Every participant was asked the similar questions as in the interview protocol. However, the order of the questions changed if the participants talked about the topic before being asked the questions. The prompt questions were used when the interviewee's answers did not cover much of the topic under discussion and the probe questions were added when they were needed to tease out the participants for relevant information as a result of their answers. As suggested by McNamara (2009), 'why' questions were not used when unscripted probing the participants in order to avoid defensive answer and to create a friendly atmosphere while the interview took place. In order to concentrate on what the participants said, the notes were only taken on important points such as the participants' answers which required further probing. The participants were

steered to the original topics if they moved away from the topic under discussion. They were also indicated for moving to another topic after each major topic. At the completion of each interview, the researcher checked the interview schedule to verify that all was complete.

Although both the interviewer and the interviewees had no problem in listening to each other during the interviews, four interviews became disconnected in the middle of the conversation. Second calls were immediately made and the interviews were successfully continued and completed as stipulated in the protocol. In addition, there was one interviewee who requested to stop and continue the interview in the afternoon on the same day. The first part of the interview took 43 minutes and 48 seconds whilst the second one lasted 7 minutes and 48 seconds. All interview data were successfully recorded. Overall, twenty three interviews were conducted and each interview lasted approximately from 30 minutes to an hour. The data collection was completed over a period of three months. The researcher successfully obtained as much information as possible from the participants with no distraction.

As suggested by Yin (2003), a case study database was created for documenting and organizing the collected data so that it could be retrieved when needed. A folder specifically for this research was created on the researcher's personal laptop to catalogue and organise the vast amount of audio and text data (transcribed data). The audio data were transferred in the folder and saved using the Windows Media Player (WMA) format whilst the text data (interview transcripts) were saved in the folder using the MS Word format. The database, in this regard, increases the reliability and provides for the maintenance of a chain of evidence (Yin, 2003).

3.10. Qualitative data analysis

3.10.1 Transcribing, translating and coding the data

To begin the analysis, each data from the digital voice recorder was first transcribed and then rechecked for accuracy. All the transcribed data (except two which was conducted in English) were translated to English and back to the original (Malay) language. The back-to-back translation was conducted in order to ensure that the translated data is equivalent to the original language (Chen and Boore, 2010). Each interview transcript was saved in the form of a Word document and was ready for codifying.

Structural coding was adopted for codifying the data as this type of coding is appropriate for data gathered using the semi-structured interview (Saldan  , 2009). According to MacQueen, McLellan-Lemal, Bartholow et al. (2008, pg. 124), “Structural Coding applies a content-based or conceptual phrase representing a topic of inquiry to a segment of data that relates to a specific research question used to frame the interview”. In this coding approach, each discrete question used in the interview was assigned a code name; ¹the program, ²educator’s background, ³curriculum, ⁴assessment, ⁵targeted outcomes, ⁶plans to achieve the outcomes, ⁷implementation, ⁸content and ⁹evaluation. Then, the codes were assigned to the questions and their associated probes and prompts along with the segments of data (participants’ answers) on the interview transcripts. Lastly, the similar coded questions and its segments of data were grouped together. The advantage of this type of coding is that it not only codes but also categorises the data corpus and prepares the data for further qualitative and quantitative analysis (Saldan  , 2009).

3.10.2. Analysing the data

Data analysis for a multiple case study involves two distinct phases; within-case analysis and cross-case analysis (Yin, 2003). The within-case analysis entails analysing the collected data of each case or the unit of analysis independently whilst the cross-case analysis is a comparative analysis to identify the similarities and differences between the individual cases. In this study, both of the analyses were carried out and these processes were guided by the case study protocol.

Categorical aggregation was utilised to analyse the data (Stake, 1995). This type of analysis refers to clustering data under the same categories. In this analysis, every group of coded segment (except educators' background) were read and re-read to identify the similar elements in each coded segment that appeared to fit together. The similar elements were then extracted and clustered under the same categories for each unit of analysis. The slight differences in wording were collapsed into single categories. The segment of data representing the educators' background was analysed using content analysis. The educator's demographic information (sex, race, professional expertise and diabetes-related qualification) were transposed into SPSS in order to determine the frequencies and percentage of the data.

3.11. Ethical considerations

In any studies involving human participants, several ethical principles such as autonomy, justice and beneficence must be adhered to in order to protect their rights (Polit and Beck, 2004; Burns and Grove, 2005). This study took these principles into account.

Prior to the data collection, the study had been assessed by the researcher and the academic supervisors for the risk/benefit ratio (See Appendix 5). Only a minimal risk was anticipated and this did not outweigh the anticipated benefits of the research; e.g. the participants could become stressed due to the questions asked or could become ill during the completion of the questionnaire. If this situation occurred, they would be referred to the registered nurses in charge of the clinic for counselling or immediate treatment. Their participation in this study was voluntary and they had the right to withdraw from the study at any time and at any stage, without affecting their current or future care or services.

The data collection only commenced after the researcher had obtained a completed and signed informed consent. The study data obtained from the participants were treated confidentially and would not be shared with their healthcare providers such as the endocrinologists and the diabetes educators. The original data and the informed consent were kept separately in a locked filing cabinet accessible only to the researcher. The data were also transferred into the researcher's personal computer in a password-protected file. These data will be destroyed after seven years of the study's completion. Only the researcher and the Academic Supervisors would have access to the completed questionnaires in order to ensure the protection of study participants' confidentiality and anonymity. The study participants would also have the right to know the results of the analysis if they wished (Data Protection Act, 1998). The data were reported as numbers and in a collected manner, with no reference to a specific individual to ensure anonymity.

The study was approved by two ethics committees; the UKM Research Ethics Committee (UKMREC) for Site A (see Appendix 6) and the Medical Research and Ethics Committee Ministry of Health Malaysia (MREC-MOH) for Site B and C (see Appendix 7). Each committee had set up the guiding principles and offered ready-designed forms, which could be downloaded from their website to ensure that the study could meet their requirements. The consent forms, study information sheet and study instruments were required to be written in two languages (English and Bahasa Malaysia). The UKMREC restricted the consent forms to their standard format. Since the MREC-MOH did not restrict the consent form to a standard format, the same consent form as requested by the UKMREC was used in this study.

In addition to the ethical approvals, this study was also approved by the government of Malaysia through the Economic Planning Unit (EPU), the Prime Minister's Department of Malaysia (see Appendix 8). This procedure is applied for every Malaysian researcher who is a domicile overseas and wants to conduct their study in Malaysia. The researcher had to complete the online application and then downloaded the requested documents, completed and submitted them to the EPU with the researcher's photocopy of the identity card and the research proposal containing the objective of the research, scope, methodology, conceptual definitions, locations and schedule of the research. Three copies of the thesis or publication in English and Bahasa Malaysia, together with its softcopy, have to be submitted to the EPU as soon as the research was completed.

3.12. Summary

In summary, the study on which this thesis was based was a longitudinal investigation of the predictive ability of health beliefs in self-care practices in patients with insulin-treated diabetes aged 18-40 years old from three endocrinology clinics in Malaysia. The data were collected using a set of existing questionnaire. In addition, participants' glycaemic control was also measured as the objective measurement for the self-care practices. This was based on their HbA1c results obtained from their medical records. The measurement occurred at baseline (at the beginning of the study - Time 1) and follow-up (at six-month follow-up – Time 2). The self-care practices, including glycaemic control and health beliefs, were compared between Time 1 and Time 2, and the ability of the health beliefs to predict self-care practices and glycaemic control were tested at Time 1, Time 1-2 and Time 2.

A qualitative evaluation was also conducted to provide the context to the self-care practices among the study participants by exploring the diabetes education given to them. Phone interviews were conducted with all diabetes educators of the clinics to explore the content, process and conduct of their diabetes education programme. The results of the 2-wave longitudinal investigation and qualitative interviews are reported separately in the next two chapters.

CHAPTER 4: LONGITUDINAL FINDINGS

4.1. Introduction

This chapter presents the findings of the study. Firstly, the next section describes the final sample size and retention rate of the study. This is followed by a description of the demographic characteristics and diabetes knowledge of the study participants, respectively in sections 4.3 and 4.4. Section 4.5 illustrates the participants' self-care practices based on the self-reported questionnaire and glycaemic control while section 4.6 depicts the participants' health beliefs. The predictors of self-care practices are presented in section 4.7. Finally, the finding of the attrition bias analysis is described in section 4.8. In this chapter, the terms 'HBM constructs' and 'health beliefs' are interchangeably used in reporting the participants' health beliefs. For all results, the levels of significance were set at $p < 0.05$ (two-tailed).

4.2. Sample size and retention rate

At the outset of the study, it was initially planned that a minimum of 190 participants would be recruited as participant in this study in order to allow 32% attrition rate. Nevertheless, the number of participations recruited at Time 1 was lower than originally planned because 34 patients in Site A and 15 patients in Site C which were aged 18-40 in the appointment list did not attend their clinical appointment during the study period. However, it was unknown whether they had met the inclusion and exclusion criteria of the study. Among the eligible patients approached, a total of 10 patients from all settings had declined to participate due to time constraints. As a result, only 159 patients had participated in the study and completed the questionnaire at the beginning of the study. Out of these 159

participants, 40.3% (64/159) were recruited from Site A, 32.1% (51/159) from Site B and 27.7% (44/159) from Site C. During the follow up, only 67.9% (N=108) of the participants had completed the questionnaire, while 32.1% (N=51) of the participants had dropped out from the study. However, the HbA1c results for 34 out of 51 of these drop outs were available from their clinical records. These individuals are referred to as “dropouts,” although their HbA1c results had been kept for the analysis. Reasons for this attrition, as shown in Table 4, were categorised into four types; too ill to complete the second questionnaire, withdrawn, lack of success in contacting these respondents (lack of contact details) and non-return where it was known that these participants had received the questionnaire but they did not return the questionnaire back to the researchers. Furthermore, the reasons for withdrawal from the study were also recorded. These reasons included having too many other commitments or no longer being interested in the study.

4.3. Participants’ demographic characteristics

The participants’ demographic characteristics are presented in Table 5. At Time 1, the mean age for the study’s sample was 30 years old (SD 6.8) and the mean duration of diabetes was 9 years (SD 6.9). The gender variable showed that there were more females (56.6%, N=90) than males (43.4%, N=69). The study sample also comprised of several ethnic backgrounds with Malay constituted 66.7% (N=106) of the sample. Nearly all (153 of 159) participants reported that they had at least secondary level of education and over two-thirds of the participants (127/159) were employed. The proportion of single and married participants was almost equal (50.3%, N=80 and 48.4%, N=77, respectively). Furthermore, the majority of the participants lived with their family (83.6%, N=133).

Table 4: Attrition in the second wave (Time 2)

	N	%
Total respondent in the first wave	159	100
Attrition in the second wave	51	32.1
Source of attrition		
Respondents not located		
Telephone number not contactable	19	11.9
Refusal for further participation		
Too busy; no time	3	1.9
Not interested	2	1.3
Health reasons		
Admitted to hospital	2	1.3
Non-return		
Email	15	9.4
Mail	10	6.3

Based on the longitudinal study sample (N=108) with the complete data for the variables of interest, the mean age was 30 years old (SD = 6.9) and the average time since they received a professional diagnosis for diabetes was 9 years (SD = 7.0). In addition, there were more females (58.3%) than males and more married (53.7%) than single participants who completed the study. About 40.7% completed secondary school and 36.1% graduated from tertiary level of education. The majority of the participants who remained in the study were employed (77.8%, N = 84) and lived with their family (85.2%, N = 92). The participants' demographic characteristics, however, were not significantly different between those who completed the study and those who dropped out of the study (see Table 6).

Table 5: Demographic data of participants

	TIME 1 (N = 159) Mean (S.D)/N (%)	TIME 2 (N=108) Mean (S.D)/N (%)
Age (year)	29.9 (6.8)	30.1 (6.9)
Duration of diabetes (year)	9.0 (6.9)	9.1 (7.0)
Gender		
Male	69 (43.4)	45 (41.7)
Female	90 (56.6)	63 (58.3)
Race		
Malay	106 (66.7)	77 (71.3)
Chinese	34 (21.4)	23 (21.3)
Indian	18 (11.3)	8 (7.4)
Others	1 (0.6)	0 (0)
Education		
Primary	5 (3.1)	3 (2.8)
Secondary	68 (42.8)	44 (40.7)
College	38 (23.9)	22 (20.4)
Tertiary	48 (30.2)	39 (36.1)
Current job status		
Studying	21 (13.2)	18 (16.7)
Working	127 (79.9)	84 (77.8)
Studying and working	10 (6.3)	5 (4.6)
Others	1 (0.6)	1 (0.9)

Table 5: Demographic data of participants (continued)

	TIME 1 (N = 158) Mean (S.D)/N (%)	TIME 2 (N=108) Mean (S.D)/N (%)
Marital status		
Single	80 (50.3)	50 (46.3)
Married	77 (48.4)	58 (53.7)
Widowed	1 (0.6)	0 (0)
Others (Partner)	1 (0.6)	0 (0)
Living arrangement		
Family	133 (83.6)	92 (85.2)
Friends	16 (10.1)	9 (8.3)
Alone	5 (3.1)	3 (2.8)
Others	5 (3.1)	4 (3.7)

4.4. Participants' diabetes knowledge

The participants scored 67.35% ($SD = 13.78$, range = 22%-96%) for the diabetes-related knowledge test at Time 1. Meanwhile, the scores were higher at Time 2 ($M = 73.39\%$, $SD = 12.38$), ranging from 43%-96%. As shown in Table 7, the scores for 108 participants differed significantly between Time 1 ($M = 69.81$, $SD = 13.99$) and Time 2 ($M = 73.39$, $SD = 12.38$), $t (107) = -3.05$, $p < .01$ (two-tailed). The mean difference in the knowledge scores was -3.58 with a 95% confidence interval ranging from -5.90 to -1.25. The eta squared statistic (0.08) indicated a moderate effect size.

Table 6: Demographic characteristics of completers versus dropouts

Baseline characteristics	Droppers (N=51) Mean (S.D)/%	Completers (N = 108) Mean (S.D)/%	Test statistic	P value
Age (year)	29.5 (6.6)	30.1 (6.9)	-.514	0.61
Duration of diabetes (year)	8.8 (6.7)	9.1 (7.0)	-.245	0.81
Gender				
Male	49.0	41.7		
Female	51.0	58.3	.491	0.48
Race				
Malay	54.9	71.3		
Non-Malay	45.1	28.7	3.45	0.06
Education				
Schools	51.0	43.5		
Higher Education	49.0	56.5	.505	0.48
Current job status				
Working only	84.3	77.8		
Non-Working only	15.7	22.2	.559	0.46
Marital status				
Single	58.8	46.3		
Not Single	41.2	53.7	1.70	0.20
Living arrangement				
Family	78.4	85.2		
Non-Family	21.6	14.8	.693	0.41

Note: *t* test: continuous variables; χ^2 : categorical variables

Table 7: Knowledge scores between Time 1 and Time 2 (N=108)

Knowledge	Mean	SD	Mean	95% CI		t	df	P value ^a
			difference	Lower	Upper			
Time 1	69.81	13.99	-3.58	-5.90	-1.25	-3.05	107	.003
Time 2	73.39	12.38						

Note: ^aPaired t test

4.5. Participants' self-care practices

In this study, the aspects of the participants' self-care practices include diet, insulin intake, physical activity, self-blood glucose monitoring (SMBG) and glycaemic control. The findings for each self-care practice are presented individually in the five following sections.

4.5.1. Diet self-care

In regards to diet self-care, the number of participants who demonstrate good dietary habits in all diet items was 66.7% at Time 1 and 68.5% at Time 2 (see Table 8). There was no significance difference in the number of participants who reported good or poor dietary habits between Time 1 and Time 2, indicating that their diet self-care practices remained unchanged throughout the duration of study (see Table 13).

Table 8: Diet self-care at Time 1 and Time 2

Diet practice	Time 1 (N=159)	Time 2 (N=108)
Good dietary habits	66.7% (106)	68.5% (74)
Poor dietary habits	33.3% (53)	31.5% (64)
Insufficient	5.0% (8)	2.8% (3)
Excessive	28.3% (45)	28.7% (31)

4.5.2. Medication intake practices

In regards to medication, 76 out of 159 (47.8%) participants in this study were treated with insulin therapy while 52.2% (n=83) were on a combination of insulin injection and oral hypoglycaemic agent (OHA). At time 2, the number of participants with insulin therapy was slightly higher (51.9%, n=56) than with combination treatment (48.1%, n=52) (see Figure 5). Furthermore, almost three quarters of the participants with insulin therapy had Type 1 diabetes (63%) while over three quarter of the participants with combination therapy had Type 2 diabetes (89%). The mean number of insulin injection per day was three at both study phases and most participants were prescribed with four insulins injections per day at both study phases (see Figure 6). Fifty two per cent of participants reported missing between one to seven injections during the previous week. All participants (n=157, 98.7%) were on fixed-regimens.

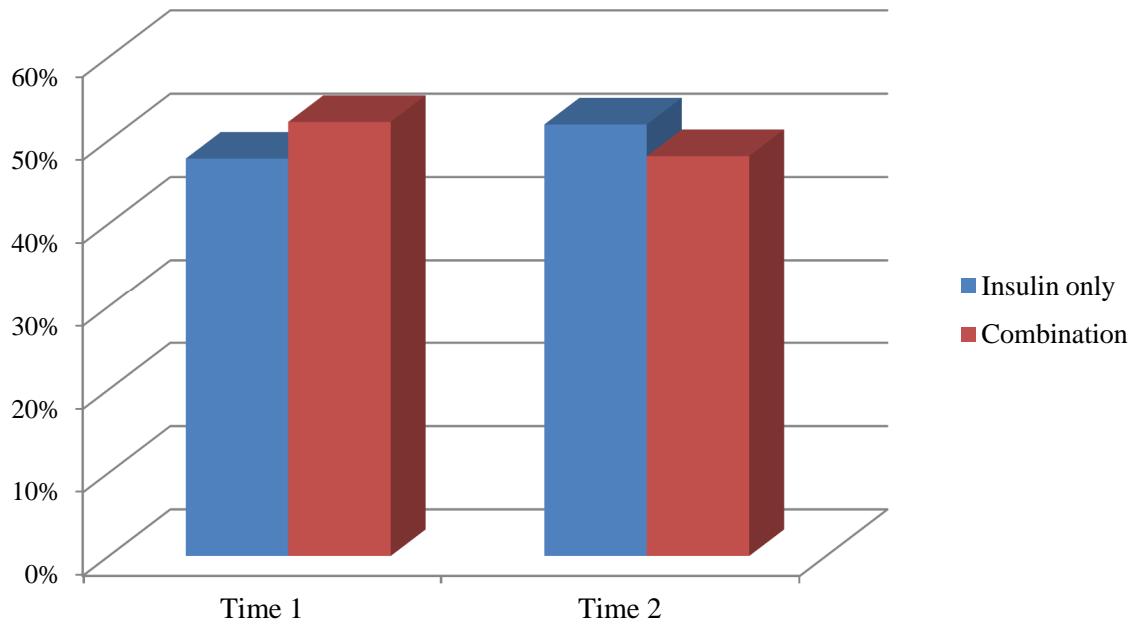


Figure 5: Type of diabetes medication

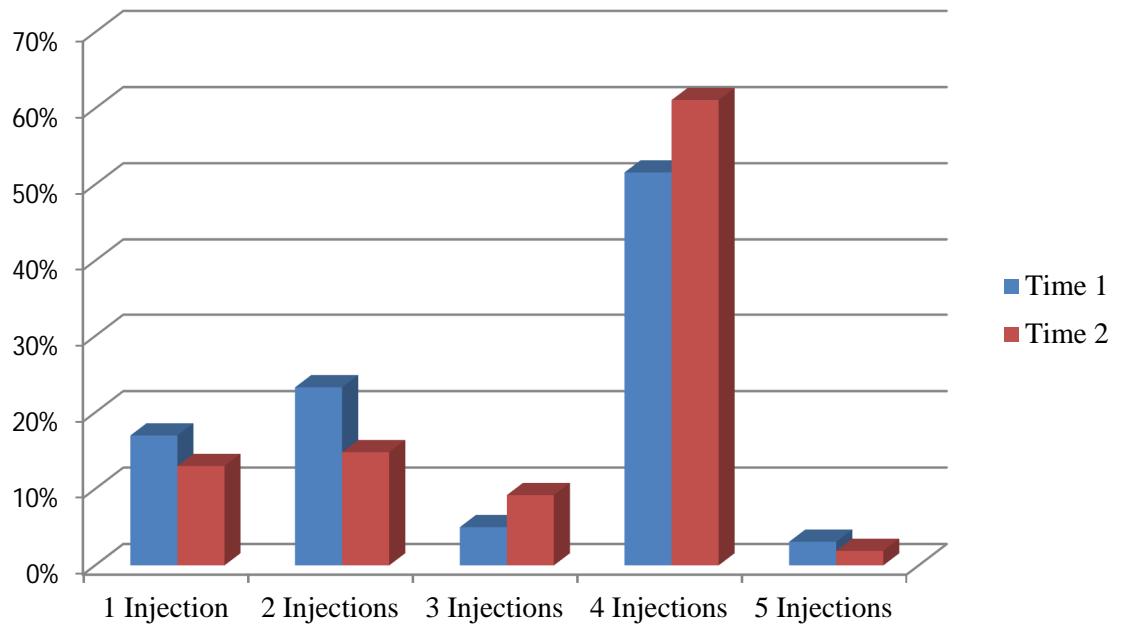


Figure 6: Number of insulin injection prescribed (per day)

Over two-thirds of the participants reported adhering to their prescribed insulin injection at both study phases. The proportion of adherence was slightly higher at Time 2 (77.8%) than Time 1 (73.6%) (see Table 9). Most participants who reported

adhering to their prescribed insulin were on combination therapy and had less number of injections per day than those who did not adhere. However, the number of participants who reported adherence was not significantly different between Time 1 and Time 2 and this demonstrate that their insulin intake practices remained the same during the study period (see Table 13).

Table 9: Insulin intake practices at Time 1 and Time 2

Medication intake	Time 1 (N=159)	Time 2 (N=108)
Adherence		
(90%-100%)	73.6% (117)	77.8% (84)
Non-adherence	26.4% (42)	22.2% (24)
(< 90%)	11.9% (19)	8.3% (9)
(> 100%)	14.5% (23)	13.9% (15)

4.5.3. Physical activity self-care

The descriptive findings on the physical activity self-care are presented in Table 10. Half of the participants were moderately active at Time 1 (50.9%, N=81) and least active at Time 2 (60.2%, N=65) during non-leisure times such as working or studying. In leisure activities, most participants were least active at both study phases; 66.7% at Time 1 and 69.4% at Time 2. Overall, more than half of the participants were less active in both non-leisure and leisure activities at Time 1 (58.5%, N=93) and Time 2 (59.3%, N=64)

Table 10: Physical activity self-care

Types of physical activity	Time 1 (N=159)	Time 2 (N=108)
Non-leisure activity		
Least active	48.4% (77)	60.2% (65)
Moderately active	50.9% (81)	38% (41)
Most active	0.6% (1)	1.9% (2)
Leisure activity		
Least active	66.7% (106)	69.4% (75)
Moderately active	28.9% (46)	25% (27)
Most active	4.4% (7)	5.6% (6)
Total physical activity		
Least active	58.5% (93)	59.3% (64)
Moderately active	40.9% (65)	40.7% (44)
Most active	0.6% (1)	0% (0)

The sub-analysis on the exercise items (see Table 11) showed that out of the 159 of participants at Time 1, more than two thirds of them reported that they did not exercise at all (71.1%, n=113). Among those who reported exercising, only a small proportion of the participants (7.5%, n=12) exercised regularly. Similarly to Time 1, over two thirds of the participants (70.4%, n=76) reported that they did not engage in exercise and only a small proportion (7.4%, n=8) was engaged in regular exercises during the six months follow up. Consequently, the proportion of participants who reported regular exercise and non-regular exercise were not significantly different between the two study points, indicating that their exercise self-care had not changed from the beginning of study (Time 1) until the six months follow up (Time 2) (see Table 13).

Table 11: Exercise self-care at Time 1 and Time 2

Exercise	Time 1 (N=159)	Time 2 (N=108)
Regular	7.5% (12)	7.4% (8)
Not regular	92.5% (147)	92.6% (100)
Less exercise	21.4% (34)	22.2% (24)
Not exercise	71.1% (113)	70.4% (76)

4.5.4. Self-monitoring blood glucose (SMBG) practices

At Time 1, 17% (N=27) participants reported that they did not test their blood glucose in between their clinic visits. Those who tested reported that they only performed the SMBG three times per week (SD 2.99). At Time 2, the number of participants who did not test the SMBG in between clinic visits was slightly lower than Time 1 (12%, N=13) while the mean of SMBG frequency reported by those who tested at Time 2 was higher than Time 1 (M 3.66, SD 3.46). Of those that tested, only one participant at each study phase reported performing the SMBG at least three times per day whereas more than two-third at Time 1 (76.7%, N=122) and Time 2 (85.2%, N=92) tested less than three times per day (see Table 12). The number of participants who tested SMBG at least three times per day was not significantly different between Time 1 and Time 2. This demonstrates that the practice of SMBG remained the same during the six-month study periods (see Table 13). In addition, not all participants used their SMBG results as a guidance to modify their treatments at both study phases; 69.4% at Time 1 and 63.9% at Time 2 (result not included).

Table 12: Self-monitoring blood glucose (SMBG) practices at Time 1 and Time 2

SMBG practice	Time 1 (N=159)	Time 2 (N=108)
Yes	83% (132)	88% (95)
At least 3 times per day	0.6% (1)	0.9% (1)
< 3 times per day	76.7% (122)	85.2% (92)
Not tested	5.6% (9)	1.9% (2)
No	17% (27)	12% (13)

Table 13: Self-care practices between Time 1 and Time 2 (N=108)

Self-care practices	Time 1 (N=108)	Time 2 (N=108)	P value ^e
Diet^a	67.6%	32.4%	68.5%
Insulin intake^b	74.1%	25.9%	77.8%
Exercise^c	7.4%	92.6%	7.4%
SMBG^d	.9%	99.1%	.9%
			99.1%

Notes: ^agood dietary habits vs poor dietary habits; ^badherence to 90-100% of the insulin prescribed vs non-adherence to 90-100% of the insulin prescribed; ^cregular exercise vs non-regular exercise, ^d≥ 3 times per day vs < 3 times per day; ^eMcNemar's test

4.5.5. Glycaemic control

Glycaemic control in this study was assessed according to the participants' HbA1c results. The HbA1c results were available for 156 and 137 out of 159 participants' at Time 1 and Time 2 respectively. The mean of HbA1c for 156 participants at Time 1 was 9.8% (SD 2.6) and the mean for Time 2 (N=137) was 9.8% (SD 2.7).

Meanwhile, the ranges of HbA1c levels were between 3.6% to 17.5% at Time 1 and 4.6% to 19.3% at Time 2 and the majority of the study participants did not achieve the HbA1c target < 7% at both study phases (Time 1: 87.2%, N=136, Time 2: 87.3%, N=124).

The comparison analysis for the glycaemic control was performed after the missing values were imputed and the findings of the missing value analysis are presented in Table 14. The comparison analysis that was performed on all of the participants showed that the mean of HbA1c was higher at Time 2 (N=159), but after excluding those who dropped out from the study at Time 2 (N=108), the mean of HbA1c was higher at Time 1. However, these differences were not statistically significant. This indicates that the participants' HbA1c results had not changed during the study period and nevertheless, it is noted that the confidence interval was wider when the dropouts were excluded from the analysis. The findings of the comparison analysis are presented in Table 15.

Table 14: Data imputation for HbA1c

HbA1c	N	Missing values (%)	Min	Max	Mean	SD
Time 1						
Before imputation	156	1.9%	3.6	17.5	9.83	2.61
After imputation	159	None	3.6	17.5	9.83	2.60
Time 2						
Before imputation	137	13.8%	4.6	19.3	9.82	2.69
After imputation	159	None	4.6	19.3	9.91	2.56

Table 15: HbA1c between Time 1 and Time 2

N	Mean	SD	Mean Difference	CI	T	df	P value ^a
159	9.83	2.60					
	9.91	2.56	-.086	-.46 - .29	-.453	158	.651
108	9.57	2.55					
	9.44	2.48	.137	-.30-.57	.625	107	.533

Note: ^aPaired t test

4.6. Participants' health beliefs

The findings for health beliefs are presented in Table 16. Overall, at both study points, the perceived severity was high; indicating that the participants in this study believed that diabetes is a severe and serious disease. However, the participants' mean scores for susceptibility were fairly low which indicate a 20-39% chance that they feel susceptible to diabetes complications. The participants' mean scores for the perceived barriers were also fairly low, indicating moderate inconveniences in following the adherence recommendations. Meanwhile, the mean benefit scores reflected high values which mean that for the most part, the participants in this study believed that following the adherence recommendations would lead to benefits, such as "decreasing the chance of having serious complications later in life" and "to feel better physically." Similarly, the mean of cues to action scores was fairly high, signifying that participants were experienced in recognising the symptoms of high and low blood sugar level as well as remembering the various aspects of their regimen. There were no significant differences between the health beliefs scored at Time 1 and Time 2 (see Table 17).

Table 16: Health belief scores at Time 1 and Time 2

Scale	Time 1 (N=159)	Time 2 (N=108)
Severity	3.87 ± 0.69	3.89 ± .72
Susceptibility	2.48 ± 1.11	2.48 ± 1.04
Barriers	2.03 ± 0.62	1.97 ± .64
Benefits	3.87 ± 0.73	3.92 ± .68
Cues to action	3.22 ± 0.66	3.30 ± .62

Table 17: Health beliefs scores between Time 1 and Time 2 (N=108)

	TIME 1	TIME 2	T value	P value^a
Severity	3.84 ± .68	3.89 ± .72	-.715	.476
Susceptibility	2.45 ± 1.11	2.48 ± 1.04	-.335	.738
Barriers	2.03 ± .62	1.97 ± .62	.941	.349
Benefits	3.90 ± .73	3.92 ± .68	-.216	.829
Cues to action	3.25 ± .62	3.30 ± .62	-.894	.373

Note: ^aPaired t test

4.7. Predictors of self-care practices

The predictors of self-care practices are presented individually for each self-care practice including glycaemic control.

4.7.1. Predictors of diet self-care

At time 1, the models were not able to distinguish between participants who reported good dietary habits and those who did not; the demographic alone, $\chi^2 (3, N = 159) = 1.244, p = .742$, with the addition of knowledge variable, $\chi^2 (4, N = 159) = 1.355, p =$

.852 and the HBM constructs, $\chi^2 (9, N = 159) = 8.060, p = .528$. Similarly, the log-likelihood comparison was not significant, indicating that knowledge alone $\chi^2 (1, N = 159) = .111, p = .739$ and HBM constructs alone, $\chi^2 (5, N = 159) = 6.705, p = .244$ were not related to the outcome category. The model as a whole only explained 4.9% (Cox and Snell R square) and 6.9% (Nagelkerke R square) of the variance. The overall classification correctly made by the model as a whole model was 69.8%; and only a slight improvement of over 66.7% in the model with constant only. In table 18 below, the individual predictor that significantly contributed to the final model was perceived benefit only ($p = .024$). The odds ratio for perceived benefit was 1.92, indicating that for every score increase in perceived benefit, the study participants were over one time more likely to report good dietary habits, controlling the other predictors in the final model.

Table 18: Predictors of diet self-care at Time 1

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Age	-.001	.001	1	.975	.999	.950	1.051
Gender (F)	.102	.085	1	.770	1.108	.558	2.200
Race (Non-Malays)	.601	2.164	1	.141	1.824	.819	4.062
Knowledge1	-.006	.199	1	.655	.994	.968	1.021
Perceived severity1	-.383	1.918	1	.166	.682	.396	1.173
Perceived susceptibility1	.010	.004	1	.951	1.010	.736	1.387
Perceived barrier1	.267	.697	1	.404	1.306	.698	2.446
Perceived benefit1	.651	5.121	1	.024	1.918	1.091	3.372
Cues to action1	-.233	.615	1	.433	.792	.442	1.419
Constant	.049	.001	1	.980	1.051		

In predicting the diet self-care at the six months follow up using Time 1 predictors (Time 1-2), the models were significant with the demographic alone, $\chi^2 (3, N = 108) = 16.188, p = .001$, addition of knowledge, $\chi^2 (4, N = 108) = 16.236, p = .003$ and HBM constructs $\chi^2 (9, N = 108) = 22.154, p = .008$ to classify the diet self-care category. Thus, knowledge and HBM constructs alone were not significantly related to good dietary habits as indicated by the log likelihood differences, $\chi^2 (1, N = 108) = .048, p = .826$ and $\chi^2 (5, N = 108) = 5.918, p = .314$ respectively. The model as a whole explained 18.5% (Cox and Snell R square) and 26% (Nagelkerke R square) of the variance and correctly classified 93.2% of good and 38.3% of poor dietary habits. The overall classification was 75.9%, an improvement above the 68.5% in Block 0. As shown in Table 19, only one independent variable (race) made a unique statistically significant contribution to the full model in Block 3. After controlling all of the other predictors, the odds ratio for race was 8.844, CI 95% between 1.741 and 44.936, indicating that the non-Malays were over eight times more likely to report good dietary habits than the Malays.

In contrast, all three models at Time 2 were significant to classify the categories of diet self-care. The demographic variables in block 1 was $\chi^2 (3, N = 108) = 16.188, p = .001$ and knowledge added the prediction to the model of demographic, $\chi^2 (4, N = 108) = 18.068, p = .001$ and finally the HBM constructs also added prediction, $\chi^2 (9, N = 108) = 34.834, p = .000$ to the model that consisted of demographic and knowledge. Consequently, the differences in the log likelihood comparison at Time 2 showed that HBM constructs alone was related to diet self-care, $\Delta\chi^2 (5, N = 108) = 16.766, p = .005$ whereas the knowledge alone was not related to diet self-care, $\chi^2 (1, N = 108) = 1.880, p = .170$. The perfect model with all predictors explained 27.6%

(Cox and Snell R square) and 38.7% (Nagelkerke R square) and correctly classified 87.8% of good and 52.9% of poor dietary habits with the overall correct classification of 76.9% above the classification made by the model with constant only (68.5%). The race and the perceived benefit made a significant contribution to the model ($p < .05$) (see Table 20). Non-Malays in this study were fourteen times more likely to report good dietary habits than Malays (OR 14.123, CI 95% 2.65 – 75.18). On the other hand, for every one score increase in the perceived benefit, the participants were .23 less likely to report good dietary habits (CI 95% .092 - .575).

Table 19: Predictors of diet self-care at Time 1-2

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Age	.007	.037	1	.848	1.007	.941	1.077
Gender (F)	.605	1.604	1	.205	1.832	.718	4.675
Race (Non-Malays)	2.180	6.908	1	.009	8.844	1.741	44.936
Knowledge1	.005	.076	1	.782	1.005	.967	1.045
Perceived severity1	-.663	2.974	1	.085	.515	.243	1.095
Perceived susceptibility1	.086	.155	1	.694	1.089	.711	1.668
Perceived barrier1	.540	1.463	1	.226	1.716	.715	4.117
Perceived benefit	-.175	.191	1	.662	.840	.384	1.838
Cues to action1	.001	.000	1	.999	1.001	.414	2.420
Constant	1.454	.300	1	.584	4.279		

Table 20: Predictors of diet self-care at Time 2

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Age	.011	.077	1	.781	1.011	.938	1.088
Gender (F)	.772	2.195	1	.138	2.165	.779	6.016
Race (Non-Malays)	2.648	9.632	1	.002	14.123	2.653	75.184
Knowledge2	-.017	.562	1	.453	.983	.942	1.027
Perceived severity2	-.473	1.338	1	.247	.623	.280	1.388
Perceived susceptibility2	.254	.968	1	.325	1.289	.777	2.138
Perceived barrier2	-.569	1.622	1	.203	.566	.236	1.359
Perceived benefit2	-1.472	9.875	1	.002	.229	.092	.575
Cues to action2	.004	.000	1	.992	1.004	.427	2.363
Constant	9.065	7.847	1	.005	8649.197		

4.7.2. Predictors of insulin intake practices

At Time 1, the insulin intake practice category was able to be classified by models on the basis of demographic and knowledge predictor, $\chi^2(4, N = 159) = 11.68, p = .020$ and on the basis of demographic, knowledge and HBM constructs predictors, $\chi^2(9, N = 108) = 24.98, p = .003$. The demographic predictor alone was not significant, $\chi^2(3, N = 159) = 6.08, p = .108$. Meanwhile, the comparison of log-likelihood ratios for models showed that knowledge variables in block 2 was statistically significant $\chi^2(1, N = 159) = 5.59, p < .05$ and HBM constructs in block 3 were also significantly related to the insulin intake practice $\chi^2(5, N = 159) = 13.30, p < .05$. The model as a whole correctly classified 78% of cases and explained between 14.5% (Cox and Snell R square) and 21.2% (Nagelkerke R square) of the variance in insulin intake practice.

Among the predictors, age, knowledge and the perceived benefit contributed significantly to the model, $p = .04$ (age), $p = .005$ (knowledge), $p = .001$ (perceived benefit) (see Table 21). The odds ratio for age indicates that for a year increase in their age, the participants were 1.06 times (1.00 – 1.12) more likely to report adherence to their prescribed insulin whilst the odd ratio for knowledge indicates that for each increase in score of knowledge, the participants were less likely to report adherence to their prescribed insulin (OR 0.96, CI 95% .927 - .986). The OR value for perceived benefit was the highest (3.17, CI 95% 1.6 – 6.1), indicating that for every one increment in score of the perceived benefit, the participants were over three times to report adherence to their prescribed insulin.

Table 21: Predictors of insulin intake practice at Time 1

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
						Lower	Upper
Age	.059	4.136	1	.042	1.061	1.002	1.124
Gender (F)	.039	.010	1	.922	1.040	.477	2.267
Race (Non-Malays)	-.102	.055	1	.815	.903	.385	2.117
Knowledge1	-.045	7.909	1	.005	.956	.927	.986
Perceived severity1	-.092	.090	1	.764	.912	.500	1.663
Perceived susceptibility1	-.025	.018	1	.894	.976	.679	1.402
Perceived barrier1	.424	1.292	1	.256	1.527	.736	3.171
Perceived benefit	1.153	11.776	1	.001	3.168	1.640	6.122
Cues to action1	-.230	.471	1	.493	.794	.411	1.534
Constant	-1.677	.554	1	.457	.187		

When predicting the insulin intake practice at Time 2 using the predictors at Time 1 (Time 1-2), the models at each block had a good model fit (discrimination among the group); Block 1, $\chi^2 (3, N = 159) = 8.281, p = .041$, Block 2, $\chi^2 (4, N = 108) = 12.170, p = .016$, Block 3, $\chi^2 (9, N = 108) = 20.081, p = .017$. The model as a whole explained between 17% (Cox and Snell R square) and 26% (Nagelkerke R square) of the variance in the insulin intake practice at Time 2, correctly classified 80.6% of the cases; 33% of insulin non-adherence and 94% insulin adherence. However, the comparison of log-likelihood ratios indicate that knowledge and HBM constructs alone did not significantly relate to the insulin intake practice. Nevertheless, among the variables in the equation table (see table 22), race ($p < .039$), knowledge ($p < .024$) and perceived benefit (.037) made a significant contribution to the model. The strongest predictor of reporting the adherence to the prescribed insulin was perceived benefit, recording an odds ratio of 2.68 at CI 95% 1.06 – 6.78. This indicated that the participants were over two times more likely to report adherence to their prescribed insulin for every increment in the score of the perceived benefit. However, the participants were less likely to report adherence to their prescribed insulin for every one mark increase in their knowledge (OR .949, CI 95% .907 - .993). Similarly, the non-Malay participants were .30 less likely to report adherence to their prescribed insulin than Malays (OR .301, CI 95% .096 - .943).

Unlike the two logistic regression results above, the model that consisted of demographic variable alone was significant, $\chi^2 (3, N = 108) = 8.281, p = .041$, however, the model was no longer significant after the addition of knowledge, $\chi^2 (4, N = 108) = 9.210, p = .056$ and HBM constructs, $\chi^2 (9, N = 108) = 10.410, p = .318$ to distinguish the insulin intake practice category. Moreover, knowledge and HBM

constructs alone were also not related to the insulin intake practice, $\chi^2 (1, N = 108) = .929, p = .335$ and $\chi^2 (5, N = 108) = 1.200, p = .945$ as indicated by the log-likelihood comparisons. The model as a whole explained 9.2% (Cox and Snell R Square) and 14.1% (Nagelkerke R square) variance. The complete model correctly classified 96.4% of insulin adherence and 12.5% of insulin non-adherence. Nevertheless, the overall classification (77.8%) did not show any improvement when comparing with the overall classification predicted in block 0 (77.8%). Furthermore, among the variables listed in the equation table (Table 23), only race had made a unique significant contribution to the final model ($p = .009$). The model's OR showed that non-Malay participants were .23 less likely to report adherence to their prescribed insulin.

Table 22: Predictors of insulin intake practice at Time 1-2

Predictors	B	Wald	df	Sig.	Exp (B)	95% C.I. for EXP(B)	
						Lower	Upper
Age	-.078	3.394	1	.065	.925	.852	1.005
Gender (F)	-.450	.693	1	.405	.637	.221	1.840
Race (Non-Malays)	-1.200	4.247	1	.039	.301	.096	.943
Knowledge1	-.053	5.130	1	.024	.949	.907	.993
Perceived severity1	-.569	1.669	1	.196	.566	.239	1.342
Perceived susceptibility1	.209	.662	1	.416	1.233	.745	2.039
Perceived barrier1	-.145	.092	1	.762	.865	.337	2.216
Perceived benefit1	.986	4.343	1	.037	2.681	1.060	6.779
Cues to action1	-.257	.268	1	.605	.774	.293	2.044
Constant	7.153	4.708	1	.030	1277.713		

Table 23: Predictors of insulin intake practice at Time 2

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Age	-.050	1.589	1	.207	.951	.881	1.028
Gender (F)	-.285	.317	1	.573	.752	.279	2.026
Race (Non-Malays)	-1.452	6.900	1	.009	.234	.079	.692
Knowledge2	-.021	1.030	1	.310	.979	.939	1.020
Perceived severity2	.024	.004	1	.949	1.024	.491	2.137
Perceived susceptibility2	-.177	.531	1	.466	.838	.521	1.348
Perceived barrier2	-.086	.040	1	.841	.917	.395	2.132
Perceived benefit2	-.272	.501	1	.479	.762	.359	1.617
Cues to action2	.185	.161	1	.689	1.204	.486	2.982
Constant	6.023	3.587	1	.058	412.657		

4.7.3. Predictors of exercise self-care

The models for predicting the likelihood of regular exercise at Time 1 was only significant when all of the predictors (demographic, knowledge and five HBM constructs) were in the model, $\chi^2 (9, N = 159) = 17.923, p = .036$. The models were not significant when only the demographic variables alone, $\chi^2 (3, N = 159) = 6.360, p = .095$ or when knowledge was added to the model, $\chi^2 (4, N = 159) = 8.694, p = .069$. Moreover, the non-significant model consisting of knowledge, $\chi^2 (1, N = 159) = 2.334, p = .127$ and HBM constructs alone, $\chi^2 (5, N = 159) = 9.229, p = .100$ indicated that knowledge and all HBM constructs were not related to the exercise self-care category. The model as a whole explained 10.7% (Cox and Snell R Square) and 25.7% (Negelkerke R Square) and correctly classified 8.3% of regular exercises and 98.6% of non-regular exercises. The overall classification, nevertheless, was 91.8%, a slight decrease in comparison to the overall classification (92.5%) predicted

by the model without any predictors in block 0. Here, only the gender variable had significantly contributed to the predictive final model ($p = .015$) (see Table 24). In the meantime, the odds ratio of gender variable indicates that the female participants were over six times more likely to report that they are engaged in regular exercise than male participants (OR 6.812, CI 95% 1.445 to 32.111).

Table 24: Predictors of exercise self-care at Time 1

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Age	.014	.069	1	.792	1.014	.914	1.124
Gender (F)	1.919	5.883	1	.015	6.812	1.445	32.111
Race (Non-Malays)	-1.190	2.611	1	.106	.304	.072	1.288
Knowledge1	.032	1.416	1	.234	1.033	.979	1.089
Perceived severity1	.701	1.295	1	.255	2.016	.603	6.747
Perceived susceptibility1	.555	2.638	1	.104	1.742	.892	3.402
Perceived barrier1	-.168	.082	1	.775	.845	.268	2.670
Perceived benefit1	1.006	2.845	1	.092	2.734	.850	8.801
Cues to action1	.066	.015	1	.903	1.068	.368	3.102
Constant	-13.898	8.267	1	.004	.000		

Moreover, in terms of predicting exercise self-care during the study follow up using the baseline predictors (Time 1-2), the models at each block were statistically significant in predicting the likelihood that the participants would report that they are engaged in regular exercises, in which, in block 1 (demographic), $\chi^2 (3, N = 108) = 13.670, p = .003$, when knowledge was added in block 2, $\chi^2 (4, N = 108) = 14.087, p = .007$ and when HBM constructs were entered in block 3, $\chi^2 (9, N = 108) =$

20.849, $p = .013$. However, the differences in the log likelihood comparison showed that knowledge and HBM constructs alone were not significant; $\chi^2 (1, N = 108) = .417, p = .518$ and $\chi^2 (5, N = 108) = 6.761, p = .239$. Consequently, the model as a whole explained 17.6% (Cox and Snell R Square) and 42.8% (Negelkerke R square) in the variance and correctly classified 25% of regular and 98% of non-regular exercise with overall classification of 92.6% which was similar to the overall classification made by the model with constant only. As shown in Table 25, none of the individual predictors significantly predicted regular exercise.

Table 25: Predictors of exercise self-care at Time 1-2

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Age	.193	3.517	1	.061	1.213	.991	1.485
Gender (F)	-1.500	1.912	1	.167	.223	.027	1.870
Race (Non-Malays)	1.653	2.595	1	.107	5.223	.699	39.021
Knowledge1	.042	1.153	1	.283	1.043	.966	1.126
Perceived severity1	-.088	.016	1	.899	.916	.234	3.586
Perceived susceptibility1	-.497	.791	1	.374	.608	.203	1.819
Perceived barrier1	1.636	3.520	1	.061	5.135	.930	28.370
Perceived benefit1	-.916	1.190	1	.275	.400	.077	2.076
Cues to action1	.671	.507	1	.477	1.956	.308	12.412
Constant	-12.980	3.291	1	.070	.000		

Similarly, at Time 2, the models at each block were significant to predict the exercise self-care practice category; the demographic variables in block 1, $\chi^2 (3, N = 108) = 13.670, p = .003$, with addition of knowledge in block 2, $\chi^2 (4, N = 108) = 13.959, p$

= .007 and the addition of the five HBM constructs in block 3, χ^2 (9, $N = 108$) = 18.493, $p = .030$. However, the log likelihood comparison for blocks 2 and 3 indicated that knowledge and HBM constructs alone were not significant, χ^2 (1, $N = 108$) = .289, $p = .591$ and, χ^2 (5, $N = 108$) = 4.533, $p = .475$ respectively, indicating that knowledge and HBM constructs alone were not related to exercise self-care at Time 2. The final model which consisted of demographic, knowledge and HBM constructs explained 15.7% (Cox and Snell R Square) and 38.4% (Nagelkerke R Square) and correctly classified 0% of regular exercise and 99% of non-regular exercise practice with overall classification of 91.7%, a slight decrease below 92.6% as obtained in block 0. Age, gender and race were the factors that made statistically significant contribution to the predictive final model (see Table 26).

In Table 26, the highest odds ratio was the race variable which showed that non-Malays were 12 times more likely to report regular exercise than Malays (OR 12.311, CI 95% 1.261 to 120.241). The second highest odds ratio value was the age variable. This indicates that for every point increase in age (one year), the participants would be one time more likely to report regular exercise (OR 1.27, CI 95% 1.04 – 1.55). In contrast to the exercise self-care at Time 1, at time 2, the female participants were .051 (CI 95% .004 - .687) less likely to report regular exercise than the male participants.

Table 26: Predictors of exercise self-care at Time 2

Predictors	B	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
						Lower	Upper
Age	.237	5.401	1	.020	1.267	1.038	1.548
Gender (F)	-2.971	5.031	1	.025	.051	.004	.687
Race (Non-Malays)	2.511	4.662	1	.031	12.311	1.261	120.241
Knowledge2	.006	.023	1	.881	1.006	.929	1.089
Perceived severity2	.233	.128	1	.721	1.262	.352	4.519
Perceived susceptibility2	.006	.000	1	.989	1.006	.446	2.266
Perceived barrier2	1.580	2.890	1	.089	4.854	.785	30.001
Perceived benefit2	-.103	.028	1	.867	.902	.271	3.005
Cues to action2	1.687	3.050	1	.081	5.404	.814	35.894
Constant	-20.308	6.155	1	.013	.000		

4.7.4. Predictors of glycaemic control

In the first regression test (see Table 27), demographic variables in step 1 explained 4.2% of the variance in HbA1c. After the entry of knowledge variable in step 2, the total variance increased to 9.5%. Finally, after adding the health belief variables at step 3, the total variance as a whole was 14.9% [$F(9, 149) = 2.902, p < .005$]. The regression model as a whole was significant in predicting HbA1c. However, the HBM constructs alone did not make a significant contribution to in predicting HbA1c. The HBM constructs only explained an additional 5.4% of the variance in HbA1c, after controlling for demographic and knowledge variables, R^2 squared change = .054, F change (5, 149) = 1.903, $p > 0.05$. When evaluating each of the independent variables, the beta coefficient for the three predictors (age, knowledge and perceived susceptibility) made unique and statistically significant contributions to the prediction of the HbA1c results. Consequently, among these three predictors,

knowledge score made the highest contribution ($\beta = -.211$, $p < 0.01$) followed by perceived susceptibility ($\beta = .169$, $p < 0.05$) and age ($\beta = -.166$, $p < 0.05$).

Table 27: Predictors of glycaemic control at Time 1 (N=159)

Variable	Model1		Model2		Model3	
	β	sr_i^2	β	sr_i^2	β	sr_i^2
Age	-.169*	-.169	-.168*	-.168	-.166*	-.163
Gender	-.105	-.105	-.092	-.092	-.110	-.109
Race	-.048	-.048	-.061	-.060	-.037	-.034
Knowledge			-.230**	-.230	-.211**	-.201
Perceived severity					.058	.055
Perceived susceptibility					.169*	.161
Perceived barrier					-.156	-.137
Perceived benefit					-.079	-.066
Cues to action					-.104	-.093
Intercept	12.163		15.061		16.688	
R²	.042		.095		.149	
R² changed	.042		.053**		.054	
ANOVA (F)	2.266		4.032**		2.902**	

* $p < .05$ ** $p < .01$

For predicting the HbA1c at Time 2 using Time 1 predictors (Time 1-2), the test was performed on two datasets; 1) all participants (N=159) 2) completers only (N=108). In the regression test on dataset 1 (see Table 28), age, gender and race explained 3.5% of the variance in HbA1c at Step 1. After the entry of the knowledge score at Step 2, the total variance explained by the model was 18%. The knowledge score explained an additional 14.5% of the variance in HbA1c, after controlling for age,

gender and race (R^2 squared changed = .145, F change (1, 154) = 27.24, $p < .001$).

Once the five health beliefs were entered at Step 3, the model explained a further 6.9% of the variance in HbA1c (R^2 square changed = .069, F change (5, 149) = 2.74, $p = <0.05$) after controlling for age, gender, race and knowledge. The total variance explained by the model as a whole was 24.9% ($R^2=.249$), F (9, 149) = 5.206, $p < .0001$. The model of knowledge alone and the HBM constructs alone both predicted HbA1C score while the model that consists of age, gender and race added no predictions. In the coefficient table, only three variables were independently and statistically significant, where the knowledge score recorded a higher beta value (beta = -.354, $p < .0001$) followed by the cues to action score (beta = - .233, $p < .005$) and age (beta = -.159, $p < .05$) (see Table 28). When the regression test excluded the dropouts (see Table 29), the HBM constructs alone were no longer predictive of HbA1c. Furthermore, only the knowledge variable made a significant contribution to predict the HbA1c.

In the fourth regression test (see Table 30), the R^2 for demographic variables in each step was .026 in step 1 ; .057 in step 2 and .283 in step 3 respectively, indicating that the nine predictors accounted for 28.3% of the variance in HbA1c result, with F (9, 98) = 4.812, $p < 0.001$. In this regression test, the knowledge variable only added 3.1% (R^2 change = .031, F (1, 103), $p > 0.05$ while the HBM constructs in step 3 added 22.6% (R^2 change .226, F = 5, 98, $p < 0.001$ to the model. This pattern of results suggests that over a third of the variability in the HbA1c level results was predicted by the HBM variables. Meanwhile, as observed from the coefficient table, race, perceived barrier and perceived benefit had made unique and significant contributions to predicting HbA1c. The highest was perceived benefit ($\beta = -.397$, $p <$

0.001) followed by perceived barrier ($\beta = -.206$, $p < 0.05$) and race ($\beta = -.203$, $p < 0.05$).

Table 28: Predictors of glycaemic control at Time 1-2 (N=159)

Variable	Model 1		Model 2		Model 3	
	β	sr_i^2	β	sr_i^2	β	sr_i^2
Age	-.180*	.179	-.178*	.178	-.159*	.157
Gender	.044	.044	.066	.066	.055	.054
Race	-.038	-.038	-.059	-.058	-.006	-.006
Knowledge			-.382**	-.381	-.354**	-.338
Perceived severity					.068	.065
Perceived susceptibility					.101	.096
Perceived barrier					-.011	-.010
Perceived benefit					.021	.017
Cues to action					-.233*	-.208
Intercept	11.883		16.615		17.132	
R²	.035		.180		.249	
R² changed	.035		.145**		.069*	
ANOVA (F)	1.886		8.465**		5.500**	

* $p < .05$. ** $p < .001$.

Table 29: Predictors of glycaemic control at Time 1-2 (N=108)

Variable	Model 1		Model2		Model3	
	β	sr_i^2	β	sr_i^2	β	sr_i^2
Age	-.046	-.46	-.077	-.077	-.066	-.063
Gender	.019	.019	.026	.026	.025	.024
Race	-.155	-.154	-.185	-.183	-.152	-.135
Knowledge			-.363**	-.360	-.342**	-.314
Perceived severity					.000	.000
Perceived susceptibility					.043	.041
Perceived barrier					-.075	-.065
Perceived benefit					-.050	-.039
Cues to action					-.093	-.080
Intercept		10.127		14.977		16.785
R²		.026		.156		.170
R² changed		.026		.130**		.015
ANOVA (F)		.912		4.744**		2.233*

* $p < .05$. ** $p < .001$.

Table 30: Predictors of glycaemic control at Time 2 (N=108)

Variable	Model 1		Model2		Model3	
	β	sr_i^2	β	sr_i^2	β	sr_i^2
Age	-.046	-.046	-.063	-.062	-.058	-.057
Gender	.019	.019	.017	.016	.045	.045
Race	-.155	-.154	-.158	-.158	-.203*	-.188
Knowledge			-.177	-.176	-.104	-.100
Perceived severity					-.102	-.092
Perceived susceptibility					.169	.163
Perceived barrier					-.206*	-.178
Perceived benefit					-.397**	-.357
Cues to action					-.039	-.034
Intercept	10.127		12.920		19.926	
R²	.026		.057		.283	
R² changed	.026		.031		.226**	
ANOVA (F)	.912		1.548		4.294**	

* $p < .05$. ** $p < .01$.

4.8. Attrition bias

Since the drop-out rate often causes attrition bias, which can affect the external and internal validity of a study (Miller and Hollist, 2007), an additional logistic regression test was performed to detect the attrition bias in this study. This test was performed on the same set of demographic variables as listed in Table 6.

Attrition bias is present if any of the demographic variables can significantly predict the dummy variable coded as ‘missing/ non-missing’ (Miller and Hollist, 2007). In the logistic output table (see Table 31), however, none of the demographic variables

were significant ($p < .05$). The results of the analysis indicate that the individuals who remained in the longitudinal study were not significantly different from those who had dropped out. Thus, it could be concluded that there was no attrition bias in this study.

Table 31: Attrition bias analysis

	B	Wald	df	Sig	Exp(B)	95% CI for Odds	
						Lower	Upper
Age	.011	.088	1	.767	1.011	.943	1.083
Diabetes duration	.025	.751	1	.386	1.025	.969	1.085
Gender	.232	.401	1	.526	1.261	.615	2.584
Race	-.770	3.624	1	.057	.463	.210	1.023
Marital status	.238	.256	1	.613	1.269	.504	3.197
Educational level	.413	1.201	1	.273	1.512	.722	3.166
Living	-.547	1.280	1	.258	.579	.224	1.493
Job status	.688	1.705	1	.192	1.990	.708	5.590

4.9. Summary

In summary, 159 patients from the three study settings had participated in the study at Time 1 and 108 of the participants completed the study at Time 2. There was a high attrition rate in this study (32%). However, the t test results which compared the demographic characteristics of those who completed and dropped out from the study showed no significant differences.

In all, there was a statistically significant increase in the participants' scores for knowledge from Time 1 to Time 2. During the study period, the data analyses on self-care practices revealed that about two third, over two third, <10% and <1% of the participants reported that they had good dietary habits, adhered to their prescribed insulin, exercise regularly and performed SMBG \geq 3 times per day respectively. The mean for HbA1c results at both study phases were higher than 7% ($>$ 9%). At both study phases, the participants held a belief that diabetes is a serious and severe disease, but they only believed that the chances they have to be susceptible to any diabetes complication were only between 20-30%. They also reported fewer barriers and more benefits in carrying specific self-care activities at Time 1 and Time 2. Their high scores on the cues to action indicate that they were able to carry out self-care activities throughout the study period. Unlike knowledge, all the other study variables did not statistically change from the beginning of the study until the six months follow up.

The HBM with the demographic variables and knowledge significantly predicted good dietary habits at Time 1-2 and Time 2, insulin adherence at Time 1 and Time 1-2 and regular exercise at Time 1, Time 1-2 and Time 2. Nevertheless, the HBM without the demographic variables and knowledge were only significant to predict good dietary habits at Time 2 and insulin adherence at Time 1. Meanwhile, in predicting the glycaemic control, the HBM that contained demographic variables and knowledge significantly predicted HbA1c in all the regression analyses. However, after controlling for the demographic and the knowledge variables, the HBM was only significantly predictive of HbA1c at Time 1-2 and Time 2.

Besides that, among the HBM constructs, only perceived benefit had consistently made a contribution to predict self-care practices in the logistic regression analyses. Meanwhile, perceived susceptibility, perceived barrier, perceived benefit and cues to action had made a unique significant contribution to predict HbA1c values in multiple regression analyses. Finally, perceived severity, did not make any contribution in any of the analyses. The results of this study are discussed in the discussion chapter (Chapter 6).

CHAPTER 5: QUALITATIVE FINDINGS

5.1. Introduction

Semi-structured interviews were conducted with 23 diabetes educators of the three study settings. The interviews asked each of the diabetes educators about diabetes education that they provided to their patients. This includes the structure, process and outcome of the education. This chapter presents the findings of the analysis of the interview data. This begins with a presentation of the interview participants' personal data. The next section provides the profile of diabetes education for each unit of analysis. The following sections present about the assessment, contents, and targeted outcomes and their evaluations of all diabetes education programmes across the study settings. Finally, a summary of this chapter is provided at the end of the chapter.

5.2. Participants' personal data

A total of 23 educators had agreed and consented to participate in the interview whilst others (n=32) were not available during the study period (See Table 32). Most educators were female (96%) and Malays (88%). The educators were registered nurses (70%), dietitians (20%) and pharmacists (10%). However, only registered nurses were considered as certified diabetes educators as they had obtained the certificate by attending a 6-month diabetes post basic course. On the other hand, none of the educators interviewed reported that they had received regular training or continuous education in relation to diabetes education.

Table 32: Participants within each site

Case Study Site	Unit Analysis (Diabetes education programme)	Number of Educators Approached	Number of Educators Participated	Number of Non-Participants
A	Diabetes nurse educator's programme	7 Registered nurses	7 Registered nurses	24 Registered nurses (All were part time educators) - Not on duty
	Diet counselling	2 Dietitians	2 Dietitians	1 Dietitian – On maternity leave 1 Dietitian - Not on duty
	Medication counselling	1 Pharmacist	1 Pharmacist	-
B	Diabetes nurse educator's programme	3 Registered nurses	3 Registered nurses	2 Registered nurses - Not on duty
	Diet counselling	3 Dietitians	3 Dietitians	1 Dietitian - Not on duty
	Medication Counselling	2 Pharmacists	2 Pharmacists	2 Pharmacists - Only involved in the follow up session
C	Diabetes nurse educator's programme	2 Registered nurses	1 Registered nurse	1 Registered nurse - Not on duty
	Diet counselling	1 Dietitian	1 Dietitian	-
	Medication counselling	2 Pharmacists	2 Pharmacists	-
Total		23	23	32

5.3. Case study (diabetes education) profiles

5.3.1. Site A

5.3.1.1. Diabetes nurse educator's programme

The goals of the diabetes education were to increase patients' knowledge and awareness about diabetes, reduce early complications and empower patients in diabetes self-management. It operated every day from Monday to Friday in the endocrinology clinic. There were 31 diabetes nurse educators (DNEs) involved in the

diabetes education, including a coordinator (DNE 1). However, only DNE 1 provided the diabetes education on a permanent basis. Other DNEs only involved in the programme as part-timers because they also worked as a registered nurse in various disciplines such as the medical and surgical wards and a surgical clinic. They were only on duty for the diabetes education on five days rotation basis once in every two to three months. On average, there would be three DNEs on duty for the diabetes education in a single day. All patients with any types of diabetes were accepted to be educated by the DNEs based on referral basis only. The number of patients referred for the diabetes education was normally between 20-25 patients during the endocrinology (diabetes) clinic days (Monday, Wednesday and Friday).

In the programme, every patient was educated individually in the diabetes nurse educators' room. However, sometimes, there would be more than one patient in the room needed to be consulted by one DNE at a time. One DNE highlighted the consequences of educating more than one patient at a time:

“Some patients do not mind when there are about 3-4 patients in the room at the same time because they can share their problems. But some patients do not want it because they are ashamed to share their problems.” (DNE 7).

Another DNE stated her preference for educating one patient at a time:

“I’m more comfortable giving it personally. Meaning I need to give it to them alone, because I want to know their level of understanding. If there are two people and one of them understands, the other one can be embarrassed to ask”. (DNE 6).

The duration of each diabetes education session varied depending on the DNE or the patient's condition. Approximately, it took about 30 to 45 minutes. One DNE, however, conducted a shorter session of diabetes education.

“Actually, we have been taught not to do it for too long. But sometimes if they don’t understand, or if patients are more educated and have lots of questions, it can become long. Sometimes it’s around 10-15 minutes. But actually, it’s supposed to be just 5-10 minutes.” (DNE 6).

The contents of the programme included the knowledge about diabetes and self-management of medication, self-monitoring of blood glucose (SMBG), exercise and diet. The DNEs had been provided with the Clinical Practice Guideline (CPG) developed by doctors at the Ministry of Health Malaysia (MOH) to guide their teaching. However, they sometimes went beyond the information available in the CPG by consulting the endocrinologists in the clinic for the information that were not available in the CPG. Every patient was first assessed prior to delivering the content to patients.

The patients were given follow up session in every two weeks if their SMBG was uncontrollable. If the SMBG was controllable, they were seen once a month or the latest, once in every six weeks. However, for patients who lived far away from the hospital or could not afford to come as scheduled, they were asked to come on the same day they came for medication collection or for other clinic appointments. Every appointment, nevertheless, was only given based on the patients' agreement. The DNEs recorded what they had thought to their patients in the patients' file (if available). This file was only accessible to the referring providers and dietitians.

5.3.1.2. Diet counselling

Diet counselling at Site A was conducted every working day by four dietitians. The goals of the counselling were to ensure patients' blood sugar levels within the normal range and patients followed their recommended diet and to control diabetes-related illnesses such as hypertension, high cholesterol level and kidney problems from getting worst. The counselling was held everyday from 9.30am to 1pm in the endocrinology clinic by a different dietitian each day. However, during the data collection, the counselling was not available on Tuesday due to the shortage of dietitian. Patients must first be referred by their physician in order to be eligible for the counselling. The average number of patients counselled was between four to five patients per day and this could be up to nine patients on Wednesday (the diabetes clinic day). The counselling involved the patients' family especially for patients who were aged between 60 to 70 years old or had difficulties of understanding or had hearing problems.

The focus of the counselling was mainly on diabetic diet and the patients' individual meal plan. Topics such as knowledge of diabetes, exercise and diabetes medications were only briefly highlighted while topic regarding SMBG was not included at all in the counselling. The counselling was supposed to be fully based on the Medical Nutrition Therapy (MNT) that had been developed by the Malaysia Dietitian Association (MDA). However, some of the dietitians who graduated overseas adapted their own knowledge when counselling their patients. In addition, the counselling was guided by a teaching flipchart which consisted of the content and sequence of the content.

All patients attended the counselling were given follow-up sessions at every three months. Appointments would be given on the same day as their clinic or DNEs appointments on their request. If the date requested was not available, the appointment had to be postponed. Those who were shown positive progress of their blood glucose level, they were then given six month appointments. Patients had the choice to either continue or stop the six months follow-up. All information regarding the counselling sessions was recorded in patient folders. The folders were shared with other health care providers such as DNEs, pharmacists and the patients' physicians.

5.3.1.3. Medication counselling

At site A, the medication counselling programme only focused on disease awareness and the usage techniques of medical devices. The programme, however, was not only for diabetic cases but also for other cases which needed the use of medical devices. It was conducted every day in the pharmacy department by one pharmacist who was assisted by one different pharmacy houseman for every three weeks. For diabetic cases, its aims were to enable patients to perform insulin injection correctly and independently at home. The patients must be referred by their doctors and they were counselled on the same day as they were referred or when they came to collect their medications. According to the pharmacist, most of the diabetic cases counselled were type 2. On average, five diabetic cases were counselled per day and each case took about 45 minutes.

The content of the programme was mainly about teaching the patients about the correct technique of insulin injection. This was guided by the Malaysian CPG for

type 2 diabetes management. The information from the CPG was transferred into brochure and booklet forms and was given to each patient. The pharmacist stated no assessment was done for any patient.

“Briefly we just look at the prescription what is he currently on and explain the possible side effects, possible interaction, err... yea...very briefly. We have no access to their case note”.

The counselling was only given as a one-off session and no follow-up session was offered to the patients. However, the patients could just walk-in to see the pharmacist again whenever needed. According to the pharmacist, patients were seen on regular basis by the DNEs.

“No. Because we do not see them again. Diabetes nurse educators usually see them on the regular basis. But for these patients, we are mainly focusing on the technique and the disease awareness. So, they don’t have to come back for us. One off thing”

After the counselling session, each patient was given an insulin pen and this would be recorded in the pharmacy's database so that it could be traced to determine whether the patient had been counselled or not when they returned for another counselling in the future. On the other hand, the information on what had been given to the patients during the counselling session was not recorded at all.

5.3.2. Site B

5.3.2.1. Diabetes nurse educator’s programme

Diabetes education conducted by DNEs at Site B aimed to equip patients with diabetes-related knowledge, monitor the patients' glycaemic control and to prevent

diabetes complications. The education took place either in the Diabetes Resource Centre (DRC), in wards (for in-patients) or in the physician clinic (this clinic consisted of two other sub-clinics; the endocrinology and the medical clinics). There were five DNEs involved in the diabetes education. One DNE (DNE 3) was based in the physician clinic whilst the rest were based in the DRC and visited any wards whenever needed. The DRC was opened every day and patients could access the centre either through physician referrals or by walking-in whenever they wanted. In contrast, the diabetes education in the physician clinic was only available from Monday to Thursday and it access was through doctor referrals only. Patients of the endocrinology clinic, who needed to be educated by the DNE, would be referred by their physician to either the DRC educators or to DNE 3. Those who were referred to DNE 3, however, must be those who had just started to use insulin injection and SMBG.

The patients were first assessed by the DNEs prior to educating. The content areas covered in the education sessions were knowledge about diabetes and all aspects of diabetes-self management such as foot care, diet, medication, SMBG including glucometer and exercise. Each educator used their own materials to guide the teaching.

“We have our own book or file and we have to refer to our own file when giving counselling.” (DNE 2).

Patients who had been taught by the DNEs were seen in every two weeks in order to monitor their SMBG reading. Once the SMBG readings were controllable, patients were then given one follow-up in every three months.

5.3.2.2. Dietary counselling

Patients at Site B were received diet counselling based on referral basis only. The counselling was held every day in the dietetic department for all cases including diabetes. There were four dietitians involved in the counselling programme and the average number of diabetic cases counselled each day was five for each dietitian. The patients who were referred for the counselling sessions were educated individually on the same day as they were referred. The goals of the individual diet counselling for diabetics were to help normalise or stabilise the patients' blood sugar level, maintain or reduce one's weights if the patient was obese and develop a further understanding about food care/management and carbohydrate calculation. In addition to the individual counselling, the dietetic department also provided a diabetes lecture once a month. The lecture, however, aimed to reinforce the patients' knowledge on the things that they normally heard. The patients were advised to attend the diabetes lecture prior to the individual counselling. Furthermore, family participation in the individual counselling sessions was required especially for older patients.

The counselling taught the patients to control their blood sugar level through diet and exercise. This included the development of a meal plan for every patient. In addition, the aspects of medication and SMBG were briefly taught in relation to their diet. The content of the diet counselling was guided by the MNT. An assessment was carried out on every patient prior to counselling.

Each counselling session took about 40-45 minutes or sometimes could be up to an hour if the patient had many questions. The patients were then seen in every three months during their clinic appointment or one in every two or three months if the

patient was obese or lived nearby the clinic. The patients were also given the dietetic department's phone number for them to contact if they had any problem or enquiry between the follow-ups. Those who had achieved good glycaemic control or diet control or did not want to see the dietitian anymore would be discharged from the programme.

5.3.2.3. Medication counseling: The Medication Adherence Therapy Clinic (MTAC)

The pharmacy department at Site B conducted a programme called Medication Adherence Therapy Clinic (MTAC) for patients attending the diabetes specialised endocrine clinic in order to optimise and maximise medications prescribed for them. Four pharmacists involved in the MTAC programme; two pharmacists in-charge the MTAC in the physician clinic every Thursday whilst the other two were based in the pharmacy department every day from Monday to Friday. This programme was limited to patients with HbA1c result > 8 or 9%. Every Thursday, the eligible patients were identified by the pharmacists by looking at the HbA1c results from the patients' green book or diabetes files in the clinic. In addition, the MTAC accepted patients through physician referrals in the afternoon session. Furthermore, the programme also accepted walk in patients who's HbA1c were under control but they did not know how to do SMBG or insulin adjustment for a long run or they would like to know more about diabetes.

In the MTAC, patients were taught individually by the pharmacist. The content of the programme included an explanation about diabetes and its complications, symptoms of hypo- and hyper-glycaemia and its management, medications, diet and exercise,

and other diabetes-related topics. The education was based on a diabetes protocol which had been developed by the MTAC team. However, patients were taught according to their own problems. Therefore, when the patient came for the first time, the pharmacist conducted a thorough assessment to identify the problems before starting the counselling session. For example, from the assessment, if the patient reported taking herbals or other traditional medications, they would be taught on the benefits of their diabetes medications and the possible side effects and risks of the herbals if the herbals had already been known not suitable for diabetes.

The first counselling session took about 45 minutes to an hour. After the first session, the patients were then seen at the pharmacy department by the other two MTAC pharmacists in every two months. The follow-up sessions were quite quick because it only focused on reviewing the patient's lab results, SMBG results, their progress of insulin technique and medication compliance. Every patient was given the pharmacist's phone number for them to call at any times if they wanted to ask about their SMBG results, were unsure about the results or if they had any problems in between the follow-up appointments. Tagging system was used on the patients' appointment book in order to detect who were defaulted the MTAC appointment.

Most patients in this programme were discharged after three months while some patients were continued to be followed up for a year or more. Patients were discharged when they already knew how to control their blood sugar level, had good knowledge and medication compliance. However, patients were allowed to come back for the programme if they had problems after the discharge. Pharmacist 2 stated

that so far none of her patients had been discharged because the patients' diabetes control often went up and down.

5.3.3. Site C

5.3.3.1. Diabetes nurse educator's programme

Diabetes education conducted by DNEs at Site C was provided as part of diabetes care to all patients attending the endocrinology clinic. The aims were to equip the patients with knowledge about diabetes, its control and complications and to regularly examine their feet. It was conducted by two registered nurses of the clinic who were qualified as a DNE. The programme was delivered using two approaches: group and individual sessions. Group session was run every Monday concurrently with the diabetes clinic session. Every patient who came for their clinic appointment were approached and invited by the DNEs to participate in the group session while they waited to be seen by their doctors. Participants for the individual session, on the other hand, were enrolled through the clinic's physician referrals. The patients could choose to be educated either on the same day as they were referred or to come on any days between Tuesday and Friday from 8am to 5pm. The appointment, nevertheless, were only given to patients who had promised to come. Family or caregiver involvement was highly recommended if the patient had language problem. Overall it was estimated about 70-80% of patients of the clinic had received diabetes education either through group or individual session.

Topics covered in both approaches were diabetes and its complications, SMBG, exercise, medication, insulin adjustment, diet and foot care. The contents were delivered to the patients based on pamphlets, scales and a guide book that had been

prepared by the health education unit. However, the DNEs would add any new information that was not available in the pamphlets, scales or guide book.

All the topics were highlighted in every group session. The patients were given out a set of questionnaires for them to answer before and after the education in order to assess their knowledge and understanding of diabetes pre and post sessions. It lasted about 20-30 minutes. In the individual session, only topic on knowledge about diabetes and its control and complications and foot care were taught for every patient while topics on self-care were only given according to the physician's requests as stated in the referral letters and/or the patient's condition. For example, topic on diabetic diet was only given in details if the patients referred for dietary advices and topic about medication was only taught to patients who had just started insulin injection. The DNE conducted a thorough assessment before starting the education session.

All topics were not given in one education session if the patients were newly diagnosed patients. These patients were usually given a brief introduction in the first session and educated in the next session. The patients were given up to 12 times per year or one a month for the follow-up. Those who did not turn up for the appointment would be telephoned and asked the reason for not coming and were advised to come.

5.3.3.2. Dietary counselling

At Site C, the dietetic department allocated one dietitian to run a diet-counselling programme in the endocrinology clinic. The counselling served two purposes: 1) to

teach patients how to plan their menu and 2) to control and monitor their blood sugar level. It took place in the clinic every Monday from 8am to 12.30pm and served patients who were referred by their physicians. The dietitian also opened the counselling to patients who were not referred if there were cancellations on the appointment days. The dietitian would select patients who had HbA1c > 8% while they waited for their turn to be seen by their doctors. If there were too many patients, the dietitian would choose patients with HbA1c > 10% or patients who had already developed any diabetes complications. The number of patients counselled was between 6 to 7 patients a day. However, the number of patients could sometimes be more, but it was restricted for a maximum of twelve or thirteen patients a day as the counselling was only run by one dietitian and it was a half-day programme. Patients who had language barriers such as Chinese, Indian or elderly patients were asked to attend the programme with their care givers.

The content of the diet counselling was diabetes diet, knowledge of diabetes, exercise, SMBG and insulin injection. The counselling was guided by the MNT, yet it was delivered to the patients according to their circumstances. Therefore, the dietitian conducted a thorough assessment before counselling the patients. Information from the assessment was then used to formulate a diet plan for the patient. The counselling took about 30 to 45 minutes per session.

The patients were offered follow-up sessions for every three months which would be on the same day as their clinic appointment. They would be continued to be followed up until they were able to follow their meal plan. The duration of each follow-up session was only about 15 minutes to half an hour. The patients were also given the

dietitian's official phone number to contact if they had any problem relating to their diet in between the follow-ups.

5.3.3.3. Medication counseling: The Medication Adherence Therapy Clinic (MTAC)

Similar to Site B, the pharmacy department at Site C also developed a programme called Medication Therapy Adherence Clinic (MTAC) for patients of the endocrinology clinic. Its aim was to help the patients to optimise their medication therapy. The programme was run every Monday, which was concurrent with the diabetes clinic session. It was conducted by two pharmacists and it targeted patients with type 1 and type 2 diabetes mellitus only; patients with type 1 diabetes were enrolled in the MTAC programme through physician referrals whilst patients with type 2 were identified and selected by the MTAC pharmacists if their HbA1c >8%. On average, about 8 to 16 patients participated in the programme in one single day.

In the programme, enrolled patients were mainly educated about their medications. In addition, topic on exercise and diet were only briefly taught whilst knowledge about diabetes was only given to newly diagnosed patients. The education was guided by a standard protocol provided by the MOH as well as the pharmacists' experiences.

“We would use that guideline for the main things but we would just base on experience for other things.” (Pharmacist 1, Site C).

The whole session for each counselling usually took about 15 to 20 minutes. For new patients, however, it would take longer time which was approximately around 30 to

45 minutes. The entire details on the patients' visitations were recorded in their file. The patients were given follow-up sessions up to four times in a year if their HbA1c was >10%. Patients who had difficulties to come for follow-ups would be contacted via telephone in order to get their latest SMBG results. The patients were discharged if their HbA1c was stable or <10%.

In addition, participation in MTAC required the patients to actively participated, hence, patients who were not motivated and had difficulties in cooperating during the teaching session would be excluded from the follow-up session. Furthermore, patients who were no longer interested to participate would also be discharged from the programme.

“Yes. Usually we will look at the status of their HbA1c. For stable patients, I do not think we have to monitor them. For unstable patients, HbA1c more than 10, we will do a follow-up” whereas “Stable patients will be discharged straightaway.”

(Pharmacist 2)

5.4. The assessment phase

The most aspect assessed by almost all educators was the patients' knowledge of diabetes and its medications. The knowledge of diabetes included symptoms of diabetes, how they got to know about diabetes, symptoms and managements of hyperglycaemia and hypoglycaemia. However, at Site C, the dietitian only performed the assessment of the knowledge of diabetes on patients who were newly diagnosed with diabetes. In term of knowledge about diabetes medications, the patients were assessed on the knowledge of their current medications and the side effects of the medications. The current medications assessed by dietitians at Site B were not only

limited to the medications prescribed by the endocrinology clinic but also any other medications prescribed by any other hospitals, clinics or healthcare centres. Pharmacists at Site B utilised a set of 20 questions to assess the patient's knowledge on diabetes and its medications.

The pharmacists and DNEs also assessed the patients' technique of insulin injection, sites of the injection and the use of any traditional medications. They also assessed the patients' health beliefs toward the benefit of diabetes medications especially the insulin injection. One pharmacist assessed this by asking an indirect question:

"people nowadays are using this sort of medication because it is good for them, have you tried it?..something like that" (Pharmacist 1, Site C).

However, the pharmacists further assessed the patients' medication compliance based on four aspects (dose, frequency, medication and method of administration) using Morisky's Medication Adherence Scale (MMAS). Furthermore, pharmacists at Site B also assessed patients' 24-hour daily routine in order to know the times of insulin injection.

Patients' dietary habits were only assessed by the DNEs and dietitians. However, the dietitians conducted this assessment using the 24-hour diet recall in order to elicit information on the foods and beverages that the patient had consumed in the 24-hour period. This included the quantity of carbohydrates the patient took and what method was used to measure the quantity. If the patient was on insulin injection, the dietitians at Site A would assess the time of eating and insulin injection as well. The

dietitians also assessed patients' anthropometry data; height, weight and BMI. At Site A, patients' waist measurement was also taken for obese patients.

The dietitians and DNEs also assessed the patients' physical activities and several psychosocial aspects such as smoking habits, alcohol consumption and occupation. In addition, the dietitians and pharmacists at Site B assessed the patients' family history, the dietitian at Site B assessed the patients' financial status, lifestyle, history of weight loss, educational status, language that patients' preferred to be used in the programme and the living arrangement if the patient was a teenager or elderly while the DNEs at Site A performed the assessment on the patients' SMBG, routine eye check-up and family support.

5.5. The contents of the programmes

5.5.1. Knowledge about diabetes

All educators included a topic about diabetes as a disease and its short- and long-term complications in their teaching. In this topic, the patients were explained about the process of the disease, sugar control, how their medications help to improve the blood control and how diabetic diets helps to reduce their sugar level. They were also explained about their blood glucose level and control in relation to diabetes and its complications. DNE at Site A and pharmacists at Site C related the process of diabetes to how and why the patient got diabetes. At Site B and C, the patients were shown the pictures of diabetes complications by the DNEs. In addition, the DNEs and pharmacist at Site A and the dietitians in Site C also taught their patients regarding the management during hypo- and hyperglycaemia. The DNE at Site C

would re-explain this topic in the follow up sessions for patients who found it was difficult to understand the topic.

However, some programmes did not teach the topic about knowledge of diabetes to all of their patients. At Site A, the DNEs only taught the topics to newly diagnosed patients whilst for patients with long standing diabetes would only be taught a particular knowledge that they seemed to be lacking. The dietitian at Site B, on the other hand, did include the topic in their teaching because they expected that every patient who came for the diet counselling had already had attended education sessions with the DNEs and that the patients had been taught the topic. However, the dietitians would begin the counselling session by educating the patient about diabetes in general if the patient was found to have a lack of knowledge about diabetes during the assessment phase. On the other hand, the pharmacists at Site C excluded the topic for all patients with long-established history of diabetes because the pharmacists assumed that the patients already knew about it.

5.5.2. Diabetes diet

5.5.2.1. Appropriate diet for diabetes

All educators taught about the types of food that patients with diabetes should and should not take. These included several groups of food such as carbohydrate, fibre and fat. The main focus was on carbohydrate. They explained about what carbohydrates are, why reducing carbohydrates are important and the sources of carbohydrate to their patients. A variety of example of food that contained carbohydrate and fibre was explained to the patients so that the patients would know the variety of foods. They also taught the differences between the foods within the

group. For example, dietitians at Site A explained the difference between green leafed vegetables and spuds and advised their patients to go for the green leafed vegetables because potatoes contain carbohydrate which can raise the blood sugar level whilst green leafed vegetables also have carbohydrates but at a minimum and therefore, it can be taken in a large quantity.

In addition, the educators also advised their patients to increase fibre and reduce their carbohydrate and high fat intakes. Generally, the patients were advised to have one ladle of rice with a lot of vegetables for one meal. If the patient complained that he/she could easily get hungry, the educators advised the patient to reduce the portion to the smaller amount and take them more frequently. If the patient was afraid about getting hypoglycaemia, the educators explained that hypoglycaemia would not happen if the patient ate at the right time. If the patient had a big appetite, the educators taught the patients to his/her their fibre intakes and add more vegetables in their diet and drink plenty of water in order to reduce the appetite. Alternatively, they advised their patients to take foods that could delay hunger such as oats, low fat milk, whole bread sandwiches or tomato salad. All DNEs, however, would look at their patients' insulin requirement (if the patient was on insulin injection) and made some modification if the patients said that the recommended quantity was not enough.

The educators also advised their patients to avoid foods that contain high glycaemic index (GI). However, they did not use the term glycaemic index unless the patient was educated. Dietitians would say sugary or sweet food instead of using the term 'glycaemic index' for less educated patients. A few examples were used in order to improve the patients' understanding about GI food. For example, the dietitians at Site

B explained the difference between white bread and fibre bread. They told their patients that white bread contains high GI but once the patient eats something that has fibre in it; the GI will be reduced due to the fibre, not the bread. They used simple word when explaining about the relationship between the GI foods and fibres.

"I will explain from the tie on their arms. If I tie it lightly, it would be easier for the blood to rise. So the patient will learn." (Dietitian at Site C).

All DNEs and dietitians recommended their patients to have three main meals a day. In addition to the main meals, DNE 4 (Site A) allowed the patients to have snacks in between the meals. Other educators, however, only recommended snacks for some situations; 1) patients who were really hungry, hypoglycaemic or when they skipped the meals (DNE 2 and 5 at Site A), 2) patients with normal body weight or underweight and patients who were on insulin therapy (Dietitians, Site B) and 3) for younger patients (Dietitian, Site C). If the patient had Type 1 diabetes, one sugary drink a day was included in the meal plan. The sugary drinks for patients with Type 2, however, would only be included in their meal plan on the patients' request, yet it was restricted to once a month or once in every two months (DT C). All patients especially those patients who required insulin therapy were made aware of the importance of having regular meals at regular intervals. Dietitian at Site C suggested her patients who did not have a proper eating time to always bring a snack such as bread or biscuits and eat them every 2 or 3 hours.

The dietitians at Site A also taught about food labelling in their counselling. This included about how to read the nutrition panel for the food ingredient and nutrient particularly the carbohydrate. The difference between no added sugar and free sugar

and which one was better was also explained. In addition, they emphasised the importance of counting the carbohydrate intake if the patients often took commercial food. The carbohydrate counting was taught using grams.

5.5.2.2. Meal plan

The meal plan for each patient was developed by dietitians only. The dietitians first calculated the patients' current total calorie and carbohydrate intakes. Then, they calculated the patients' actual total calorie required based on the patient's recent weight. According to the dietitians at Site A, the average recommended calorie for patients attending the diet counselling session was between 1200-1500 calories per day with 40-50% of the calorie were from carbohydrate. However, if the patient's current diet showed that he/she already took 50% carbohydrate and his/her blood remained high, the recommended amount of carbohydrate would be reduced. The amount of carbohydrate was then distributed between 3-4 exchanges for each main meal (breakfast, lunch and dinner) and 1-2 exchanges for snacks in between the main meals. The carbohydrate exchanges for the main meals included 1-2 exchanges for fruits. The total amount of carbohydrate exchange that was usually recommended for every meal plan was between 9 to 10 exchanges. The dietitians used the term of 'serving' instead of exchange to their patients.

The patients were explained about their recommended meal plan by the dietitians. This included the modification of the total calorie intake, types of suitable food, number of meal per day, carbohydrate distributions, and carbohydrate exchange. The patients were allowed to determine their favourite food for the meal plan. They were also taught to make the dietary changes gradually. For example, if the patient was

obese and the current diet was 3500 calories, the dietitians would tell the patient to cut it down gradually from 3500 to 2500 first before cutting them to 1500 calorie. The patients were advised start with one or two easier dietary changes in the first few weeks and gradually made additional or more difficult changes over several weeks or months. The easiest dietary changes, for example, taking half can of a carbonated drink and diluted with water or a quick yogurt or granola bar in the morning instead of skipping breakfast. The difficult changes might be replacing the high-fat meat or including more servings of vegetables daily.

Furthermore, the diet modification was not too strict especially for the newly diagnosed patients. For example, the patients were allowed to modify the distribution of carbohydrate exchange provided its total amount remained within the total of 10 carbohydrate exchanges. They were also advised to avoid refined sugar but they were still allowed if they wanted to have it, yet this must be included in the 10 carbohydrate exchanges. For instance, the patient can take one to two exchanges of sugary drinks, and again it must be counted in the ten exchanges.

The diet modification was also made to suit the patients' life style, working hours, appetite, religion and financial status. For example, if the patients did not have any appetite, it would be suggested for them to take nutritional fluids. If they had eaten at a midday event, they were advised not to eat heavily during the dinner. The modified diet plan also took the patient's social life into consideration. For example, the patient could modify their diet regimen if they wanted to attend any social function or party or during feast but they had to control themselves. They were taught of choosing either healthy foods or any types of food served in a small portion or

quantity. For instance, if the event served buttered rice and white rice, the patient was asked to choose the white rice, take a lot of vegetables, meat or chicken and water as well as to reduce taking side dishes because a lot of them were made from the coconut cream.

5.5.2.3. Carbohydrate counting

The dietitians also taught the patients on how to count the appropriate carbohydrate quantity for each exchange/ serving. The dietitians at Site A used a medium size Chinese bowl which was equivalent to 150gm, cups and spoons to show to their patients the right quantity for one exchange/serving. For example, $\frac{1}{2}$ cup of rice is equivalent to one exchange. In addition, a flip chart or picture of carbohydrate exchange and food samples were shown to the patients. Food samples were used if the patients did not understand about the measurement using cups or bowls.

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The dietitians at Site B utilised a food atlas when teaching their patients the right portion of food that equals to one carbohydrate exchange or serving. In addition, bowls, cups, scoops were also used to illustrate the right measurement to the patients, such as one exchange/ serving of noodles equals to $\frac{1}{3}$ cup whilst one exchange/serving of rice equals to half cup or one scoop. The one scoop of rice had to be level and not heaped and compressed. If it was heaped and not loose, the amount of rice and the calorie intake would be higher.

At Site C, the dietitian used a cup or a ladies fist to illustrate the right quantity carbohydrate that equal to one exchange. For example, one exchange of rice equals to one cup or a ladies fist full of rice. If the patients liked to drink sugary drinks,

they were explained by the dietitian that one table spoon of sugar equals to one slice of bread.

Meanwhile, for fruits, all the dietitians used fruit samples that equal to one exchange; one whole apple, pear, or orange, one cut (Ringgit Malaysia 1) of papayas, watermelons, and pineapples, seven small grapes or five big grapes. Fruits, however, were optional which could be either taken or excluded depending on the patient. If the patient chose to take it, it must be taken together with the main meal and not as a single meal.

At Site A, however, the carbohydrate counting was only taught in detail if the patient had good understanding and compliance. If the patient's compliance was not very good or the patient was not interested to listen, it would only be taught roughly.

5.5.3. Diabetes medication advices

5.5.3.1. General knowledge about diabetes medication

All educators explained about the benefits of diabetes medications that their patients were currently on. Most educators, however, focused on patients with insulin injection.

"About the insulin, we must tell patients everything that have been suggested by doctors or the dosage that have been set by doctors. Some patients don't feel really confident with the insulin dosage that we give after they've seen the doctor. Some patients have been given 20 units of insulin by the doctor and when they come to see me, they will not feel confident and say those 20 units is too much. I will explain to

them that doctors give 20 units because their glucose level is not normal or maybe their reading is not satisfying.” (DNE 2, Site B)

The educators also explained about the need of insulin as well as the side effects. According to the pharmacists at Site C, explanation on the insulin side effects such as weight gain needed to be highlighted because they wanted the patients to be aware and ready of this side effect.

Furthermore, some educators also taught their patients about how to store the insulin; in the fridge or at room temperature and to avoid sunlight or high temperatures when travelling. Furthermore, they also explained on how to dispose the needle after using it.

5.5.3.2. Insulin injection

Insulin injection was the main focus of diabetes medication topic. This content was provided by all DNEs and pharmacists. This included handling the insulin and needles or insulin pens, appropriate needle size and sites of injection, preparing the insulin, insulin techniques and how to perform the correct insulin injection. The most recommended site for the injection by the DNEs and pharmacists was on the stomach and thigh. They did not recommend their patients to perform the injection on the arms unless the patients had somebody to help. Patients with multiple insulin injection per day were reminded not to inject on the same location and encouraged to change the sites of injection. For example, pharmacists at Site B suggested that patients who had four injections a day to do three of the injections on the stomach and one on the thigh. However, it depended on the patient’s preference.

“Sometimes patients are not comfortable with injecting it on the stomach, so they can inject it on the thigh or arm. But if it is on the arm, they have to get some help to inject the insulin.” (DNE 2, Site B)

DNE 1 at Site A used pictures on her computer to show to her patients which parts of the body that is suitable for the insulin injection. One DNE at Site B, on the other hand, used a drawing to show her patients the sites for the injection.

“... I usually make a drawing and show it to patients. For example if they have to do 4 injections today, they must complete it on their right side first. Once the top and bottom side have been completed, only then they can do it on the left side. This is because once they have completed a full circle; the right side has already healed.”

(DNE 1, Site B)

The pharmacists at Site C and all DNEs used demonstration technique to show their patients on how to prepare the insulin (for patients who used needle and syringe), installation of the insulin cartridge and needle (for patients who used insulin pen) and perform the injections correctly. The DNEs at Site A demonstrated the technique of insulin injection by performing the injection on themselves in front of the patients.

After that, the patients were asked to perform the insulin injection on their own stomach. If the patient was scared of injecting themselves, at Site A, the patient's family (if present) would be asked by the DNEs to do the injection on the patient. The DNEs at Site B, nevertheless, would perform the injection together with the patients in order to convince the patients that the injection did not hurt. The

pharmacists at Site C, on the other hand, would perform the injection straight away on the patients.

“For patients who are newly on insulin, we will ask them to inject in front of us. Otherwise, we will not allow them to leave because they might not be able to do it at home.” (DNE 1, Site B)

Furthermore, psychological support would also be given to patients who felt embarrassed of doing the insulin injection.

“..... some patients think that they are already in a critical condition and they feel embarrassed by the fact that they have to take insulin. Some patients do not want to admit this, they feel ashamed of it but we will bring up this point when giving counselling to them so that they do not have to feel ashamed of it anymore.” (DNE 2, Site B)

5.5.3.3. Insulin reaction

All educators also taught about insulin reactions to their patients. This included about how long the insulin would be in the body, how long it will start to react and its symptoms. They emphasised their patients that hypoglycaemia might happen if the insulin technique was not done correctly or the meals were not taken properly. They reminded their patients to eat regularly at the right time in order to avoid hypoglycaemia. For patients who were on the type of insulin injection that required them to wait for a certain time before eating, the educators advised these patients to eat quicker and not to wait for the time if they patients has started having hypoglycaemia. Nevertheless, those who needed to the injection at night were not encouraged by the educators to eat anything because the patients would usually sleep

after having the injection. Pharmacists at Site C advised their patients to take some sugar immediately or going to the hospital immediately if severe hypoglycaemia occurred.

5.5.3.4. Insulin adjustment

Content related to insulin adjustment was also included in the medication advices. However, in all sites, this content was only provided to patients who were able to perform SMBG. In addition to this requirement, this content was limited to specific type of patients; those who always had high blood glucose levels (DNEs, Site A), had adequate understanding, was an educated person or had family members who were present during the counselling session (Pharmacist, Site A), confident to do it and/or was an educated person (Pharmacists, Site B), those who really wanted to do it (DNE, Site C), motivated and knew how to do a proper SMBG and the SMBG results were good (Pharmacists, Site C).

The insulin dosage for adjustment advised the patients varied according to different situations. For example, the DNEs at Site B advised their patients to reduce two units of the insulin dosage when they get hypoglycaemia or the SMBG reading was lower than 3.5-4mmol/L. The patient also could increase 1-2 units of the insulin dosage if the SMBG readings had been high for 3-5 days in a row or between 4-6 units if the patient had to eat sweet, heavy and buttery food when attending a social event. The pharmacists at Site B, on the other hand, allowed their patients to have additional 2-4 units of the insulin if they needed to eat at an event or when they had better appetite or when they got SMBG reading 10mmol/L twice. However, the patients were reminded that the insulin injection was something to help and was not something to

rely on because the insulin has its side effects. Therefore, the patients were not allowed to increase their insulin just because they wanted to eat more than usual but they were allowed to have it once in a month. They were also reminded that it was hard to get the normal blood glucose level after a heavy meal even though they increased the amount of the insulin. They were also explained that they might get diabetes complications if their sugar rose every day. There were some patients who were not confident enough to increase their insulin dosage when needed because they were afraid of the diabetes complications.

“Some patients are not confident to increase their insulin. They might say that when they inject insulin, there might be complications or it might affect their kidney. However, we will assure patients that insulin does not affect their internal organs.”

(DNE 2, Site B).

5.5.3.5. Medication compliance

All DNEs and pharmacists emphasised about medication compliance. This included taking the right dosage using the right method at the right time. The timing of the medication was the most concern. For example, a medication which was prescribed for twice a day must be taken every morning and evening. Explanations were given to patients on the reason why the particular medications needed to be taken at certain time because they liked to compare their medications with each other. For instance, Diamicron needs to be taken a half an hour before eating whilst Metformin is during mealtime. The pathophysiology of insulin on diabetes was taught to patients who had stopped taking their insulin injection. Meanwhile, the patients who often forgot to take their insulin were taught the strategy to overcome the problem such as setting their clocks for a certain time, noting down the time (where they could see it) or

always putting the insulin near them. They were explained the consequences if they missed the insulin.

If the patients always forgot to take their medication at the right time, they were told to take it once they remembered within five hours otherwise they were told to leave it and take the next dose as prescribed. They were also reminded to always read their prescription because sometimes the patients missed their medication dosage because they did not notice that it had been increased by their doctors.

“If they forget to take medication for more than 8 hours, for OD dosing for example, then they do not have to take the medicine for the day but if it is not more than 8 hours then they only have to eat it once a day. So for the next dose, we will not do continue it. They do not need to take a double dosage.” (Pharmacist 2, Site B).

5.5.4. Physical exercise recommendations

The recommendations for exercise varied between educators (see Table 33). In term of the frequency of exercise, most educators recommended three times per week. The recommendation for duration of each exercise was between 15 and 150 minutes with most educators recommended between 15-30 minutes for each session. The most common types of exercise recommended were walking or brisk walking, jogging and house chores. The types of exercise recommended to patients depend on their age and ability. For example, elderly patients were asked to go around the house while younger patients were advised to go jogging. At Site A, the type of exercises chosen, however, must be agreed by patients' doctor or the DNEs and patients were not recommended to exercise if they were not well. On the other hand, dietitians at Site A and C did not recommend any types of exercise.

“I can’t really suggest anything because sometimes the patient can ask about the pain in their knees, and that’s not my area of specialty.” (Dietitian 1, Site A)

Table 33: Exercise recommendations by the educators

Educator (Site)	Frequency	Duration per session	Type of Exercise
DNE 1 (A)	Daily	At least 30 mins	Depend on the patient’s ability E.g. Brisk walks and swimming
DNE 2 (A)	Daily (2-3 times a week is also acceptable)	15-30 mins	Any suitable activities for the patients and their current health status. E.g. walking, cycling, domestic activities
DNE 3 (A)	Twice a week	15-20 mins	Any suitable activities for their age. E.g. Brisk walking or any house chores such as mopping
DNE 4 (A)	3 times per week	30 mins	Any suitable activities for their age E.g. Light exercise for older patients
DNE 5 (A)	Daily	30 mins	Older patients can walk around the house or go up and down the stairs. Patients with knee problems can do light exercises such as leg movements, shaking and turning their legs, lifting their legs while they sit down watching the television
DNE 6 (A)	3 times per week (daily if patient want)	20 mins	Gardening, walking at home
DNE 7 (A)	3 times per week	45-60mins	Outdoor activities such as walking and jogging
Dietitian 1 (A)	3 times per week	NONE	No recommendation
Dietitian 2 (A)	3 times per week	30-45mins	No recommendation

Continued Table 33: Exercise recommendations by the educators

Educator (Site)	Frequency	Duration per session	Type of Exercise
DNE 1 (B)	Daily	≥30mins for obese patients ≥ 45 mins for other patients	*Target to reduce weight For obese patients: swimming, walking, cycling or any other sports that do not put much pressure on their knees
DNE 2 (B)	3 times per week	30-45 mins	Depend on patients' ability
Dietitian 1 (B)	At any time	150mins per week	Aerobic
Dietitian 2 (B)	Daily	≥30mins	Depend on patients' conditions e.g. Older or obese patients can do a lot of walking
Dietitian 3 (B)	2 times per week	20-30 mins for the first time then increases it according to patients' comfort.	Not provided
Pharmacist 1 (B)	Not provided	Not provided	Go around the house and go out for a bit for elderly patients. Jogging for younger patients
Pharmacist 2 (B)	Not provided	Not provided	Go around the house and go out for a bit for elderly patients. Jogging for younger patients
DNE (C)	3 times per week	20-30 mins	Any exercises that suit patients' capability such as walking
Dietitian (C)	3-4 times per week	30mins	Not provided

All DNEs also taught their patients about the importance of exercising in relation to the insulin and diabetes control. The DNEs at Site A further explained about the preparation before, during and after exercising. These included wearing comfortable shoes, doing SMBG before exercising and being alert for any obvious signs and symptoms of hypoglycaemia during the exercise.

5.5.5. Self-monitoring of blood glucose (SMBG) recommendations

Similar to exercise, the recommendations for self-monitoring of blood glucose (SMBG) also varied between educators (See Table 34). Most DNEs recommended SMBG three and two times per week for patients who were treated with insulin therapy and oral hypoglycaemic agents (OHA) respectively. Meanwhile, pharmacists' advices were based on the type of insulin (at Site A) or the number of insulin injection per day that patients used (at Site B and C). For example, if the patients were on basal-bolus insulin, they were advised to do SMBG four times a day. In the case of the number of insulin injection, the pharmacists recommended SMBG four times a day for patients who took four injections a day. If the patient did not want to do four times a day, the pharmacist targeted on fasting reading in the morning. Those who could not afford to do SMBG were advised to do it on an alternate day. The pharmacist, however, realised that the patients might not do the SMBG as advised.

“I know in reality they do not do because of the cost factors. They try to save money.” (Pharmacist 2, Site C)

Unlike DNEs and pharmacists, dietitians, did not provide any SMBG frequency recommendations. The dietitians at Site A only encouraged their patients to note every post-prandial readings or at least one reading so that the patients could see the trend, such as where the highest level was in order to control the sugar reading. If their patients wanted to eat more at an event, the dietitians asked them to do SBMG afterwards because it might be higher than the normal reading. At Site C, the dietitian only emphasised about the right time for doing SMBG. The patients were explained that SMBG must be performed before they took their insulin injection and

two hours after their meals every day. However, if the patients could not afford it, they were asked to do it in the morning when they woke up, and chose any other meals for the next SMBG.

Moreover, at Site A, the patients were asked by the DNEs to bring the glucose machine and strips to the DNEs or pharmacists for check-ups if the machine indicated an error when performing the SMBG or when their SMBG results were normal but the HbA1C was not good. At Site B, the patients were also needed to bring their glucometer for calibrating once a year or they could call or come to the DRC immediately if the glucometer did not work or if they had any difficulty using it.

All educators provided teaching about SMBG to all of their patients except DNEs at Site A which limited this topic to the patients who had blood glucose machine at home and dietitian at Site C only taught this topic to the insulin-treated patients who really wanted to know about it.

Table 34: SMBG recommendations by diabetes nurse educators (DNEs)

Educator (Site)	Insulin	Oral hypoglycaemic agents (OHA)
DNE 1 (A)	4 times per day and once a month test at 2 or 3 am/ when the patient feel weird	Twice a week
DNE 2 (A)	3 days in a row at the same time and skip for 2 days for patients who were just on insulin. 1 in every 3-4 days for long standing insulin-treated patients	Twice a week at different time
DNE 3 (A)	2 times a day	Once a week. If the patients can afford they can do it daily or twice a day
DNE 4 (A)	3 times a week or twice a day if they cannot afford. Do it at different times	Once or twice a week at different times
DNE 5 (A)	4 times per day. If the patient cannot afford, do it 3 times a week at different times	4 times per day. If the patients cannot afford, do it 3 times a week at different times
DNE 6 (A)	3 times a week (2 times a week if the patient cannot afford)	3 times a week (2 times a week if patients cannot afford)
DNE 7 (A)	3-4 times per week at different times	3-4 times per week at different times (2 hours post-prandial)*
Pharmacist (A)	Depend on the type of insulin: 4 times a day for basal-bolus insulin 4 times (fasting only) a day for long acting insulin. Patients who cannot afford were advised to do on an alternate day.	Not provided
DNE 1 (B)	Daily at different time for each day. If patients were incapable, do it at least 1-2 reading a week	Daily at different time for each day. If the patients were incapable at least 1-2 reading a week
Pharmacist 1 (B)	Depends on the number of insulin injection: 4 times per day for 4 insulin injections per day. If the patient does not want, the pharmacist targets on fasting reading in the	Not provided
Pharmacist 2 (B)	Depends on the number of insulin injection: 4 times per day for 4 insulin injections per day. If the patient did not want, the pharmacist targeted on the fasting reading in the morning.	Not provided
DNE (C)	4 times a day. If patients do not want, they were given an option to do it five times a week at different times	Not recommended to do it regularly but are encouraged to have one reading per week

5.6. Targeted outcomes

5.6.1. Normal blood glucose level

All educators targeted all of their patients to achieve normal glycated haemoglobin (HbA1c) after attending their diabetes education programmes. In the DNE's programmes, however, the cut off point for the normal HbA1c level varied according to the patient's age; <6.5% for patients who were aged 40 years, 7% for older patients. On the other hand, the DNEs at Site C targeted HbA1c between 6.5% - 7% for patients who were aged <50years and <8% for patients who were aged > 50 year old. For patients whose their HbA1c was already high, dietitians at Site A and B and pharmacists at Site B only expected them to have some improvement at each follow up before the HbA1c reached the normal level. The pharmacists only allowed such patients to achieve normal HbA1c level at the next follow up if the patient was really motivated and able to do self-insulin adjustment. Two educators (DNE 1 and DNE 3) at Site A, however, did not set any target for the HbA1c but they rather let their patients to set the target for themselves.

In addition to HbA1c, all programmes at Site B and DNE's programme at Site A also targeted their patients to achieve normal SMBG readings after participating in their programmes. The pharmacists set a target between 4-6mmol/L. However, the patients were told not to get 4mmol/L if they got hypoglycaemia. The DNEs at Site B also set the target, however, this differed between the educators; DNE 1 suggested the patients to achieve 4-6mmol/L and 4-8mmol/L for fasting and post-prandial respectively while DNE 2 suggested the patients to achieve 6-7mmol/L for post-prandial, 5-8 mmol/L for fasting and 5-10mmol/L for post-prandial if the patients' age was > 65 years old. The patients were expected to have at least 0.5% or 1-2%

reduction of their SBMG at each follow-up. Similar to HbA1c, two DNEs (1 and 3) at Site A let their patients to set the target of SMBG they wanted to achieve. The DNEs at Site A and B and dietitians at Site B asked their patients to record the SMBG results. The DNEs provided a diary book to their patients for this purpose.

Moreover, the pharmacists at Site B and the dietitians at Site C also targeted their patients to get normal fasting blood sugar (FBS). The dietitians targeted for FBS <10mmol/L if the patient's FBS readings were normally between 15 to 16mmol/L. If the patient's previous eating habit was uncontrollable, the FBS target would not be high.

All educators, except dietitians, explained about HbA1c to the patients and their family (if present). In contrast, explanation about SMBG to the patients and their family (if present) were only provided by the DNEs. Those explanations were given using the simplest words especially for older or less educated patients. In the explanations, pharmacists at Site B distinguished the difference between HbA1c, FBS and SMBG; HbA1c is the level of sugar that is taken at the hospital in every 3 months and it tells the average of glucose level for 3 months whereas FBS or SMBG is the sugar level at the moment only. According to the pharmacists, the comparison was needed since some patients would not take any sugar before they came to see their doctors in order to ensure their blood glucose level was not high and that they would not get scolded. The DNEs at Site B and C and dietitians at Site B also explained about the relationship between HbA1c and diabetes complications. The DNEs also included in the explanation about relationship between SMBG and diabetes complications. One DNE at Site B used pictures in the explanation.

“We will also show them pictures. For example, if we show gangrene complications to patients it will make them more convinced to control their blood sugar level”.

(DNE 1, Site B)

In order to ensure the patients achieved their targets, the DNE and pharmacists at Site C would refer their patients who complained of difficulty in following their insulin regimen or report a weight gain to their physician for changing the type of insulin injection. In addition, the pharmacists would do home visits for older patients who lived alone in order to look at the way they did the insulin injection and to teach them again if needed. They also provided the patients with a list of appropriate timings for SMBG. Those who did not have a glucometer and could not afford to buy would be referred to the hospital welfare department. For those who had the glucometer but cannot afford to buy the needles, they would be referred to the nearest clinic or healthcare centre for SMBG by the pharmacists.

5.6.2. Self-care behaviours

All patients who had attended the diet counseling were expected by their dietitians to comply with the agreed meal plan. Therefore, the patients were asked to make their food intake record. Similar to the dietitians, the DNEs at Site A also targeted on the diet aspect. However, the focus was not on the diet compliance but only on good dietary habits. The DNEs provided a diary book to every patient to record all what they ate for breakfast, lunch and dinner as well as their physical activities and insulin adjustment. In term of medication, only two programmes included it as the targeted outcomes of their programme; DNEs and pharmacists at Site B. The DNEs only targeted on the correct insulin injection technique while the pharmacist targeted on

both the correct insulin injection technique and medication compliance. In addition to the self-care behaviours, DNE at Site B and dietitians at Site A and B also targeted on reduced weight for obese patients.

5.7. Evaluation of the outcomes

All targeted outcomes of the diabetes education programmes were evaluated during the follow up sessions. In term of blood glucose level, patients' recent and previous HbA1c, FBS and SMBG results were compared to see for any improvement. The HbA1c and FBS results were retrieved from the patients' record as these was part of the routine clinics. The SMBG results, on the other hand, were based on the patients' own record. The patients were explained whether their results did or did not show improvement. For patients who failed to control the HbA1c within the targets, the dietitians at Site B would stress on the diabetes complications to the patients whilst the DNEs at Site C would assess patients' psychosocial aspects such as who did they live with, who helped them, their environment, who their trust lies in and their obedience for orders. The pharmacists at Site B and C recorded the patients' lab results and progresses in a chart and kept it in the patients' file. In addition, at Site C, the chart was also given to the patients by sticking it onto their record book.

For diet, the DNEs evaluated the patients' food record to see whether there was improvement in their diet habits. Patients who reported good dietary intakes but had uncontrollable sugar reading would be asked if they took any traditional medications. In contrast, the dietitians evaluated patients' compliance to their recommended diet plan. At Site B, the dietitians also evaluated the patients' satisfaction and problem in following their meal plan. If the patients reported having a problem to follow the diet

plan, the dietitians would discuss with the patients and the plan might be modified. The dietitians recorded the patient's progresses electronically at each follow-up. However, there was no standard format for the records.

In term of medication, the pharmacists used a specific form to evaluate the insulin injection techniques and the Morisky's Medication Adherence Scale (MMAS) to calculate the percentage of medication compliance. In addition, the pharmacists not only evaluated the patients' outcomes, but they also evaluated the effectiveness of their programme. This was done by conducting a research asking doctors and patients, or staff nurses to complete a questionnaire and to give a comment on whether the MTAC was effective for their patients.

5.8. Summary

The qualitative findings had provided valuable insights into the context of self-care practices which were found in the longitudinal investigation. There was a possibility that not all patients attending the study settings had been provided with diabetes education, especially diabetes education that was conducted by dietitians and pharmacists. In particular, the diabetes education programme which was conducted by diabetes nurse educators was available to all patients either based on referral basis or walk-in patients. On the other hand, some diet counseling and most of medication counseling only were only available to selected patients. The contents of the programme ranged from knowledge about diabetes (limited to newly diagnosed patients), medications, diet, exercise and SMBG. However, all of the topics were covered by the DNEs. The dietitians only focused on the dietary advices and the development of healthy diet regime for the patients while the pharmacists only taught

on medications and SMBG in relation to the medications. Except the pharmacist-based programme at Site A, all other programmes offered follow up to their patients.

Most educators conducted assessment prior to their teaching. The topic about diabetes knowledge was included in all diabetes education programmes, yet some educators delivered it to some patients only. For the diet topic, all educators taught about the appropriate diet for diabetes. However, only dietitians taught about the meal plan and carbohydrate counting. The topic about diabetes medications covered several aspects and focused on patients with insulin injection. These included the general knowledge about the medications, insulin injection, reaction, and adjustment and medication compliance. In term of exercise and SMBG, the recommendations were inconsistent between the educators. The most targeted outcome in each programme was the normal HbA1c level. Specifically the DNEs focused on normal SMBG, dietitians targeted on diet compliance and pharmacists aimed for medication compliance and correct insulin injection techniques. The outcomes were evaluated at every follow up session. The findings presented in this chapter will be discussed in the next chapter alongside the longitudinal results.

CHAPTER 6: DISCUSSION

6.1. Introduction

The aim of this study was to test the predictive ability of health beliefs proposed by the Health Belief Model (HBM) on self-care practices in patients with diabetes who are treated with insulin therapy in Malaysia. The study then identified which of the health beliefs within the HBM are the best predictors to explain the self-care practices. The longitudinal design was chosen to carry out the tests. In addition, a qualitative evaluation was conducted to explore the diabetes education practice in the study settings in order to provide the context in which the self-care practices occur. In this chapter, the main findings of the study are discussed. Firstly, the chapter provides the summary of the main findings of the study. Then, the findings are discussed in comparison to the findings of the previous studies. Finally, this chapter discusses the strengths and limitations of the study. The summary of this chapter is provided in the last section.

6.2. Summary of the main findings

Overall, as reported by the study participants, not all of them practiced good dietary habits, adhered to their insulin regimen, engaged in regular exercise and performed self-blood glucose monitoring (SMBG) at least three times per day. The glycaemic control, the objective measure of self-care practices which was examined based on the participants' HbA1c levels, on average, was found to be poor (mean = 9.8%). The comparative analysis of the self-reported self-care practices and the glycaemic control measured at Time 1 and Time 2 showed no significant difference. This

indicates that their self-care practices remained relatively stable across a six-month period.

The measure of health beliefs using the theory of HBM showed that on the whole, the participants in this study held a high perceived severity of diabetes and its complications, perceived benefits of engaging in self-care and cues to actions. On the other hand, they held fairly low perceived susceptibility to diabetes complications and low perceived barriers to engage in self-care practices. The participants' health beliefs also remained relatively stable throughout the study. The HBM was found to be predictive of some of the self-care practices at some of the study points. Specifically, the model predicted diet self-care, insulin intake practice and glycaemic control but did not predict exercise self-care. Among the HBM constructs, perceived benefits consistently predicted diet self-care and insulin intake practice. For the glycaemic control, all the HBM constructs (perceived susceptibility, perceived barriers, perceived benefits and cues to action), except perceived severity, were predictive. In addition to the HBM, the controlled variables were also predictive in this study. In particular, age variable was associated with insulin intake practice, exercise self-care and glycaemic control. Gender variable was only associated with exercise self-care whilst race variable was consistently related to all self-care practices tested. Knowledge was predictive of the insulin intake practice and the glycaemic control over time.

The qualitative evaluation provides a description of diabetes education practice in the study settings. The diabetes education was not provided to all patients attending all the study settings. Such programmes, especially the one that was conducted by the

dietitians and pharmacists, had for their programme set for certain criteria. Therefore, only patients that met these criteria had the opportunity to be educated by dietitians and pharmacists. The diabetes nurse educators taught all the essential contents for the diabetes self-care while the dietitians and pharmacists focused on their area of expertise with little attention given to other areas. There is evidence from the qualitative evaluation that some of the contents taught especially regarding exercise frequency and intensity and SMBG frequency varies within each study settings. The findings of the diabetes education provide the insights into the possible factors influencing the findings of self-care practices.

6.3. The practice of diabetes self-care activities

Diabetes is a chronic disease in which its treatments are managed by individuals diagnosed with the disease. However, the review of literature in Chapter 2 shows that many individuals with insulin-treated diabetes fail to effectively self-manage their disease. The findings of self-care practices in this study are in agreement with the literature and this indicates that self-care of diabetes remains a great problem in diabetes care. In addition, most participants were more likely to administer their insulin as prescribed than engaged in other aspects of self-care, as reflected in the findings that corroborate with previous research (Toljamo and Hentinen, 2001a; Peyrot et al., 2005; Weijman et al., 2005a; Weijman et al., 2005b; Broadbent et al., 2011). Since the knowledge regarding the practice of diabetes self-care activities among patients with insulin-treated diabetes in Malaysia is lacking, the descriptive findings of each self-care practice in this study, as reported by the study participants and as measured on their HbA1c results, are briefly discussed in the following subsections.

6.3.2. Diet self-care practice

Regarding diet self-care, slightly over two-thirds of the study participants reported having good dietary habits. These habits include: 1) having the recommended number of meals including snacks per day; 2) consuming the recommended amount of carbohydrate in the main meals, snacks (assessed on carbohydrate drinks only) and fruit as well as sucrose intake. It is important to bear in mind that the dietary habits did not refer to whether the participants had followed the meal plan recommended by their dietitians. Rather, they were their habits in comparison to the general recommendation of diet for individuals with diabetes. Therefore, the findings must be interpreted within this limitation.

In general, people with insulin-treated diabetes are allowed to have snacks in between their main meals (Pearson and Powers, 2006). The permitted amount of carbohydrate for Malaysians is between 50%-60% of the total calories (Clinical Practice Guideline (CPG), 2009). However, the total amount of carbohydrate for individual varies depending on the energy requirement. For insulin-treated patients, the consistency of carbohydrate intake is important unless the patients are on a flexible regimen (American Diabetes Association (ADA), 2008b; Franz et al., 2010). On average, they are recommended to consume 3-5 and 1-2 carbohydrate exchange in the main meal and for snacks respectively (Pearson and Powers, 2006). Fruits should be consumed daily with 1-2 carbohydrate exchanges per day (Tan and Margarey, 2008). On the other hand, food or drinks containing sugar are permitted up to 10% of the total calories, provided that the sugary food/drink is replaced with other carbohydrate food in the total daily calorie (ADA, 2013).

The number of participants reported good dietary habits according to the guidelines is comparable to the finding of the study conducted by Weijman et al. (2005a), which examined the extent to which patients with insulin-treated diabetes followed the dietary guidelines. This is an interesting finding because in Malaysia, there were usually very few patients with diabetes who adhered to their dietary regimen (Tan, Juliana and Sakinah, 2011). This was demonstrated in a trial which showed that patients with diabetes in Malaysia did not adhere closely to their dietary advices (Nisak, Ruzita, Norimah et al., 2013). Nevertheless, it should be noted that the carbohydrate consumption in the snack meals were only assessed based on the drinks only. In Malaysia, the snack meals usually include both drink and light food (e.g. ‘*kuih*

6.3.1. Insulin intake practice

This study demonstrates that 73.6% and 77.8% of the participants reported adhering to their prescribed insulin at Time 1 and Time 2 respectively. Interestingly, although the study used 90% as the cut-off point for the adherence level, the findings were higher than the previous studies that used a lower cut-off point (80%) (Cramer and Pugh, 2005; Lee et al., 2006; Donelly et al., 2007; Kleinman et al., 2008; Nair et al., 2009; Khan et al., 2012; Kalyango et al., 2013). However, those studies may not be comparable due to the differences in methods of data collection or adherence measurements.

When compared to a similar study, which was also conducted in Malaysia (Tan and Margarey, 2008), the adherence was slightly lower in the current study. There are several possible explanations for this discrepancy. Firstly, the current study only focused on adults aged 18-40 years and the mean age of the participants was younger than the previous study. It has been determined that younger adults were less likely to adhere to their insulin regimen compared to older adults (Cramer and Pugh., 2005; Donnelly et al., 2007). Secondly, there were more participants with Type 2 (62.9%) than Type 1 diabetes (37.1%) in the current study which could influence the results. This is because patients with Type 2 diabetes are more likely to omit their insulin injections or not to adhere to their insulin regimen than those who have Type 1 diabetes (Peyrot et al., 2010; Peyrot et al., 2012). Lastly, there were the participants (14.5%) that reported taking their insulin injections more than it was prescribed (>100%) in the current study. These participants were categorised as non-adherence along with those who took their insulin <90% of the prescription (11.9%). In contrast, it is not known whether the previous study had participants with insulin overdose as it was not reported in the study (Tan and Margarey, 2008).

The findings of the insulin intake practice in the current study are important and should be given more attention. This is because it was revealed that the insulin adherence problem includes not only taking less but also more than the dosage prescribed. In fact, the number of participants who took their insulin more >100% was higher than the number of participants who took <90% of their prescribed insulin. It is less likely that these findings were due to the insulin adjustment as the participants were asked about their regular practice of insulin intake. Most of the previous studies did not report this problem. This could be due to their adherence

measurement limitation. For example, the adherence was calculated based on the number of insulin intakes missed, not on the actual insulin dosage the participants took (Khan et al., 2012; Kalyango et al., 2013). However, the studies involving children and adolescents indicated that overdosing insulin intake did exist among insulin users and the reason was to enable them to eat more carbohydrate than what was prescribed by their dietitian (Franklin, Bluff, Ramsay et al., 2007; Osipoff, Sattar, Garcia et al., 2010). Based on the findings of the present study, it is recommended for future studies to consider their insulin adherence measurement to measure overdosing as well.

6.3.3. Physical activities and exercise self-care practices

The findings of physical activities, which measured on both leisure and non-leisure activities, revealed that 59% of the study participants were not active and lived a sedentary lifestyle. However, this finding is not surprising as it is consistent with the prior reports that most Malaysian adults (Poh, Safiah, Tahir et al., 2010; Nor Anita, Ruby, Aminuddin et al, 2010), including those with diabetes, are inactive (Tan and Margarey, 2008; Gillani, Syed Sulaiman, Baig et al., 2013). In terms of exercise, this study found that only less than 10% (7.5% at Time 1 and 7.4% at Time 2) of the study participants exercised regularly. This finding is very low compared to the previous studies which reported a higher percentage in their findings (20%-30%) of insulin requiring patients who engaged in exercise (Nelson et al., 2002; Wallymahmed et al., 2007; Campbell et al., 2011; Yekta et al., 2011). Nevertheless, it is inappropriate to compare the findings as the operational definition of exercise varies and is inconsistent. Patients with diabetes generally are recommended to exercise at least 150 minutes/week of moderate-intensity aerobic or 90 minutes a

week of vigorous aerobic activity in which the total minutes are distributed for at least three days in a week, with no more than two consecutive days without aerobic physical activity (Holcomb, 2008; CPG, 2009; Franz et al., 2010). In the current study, the researcher measured the exercise in terms of the three elements: type, frequency and duration. Nevertheless, Nelson et al. (2002) only examined the type and frequency, but did not examine the duration of the exercise. Meanwhile, Wallymahmed et al. (2007) only examined the type and duration, but did not examine the exercise frequency. Campbell et al (2011) and Yekta et al. (2011), on the other hand, measured the three elements of exercise; nevertheless, they used a lower frequency of exercise than the current study.

In addition, this study also found that the majority (70%) of the remaining participants reported they did not exercise at all during the study period. In fact, the number of non-exercisers in this study were higher than the number of non-exercisers in the Malaysian general population; 41.4% (Lim, Chee, Kandiah et al., 2002), 37.5% (Karim and Kather, 2003), 30.8% (Zukri, Niang, Tengku Hamzah et al., 2009) and 9.6% (Ibrahim, Karim, Oon et al., 2013). Although it has been shown that more people with diabetes did not engage in exercise than those without diabetes (Zhao, Ford, Li et al., 2008), the findings showing that many participants in the current study did not exercise at all is somewhat unexpected. This is because all the study participants were young (aged 18-40 years) and exercise was determined to be common in this age group (Miles, 2007). It seems possible that they might not have time for exercising due to employment commitments given that the majority of participants (80%) were employed during the study.

6.3.4. Self-blood glucose monitoring (SMBG) practices

Despite the importance of SMBG for patients with insulin-treated diabetes, the previous studies have consistently reported that not all patients included the SMBG practice in their daily life (Davis et al., 2006; Tengblad et al., 2007; Lecomte et al., 2008; Angamo et al., 2013; Gomes et al., 2013). The current study also yielded similar findings where up to 17% of the study participants never monitored their blood glucose level at home and/or between their clinic visits.

Although the number of participants who practiced the SMBG was quite high in this study, the average number of the SMBG tested was only between three to four tests per week, which is far below the recommended SMBG frequency for patients with insulin-treated diabetes proposed by several guidelines (ADA, 2012; Diabetes UK, 2012). The recommended frequency of the SMBG varies depending on the number and types of insulin (ADA, 2012; Diabetes UK, 2012). That said, this study adopted the recommendation by Franz et al. (2010) which recommends that all patients with Type 1 and Type 2, who are treated with insulin therapy regardless of the number of insulin injections they need to take per day, to do at least three tests per day. Surprisingly, only one participant in this study tested the SMBG at least three times per day. This result is much lower than a similar study, which recorded 35%-58% of the participants who tested at least three times per day (Lecomte et al., 2007). However, this difference could be because the country where that study has been conducted provides insurance reimbursement for the cost of the SMBG strips for patients with diabetes. In contrast, the SMBG strips in Malaysia are not subsidised by the government. Here, patients have to buy the strips on their own. The SMBG International Working group (2008) has demonstrated that the SMBG practice and its

frequency in 14 countries worldwide, was higher in the countries that provide reimbursement policy.

Even worse, the majority of the participants (85%) did not monitor their blood glucose daily. To date, to the researcher's knowledge, this is the highest rate compared to the previous studies (Centers for Disease Control and Prevention, 2007; Nwasuruba et al., 2007; Tengblad et al., 2007; Trinacty et al., 2007; Hansen et al., 2009; Levine et al., 2009). Although a similar proportion or even a lower number of Malaysians with diabetes monitored their blood glucose daily has already been reported by several studies (Mastura, Mimi, Piterman et al., 2007; Tan and Margarey, 2008), the findings only reflected the non-insulin users. Those findings may not be unexpected as the need of the SMBG or its recommended frequency for non-insulin users is unclear (CPG, 2009; ADA, 2012, Diabetes UK, 2012). In contrast, all participants in the present study were insulin users with the majority of them (80% Type 1 and 50% Type 2) reported using multiple daily insulin injections (MDI), in which the SMBG is highly required not only daily but also several times per day (CPG, 2009; ADA, 2012, Diabetes UK, 2012). Practically, they need to know their SMBG results in order for them to make decision to modify their treatment and also to monitor hypoglycaemia, one of the side effects of the insulin therapy. It seems that the SMBG practice was neglected by most of the participants in this study. This is important since the guidance from SMBG results is important in the management of diabetes.

6.3.5. Glycaemic control

On average, the HbA1c level of the participants in this study was 9.8% and this remained relatively stable until the six-month follow up. The results were higher than the level of glycaemic target <6.5% recommended by the Malaysian guideline (CPG) (2009), or <7% proposed by the ADA (2009). This indicates that the participants in this study had an inadequate glycaemic control at both time points. When the HbA1c results were categorised according to the ADA recommendation (2009), the majority of the participants (87%) did not achieve the glycaemic target <7%. Even worse, almost all participants (92%) did not achieve the glycaemic target when the results were classified according to the recommendation for Malaysian (CPG (2009)). The previous studies have indicated that higher HbA1c results or poor glycaemic control was due to inadequate self-care practices (Toljamo and Hentinen, 2001a; Murata et al., 2003; Lancaster et al., 2010). Given the findings of the participants' self-care practices, it is not surprising that their HbA1c levels were high and many of them did not achieve the adequate glycaemic control. However, it is beyond the scope of this study to examine the relationship between the glycaemic control and the self-care practices.

It is noteworthy that the HbA1c level in this study was higher than other diabetes studies conducted in Malaysia (9.8% vs 7.4%-8.8%) (Wong and Rahimah, 2004; Eid, Mafauzy and Faridah, 2004; MaFauzy, 2005; MaFauzy, 2006; Sazlina, Zailinawati, Zaiton et al., 2010; Chua and Chan, 2011; MaFauzy, Hussein and Chan, 2011; Chew, Ismail, Lee et al., 2012; Chew, Ming and Chia, 2015). The proportion of participants with inadequate glycaemic control were also greater than those studies for both targets; <6.5% (92% vs 67-89.5%) (Wong and Rahimah, 2004; Nor Shazwani,

Suzana, Hanis Mastura et al., 2010; Sazlina, et al., 2010; Chua and Chan, 2011; MaFauzy et al., 2011; Tan, Magarey, Chee et al., 2011; Sharoni and Wu, 2012; Al-Zurfi, Aziz, Abdullah et al., 2012) and <7% (87% vs 59-80%) (Ooyub, Ismail and Daud, 2004; Eid et al., 2004; MaFauzy, 2005; MaFauzy, 2006; Chua and Chan, 2011; MaFauzy et al., 2011). In fact, a recent study on HbA1c of 37,263 patients with Type 2 diabetes from 289 health clinics and 14 hospitals in Malaysia also showed a lower rate of patients with inadequate glycaemic control than the current study; 82% (>6.5%) and 69% (>7%) (Chew et al., 2012). These findings indicate that the prevalence of inadequate glycaemic control remains high among Malaysians with diabetes and those under the present study had poorer glycaemic control than those in the previous studies.

Nevertheless, the higher HbA1c result or the greater inadequate glycaemic control rate in this study than the above-mentioned studies could be due to the difference in the study samples. The current study focused solely on the patients with insulin-treated diabetes, whereas most of the previous studies only had a few numbers of insulin users in their samples (Wong and Rahimah, 2004; MaFauzy, 2005; MaFauzy, 2006; Sazlina et al., 2010; Chua and Chan, 2011; MaFauzy et al., 2011; Al-Zurfi et al., 2012). It has been shown that patients with diabetes, who require insulin therapy, were more likely to have poor glycaemic control (Khattab, Khader, Al-Khawaldeh et al., 2010). Many studies have shown that their HbA1c levels were often higher (Benoit, Fleming, Philis-Tsimikas et al, 2005; Kobayashi, Yamazaki, Hirao et al., 2006; Hoerger, Segel, Gregg et al., 2008; Arai, Hirao, Matsuba et al., 2009; Chan, Malik, Jia et al., 2009), and many did not achieve the glycaemic control target than those who are not treated with insulin therapy (Wong and Rahimah, 2004; Fox,

PharmD, Bolinder et al., 2006; Hoerger et al., 2008; Chan et al., 2009; Jr Moreira, Neves, Nunes et al., 2010; Khattab et al., 2010). This is believed to be due to the fact that diabetes is severe and difficult to control in those who require insulin therapy.

However, the HbA1c level is still higher even when compared to the studies that examined only patients with insulin-treated diabetes who were either Type 1 (Chan et al., 2009) or Type 2 (Lim-Abrahan, Jain, Wan Bebakar et al., 2013; Soewondo, Mohamed, Jain et al., 2013) or both types (Kobayashi et al., 2006; Lowe, Linjawi, Mensch et al., 2008; Stetson, Schlundt, Rothschild et al., 2011). The previous studies indicate that younger adults often had higher HbA1c level than older adults (Cramer and Pugh, 2005; Fox et al., 2006; Hessler, Fisher, Mullan et al., 2011; Toh, Wu and Leong et al., 2011; Quah, Liu, Luo et al., 2013). This could explain why the HbA1c level of the current study is only comparable to the studies which conducted on patients from young adult clinics in the UK (Bryden, Dunger, Mayou et al., 2003; Wills, Scott, Swift et al., 2003; Saunders, Wallymahmed and MacFarlane, 2004) and USA (Lane, Ferguson, Hall et al., 2007). This suggests that glycaemic control is not only a problem in young adults receiving care under diabetes clinics specifically for them, but also in adults clinics and it involves adults aged up to 40 years old.

6.4. Relationship between health beliefs and the self-care practices

The Health Belief Model (HBM) was utilised to explain the abovementioned self-care practices. The findings of the regression analyses show that the model was only able to predict diet self-care at Time 2 and insulin intake practice at Time 1. In addition, the model was predictive of glycaemic control measured at Time 1-2 and Time 2, yet the variance of the prediction was only between 6.9% - 22.6%. It is

possible that the model may not be powerful enough to make prediction in all analyses in this study due to the low perceived susceptibility held by the study participants. According to the HBM, the likelihood of an individual to engage in a recommended behaviour can be predicted when perceived severity and perceived susceptibility are high, perceived benefits outweigh perceived barriers and cues to action are high as well. In this study, the measure of the HBM demonstrated that the participants in this study believed that 1) diabetes and its complications such as blindness, a leg or foot amputation and kidney failure are severe, 2) engaging in self-care activities are beneficial to reduce the chance of having serious complications later in life and make them feel better physically and 3) barriers to carry the self-care activities are only moderately inconvenient. In addition, they were experienced in recognising the symptoms of high and low blood sugar as well as to trigger them to engage in self-care practices. Nevertheless, they only perceived that the chances they would be susceptible to the diabetes complications were fairly low.

Perceived susceptibility to diabetes complications were often rated low to moderate in many studies (Bond et al., 1992; Coates and Boore, 1998; Daniel and Messer, 2002; Broadbent et al., 2011). Very few patients perceived greater susceptibility to diabetes complications when they were asked to estimate the susceptibility to diabetes complications for themselves (Ayele et al., 2012). In fact, some studies found that the majority of their study samples did not even believe that they would be susceptible to diabetes complications (Tan, 2004; Poughaznein et al., 2013). A study by Patino et al. (2005) reveals that individuals with diabetes rated low perceived susceptibility to diabetes complications for themselves but high for others. It is possible that the type of question posed to the participants to estimate the percentage

of chance they themselves would get diabetes complications could lead to anxiety, which in turn trigger the participants to react to their susceptibility with denial, in which, in reality they perceived high susceptibility to the complications. On the other hand, they might have lacked the understanding of the process of diabetes and its complications, and therefore not able to relate themselves to the risk of getting such complications (Ali and Jusoff, 2009).

Of the HBM constructs, only perceived benefit was predictive for the self-reported behaviours (insulin adherence and good dietary habits only). The association between perceived benefits and dietary habits in patients with diabetes has been reported previously (Aalto and Uutela, 1997). Most importantly, in the present study, this construct was predictive over time. Perceived benefits at Time 1 predicted the insulin adherence from the beginning of the study until the six-month follow-up whilst in diet self-care, perceived benefits measured at Time 1 and Time 2 were both predictive of good dietary habits at Time 1 and Time 2 respectively. The ability of perceived benefits to consistently predict insulin adherence and good dietary habits is an important finding which indicates that it is the component of the HBM that plays an important role in both of the self-care behaviours. This is supported by a previous review indicating that perceived benefit is the component of the HBM most strongly related to health behaviour (Carpenter, 2010).

Nevertheless, while perceived benefits was consistently predictive of insulin adherence in the direction proposed by the HBM in which participants were more likely to adhere to their insulin intake as their perceived benefit increased, this was not the case for diet self-care practice. Perceived benefit was not uniformly

associated with good dietary habits. At Time 1, as the perceived benefits increased, the participants were more likely to report good dietary habits, a finding consistent with the HBM. At Time 2, however, it became negative in which the participants were less likely to practice good dietary habits as their perceived benefits increased, a finding that is contrary to the HBM. There are possible explanations for the inverse relation between perceived benefits and good dietary habits. Perhaps, despite having higher perceived benefits, the participants might no longer be motivated to practice good dietary habits because they did not see the actual benefits. In this case, the glycaemic control remained poor from the beginning of the study until the six-month follow-up.

In the case of the glycaemic control, except perceived severity, all other HBM constructs were predictive. However, each construct was only predictive once throughout the study. At Time 1, the best predictor to explain glycaemic control was only perceived susceptibility. When Time 1 HBM was used to predict Time 2 glycaemic control (Time 1-2), only cues to action was found predictive. This finding, nevertheless, became non-significant when the analysis was repeated to exclude those participants who dropped out from the study. Perhaps, those who dropped out from the study were more motivated individuals with higher cues to actions. At Time 2, two of the HBM constructs were predictive; perceived benefits and perceived barriers, in which perceived benefit was stronger than perceived barriers in predicting the glycaemic control ($\beta = -.397, p < 0.01$ vs. $\beta = -.206, p < 0.05$). The relation between these constructs (perceived susceptibility, perceived benefits, perceived barriers and cues to actions), and the glycaemic control have been observed in earlier studies regardless of the types of diabetes or its treatments

(Brownlee-Duffeck et al., 1987; Sjoberg, Carlson, Rosenqvist et al., 1988; Bond et al., 1992; Polly, 1992; Daniel and Messer, 2002).

As predicted by the HBM, perceived benefit and cues to action were positively related to glycaemic control. However, contrary to the HBM, higher perceived susceptibility and lower perceived barriers were associated with higher HbA1c, which signifies poorer glycaemic control instead of lower HbA1c or better glycaemic control. The negative relationship between perceived susceptibility and glycaemic control has already been reported by several studies (Brownlee-Duffeck et al., 1987; Sjoberg et al., 1988; Lewis, Jennings, Ward et al., 1990; Bond et al., 1992). However, the previous findings could be inaccurate as the data were based on a single time point or cross-sectional design. In the current study, although the contradictory finding was also found at Time 1, where the data was cross-sectional in nature, the finding is stronger than previous research. This is because the measure of perceived susceptibility was repeated six months later (Time 2) and a comparative analysis confirmed that the perceived susceptibility was unchanged after the glycaemic control was measured at Time 1. The finding is strong as the possibility of the finding to be inaccurate due to changes in perceived susceptibility at Time 2 had been taken into account, and thus confirms that perceived susceptibility did inversely relate to glycaemic control. According to Brownlee-Duffeck et al. (1987), this finding may simply reflect a realistic appreciation by the participants, who are in poor glycaemic control and that they are more susceptible to complications. Other studies relate this finding with theories of fear communication where fear message does not necessarily lead to positive behaviour outcomes (Brownlee-Duffeck et al., 1987; Bond et al., 1992).

On the other hand, the opposite relation between perceived barriers and glycaemic control is unexpected as it is inconsistent with the findings of many existing studies (Brownlee-Duffeck et al., 1987; Sjoberg et al., 1988; Daniel and Messer, 2002; Khattab et al., 2010). There are several explanations for this finding. According to Turner, Kivlahan, Sloan et al. (2007), those who already take their medication for a long time may not perceive barriers to take the medications. In the present study, on average, the participants had already had diabetes for nine years and that they should have been engaging in their diabetes self-care activities for quite some time. Due to this, it might be possible that they may just simply perceive fewer barriers to carry out diabetes self-care activities, where in reality they may actually face many barriers to control their diabetes. In addition, they may have loss of motivation to control their diabetes since there was no improvement in their glycaemic control as indicated by Tong, Vethakkan and Ng (2015). Nevertheless, a further investigation is needed to clarify whether the relation remains or reverses over time.

Among the predictive constructs, only perceived benefit was related to both subjective (self-reported) and objective (glycaemic control) measures of self-care practices. Perceived susceptibility, perceived barriers and cues to action, on the other hand, were only related to glycaemic control, but not to self-care practices reported by the participants at any study points. Several previous studies have also reported that some of the HBM constructs were not related to self-care behaviours but were directly related to the glycaemic control (Harris and Linn, 1985; Brownlee-Duffeck et al., 1987; Daniel and Messer, 2002). Earlier researchers have explained that the finding was not impossible for perceived susceptibility as it can directly affect the glycaemic control physiologically due to the effect of anxiety (Harris and Linn,

1985; Brownlee-Duffeck et al., 1987). However, the explanation is not appropriate for other constructs. Alternatively, Brownlee-Duffeck et al. (1987) suggested that the association between the HBM constructs and the glycaemic control could reflect self-reported adherence as well. This may be appropriate because the glycaemic control, although not necessary, often mirrors self-care behaviours especially in the case where all the diabetes self-care activities are poorly exercised (Toljamo and Hentinen, 2001a; Murata et al., 2003; Lancaster et al., 2010). Thus, it could be concluded in the current study that all the HBM constructs that were predictive of glycaemic control may also be applied for findings of the behaviour of the self-care practices. Since the result shows that the HBM is better able to predict glycaemic control than lifestyle behaviour, it is emphasised that future studies do not restrict the use of the model to only predict self-care behaviours as in many recent studies (Aljasem et al., 2001; Wdowick et al., 2001; Koch, 2002; Tan, 2004; Chao, Nau, Aikens et al., 2005; Gillbrand and Stevenson, 2006; Park et al., 2010; Ayele et al., 2012; Pourghazbein et al., 2013). Restricting the applicability of the HBM to self-care behaviours only may limit the explanation of the HBM in diabetes self-care practices.

On the other hand, perceived severity was the only construct that was not related to insulin adherence, dietary habits and glycaemic control at any time points of the study. The failure of this construct to predict self-care practices reported by the study participants is not surprising as the construct has been found to be weak in predicting behaviours (Carpenter, 2010). However, the failure to find a significant relation of the construct to glycaemic control is unexpected as this construct was found to be predictive of glycaemic control over time in a longitudinal study (Daniel and Messer,

2002). This difference could be due to several discrepancies between the studies. For example, Daniel and Messer (2002) only examined the HBM in Type 2 diabetes patients who had just been diagnosed with the disease for six months or only for three years during the study. The type of diabetes treatment was not reported, yet it is assumed that all or most of them were non-insulin users. Furthermore, the HbA1c level of the study samples was only below 7.5% and the data were analysed using the simple linear regression due to the small sample size to perform multiple regression analysis. In the present study, the participants had already been diagnosed with diabetes for nine years, all were treated with insulin therapy, the HbA1c level was high (>9%) and the data were analysed using multiple regression analyses. The discrepancies such as the duration of diabetes may influence such findings. It is possible that the participants in the current study believed in the fact that diabetes and its complications are severe regardless of the level of their HbA1c level for they already had the disease for a long time.

Furthermore, although there is evidence demonstrating the relation between the HBM constructs and exercise self-care (Swift, Armstrong, Beerman et al., 1995; Pham et al, 1996; Aljasem et al., 2001; Koch, 2002), neither the model nor its constructs made any predictions relating to exercise self-care practices throughout this study. According to Janz and Becker (1984), the HBM is a psychosocial model and as such, it is not intended or able to account for the variance in individual behaviours which are not related to attitudes and/or beliefs. This leads to an assumption that the participants in this study exercised for reasons that are not related to their health beliefs. For example, they might exercise for body image such as to lose weight in females or for body fitness in males as determined in Balfe (2007).

6.5. Demographic characteristics and knowledge in the self-care practices

The demographic variables (age, gender and race/ethnicity) and knowledge which were used as the controlled variables in the regression analyses were also found to be predictive of self-care practices in this study. Therefore, the findings were also included in the discussion.

6.5.1. Age and self-care practices

Except dietary self-care practice, the participants' age was related to their insulin intake practice at Time 1, exercise self-care at Time 2 and glycaemic control at Time 1 and Time 1-2. As age increased, the participants were more likely to adhere to their prescribed insulin, exercise regularly and had better glycaemic control. The relation between age and insulin adherence is conflicting in the previous studies. In the majority of prior studies, insulin adherence increased with increasing age (Peyrot et al., 2010; Peyrot et al., 2012; Davies et al., 2013), while in a few studies, it increased with decreasing age (Pawaskar et al., 2007; Egede et al., 2011). The finding of this study is in agreement with the majority of the published literature. For the exercise self-care practice, the findings are not consistent with the existing evidence which suggests that age was inversely correlated with physical activity participations (Marshall, Jones, Ainsworth et al., 2007; Zhao et al., 2008; Hawkins, Storti, Richardson et al., 2009; Belcher, Berrigan, Dodd et al., 2010; NorShazwani et al., 2010; Yekta et al., 2011). For the glycaemic control, the finding is supported by earlier research (Benoit et al., 2005; Zhao et al., 2008; Chan et al., 2009; Hessler et al., 2011; Toh et al., 2011; Quah et al., 2013). Most importantly, in the current study, the age (measured at Time) 1 was consistently predictive of the glycaemic control

from the beginning of the study until the follow-up. This indicates that age is the important factor to determine glycaemic control.

The pattern of the results may be explained by the fact that individuals at the beginning of the adult life just begin to take over the responsibilities of diabetes self-care from their parents and become entirely independent for their self-care management. During this time, they may not be familiar with the tasks and are still not accustomed to the routine of self-care practices without parental supervision. In addition, as the majority of the study participants were working at the time the study was conducted, it may be possible that those who were younger just began to be responsible and independent for their normative tasks as well as in their working commitments. Therefore, they may be less likely to adhere to their insulin and exercise adequately because of competing priorities. Many studies have already reported that self-care behaviours often become compromised and the glycaemic control deteriorates at the early age of adulthood phase (Wills et al., 2003; Paucad, Yaleand Stephure, 2005; Geddes, Mcgeough and Frier, 2006; Paucad et al., 2007). Thus, as their age increases, the familiarity with the self-care tasks will result in better diabetes control and management.

6.5.2. Gender and self-care practices

Gender was only predictive of exercise self-care practices and this was consistent throughout the study. However, the finding was mixed. At Time 1, the female participants were more likely to report adequate exercise than male participants whilst at Time 2, they were less likely to report adequate level of physical exercise than the male participants. The later finding was within the researcher's expectation

as women generally have been known to be less physically active than men in both the general (Acree, Longfors, Fjeldstad et al., 2006; Miles, 2007; Zhao et al., 2008; Hawkins et al., 2009; Belcher et al., 2010; Evenson, Buchner and Morland, et al., 2012) and diabetes populations (Nelson et al, 2002; Wood 2004; Whittemore, D'Eramo Melkus and Grey, 2005; Barret, Plotnikoff, Courneya et al, 2007; Dale, Nilsen, Vatten et al., 2007). Although the previous studies of patients with diabetes in Malaysia determined no significant difference between women and men in terms of their engagement in physical activities (Tan and Margarey, 2008; NurShazwani et al., 2010), studies that were conducted on the Malaysian general population did substantiate the finding of the current study that Malaysian women were less active than men (Cheah, 2011; Liau, Shafie, Ibrahim et al., 2011; Othman, Yap and Wee, 2011). The lack of participation in exercise among women is commonly believed to be due to the women's traditional multicaregiver roles in the families. A study of rural women in Malaysia showed that women spend their time more on domestic activities such as child care, cooking, house cleaning and cloth washing (Shariff and Khor, 2005) and therefore, lack of time was one of the reasons given by most women for not exercising (Nordin, , Shamsuddin, Jamaludin et al., 2003).

On the other hand, the finding that women were more likely to have regular exercise than men at the beginning of the study is unanticipated. It is difficult to explain the result which showed that the female participants were over six times more likely to report engaging in regular exercise than male participants at Time 1. Commonly, young women with diabetes concern more about their body weight and thrive for thinness (Hilleg, Beale and Mcmaster, 2008; Kay, Davies, Gamsu et al., 2009). Engaging in excessive exercise is one of the methods that they use for the weight

control (Colton, Olmsted, Daneman et al., 2004). Thus, it might not be impossible that, at Time 1, women in this study also eagerly exercised in order to lose weight. On the other hand, the female participants in this study could exaggerate their exercise behaviours, the uncommon finding of a self-reported study (de Vaus, 1996).

6.5.3. Race and self-care practices

In Malaysia, there are three major racial groups namely Malay, Chinese and Indian. In this study, the Chinese and Indian (including one patient from the minority racial group) were combined to represent the non-Malay vs. Malay participants due to a small number of the non-Malay participants. It is somewhat interesting that race was individually predictive in almost all regression analysis models (diet self-care, insulin intake practice, exercise self-care and glycaemic control). Most importantly, race was predictive over time. The non-Malay participants were more likely to report good dietary habits, regular exercise and better glycaemic control than Malay participants. On the other hand, they were less likely to report adherence to their prescribed insulin.

Based on the report of several existing studies, dietary habit difference does exist between the major races in patients with diabetes in Malaysia. Tan and Margarey (2008) and Gillani et al. (2013) found that the Malays demonstrated a greater sweet intake than other races. In a trial study of Medical Nutrition Therapy (MNT), Nisak et al. (2013) found that the Chinese and Indians followed their dietary recommendations better than the Malays. The Chinese population was also found to have better protein and fibre intake than other races (Chin, Sathyasurya, Abu Saad et al., 2013). In the general population, the Malays consumed higher carbohydrate than

Chinese and Indians (Mirnalini, Zalilah, Safiah et al., 2008), while more Chinese consumed at least five servings of fruits and vegetables a day than the Malays and Indians (Liau et al., 2011). Although those studies cannot be directly compared for their individual examination of the races, their findings did indicate that the non-Malays (Chinese and Indians) had better dietary habits compared to the Malays.

In contrast, the association between race and insulin intake practice is an interesting new finding as race differences in diabetes medication adherence was not observed in the existing studies (Tan and Magarey, 2008; Al-Qazaz, Hassali, Shafie et al., 2010; Chua and Chan, 2011; Ahmad, Ramli, Islahudin et al., 2013). It may be that the previous studies examined the medication adherence for each racial group (Malay, Chinese, Indian and others) separately, whereas this study combined the non-Malay participants together. In addition, those studies did not examine insulin injections independently when analysing the inherent influence of race (Tan and Magarey, 2008).

However, it is not fully understood why the non-Malays in this study were less likely to adhere to their insulin therapy throughout the study. This finding is unlikely due to the healthcare system as in Malaysia every racial group has equal access to the public and teaching hospitals as well as the health institutions involved in the study. In addition, the cost of medication for patients who are treated within the institutions is highly subsidised by the government of Malaysia regardless of their racial group. The finding thus could be due to language barrier. In the study settings, most healthcare providers especially diabetes nurse educators use Malay language in their communications with the patients. It cannot be ignored that language barrier may

exist among the non-Malays and thus, may result in a lower understanding of the benefits, usage, and administration of the insulin injection among the non-Malays. This eventually affects their likelihood of adhering to insulin intake practice. Nevertheless, the findings warrant future study.

As for exercise, the influence of racial group on exercise among patients with diabetes has not been examined in the previous studies (Tan and Margarey, 2008; NurShazwani et al., 2010). In the general population, only one study examined the difference in exercise between the Malays and the non-Malays (Nordin et al., 2003). However, the study (Nordin et al., 2003) did not support the finding of the current study where the non-Malays were more likely to engage in exercise, as no significant difference was found between these two groups although the proportion of exercisers was higher among the non-Malays than the Malays. Nevertheless, in the studies that examined exercise in each racial group (Malay, Chinese and Indian) individually in the general population, the Chinese group was found more likely to exercise than the Malays (Nor Anita et al., 2010; Cheah, 2011), while the Indians did not differ from the Malays (Cheah, 2011). It seems possible across the finding that the greater engagement of the non-Malays in regular exercise in the current study might be due to the higher proportion of the Chinese in the non-Malay group.

On the other hand, race has already been identified as an important predictor of HbA1c in patients with diabetes in Malaysia (Ahmad, Khalid, Zaini et al., 2011). For Type 1 diabetes, the Indians were found to have higher HbA1c level than the Chinese and the Malays. Meanwhile for Type 2 diabetes, the Malays were more likely to have higher HbA1c than the Chinese and the Indians (Ismail, Wan Nazaimoon, Wan

Mohamad et al, 2000). A recent study did not specify the type of diabetes, yet recorded 45% of patients who used insulin injection and found that the Chinese had the lowest or the best glycaemic control compared to the Indians and the Malays (Ahmad et al., 2011). For Type 2 diabetes, the finding that the Malay patients had poorer glycaemic control than the Chinese and the Indian patients was consistent across the studies that examined only Type 2 diabetes (Ng, Goh, Tan et al., 2005; Al-Qazaz, Sulaiman, Hassali et al., 2011; Toh et al., 2011). In fact, a longitudinal study of ethnic differences in glycaemic control in Singaporean (a country that has similar ethnic group) adults with Type 2 diabetes also showed similar findings, and even the finding that the Malays had higher HbA1c than the Chinese and the Indians was consistent for three years (Ng et al., 2005). Regardless of the types of diabetes, those previous studies demonstrate that the Chinese patients consistently had better glycaemic control than the other racial groups (Ng et al., 2005; Al-Qazaz et al., 2011; Toh et al., 2011; Chin et al., 2013).

Nevertheless, the findings cannot directly be compared as the current study did not examine the HbA1c level for Type 1 and Type 2 diabetes separately and for the ethnic group individually. Similar to exercise self-care, perhaps the findings found in the current study were due to the higher proportion of Chinese in the non-Malay group. In addition, the findings that the non-Malays were more likely to practice good dietary habits and engage in adequate exercise than the Malays might also explain the difference in their HbA1c levels. The influence of race on diet self-care, insulin intake practice, exercise self-care and glycaemic control suggests that there is a strong cultural influence in diabetes self-care practices among Malaysians.

Previously, the findings were lacking for exercise self-care and insulin intake practices and were confined to only diet self-care practices.

6.5.4. Knowledge and self-care practices

In this study, the participants' knowledge of diabetes and its management increased significantly from Time 1 to Time 2. The knowledge score was predictive of insulin intake practice and glycaemic control over time. However, the role of knowledge of the participants in this study is conflicting. As the knowledge score increased, the participants were more likely to have better glycaemic control but were less likely to adhere to their insulin. The finding for glycaemic control is anticipated. Several studies have already reported that knowledge was a predictor of good glycaemic control (Al-Qazaz et al., 2011) and demonstrated that adequate knowledge was associated with good glycaemic control (Berikai, Meyer, Kazlauskaite et al., 2007; McPherson, Smith, Powers et al., 2008; Al-Adsani, Moussa, Al-Jasem et al., 2009) while deficit in knowledge was associated with poor glycaemic control (Angamo et al., 2013).

On the other hand, the relation between knowledge and insulin intake practice found in the current study contradicts the findings of a previous study of diabetes medication adherence (Al-Qazaz et al., 2011). However, since the previous study did not measure adherence to insulin independently, their findings may not be comparable. It is hardly understood why the increase in knowledge leads to less insulin adherence among the participants under this study. It could be that the participants only guessed the answer without truthfully knowing them. This finding

warrants a further investigation. It also warrants extra attention from healthcare providers who educate patients with insulin-treated diabetes aged 18-40 years.

6.6. Diabetes education may influence the patients' self-care practices

Self-care practices in this study could not all be explained by the health beliefs proposed by the HBM. The qualitative evaluation revealed two areas that could be another reasons behind the findings of the self-care practices in this study: the diabetes education is not provided to all patients attending the study settings and inconsistencies in the messages given. These reasons indicate that there are other factors in addition to the health beliefs that may influence self-care practices of the participants in this study.

6.6.1.The diabetes education programme was not for all patients

Diabetes education is the pre-requisite for patients with diabetes to self-care of their disease (Rutten, 2005). Therefore, it has been emphasised in several diabetes guidelines that every patient with diabetes should be given the opportunity to acquire the necessary knowledge and skills through diabetes education at the beginning of their diagnosis (CPG, 2009; ADA, 2012b). Nevertheless, the interviews in the qualitative evaluation showed that diabetes education was not provided to all patients attending the study settings, especially the programme provided by the dietitians and pharmacists. This finding indicates that there is a possibility that not all patients participated in this study had had the opportunity to participate in such programme. According to two previous studies in Malaysia, only about 30-50% of patients with diabetes had received diabetes education (Mastura et al., 2007; Azimah, Radzniwan, Zuhra et al., 2010). This signals that, as in other countries (Shahpurwala et al., 2006;

van de Sande et al., 2007; Aikens and Piette, 2009; Strock and Mazze, 2009; Sadowski et al., 2012), diabetes education in Malaysia is not fully integrated into diabetes care.

The importance of diabetes education for patients with diabetes have widely been demonstrated in many studies (Kibligner and Braza, 2007; Scain, dos Santos, Friedman et al., 2007; Cusack, Asyo, Frost et al., 2008; Uchenna, Ijeoma, Pauline et al, 2010; Rankin, Heller and Lawton, 2011). Patients who have never been provided with diabetes education demonstrates reduced ability to perform diabetes self-care activities compared to those who had ever been educated (Atak, 2008; Gagliardino et al., 2012; Gumbs, 2012). Thus, in addition to the health beliefs, it is possible that the findings of self-care practices in this study are also due to having or not having been provided with diabetes education. Those participants reporting good dietary habits in this study could be those who might have been taught through the diabetes education programme while those who did not, might not have had such opportunity.

In the absence of diabetes education, patients would seek knowledge by their own initiatives through other sources such as healthcare providers, family and other patients who have diabetes in order for them to manage their disease (Chlebowy et al., 2010; Hortensius et al., 2012a). This may lead to inappropriate self-care practice as information from those sources may be inconsistent from one another or may be contradictory to the actual diabetes management (Rankin et al., 2011). Diabetes education at the beginning of the diagnosis is not only important to ensure patients' obtainment of the appropriate information regarding their self-care, but also forms appropriate health beliefs towards the self-care. Therefore, if the self-care is to be

improved, it is imperative that all patients need to be educated once they are diagnosed with diabetes.

6.6.2. Inconsistencies of recommendations

The qualitative findings also revealed the recommendations for self-care activities, in particular, the recommendations for exercise and SMBG that varied from one educator to another at each site. The recommendations for exercise were multifarious in terms of the types, frequency and duration of exercise. For example, at Site B, the frequency of exercise ranges from everyday to three times per week. Some educators even did not recommend any frequency. The recommendations for SMBG were between two times per day to three to four times per week. The inconsistencies were not only observed within the sites but also within the DNEs and the dietitians. Venters et al. (2004) have highlighted that inconsistent messages between educators could lead to confusion in practice among the patients.

Most importantly, almost all recommendations for exercise and SMBG were well below the recommendations by the Malaysian guideline (CPG, 2009), in which patients with diabetes are recommended to exercise five days a week, preferably most days of the week and with no more than two consecutive days without physical activity. The duration of exercise should be at least 150 min/week of moderate-intensity aerobic physical activity and/or at least 90min/week of vigorous aerobic physical activity. In terms of SMBG, the CPG recommends insulin users to test at least four times per day. However, majority of the educators interviewed only recommended their patients to walk 15-30 minutes for three times per week. Meanwhile for the SMBG, most recommendations were three times per week. Given

these findings, it is unexpected that almost all (90%) of the patients in this study did not exercise as recommended by the CPG (2009) and the average of the SMBG frequency was three times per week. These indicate that those patients who participated in this study may not have poor practice in exercise self-care and the SMBG but they rather followed what had been advised to them as suggested by Hortensius et al. (2012b).

The benefit of exercising and SMBG performance undertaken at the recommended level is important in achieving good glycaemic control, as explained in Chapter 2 (See Section 2.3.3). Having advised the patients with diabetes with a lower recommendation for these two self-care components may result in difficulty for patients to achieve the targeted glycaemic level. It seems that there was a lack of standard of practice among diabetes educators since only some of them taught the patients according to the Malaysian guideline while others did not use the guideline but rather made recommendations based on their experiences. The diabetes education in the study settings needs to be reviewed and improved in order to ensure that the adequate and appropriate information is provided to the patients.

6.7. Strengths and limitations of the study

6.7.1. Study design

To the researcher's knowledge, this is the first study to examine the predictive ability of the HBM in self-care practices in patients with insulin-treated diabetes in Malaysia. The strength of this study is its selected longitudinal approach regarded to be the most appropriate design when studying health beliefs (Carpenter, 2010), which yields stronger and more substantiated findings than the previous studies that

were largely cross-sectional (Cerkoney and Hart, 1980; Brownlee-Duffeck et al., 1987; Bond et al., 1992; Aalto and Utela, 1997; Coates and Boore, 1998; Wdowick et al., 2001; Patino et al., 2005; Gillbrand and Stevenson, 2006). This is because the health beliefs have been examined twice; at the beginning of the study and at the six-month follow-up. The health beliefs at both of the study points were compared and the findings showed that they remained relatively stable throughout the study. Thus, the relations between Time 1 health beliefs and Time 1 self-care practices is strong because it has been confirmed that the health beliefs did not change after Time 1 self-care practices took place. In addition, the possibility of Time 2 health beliefs to influence the relations between Time 1 health beliefs and Time 2 self-care practices as highlighted by Carpenter (2010) has been minimised because the health beliefs remain unchanged when Time 2 self-care practices were measured.

Moreover, the longitudinal design also yields the stability of some of the predictions over time because the data were tested at different points of time. Thus, it provides a more consistent and clearer picture of the ability of the HBM in predicting self-care practices. Furthermore, it yields important insights into the ways the study participants engaged in self-care practices and provides the evidence about their diabetes control over time. Overall, the study findings provide greater clarity into the pattern of self-care practices and the type of beliefs held by individuals with insulin-treated diabetes.

The inclusion of the qualitative evaluation on diabetes education conducted in the study settings provides the additional strength of the study which further explains the reason behind the findings of self-care practices this study has successfully garnered.

Having interviewed the diabetes educators, the persons who were responsible to educate the patients of the study settings, the researcher has managed to gauge the overall picture of how the diabetes education was conducted and what was provided to the patients in the diabetes education. However, the findings have several limitations. The exact number of patients who had or had not had received diabetes education, and who had received recommendations below the guidelines, is not known since the study did not interview the patients. Thus the qualitative findings could not confirm that the patients' self-care practices are due to the lack of or inappropriate information supplied in diabetes education, but rather provide deeper insights into other reasons of the findings of the self-care practices. This is particularly important with regard to the findings of exercise self-care where the HBM could not make any predictions, and for the SMBG practice where the inferential test could not be performed because the data did not fulfil one of the test assumptions due to the insufficient number of participants ($n=1$) in the category of good SMBG practice.

6.7.2. Recruitment and attrition

The initial plan of the study to recruit at least 190 participants in order to allow for 32% attrition rate was not achieved due to a low number of eligible patients in all study settings. However, the recruitment of the eligible patients could be deemed successful as only 10 of the patients approached across study settings declined to participate due to time constraint. It was emphasised to patients that the participation was voluntary and all of them were given sufficient time to consider their participation. The successful recruitment in the present study could be attributed to several factors including giving a clear explanation of the study and building up the

rappor with the patients when approaching them.

Attrition is an inherent problem in a longitudinal study. The present study recorded 32% attrition rate (51/159) despite the use of repeated phone calls as the tracking methods. However, there was no significant difference in demographic characteristics between those who completed and dropped out from the study. This reflects that the attrition did not cause bias in the study. The main reason for loss to follow-up was non-return where the research participants were known to have received the questionnaire but did not return it (n=25), and lack of success in contacting the respondents (no contact) (n=19), with the remaining attrition that was due to participants' illness, withdrawal due to time constraints or lack of interest to continue with the study. However, it cannot be overruled that there was a possibility that the patients who did not return the questionnaire at Time 2 were no longer interested to continue their study participation, and that their self-care practices might be different from those who responded.

Although the rate of the attrition was not something unexpected as previous studies involving younger adults have shown a similar attrition rate (Young et al., 2006), it may cause loss of power to the study because the number of participants were lower than the original plan due to the limited eligible participants. Therefore, except glycaemic control, the conclusions drawn, where no difference between Time 1 and Time 2 insulin intake practice, diet self-care, exercise self-care, SMBG practices and health beliefs, should be interpreted with caution as the study might not be able to detect small differences due to the loss of power.

6.7.3. Self-report

Except glycaemic control, all other data in this study relied on the participants' self-report. The data collected using this method can be inaccurate due to under or over reporting, or inaccurate recall. However, in this study, it was very unlikely that the participants had a problem to recall their self-care activities as the questions only required them to recall their preceding 7-day self-care practices. According to Toobert and Glasgow (1994) and Toobert et al. (2000), only data that require research participants to recall any longer than this period may introduce errors in the form of inaccurate recollections. Furthermore, over-reporting is unlikely since the number of participants who reported did not engage in adequate exercise and SMBG ≥ 3 times perday is very high and this remained the same throughout the study. Furthermore, the HbA1c results were used as the objective data of self-care practices and the results were in agreement with the self-reported self-care practices.

However, there was a possibility that the participants might have underestimated their carbohydrate intake; nonetheless, this was not due to inaccurate recall but rather the lack of skills in estimating carbohydrate serving size as found in Cavanaugh, Huizinga, Wallston et al. (2008) and Brazeau, Mircescu, Desjardins et al. (2013). There was also a possibility that the participants had inaccurately estimated their intake due to the difficulty in calculating the portion sizes as Malaysian food are usually eaten as a combination of several dishes (Gillani et al., 2013). In addition, it was recognised that the study participants might have felt uncomfortable in providing the estimation of how much they would be susceptible to diabetes complications such as blindness, a foot or leg imputation and renal failure. This feeling could affect their responses to perceived susceptibility scales in two ways; 1) the patients might

answer the questions correctly 2) they might deny the possibility and provided a low score in order to comfort themselves. As mentioned earlier, the previous studies have shown that patients rated low to moderate level of themselves getting diabetes complications (Bond et al., 1992; Coates and Boore, 1998; Daniel and Messer, 2002; Broadbent et al., 2011), but high for other people (Patino et al., 2005).

6.7.4. Generalisation of the findings

The detail about the whole population of which the study samples were drawn is not known due to the non-existence of database for the disease in the study settings. However, it is assumed that the study samples represent the target population as the data collection was conducted over a 3-4 month period in order to ensure that every hospital-registered individual had a chance of being included, since each patient comes to see the doctor every 3 months. Nevertheless, given the study selection criteria, the findings of this study can only be generalised to patients with insulin-treated diabetes aged 18-40 years attending public or teaching hospital in Malaysia. This is because health beliefs and self-care practices in non-adults or adults older than 40 years old may be different than the population involved in the study. Similarly, it cannot be generalised to patients who attend private health institutions in which medical treatments are not subsidised as this may affect their health beliefs especially perceived barriers. Finally, the findings are not appropriate for non-Malaysian population as patients in other countries may possess different health beliefs due to different context in which they belong to.

6.8. Summary

This chapter discussed the study findings including its strengths and limitations in the study design, the patients' recruitment and attrition, the methods of data collection and the study's generalisability. The study has shown that there was lack of self-care practices and inadequate glycaemic control for over a six-month period among Malaysians with diabetes and treated with insulin therapy aged 18-40 years. Except exercise, the HBM was found to be useful in predicting self-care practices in this study. It supports the importance of targeting on health beliefs. Furthermore, the HBM constructs played a significant role in explaining the participants' self-care practices especially perceived benefits which were predictive over time. However, the support for specific HBM constructs was mixed. Some of the constructs were related to the self-care practices in the direction predicted by the HBM while some did not. Moreover, the significant findings of the demographic variables and knowledge further explained that diabetes self-care practices are not only influenced by their health beliefs. Most importantly, the relation between the race and self-care practices in all analyses suggests that diabetes self-care practices in Malaysia are a highly cultural influence. Despite any study limitations especially when the empirical evidence on the HBM in adults with insulin-treated diabetes in Malaysia is lacking, this study nonetheless provides a worthwhile contribution to the literature on diabetes in this population.

The qualitative findings provide further explanations that the health beliefs might not be related to the self-care practices due to the inconsistent messages or absence of diabetes education. The overall findings from this study can inform

recommendations for future practice and research which are presented in the final chapter (Chapter 7).

CHAPTER 7 – RECOMMENDATIONS AND CONCLUSION

7.1. Introduction

This study has demonstrated that there was a lack of self-care practices and a poor glycaemic control among the patients with insulin-treated diabetes aged between 18-40 years in Malaysia for over a six-month period. The Health Belief Model (HBM) and its constructs have been determined to be predictive of the self-care practices. In addition, the diabetes education provided to the patients may have some influence on the self-care practices found in this study. These results are worthy of healthcare providers' attention especially the diabetes educators who are involved in educating patients with insulin-treated diabetes in this age group. This is because the lack of self-care practices can be improved by modifying those beliefs through diabetes education as well as by improving the diabetes education itself. This, however, requires changes in the content and delivery process of diabetes education, knowledge and skills of diabetes educators as well as support from the organisation. This chapter examines the implications for diabetes education practice, diabetes educator training and the health authority in relation to the improvement of diabetes self-care practices in Malaysian context. This chapter also examines the implications of the study on future research.

7.2. Implications for diabetes education practice

7.2.1. Targeting on patients' health beliefs

From clinical perspectives, the findings of self-care practices in this study suggest that implementation strategies to improve patients' self-care are urgently needed. Targeting on health beliefs is one of the strategies found to be successful in

facilitating patients to practice the self-care of their diabetes (Jalilian, Motlagh, Solhi et al, 2014).

In this study, adherence to insulin prescription and good dietary habits were predicted by perceived benefits while good glycaemic control was predicted by perceived susceptibility, perceived barriers, perceived benefits and cues to action. These findings indicate that helping people to understand that they are at risk, addressing their barriers, focusing on the benefits of self-care practices and increasing cues to action, might be a better approach for this group than focusing on the negative aspects (such as how severe the condition and complications are). Diabetes educators can target on those beliefs when educating patients who do not adhere to their insulin, do not practice good dietary habits and do not have good glycaemic control.

However, caution must be applied when educating about the risks because the study's findings indicate that the participants' glycaemic control was poorer as their perceived susceptibility increased. Since this has been speculated to have been related to fear (Brownlee-Duffeck et al, 1987; Bond et al, 1992), strategies are also needed to elicit whether the patients are in a fear state and if presence entails, steps should be taken to alleviate the fear. As part of the process, diabetes educators may need to assess patients' understanding about diabetes complications to identify any misconceptions concerning their risks.

In addition, in helping patients to recognise the personal benefits of self-care practice, it is essential for the educators to highlight the everyday benefits such as

either they are feeling good or better rather than only to focus on glycaemic control. This is because the benefits of self-care practices on glycaemic control are not immediately felt or seen by patients. Patients are more likely to adhere or follow their recommended diabetes treatment which they can feel or are able to see the effectiveness of the treatment such as when patients are feeling healthier or good and having more energy as well as stable blood glucose levels (Nair et al, 2007; Shultz et al, 2009). Patients should also be made aware of the fact that engaging in self-care-practices is not always associated with good glycaemic control (Beluchin et al, 2013) as there are many other factors that can influence the HbA1c level (Müller et al, 2011). This is because patients can be frustrated if self-care practices do not lead to positive improvements. Therefore, their motivation to do so may be reduced (Nagelkerk et al, 2006; Nair et al, 2007).

7.2.2. The need of culturally appropriate education

The practice of all self-care activities examined in this study, as well as the glycaemic control, was also found to have been related to the race. These findings signal that diabetes self-care practices in Malaysia are highly influenced by the patients' culture. Thus, it is recommended for diabetes educators to consider their programme to be culturally appropriate and assimilative of every racial group in Malaysia. This type of education has been found to increase patients' involvement in their diabetes self-care activities such as the physical activity level and the frequency of self-blood glucose monitoring (SMBG) compared to the 'usual' diabetes education (Vincent, 2009). A systematic review of randomised controlled trials has shown that the culturally appropriate diabetes education is effective to improve glycaemic control for three to six months compared to the 'usual' diabetes education

(Hawthorne, Robles, Cannings-John et al., 2010). Meanwhile, a recent systematic review has demonstrated that such type of education improves patients' glycaemic control for a longer period which is up to 24 months after the education is provided (Attridge, Creamer, Ramsden et al., 2014).

In this study, the non-Malay participants were more likely to report good dietary habits, engage in regular exercise and have better glycaemic control; nevertheless, they were less likely to report adherence to their prescribed insulin compared to the Malay participants. The educators may use these findings to develop their educational materials that tailor to these racial groups. This may reflect their languages, customs and traditions. In addition, the educators also have to have a cultural humility when delivering the content (American Association of Diabetes Educators (AADE), 2015). This aspect is important because in providing a culturally appropriate education, not only the content of the education that must be tailored to the need of the particular racial group, but also the delivery of the content that is highly sensitive so as to respect such needs (AADE, 2015).

7.2.3. Structured education

An abundance of research have shown that a structured diabetes education is more effective to improve patients' self-care behaviours in diabetes compared to the one that is less structured (Gobl, Dobes, Luger et al., 2010; Tan et al., 2011; Gagliardino et al., 2012). There are several types of structured diabetes education such as DAFNE (DAFNE, 2002), DESMOND (Davies et al., 2008) and X-PERT (Deakin, Cade, Williams et al., 2006). One of the criteria of a structured education is having a written structured curriculum (Department of Health, 2005). This curriculum must be

on a theoretical basis, evidence-based, resource-effective and has its supporting materials (National Institute of Health and Care Excellent, 2011). The curriculum consists of the details about the programme such as its aims and objectives, the content to be covered in each session as well as the activities to be utilised for the learners and educators (Health Service Executive, 2009). The purpose of a written curriculum is to serve as an educational aid to assist the educators in teaching their patients (Everett, 2007).

From the interviews in this study, it is evident that the diabetes education in the study settings was less structured as it did not have a written curriculum to serve as a framework of the educators' teaching. The teaching was either based on the Clinical Practice Guideline (CPG), (2009) or on the educators' own educational materials which were developed by them for their personal use, or based on the lecture notes that they had during their diabetes education course. Meanwhile, some of them delivered the teaching based merely on their experience. This could be the reason of the lack of consistency in their practice. It has been indicated that inconsistent teaching practice influences patients' actual practice (Rankin et al., 2011). This may be one of the reasons for the evident lack of practice of self-care and poor glycaemic control among the patients who participated in this study.

Having known the negative impact of inconsistent diabetes education practice on patients' involvement in their self-care activities, and given the known benefits of a structured education compared to a less structured one, it is highly advisable that the diabetes educators in each setting develop a written curriculum for their education. In order to do this, there is a need for the diabetes educators to determine the

philosophy of their programme, types of theories to be used, learning outcomes for each session, the educator's and participants' activity and the resources needed (Everett, 2007). There are several types of theories that are often used as the framework for diabetes education such as cognitive theories and adult learning theory. The educators may choose the theories that have been shown effective in improving patients' self-care practices. The content of the education programme must be based on the current evidence, reflect the practice guidelines (AADE, 2011), and tailor to the health beliefs as well as be culturally appropriate as suggested in the previous sections.

7.3. Implications for diabetes educators in education and training

Generally, the implementation of diabetes education requires a knowledgeable and skilled person not only in diabetes, but also in the educational aspects. Therefore, it has been agreed that those who are involved in diabetes education should have obtained a specialised diabetes and educational training in addition to his/her professional qualification (Funnell et al., 2009; AADE, 2013). In Malaysia, to be a diabetes educator, the person must attend a six-month to a one-year programme called post-basic diabetes education. However, this study shows that only the registered nurses have obtained such qualification. The dietitians and pharmacists, on the other hand, have no such qualification. This case is prevalent especially in Malaysian context as the role of diabetes educators is often emphasised for registered nurses only. In fact, it has been called for the government of Malaysia to recognise this role as a specialised field of nursing (Chan, 2015). However, given the fact that all staff that are involved in educating patients with diabetes need to have

qualification specific to diabetes education, it is recommended that dietitians and pharmacists in this study also obtain such qualification.

Specifically, to implement a structured education as suggested in the previous section, the diabetes educators must be familiar with the available theories relevant to their diabetes education practice (Department of Health, 2005). Moreover, since diabetes education must be evidence-based, the diabetes educators need to be equipped with the knowledge and skills in critically appraising and utilising evidence (Soltani, 2008). It is not known whether the diabetes educators have sought these knowledge and skills in their diabetes education training. If so, there is a need for them to obtain continuing education or trainings in order to maintain their competencies of such skills and knowledge (Funnell et al., 2009). If not, it is the responsibility of the organisation of which the educators belong to make their diabetes educators aware of the need of imparting theories and evidence-based in the diabetes education practice as well as to provide essential trainings in relation to the application of the theories and evidence-based for the educators.

7.4. Implications for the Ministry of Health Malaysia

As in other countries, diabetes education has also become one of the diabetes care services in Malaysia in which every patient should have been made accessible to it in order to help them to be able to self-care their disease (CPG, 2009; Disease Control Division, 2010). However, until now, not all patients with diabetes in Malaysia have the opportunity for such programme. One of the reasons could be because of the shortage of diabetes educators particularly diabetes nurse educators as indicated by Chan (2015). Since diabetes prevalence continues to increase and its complications

are common in Malaysia, it is urgently needed that the shortage of diabetes educators be given a high consideration by the health authority in order to ensure that every patient with diabetes in the country has the opportunity to receive the knowledge and skills required to self-care their disease.

In addition, the quality of diabetes education is equally important as to the access. This study demonstrates that the practice of diabetes education varies, is inconsistent and at some point inaccurate. In several countries such as the United Kingdom and Ireland, their diabetes education programmes are regularly monitored and audited by a relevant body in order to ensure that their patients receive a high quality of diabetes education (Department for Health, 2005, Health Service, 2009). It is not clear whether such activities have been implemented for the diabetes education programme in Malaysia. However, it has been highlighted in the InfoMed (2014) that there is a need for the diabetes education in Malaysia to have an accredited and standardised curriculum as well as to have an authorised professional body for diabetes educators in order to standardise the practice of diabetes education and its educators. These suggestions should be given the appropriate attention by the Ministry of Health in order to ensure that all patients with diabetes in Malaysia receive a good quality of diabetes education.

7.5. Implications for further investigation

The results of this study suggest that self-care practices are related to health beliefs and may also be a result of the diabetes education provided in the study settings. However, the findings have several limitations. Given the fact that the prevalence of poor glycaemic control as well as diabetes complications are high among patients

with diabetes in Malaysia, future studies that deal with these methodological problems should be undertaken. The study should also be expanded to other diabetes populations in Malaysia as the results from this study cannot be directly transferable and generalised to other groups of patient without further investigations.

In this study, perceived susceptibility to diabetes was rated low by the patients and the direction of relationship between this construct and glycaemic control was opposite to the direction proposed by the model. Similar findings have also been reported by many previous studies while various speculations have been made to explain such findings (Bond et al., 1992; Coates and Boore, 1998; Daniel and Messer, 2002; Patino et al, 2005; Broadbent et al., 2011; Ayele et al., 2012). These findings require a further clarification. A qualitative study might be helpful to gain a more nuanced understanding of why patients with diabetes often perceive low susceptibility to diabetes complications and why the relationship between the perception and their self-care and glycaemic control often contradicts to the HBM.

Despite having high perceived benefits, the participants in this study, in addition, were only more likely to report good dietary habits at the beginning of the study. However, they less likely did so after a six-month period. Furthermore, their glycaemic level was poorer even though they rated low perceived barriers. It is assumed that the participants in this study may have experienced loss of motivation to engage in good dietary habits and control their glycaemic level based on the consistently poor glycaemic control recorded throughout the study. The HBM has its extended version which consists of the construct of health motivation. This construct was added by Becker, Drachman, and Kirscht (1974). It is defined as an individual's

degree of interest in or concern about health in general. Becker et al. (1974) theorises that a desire to attain or maintain health and to avoid illness results in a willingness to comply with health recommendations. Therefore, future research may need to consider using the extended version of the HBM when studying the diet self-care and the glycaemic control. The extended version may also be applied to examine whether the HBM with the added construct is able to predict exercise self-care since the original version has failed to make any predictions for this self-care in this study.

7.6. Conclusion

This study has demonstrated that there was a lack of involvement in diabetes self-care activities by the patients with insulin-treated diabetes aged between 18-40 years in Malaysia as reported by the patients involved and as indicated by their poor glycaemic control. Some components of the self-care practices, including the glycaemic control, were found to be related to some of the patients' health beliefs. These findings are stronger than the previous studies due to the use of the longitudinal approach whereby the possibility of inaccurate findings have been taken into account. The findings of the qualitative evaluation provide another reason that can explain the findings of the self-care practices.

The number of patients with diabetes in Malaysia is increasing and the incidence of diabetes vascular complications has become common. Patients' engagement in diabetes self-care activities such as adherence to medication, good dietary habits, regular exercise and SMBG, is required to prevent or avoid such complications. Nonetheless, this remains a significant problem as many do not engage in such

behaviours. The findings of this study not only provide the evidence for diabetes educators to target on in order to facilitate their patients to engage in the self-care activities, but also help make recommendations to improve the quality of the diabetes educators' practice so that a more optimal and appropriate education programme can be provided in the efforts to support their patients to self-manage the disease. More research are needed to clarify the finding of low perceived susceptibility, relationship between some of the HBM constructs (perceived susceptibility, perceived barriers and benefits) and some components of the self-care practices (diet self-care as well as glycaemic control) as well as the roles of health beliefs in exercise self-care within the context of Malaysian patients with diabetes.

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APPENDICES

APPENDIX 1: STUDY INSTRUMENT (ENGLISH VERSION)



HEALTH BELIEFS, SELF-CARE PRACTICES AND GLYCAEMIC CONTROL IN YOUNG ADULTS WITH DIABETES

QUESTIONNAIRE

Aishairma Aris, PhD Student

Instructions: The purpose of this questionnaire is to study your diabetes health beliefs, self-care practices and glycaemic control. It has four (4) sections: 1) diabetes knowledge 2) health beliefs 3) self-care activities 4) demographic. Please read the questions carefully and answer each of the questions in all sections. Before you begin, please read the instruction of each section. It will take approximately 30 minutes to complete the questionnaire. You are assured that all materials will be treated confidentially. Please return the questionnaire to the researcher once completed

SECTION 1: DIABETES KNOWLEDGE

In this section, we are interested in the factual information you know about diabetes. It is **very important** that you **not** consult with anyone or look up any of the answers to any of these questions while you are completing this questionnaire. We simply need to know what information that you know **only** and you as an individual are not being evaluated. The correct answers will be provided at your request after the questionnaire has been returned.

For each question, please circle which answer is the best for you

1. The diabetes diet is:

- a. the way most Malaysian people eat
- b. a healthy diet for most people
- c. too high in carbohydrate for most people
- d. too high in protein for most people

2. Which of the following is highest in carbohydrate?

- a. Chicken
- b. Milk
- c. Rice
- d. Peanut butter

3. Which of the following is highest in fat?

- a. Low fat milk
- b. Orange juice
- c. Corn
- d. Honey

4. Which of the following is considered as safe to be taken by diabetic patients??

- a. Any unsweetened food
- b. Any food that says sugar free on the label
- c. Any food that has less than 20 calories per serving

5. Glycosylated haemoglobin (haemoglobin A1) is a test that measure your average blood glucose level for the past:
- day
 - week
 - 2-3 months
 - 6 months
6. Which is the best method for testing blood glucose?
- Urine testing
 - Blood testing
 - Both are equally good
7. What effect does unsweetened fruit juice have on blood glucose?
- Lowers it
 - Raises it
 - Has no effect
8. Which should **NOT** be used to treat low blood glucose?
- 3 hard candies
 - ½ cup orange juice
 - 1 cup diet coke
 - 1 cup skim milk
9. For a person in good control, what effect does exercise have on blood glucose?
- Lowers it
 - Raises it
 - Has no effect
10. Infection is likely to cause:
- an increase in blood glucose
 - a decrease in blood glucose
 - no change in blood glucose

11. The best way to take care of your feet is to:
- look at and wash them each day
 - massage them with alcohol each day
 - soak them for one hour each day
 - buy shoes a size larger than usual
12. Eating foods lower in fat decreases your risk for:
- nerve disease
 - kidney disease
 - heart disease
 - eye disease
13. Numbness and tingling may be symptoms of:
- kidney disease
 - nerve disease
 - eye disease
 - liver disease
14. Which of the following is usually **NOT** associated with diabetes:
- vision problems
 - kidney problems
 - nerve problem
 - lung problems
15. Signs of ketoacidosis (a very high blood glucose level) include:
- shakiness
 - sweating
 - vomiting
 - low blood glucose
16. If you are sick with the flu, which of the following changes should you make?
- Take less insulin
 - Drink less liquids
 - Eat more proteins
 - Test for glucose and ketones more often

17. If you have taken intermediate-acting insulin (e.g. Humulin-N/ Humulin-L/ Isophane/NPH/ Lente) you are most likely to have an insulin reaction in:

- a. 1 h
- b. 6 h
- c. 12 h
- d. more than 15 h

18. You realize just before lunch time that you forgot to take your insulin before breakfast. What should you do now?

- a. Skip lunch to lower your glucose
- b. Take the insulin that you usually take at breakfast
- c. Take twice as much insulin as you usually take at breakfast
- d. Check your blood glucose level to decide how much insulin to take

19. If you are beginning to have hypoglycaemia (low blood glucose), you should:

- a. exercise
- b. lie down and rest
- c. drink some juice
- d. take regular insulin

20. Hypoglycaemia (low blood glucose) may be caused by:

- a. too much insulin
- b. too little insulin
- c. too much food
- d. too little exercise

21. If you take your morning insulin but skip breakfast your blood glucose level will usually:

- a. increase
- b. decrease
- c. remain the same

22. Hyperglycaemia (high blood glucose) may be caused by:

- a. not enough insulin
- b. skipping meals
- c. delaying your snack
- d. large ketones in your urine

23. Which one of the following will most likely cause insulin reaction (excessive low blood sugar):

- a. heavy exercise
- b. infection
- c. overeating
- d. not taking your insulin

SECTION 2: DIABETES HEALTH BELIEFS

People can have very different feeling about having the same illness. We are interested in how you personally feel about having diabetes. This section asks about your personal feeling. It consists of 23 questions and devided into five parts; part i, ii, iii, iv, v. Please note that we are interested in **your personal feelings** about having diabetes and **not what your doctor or family or friends may think**. Please circle the statement that comes closest to expressing your feelings. (**circle only one**). Even if you do not feel the description fits you exactly, please circle the number that comes closest and write your own description on the line marked "comment".

Part I

1. I think diabetes:

1	2	3	4	5
Is not a serious illness at all (I do not understand at all the fuss that is made about sticking to the diet and taking insulin on time)	Is not a very serious illness (If you go off diet or stop taking insulin you get sick but the doctors can always fix you up again and there is no harm done)	Can be a serious illness (If you follow the rules you will be okay but if you do not the consequences can be bad)	Is a fairly serious illness (If you do not follow the rules, the consequences down the road will probably be terrible)	Is an extremely serious illness (It is like having an illness like cancer in many ways)

COMMENTS: _____

2. To me, blindness would:

1	2	3	4	5
Not be as bad as people think	Be bad but I would learn to read Braille and I would be okay		Be very bad: It would take me a long time to adjust to	Be so terrible and I do not know if I could stand to live with it

COMMENTS: _____

3. To me, losing a leg would:

1	2	3	4	5
Not be as bad as people think	Be bad but I would learn to walk on an artificial leg and I would be okay		Be very bad: It would take me a long time to adjust to	Be so terrible and I do not know if I could stand to live with it

COMMENTS: _____

4. In general, the complications associated with diabetes seem to me to:

1	2	3	4	5
Not be as bad as people think	Be bad but I would get through okay		Be very bad: It would be a struggle to adjust	Be so terrible and I do not think I could stand to live with them

COMMENTS: _____

Part II (Please fill in the blank with your estimate as well as circling the appropriate number on the rating scale)

1. a) I think there is about a _____ % chance that I will someday go blind because of my diabetes

1	2	3	4	5
1-19% chance	20-39% chance	40-59% chance	60-79% chance	80-99% chance

COMMENTS: _____

b) How much of your estimate (**question 1a above**) is based on how well you comply with your regimen (that is, stick to your diet, exercise, test for sugar, etc)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

c) How much of your estimate (**question 1a above**) is based on the disease (regardless of your compliance)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

2. a) I feel there is about a _____% chance that I will someday lose a foot or a leg from diabetic gangrene

1	2	3	4	5
1-19% chance	20-39% chance	40-59% chance	60-79% chance	80-99% chance

COMMENTS: _____

b) How much of your estimate (**question 1a above**) is based on how well you comply with your regimen (that is, stick to your diet, exercise, test for sugar, etc)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

c) How much of your estimate (**question 1a above**) is based on the disease (regardless of your compliance)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

3. a) I feel there is about a _____% chance that I will someday have to be on a kidney machine (renal dialysis) because of kidney failure

1	2	3	4	5
1-19% chance	20-39% chance	40-59% chance	60-79% chance	80-99% chance

COMMENTS: _____

b) How much of your estimate (**question 1a above**) is based on how well you comply with your regimen (that is, stick to your diet, exercise, test for sugar, etc)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

c) How much of your estimate (**question 1a above**) is based on the disease (regardless of your compliance)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

4. a) I feel there is about a _____% chance that I will suffer from some sort of serious complications of diabetes:

1	2	3	4	5
1-19% chance	20-39% chance	40-59% chance	60-79% chance	80-99% chance

COMMENTS: _____

b) How much of your estimate (**question 1a above**) is based on how well you comply with your regimen (that is, stick to your diet, exercise, test for sugar, etc)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

c) How much of your estimate (**question 1a above**) is based on the disease (regardless of your compliance)?

1	2	3	4	5
None of my estimate		A moderate amount of my estimate		Almost all of my estimate

COMMENTS: _____

Part III

1. Having to limit the amount of everything I eat and not being able to eat sweets is:

1	2	3	4	5
A minor inconvenience (I do not care much for sweets anyway)	Moderately inconvenience	A major inconvenience (But it is not the worst thing in the world)	Difficult for me (I love sweet)	Terrible for me (I can hardly stand it)

COMMENTS: _____

2. Having to take insulin is:

1	2	3	4	5
A minor inconvenience (It really does not bother me much)	Moderately inconvenience	A major inconvenience (But it is not the worst thing in the world)	Difficult for me (I dislike injections very much)	Terrible for me (I can hardly stand getting or giving myself injections)

COMMENTS: _____

3. Having to test my urine is:

1	2	3	4	5
A minor inconvenience	Moderately inconvenience	A major inconvenience	Unpleasant for me (Handling specimens is a little bit disgusting to me)	Terrible for me (I can hardly stand to handle specimens)

COMMENTS: _____

4. Having to test my blood sugar is:

1	2	3	4	5
A minor inconvenience	Moderately inconvenience	Very inconvenience	Extremely Difficult for me (Pricking my finger is fairly painful)	Terrible for me (I can hardly stand prick my finger)

COMMENTS: _____

5. Having to keep regular hours and eat on schedule is:

1	2	3	4	5
A minor inconvenience (with respect to my social and personal activities)	Moderately inconvenience (It occasionally disrupts my social and personal activities)	Very inconvenience (It often disrupts my social and personal activities)	Extremely Difficult for me (It usually causes major disruptions in my social and personal activities)	Terrible for me (It constantly ruins my social and personal activities)

COMMENTS: _____

6. Seeing a physician as often as I am required because of my diabetes is:

1	2	3	4	5
A minor inconvenience	Moderately inconvenience	A major inconvenience	Difficult for me (It interferes greatly with my schedule at school, work or home)	Terrible for me (It's almost impossible given my life situation)

COMMENTS: _____

7. The financial costs of my diabetes:

1	2	3	4	5
Have very little impact on me or my family economically	Are moderate (I/my family can handle it without too much problem)	Are high (But I/my family can still handle it)	Are great financial burden for me and/or my family (It is difficult to handle)	Are terrible for and have caused great hardships for me and/or my family; (It is almost impossible to handle)

COMMENTS: _____

Answer No.8 only if you drink alcohol

8. The limit my diabetes puts on drinking alcohol is:

1	2	3	4	5
Not a problem for me	A minor problem for me	Somewhat of a problem for me	A major problem for me	A terrible problem for me

COMMENTS: _____

Part IV

1. I feel that keeping my blood sugar as close to normal as possible:

1	2	3	4	5
Will have no effect whatever on preventing complications later in life	Probably will not have much of an effect on preventing complications later in life	May decrease the chance of my having serious complications later in life	Will <u>probably</u> decrease the chance of my having serious complications later in life	Will greatly decrease the chance of my having serious complications later in life

COMMENTS: _____

2. When my blood sugar is 'Normal':

1	2	3	4	5
I actually feel worse like I am having hypoglycaemia	I am always worried about getting hypoglycaemia	I do not feel any different than when it is high	I feel better (more clear headed, less tired, etc) than when it is high	I feel great.

COMMENTS: _____

3. When I stick to my diet and eat on a regular schedule:

1	2	3	4	5
I do not feel any better physically than when I do not stick to my regimen		I feel somewhat better physically		I feel great physically.

COMMENTS: _____

4. When I stick to my diet and eat on a regular schedule:

1	2	3	4	5
I just feel deprived: I do not feel I am doing anything for my future health		I feel good about myself for doing the right thing		I feel really great about myself for doing what is best for my health and the long run

COMMENTS: _____

5. I believe that testing my sugar by examining my _____ urine/_____ blood (tick one):

1	2	3	4	5
Is completely useless in regulating my diet and insulin dosage		Is somewhat helpful in regulating my diet and insulin dosage		Is extremely helpful in regulating my diet and insulin dosage

COMMENTS: _____

6. When I test my urine/blood sugar regularly like I am supposed to:

1	2	3	4	5
It does not make any difference in how I feel about myself	I feel okay about myself	I feel good about myself for doing the right thing	I feel very good about myself	I feel really great about myself for doing the right thing

COMMENTS: _____

7. Testing my urine or blood sugar:

1	2	3	4	5
Has no effect on how I feel physically on a day-to-day/week-to-week basis		Is somewhat helpful in enabling me to feel better on a day-to-day/week-to-week basis		Is extremely helpful in enabling me to feel better physically on a day-to-day/week-to-week basis

COMMENTS: _____

Part V

1. Which of the following statements best describes your experience with being able to tell when your sugar is high?

1	2	3	4	5
I can never tell; (The results of my testing are always a complete surprise to me)	I can really tell; (If I did not test I probably would not realize my sugar was high)	I can sometimes tell; (When sugar is high, it sometimes makes me feel different)	I can usually tell; (When my sugar is high, it usually feels different)	I can always tell; (When my sugar is high, it always feels different)

COMMENTS: _____

2. Which of the following statements best describe your experience with being able to tell when you are getting an insulin reaction?

1	2	3	4	5
I <u>never</u> seem to be able to prevent insulin reactions (They always seem to just happen all of sudden)	I can <u>sometimes</u> tell when my sugar is getting low early enough to prevent a reaction but other times they seem to creep up on me all of a sudden			I can <u>always</u> tell that my sugar is low early enough to prevent a reaction

COMMENTS: _____

3. How often do people in your family or your friends remind you about things you are supposed to do because of your diabetes?

1	2	3	4	5
Almost never	Once every month or two or so	Once a week or so	Once a day	Several times a day

COMMENTS: _____

4. In terms of remembering to test my sugar, eat, take insulin, etc., I:

1	2	3	4	5
Ignore time in terms of eating, insulin, etc.		Kind of keep track of the time to eat and take insulin within an hour or so of the appropriate time		Carefully monitor what time it is so I eat and take my insulin within a few minutes of when I should

COMMENTS: _____

SECTION 3: SELF-CARE ACTIVITIES

This section consists of six (6) parts; diet, insulin/ medication adherence, exercise, self-monitoring blood glucose and demographic data. Please read the questions carefully and **tick (✓)** the answers for each of the following questions based on your behaviour during the past week, day, or whatever is requested. We are not interested in the “correct” answer but rather how you actually did things during the past week, day, etc.

If the immediate example was very unusual for some reason (i.e., you were away on a holiday or had the flu, etc.) Please think back to the most recent time before that which you consider typical for you.

I) Diet

1. Last week, how many meals did you eat each day including snacks?

1 2 3 4 5 6 7 or more Inconsistent

* **Question 2 to 8: The size of a serving portion is based on what has been taught by your doctors, nurses or dietitians**

2. Last week, on average, how many carbohydrate serving(s) did you take for your breakfast?

1 2 3 4 5 6 7 or more Inconsistent

3. Last week, on average, how many carbohydrate serving(s) did you take for lunch?

1 2 3 4 5 6 7 or more Inconsistent

4. Last week, on average, how many carbohydrate serving(s) did you take for dinner?

1 2 3 4 5 6 7 or more Inconsistent

5. Last week, on average, how many of carbohydrate drink(s) did you consume each day? (Example of carbohydrate drinks are soft drinks/ Ribena/ syrup/ honey/ Milo/ Horlick/ Ovaltine/ coffee or tea with sugar/ Vitagen/ milk powder/ condensed milk/ fruit juice/ cereal/ soya bean/ bean powder/red or green pea soup/ coconut water/ sugar canewater)

0 1 2 3 4 5 6 7 or more Inconsistent

6. What was the average carbohydrate serve(s) in each of the carbohydrate drink(s) you consumed last week?

0 1 2 3 4 5 6 7 or more Inconsistent

7. How many days did you eat fruit last week?

1 2 3 4 5 6 7

8. Each time, how much fruit did you eat?

1 2 3 4 5 6 7 or more Inconsistent

9. How many days did you have sweetened food or drinks last week?

(Example of sweetened foods are sweets/ chocolate/ ice cream/ cakes/ honey/ syrup/ condensed milk/ kaya/ jam/ sweetened biscuits or burns or pau or kuih or pancake oo sweetened drinks)

0 1 2 3 4 5 6 7

10. Last week, each time when you ate your sweetened food or drinks, did you reduce your intake of carbohydrate food during meals?

Never Seldom Sometimes Most of the time All the time

11. Did your eating habits last week resemble the way you ate **in the last 3 months?**

Never Seldom Sometimes Most of the time All the time

II) Medication

1. How do you control your diabetes?

Insulin injection
 Combination of diabetes tablet and insulin injection

What current diabetes tablet(s) and insulin injection(s) do you take for your diabetes?

No	Medicine	Prescribed dose	Actual dose taken	Prescribed frequency	Actual frequency taken	Not sure
2						
3						
4						
5						
6						
7						

8. Last week, how many times did you miss taking your insulin injection(s)?

0 1 2 3 4 5 6 7 or more

9. Last week, how many times did you need help in taking your insulin injection(s)?

0 1 2 3 4 5 6 7 or more

III) Physical activity

A) Non-leisure physical activities

When you are at work or doing housework or in college, on an average:

1. How much do you spend sitting?

- Almost all the time
- More than ½ the time
- About ½ the time
- Less than ½ the time
- Almost none of the time

2. How much time do you spend standing?

- Almost none of the time
- Less than ½ the time
- About ½ the time
- More than ½ the time
- Almost all the time

3. How much time do you spend walking?

- Almost none of the time
- Less than ½ the time
- About ½ the time
- More than ½ the time
- Almost all the time

4. Do you have to lift or carry heavy things?

- Never
- Seldom
- Sometimes
- Most of the time
- All the time

5. How do you travel to and from work or marketing or shopping or college?
- Others (**Please state**) _____
- Car and/ or Motorbike
- Bus and/ or Train
- Cycle and/ or walk* (**go to question 6 or 7**)
6. If you cycle to and from work or marketing or shopping or college, how many minutes do you cycle?
- 0-5 mins
- 6-15 mins
- 16-30 mins
- 31-45 mins
- > 45 mins
7. If you walk to and from work or marketing or shopping or college, how many minutes do you walk?
- 0-5 mins
- 6-15 mins
- 16-30 mins
- 31-45 mins
- > 45 mins

B) Leisure physical activities

8. How often do you walk around your house or apartment during you leisure hours?
- Never
- Seldom
- Sometimes
- Most of the time
- All the time

9. How often do you do gardening like mowing or digging but not watering pot plants during you leisure hours?

- Never
- Seldom
- Sometimes
- Most of the time
- All the time

10. How often do you read book/ magazine/ newspaper, watch TV, play or work on a computer during you leisure hours?

- All the time
- Most of the time
- Sometimes
- Seldom
- Never

11. Do you have a regular exercise program?

- No (**go to part IV**)
- Yes

12. If yes, what exercise do you do?

- Mild exercise (minimal effort)
(Examples are yoga, golf, easy walking, Tai chi, Chinese martial art, fishing from river bend, archery)
- Moderate exercise (mild increased in heart beats or breathing)
(Examples are brisk walking, easy bicycling, volleyball, badminton, table tennis, leisure swimming, popular and folk dancing, bowling)
- Extraneous exercise (heart beats rapidly and increase breathing)
(Examples are running, jogging, football, soccer, squash, basketball, vigorous swimming, long distance bicycling, tennis)

13. Last week, how many days did you exercise?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7

14. If you exercise regularly last week, on average, how many minutes did you exercise each session?

- 0-5 mins
- 6-15 mins
- 16-30 mins
- 31-45 mins
- > 45 mins

IV) Self-monitoring

1. Do you test your blood glucose at home or in between clinic visits?

- No
- Yes (**go to question no 2-3**)

2. Last week, how many times did you test your blood glucose level?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7 or more (please state: _____ times)

3. Last week, how many times did you change your treatment plan like modify your diet intake or physically activity or medicine based on your blood glucose reading(s)?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7 or more (please state: _____ times)

SECTION 4: DEMOGRAPHIC DATA

I/C No: _____

Hospital: _____

Age: _____ years

Duration of diabetes: _____ years

Please tick (✓) appropriate answers for the questions below

Gender: Male Female

Race: Malay Chinese Indian Others

Marital status: Single Married Divorced Separated Widowed

Education: Never Primary Secondary College Tertiary

Current job status Studying Working Studying and Working Not Working

Living with: Family member Friends Alone Others

*To be completed by the researcher		
HbA1C result :		Date:

Please return the questionnaire to the researcher once completed

THANK YOU FOR PARTICIPATING

APPENDIX 1: STUDY INSTRUMENT (MALAY VERSION)



KEPERCAYAAN TERHADAP KESIHATAN, PRAKTIS JAGAAN DIRI SENDIRI DAN KAWALAN PARAS GLUKOS DALAM DARAH DIKALANGAN DEWASA MUDA YANG MENGHIDAP DIABETES

SOALSELIDIK

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ARAHAN: Soalselidik ini bertujuan untuk mengkaji kepercayaan anda terhadap kesihatan diabetes, praktis penjagaan diri anda dan kawalan paras glukos di dalam darah anda. Soalselidik ini mengandungi empat (4) bahagian: 1) pengetahuan diabetis 2) kepercayaan terhadap kesihatan diabetes 3) aktiviti-aktiviti penjagaan diri 4) demografi/latar belakang. Sila baca soalan dengan teliti dan jawab setiap soalan di setiap bahagian. Sila baca arahan pada setiap bahagian sebelum menjawab. Soalselidik ini mengambil masa lebih kurang 30 minit. Kesemua bahan dalam soalselidik ini adalah sulit. Sila kembalikan soal selidik ini kepada penyelidik setelah anda selesai menjawab semua soalan.

BAHAGIAN 1: PENGETAHUAN MENGENAI DIABETIS (KENCING MANIS)

Di dalam bahagian ini, kami ingin mengetahui apakah yang anda tahu mengenai diabetis (kencing manis). Adalah sangat penting anda tidak bertanya kepada orang lain ataupun mencari jawapan bagi setiap soalan semasa menjawab soalselidik ini. Kami hanya ingin mengetahui apakah maklumat yang anda tahu dan bukannya diri anda. Anda boleh meminta jawapan yang betul setelah anda selesai menjawab soalselidik ini. **Sila bulatkan jawapan yang terbaik bagi anda**

1. Diet untuk diabetis ialah
 - a. Cara kebanyakan orang Malaysia makan
 - b. Diet yang sihat untuk kebanyakan orang
 - c. Karbohidrat yang terlalu tinggi untuk kebanyakan orang
 - d. Protein yang terlalu tinggi untuk kebanyakan orang
2. Antara berikut, yang manakah mempunyai kandungan karbohidrat paling tinggi?
 - a. Ayam
 - b. Susu
 - c. Nasi
 - d. Mentega kacang
3. Antara berikut, yang manakah mempunyai kandungan lemak paling tinggi?
 - a. Susu rendah lemak
 - b. Jus oren
 - c. Jagung
 - d. Madu
4. Antara berikut, yang manakah paling selamat dimakan oleh pesakit diabetis?
 - a. Sebarang makanan tawar
 - b. Sebarang makanan yang pada labelnya tercatat ‘Bebas Gula’
 - c. Sebarang makanan yang mengandungi kurang daripada 20 kalori bagi setiap hidangan

5. Hemoglobin berglukosa (hemoglobin A1c) merupakan satu ujian yang mengukur purata paras glukos (gula) dalam darah anda pada
 - a. Sehari yang lepas
 - b. Seminggu yang lepas
 - c. 2-3 bulan yang lepas
 - d. 6 bulan yang lepas
6. Antara berikut, yang manakah kaedah ujian glukosa darah yang terbaik?
 - a. Ujian air kencing
 - b. Ujian darah
 - c. Kedua-dua ujian sama baik
7. Apakah kesan jus buahan tanpa gula terhadap paras glukos dalam darah?
 - a. Merendahkannya
 - b. Meningkatkannya
 - c. Tiada kesan
8. Antara berikut, yang manakah **TIDAK** sepatutnya digunakan untuk merawat paras glukos darah yang rendah?
 - a. 3 biji gula-gula
 - b. 1/2 cawan jus oren
 - c. 1 cawan minuman diet coke
 - d. 1 cawan susu skim
9. Bagi individu yang kawalan glukosa darahnya adalah baik, apakah kesan senaman terhadap paras glukos dalam darah beliau?
 - a. Merendahkannya
 - b. Meningkatkannya
 - c. Tiada kesan

10. Jangkitan kuman boleh menyebabkan

- a. Peningkatan glukosa darah
- b. Penurunan glukosa darah
- c. Tiada perubahan dalam glukosa darah

11. Cara terbaik merawat kaki anda adalah dengan

- a. Memeriksa dan membasuh setiap hari
- b. Urut dengan alkohol setiap hari
- c. Rendam selama sejam setiap hari.
- d. Beli kasut yang saiznya lebih besar daripada biasa

12. Memakan makanan rendah lemak akan mengurangkan risiko

- a. Penyakit saraf
- b. Penyakit ginjal/ buah pinggang
- c. Penyakit jantung
- d. Penyakit mata

13. Kebas-kebas (numbness) dan semut-semut (tingling) mungkin menandakan:

- a. Penyakit ginjal/ buah pinggang
- b. Penyakit saraf
- c. Penyakit mata
- d. Penyakit hati

14. Antara berikut, yang manakah biasanya **TIDAK** berkaitan dengan diabetes?

- a. Masalah penglihatan
- b. Masalah ginjal / buah pinggang
- c. Masalah saraf
- d. Masalah paru-paru

15. Tanda-tanda ketoacidosis (paras glukos dalam darah sangat tinggi) termasuk:

- a. menggeletar
- b. berpeluh
- c. muntah
- d. paras glukos dalam darah yang rendah

16. Jika anda selsema, manakah perubahan-perubahan berikut yang patut anda lakukan?
- Kurangkan pengambilan insulin
 - Kurangkan minum air
 - Lebihkan makan protein
 - Periksa paras glukos dalam darah lebih kerap
17. Jika anda telah mengambil *intermediate-acting insulin*, (e.g. Humulin-N/ Humulin-L/ Isophane/ NPH/ Lente), anda adalah lebih cenderung untuk mengalami tindakbalas insulin dalam masa:
- 1 jam
 - 6 jam
 - 12 jam
 - Lebih dari 15 jam
18. Sebelum anda makan tengahari, anda telah menyedari bahawa anda telah terlupa untuk mengambil suntikan insulin sebelum sarapan pagi. Apakah yang patut anda lakukan?
- Tidak makan tengahari untuk mengurangkan paras gula dalam darah
 - Ambil insulin yang kebiasaanaya diambil semasa sarapan
 - Ambil dua kali ganda insulin yang kebiasaanaya anda ambil semasa sarapan
 - Periksa paras glukos dalam darah dan buat keputusan berapakah jumlah insulin yang perlu diambil
19. Semasa permulaan anda mengalami tanda-tanda hipoglisemia (paras glukos dalam darah rendah), anda sepatutnya:
- bersenam
 - baring dan rehat
 - minum sedikit jus
 - ambil insulin seperti biasa
20. Hipoglisemia (paras glukosa dalam darah rendah) mungkin disebabkan oleh:
- Terlalu banyak insulin
 - Terlalu kurang insulin
 - Terlalu banyak makanan
 - Terlalu sedikit senaman

21. Jika anda mengambil insulin diwaktu pagi tetapi anda tidak mengambil sarapan, paras glukos dalam darah selalunya akan:
- meningkat
 - menurun
 - kekal diparas yang sama
22. Hiperglisemia (paras glukos dalam darah tinggi) mungkin disebabkan oleh:
- Tidak cukup insulin
 - Tidak mengambil makanan
 - Melewati-lewatkan mengambil snek
 - Banyak ketones didalam air kencing
23. Manakah yang berikut lebih cenderung menyebabkan tindakbalas insulin (paras gula dalam darah sangat rendah)
- Senaman berat
 - Jangkitan kuman
 - Terlalu banyak makan
 - Tidak mengambil insulin

BAHAGIAN 2: KEPERCAYAAN TERHADAP KESIHATAN DIABETIS

Masyarakat mempunyai pelbagai tanggapan dan kepercayaan tentang sesuatu masalah kesihatan. Kami disini berminat untuk mengetahui bagaimana tanggapan anda mengenai penyakit diabetis (Kencing Manis). Bahagian ini mengandungi 23 soalan dan terbahagi kepada 5 Bahagian; Bahagian I, II, III, IV dan V. Untuk makluman, kami hanya berminat untuk mengetahui perasaan anda sendiri mengenai penyakit diabetes yang anda hadapi dan bukan apa yang difikirkan oleh doktor, keluarga dan kawan-kawan anda. Sila bulatkan satu kenyataan sahaja yang paling hampir menerangkan perasaan diri anda. Sekiranya anda merasakan kenyataan itu tidak bertepatan dengan diri anda, sila bulatkan pada nombor yang paling hampir untuk menerangkan perasaan diri anda dan tulis kenyataan diri anda yang sebenarnya pada ruangan "Ulasan".

Bahagian I

1. Saya rasa penyakit diabetis:

1	2	3	4	5
Merupakan penyakit yang amat tidak serius. (saya tidak faham langsung mengapa pesakit diabetis perlu menjaga pemakanan dan mengambil insulin tepat pada waktunya)	Merupakan penyakit yang tidak serius. (Jika anda tidak mengawal pemakanan dan tidak mengambil insulin anda akan sakit tetapi doktor selalunya dapat membantu anda dan ianya tidak memudaratkan)	Boleh menjadi penyakit yang serius. (Jika anda mengikuti peraturannya anda akan selamat, tetapi jika tidak, kesannya boleh menjadi teruk)	Merupakan penyakit yang agak serius. (Jika anda tidak mematuhi peraturannya, kesannya adalah teruk dan kemungkinan mendatangkan masalah)	Merupakan penyakit yang amat serius. (Ianya adalah seperti menghidap barah)

Ulasan : _____

2. Bagi saya, buta itu:

1	2	3	4	5
Tidak seteruk seperti apa yang orang fikirkan	Teruk tetapi saya akan cuba belajar untuk membaca tulisan Braille dan ianya akan baik-baik sahaja		Sangat teruk. Ia boleh membuatkan saya mengambil masa terlalu lama untuk menyesuaikan diri.	Tersangat teruk dan saya tidak pasti sama ada boleh tahan untuk hidup dengan keadaan ini.

Ulasan : _____

3. Bagi saya, kehilangan kaki:

1	2	3	4	5
Tidak seteruk seperti apa yang orang fikirkan	Teruk tetapi saya akan cuba belajar untuk menggunakan kaki palsu dan ianya akan baik-baik sahaja		Sangat teruk. Ia boleh membuatkan saya mengambil masa terlalu lama untuk menyesuaikan diri.	Sangat teruk dan saya tidak pasti sama ada boleh tahan untuk hidup dengan keadaan ini.

Ulasan : _____

4. Secara amnya, komplikasi disebabkan oleh diabetis pada pandangan saya adalah:

1	2	3	4	5
Tidak seteruk seperti apa yang orang fikirkan	Teruk tetapi saya akan cuba belajar untuk bersabar dan ianya akan baik-baik sahaja		Sangat teruk. Ia mengambil masa terlalu lama untuk menyesuaikan diri.	Sangat teruk dan saya tidak pasti sama ada boleh tahan untuk hidup seperti ini atau pun tidak.

Ulasan : _____

Bahagian II (Sila isi tempat kosong dengan andaian anda dan bulatkan pada nombor yang sesuai diatas skala penilaian yang diberikan)

1. a) Saya rasa terdapat kira-kira _____ % kebarangkalian dimana suatu hari nanti saya akan menjadi buta disebabkan oleh penyakit diabetes saya ini

1 kebarangkalian	2 kebarangkalian	3 kebarangkalian	4 kebarangkalian	5 kebarangkalian
1-19%	20-39%	40-59%	60-79%	80-99%

Ulasan : _____

- b) Berapa banyak dari anggaran anda di atas (**soalan 1a**) berdasarkan kepada kepatuhan anda pada rawatan (kepatuhan menjaga pemakanan, memeriksa gula dalam darah dan lain-lain)?

1 Tidak ada dalam anggaran saya	2 Jumlah sederhana dalam anggaran saya	3 Jumlah sederhana dalam anggaran saya	4 Jumlah sederhana dalam anggaran saya	5 Hampir semua anggaran saya
Tidak ada dalam anggaran saya	Jumlah sederhana dalam anggaran saya	Jumlah sederhana dalam anggaran saya	Jumlah sederhana dalam anggaran saya	Hampir semua anggaran saya

Ulasan : _____

- c) Berapa banyak dari anggaran anda di atas (**soalan 1a**) berdasarkan pada penyakit anda? (tanpa menghiraukan kepatuhan anda terhadap rawatan)?

1 Tidak ada dalam anggaran saya	2 Jumlah sederhana dalam anggaran saya	3 Jumlah sederhana dalam anggaran saya	4 Jumlah sederhana dalam anggaran saya	5 Hampir semua anggaran saya
Tidak ada dalam anggaran saya	Jumlah sederhana dalam anggaran saya	Jumlah sederhana dalam anggaran saya	Jumlah sederhana dalam anggaran saya	Hampir semua anggaran saya

Ulasan : _____

2. a) Saya rasa terdapat kira-kira _____ % kebarangkalian dimana suatu hari nanti saya akan kehilangan kaki disebabkan oleh gangrene diabetes

1 kebarangkalian	2 kebarangkalian	3 kebarangkalian	4 kebarangkalian	5 kebarangkalian
1-19%	20-39%	40-59%	60-79%	80-99%

Ulasan : _____

b) Berapa banyak dari anggaran anda di atas (**soalan 1a di atas**) berdasarkan kepada kepatuhan anda pada rawatan (contohnya menjaga pemakanan, memeriksa gula dalam darah dan lain-lain)?

1 Tidak ada dalam anggaran saya	2 Jumlah sederhana dalam anggaran saya	3 Hampir semua anggaran saya

Ulasan : _____

c) Berapa banyak dari anggaran anda di atas (**soalan 1a di atas**) berdasarkan pada penyakit anda? (tanpa menghiraukan kepatuhan anda terhadap rawatan penyakit)

1 Tidak ada dalam anggaran saya	2 Jumlah sederhana dalam anggaran saya	3 Hampir semua anggaran saya

Ulasan : _____

3. a) Saya rasa terdapat kira-kira _____% kebarangkalian dimana suatu hari nanti saya akan menjalani rawatan dialisis kerana buah pinggang saya sudah rosak.

1	2	3	4	5
1-19% kebarangkalian	20-39% kebarangkalian	40-59% kebarangkalian	60-79% kebarangkalian	80-99% kebarangkalian

Ulasan : _____

- b) Berapa banyak dari anggaran anda di atas (**soalan 1a di atas**) berdasarkan kepada kepatuhan anda pada rawatan (contohnya menjaga pemakanan, memeriksa gula dalam darah dan lain-lain)?

1	2	3	4	5
Tidak ada dalam anggaran saya	Jumlah sederhana dalam anggaran saya			Hampir semua anggaran saya

Ulasan : _____

- c) Berapa banyak dari andaian anda di atas (**soalan 1a di atas**) berdasarkan pada penyakit anda? (tanpa menghiraukan kepatuhan anda terhadap rawatan penyakit)?

1	2	3	4	5
Tidak ada dalam andaian saya	Jumlah sederhana dalam andaian saya			Hampir semua andaian saya

Ulasan : _____

4. a) Saya rasa terdapat kira-kira _____ % kebarangkalian dimana suatu hari nanti saya akan mengalami komplikasi diabetis yang serius

1 1-19% kebarangkalian	2 20-39% kebarangkalian	3 40-59% kebarangkalian	4 60-79% kebarangkalian	5 80-99% kebarangkalian
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Ulasan : _____

- b) Berapa banyak dari andaian anda di atas (**soalan 1a di atas**) berdasarkan kepada kepatuhan anda pada rawatan (contohnya menjaga pemakanan, memeriksa gula dalam darah dan lain-lain)?

1 Tidak ada dalam andaian saya	2 Jumlah sederhana dalam andaian saya	3 4 5 Hampir semua andaian saya
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Ulasan : _____

- c) Berapa banyak dari andaian anda di atas (**soalan 1a di atas**) berdasarkan pada penyakit anda?(tanpa menghiraukan kepatuhan anda terhadap rawatan penyakit)?

1 Tidak ada dalam andaian saya	2 Jumlah sederhana dalam andaian saya	3 4 5 Hampir semua andaian saya
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Ulasan : _____

Bahagian III

1. Menghadkan jumlah setiap makanan yang saya makan dan tidak boleh mengambil gula adalah:

1	2	3	4	5
Tidak mendatangkan masalah pada saya (saya tidak kisah sangat pasal pengambilan gula dalam makanan)	Mendatangkan masalah yang kecil pada saya	Mendatangkan msalah pada saya (Tapi ini bukan hal paling teruk di dunia)	Menyusahkan saya (saya suka manis)	Mendatangkan masalah yang besar pada saya (saya tidak boleh tahan)

Ulasan : _____

2. Pengambilan insulin adalah:

1	2	3	4	5
mendatangkan masalah yang kecil pada saya (Itu benar-benar tidak banyak mengganggu saya)	mendatangkan masalah yang sederhana pada saya	mendatangkan masalah besar pada saya (Tapi ini bukan hal paling teruk di dunia)	menyukarkan saya (saya tidak suka akan suntikan)	mendatangkan masalah yang besar pada saya (saya tidak tahan mendapatkan atau memberikan suntikan pada diri saya)

Ulasan : _____

3. Keperluan untuk membuat ujian urin:

1	2	3	4	5
Mendatangkan masalah yang kecil pada saya	Mendatangkan masalah yang sederhana pada saya	Mendatangkan masalah yang besar pada saya (tapi ini bukan hal yang paling teruk di dunia)	Menyukarkan saya(memeriksa urin adalah agak jijik bagi saya)	Mendatangkan masalah yang besar pada saya (Saya tidak tahan untuk mengendalikan spesimen)

Ulasan : _____

4. Keperluan menguji gula dalam darah,:.

1	2	3	4	5
Mendatangkan masalah yang kecil pada saya	Mendatangkan masalah yang sederhana pada saya	Mendatangkan masalah yang besar pada saya (tapi ini bukan hal yang paling teruk di dunia)	Sangat sukar bagi saya (mencucuk jari saya cukup menyakitkan)	Mendatangkan masalah yang besar pada saya (saya tidak tahan untuk mencucuk jari saya)

Ulasan : _____

5. Keperluan menjaga masa dan makan mengikut waktu:

1	2	3	4	5
Mendatangkan masalah yang kecil pada saya (berhubung dengan kegiatan sosial dan peribadi saya)	Mendatangkan masalah yang sederhana pada saya (lanya kadang-kadang mengganggu kegiatan sosial dan peribadi saya)	Mendatangkan masalah yang besar pada saya (lanya sering mengganggu kegiatan sosial dan peribadi saya)	Sangat sukar bagi saya (lanya menyebabkan gangguan besar dalam kegiatan sosoal dan peribadi saya)	Mendatangkan masalah yang besar pada saya (lanya selalu menghalang kegiatan sosial dan peribadi saya)

Ulasan : _____

6. Berjumpa dengan pakar perubatan seperti yang dikehendaki kerana penyakit diabetes saya:

1	2	3	4	5
Mendatangkan masalah yang kecil pada saya	Mendatangkan masalah yang sederhana pada saya	Mendatangkan masalah yang besar pada saya	Sangat sukar bagi saya (lanya sering mengganggu jadual saya di sekolah, pejabat atau di rumah)	Mendatangkan masalah yang besar pada saya (lanya agak mustahil dalam kehidupan saya)

Ulasan : _____

7. Kos kewangan dalam rawatan penyakit diabetis saya adalah:

1	2	3	4	5
Memberikan kesan yang kecil pada saya	Memberikan kesan yang sederhana (saya dan keluarga boleh mengatasinya tanpa sebarang masalah)	Memberikan kesan yang besar pada saya (tetapi saya dan keluarga boleh mengatasinya)	Memberikan beban kewangan kepada saya dan keluarga (amat sukar untuk menanganinya)	Memberikan beban kewangan yang amat besar kepada saya dan keluarga (ianya agak mustahil bagi saya untuk menanganinya)

Ulasan : _____

Sila jawab soalan No. 8 jika anda meminum minuman yang beralkohol

8. Had/limitasi yang diletakkan oleh diabetes terhadap pengambilan alkohol:

1	2	3	4	5
Tidak mendatangkan masalah bagi saya	Mendatangkan masalah yang minimum pada saya	Agak mendatangkan masalah pada saya	Mendatangkan masalah pada saya	Mendatangkan masalah yang besar pada saya

Ulasan : _____

Bahagian IV

1. Saya merasakan bahawa menjaga paras gula dalam darah saya sebaik mungkin:

1	2	3	4	5
Tidak akan memberikan kesan apa pun dalam mengelakkan diri daripada komplikasi di kemudian hari	Mungkin tidak akan memberikan kesan apa pun dalam mengelakkan diri daripada komplikasi di kemudian hari	Mungkin dapat mengurangkan peluang saya mendapat komplikasi di kemudian hari	Akan dapat mengurangkan peluang saya mendapat komplikasi di kemudian hari	Mengurangkan dengan banyak peluang saya mendapat komplikasi di kemudian hari

Ulasan : _____

2. Apabila paras gula dalam darah saya berada dalam julat yang ‘Normal’:

1	2	3	4	5
Saya merasakan sangat teruk seperti mendapat hipoglisemia	Saya sentiasa bimbang akan hipoglisemia	Saya tidak merasakan apa-apa perbezaan pun sama ada ianya tinggi atau pun tidak.	Saya rasa lebih baik (lebih segar dan tidak penat berbanding ketika ianya tinggi)	Saya rasa gembira/sihat.

Ulasan : _____

3. Apabila saya berpegang pada diet saya dan makan mengikut jadual:

1	2	3	4	5
Saya tidak merasakan fizikal saya berada dalam keadan lebih baik berbanding apabila saya tidak mengikut rejimen pemakanan	Saya merasakan fizikal saya berada dalam keadaan yang sedikit baik			Saya merasakan fizikal saya berada dalam keadaan sihat

Ulasan : _____

4. Apabila saya berpegang pada diet saya dan makan mengikut jadual:

1	2	3	4	5
Saya rasa terhalang, saya tidak rasa saya melakukan sesuatu untuk kesihatan saya pada masa hadapan.	Saya rasa bagus terhadap diri saya kerana melakukan perkara yang saya rasakan betul			Saya rasa sangat gembira terhadap diri saya kerana melakukan perkara yang terbaik untuk kesihatan jangka panjang.

Ulasan : _____

5. Saya percaya pemeriksaan gula dengan menggunakan ujian ____ urin/____darah (tandakan yang mana satu):

1	2	3	4	5
Ianya benar-benar tidak berguna dalam mengawal diet saya dan dos insulin	Ianya agak membantu dalam pengawalan diet saya dan dos insulin			Ianya amat membantu dalam pengawalan diet saya dan dos insulin

Ulasan : _____

6. Apabila saya membuat ujian gula dalam urin/darah secara berkala seperti yang di sarankan:

1	2	3	4	5
Ianya tidak mendatangkan sebarang perbezaan mengenai perasaan saya terhadap diri sendiri	Saya rasa baik-baik sahaja untuk diri saya	Saya merasa bagus untuk diri saya kerana saya melakukan perkara yang betul	Saya merasa sangat bagus terhadap diri saya	Saya merasa tersangat bagus terhadap diri saya kerana saya melakukan perkara yang betul

Ulasan : _____

7. Membuat pemeriksaan gula pada urin/darah:

1	2	3	4	5
tidak memberikan kesan fizikal kepada diri saya dari hari ke hari atau minggu ke minggu		agak membantu dalam membolehkan saya merasa lebih baik dari hari ke hari atau minggu ke minggu.		sangat membantu dalam membolehkan saya merasa amat baik dari hari ke hari atau minggu ke minggu

Ulasan : _____

Bahagian V

1. Antara kenyataan berikut, yang manakah kenyataan yang paling sesuai untuk menggambarkan pengalaman anda apabila kandungan gula anda tinggi?

1	2	3	4	5
Saya tidak pernah mengetahui; (Keputusan ujian saya selalunya menjadi kejutan bagi saya)	Saya jarang dapat mengetahui; (Jika saya tidak mengujinya saya mungkin tidak menyedari akan kandungan gula saya yang tinggi)	Kadang-kadang saya dapat mengetahui (apabila gula saya tinggi, kadang-kadang ianya membuatkan saya terasa berbeza)	Biasanya saya dapat mengetahui; (Apabila gula saya tinggi, saya biasanya terasa berbeza)	Saya selalu dapat mengetahui; (Apabila gula saya tinggi, saya selalunya terasa berbeza)

Ulasan : _____

2. Manakah antara kenyataan di bawah paling sesuai untuk menggambarkan pengalaman anda apabila anda mengetahui anda mendapat reaksi insulin?

1	2	3	4	5
saya tidak pernah dapat menghalang reaksi insulin (Ianya jadi secara tiba-tiba)	Kadang-kadang saya dapat rasakan kandungan gula saya rendah dan ianya cukup awal bagi saya untuk mengelak reaksinya, tetapi kadang-kadang ia juga datang secara tiba-tiba tanpa disedari			Saya sentiasa boleh memberitahu bahawa gula saya rendah dan ianya cukup awal bagi saya untuk mengelak reaksinya.

Ulasan : _____

3. Berapa kerapkah ahli keluarga atau rakan-rakan anda mengingatkan diri anda tentang apa yang anda patut lakukan berkaitan dengan penyakit diabetis anda?

1	2	3	4	5
Hampir tiada	Sekali sebulan atau lebih	Sekali seminggu atau lebih	Setiap hari	Beberapa kali sehari

Ulasan : _____

4. Dalam mengingati untuk menguji gula, pemakanan, mengambil insulin dan lain-lain, saya:

1	2	3	4	5
Mengabaikan masa dalam hal pemakanan, pengambilan insulin dan lain-lain.	Seorang yang agak mengikuti waktu untuk makan dan mengambil insulin dalam masa lebih kurang satu jam dari waktu yang telah ditetapkan			Sangat cermat dan berhati-hati terhadap waktu, jadi saya makan dan mengambil insulin dalam masa beberapa minit daripada waktu yang sepatutnya

Ulasan : _____

BAHAGIAN 3: AKTIVITI-AKTIVITI PENJAGAAN DIRI

Bahagian ini mengandungi empat (4) bahagian; Diet, Suntikan Insulin/ pengambilan ubat, Senaman dan Pemeriksaan sendiri glukos dalam darah. Sila baca dengan teliti dan tandakan (✓) untuk jawapan bagi setiap soalan berikut berdasarkan apa yang anda lakukan pada minggu yang lepas, hari atau seperti yang diminta. Kami hanya ingin mengetahui apakah yang anda lakukan dan bukan jawapan yang betul. Sekiranya apa yang anda lakukan adalah bukan seperti kebiasaan disebabkan perkara-perkara tertentu (anda pergi bercuti atau telah mendapat selsema), sila fikirkan apakah kebiasaan yang anda lakukan dalam masa terdekat.

I) Diet

1. Berapa kalikah anda makan dalam sehari termasuk makanan ringan pada minggu lepas?

1 2 3 4 5 6 7 atau lebih Tidak konsisten

***Soalan 2 hingga 8: Saiz bagi satu hidangan adalah seperti yang telah diajar oleh doktor, jururawat atau pegawai dietetik anda**

2. Secara purata, berapa banyakkah hidangan karbohidrat yang anda ambil ketika sarapan pada minggu lepas?

1 2 3 4 5 6 7 atau lebih Tidak konsisten

3. Secara purata, berapa banyakkah hidangan karbohidrat yang anda ambil sewaktu makan tengahari pada minggu lepas?

1 2 3 4 5 6 7 atau lebih Tidak konsisten

4. Secara purata, berapa banyakkah hidangan karbohidrat yang anda ambil sewaktu makan malam pada minggu lepas?

1 2 3 4 5 6 7 atau lebih Tidak konsisten

5. Secara purata, berapa banyak minuman berkarbohidrat yang anda minum pada minggu lepas? (Contoh minuman berkarbohidrat adalah minuman ringan/ Ribena/ sirap/ madu/ milo/horlick/ovaltine/ kopi atau teh dengan gula/ vitagen/ susu tepung/ susu pekat/ jus buah/ bijirin/ kacang soya/ bubur kacang merah atau hijau/ air kelapa/ air tebu)

0 1 2 3 4 5 6 7 atau lebih Tidak konsisten

6. Apakah purata jumlah karbohidrat bagi setiap minuman berkarbohidrat yang anda ambil pada minggu lepas?
- 0 1 2 3 4 5 6 7 atau lebih Tidak konsisten
7. Pada minggu yang lepas, berapa hari anda makan buah?
- 0 1 2 3 4 5 6 7
8. Setiap kali makan buah, berapa banyakkah (potong) buah yang anda makan?
- 1 2 3 4 5 6 7 atau lebih Tidak konsisten
9. Pada minggu yang lepas, berapa hari anda mengambil makanan atau minuman manis? (Contoh makanan manis adalah gula-gula/ coklat/ ais kirim/ kek/ madu/ sirap/susu pekat/ kaya/ jem/ biskut manis/ roti manis/ pau manis/ kuih/ pankek atau minuman manis)
- 0 1 2 3 4 5 6 7
10. Pada minggu lepas, setiap kali anda mengambil makanan atau minuman yang manis, adakah anda mengurangkan pengambilan karbohidrat ketika makan?
- Tidak Jarang-jarang Kadang-kadang Hampir selalu Sepanjang masa
11. Adakah tabiat pemakanan anda pada minggu lepas adalah sama dengan tabiat pemakanan anda dalam masa 3 bulan yang lepas?
- Tidak Jarang-jarang Kadang-kadang Hampir selalu Sepanjang masa

II) Ubat

1. Bagaimana anda mengawal diabetes?

- Suntikan insulin
- Kombinasi ubat tablet diabetes dan suntikan insulin

Apakah nama ubat tablet dan suntikan insulin yang anda ambil bagi diabetes anda?

No	Ubat	Dos ubat yang disyorkan/ diarahkan oleh doktor	Dos ubat yang anda ambil	Kekerapan yang disyorkan/ diarahkan oleh doktor (berapa kali sehari)	Kekerapan yang anda ambil (berapa kali sehari)	Tidak pasti
2						
3						
4						
5						
6						
7						

8. Minggu lepas, berapa kali anda tidak mengambil ubat suntikan insulin anda?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7 atau lebih

9. Minggu lepas, berapa kali anda memerlukan pertolongan bagi mengambil suntikan insulin anda?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7 atau lebih

III. Aktiviti Fizikal

A) Aktiviti masa tidak lapang (contoh; waktu berkerja)

Ketika anda bekerja atau membuat kerja rumah atau berada di kolej, secara purata:

1. Berapa lama masa anda peruntukkan untuk duduk?

- Sepanjang masa
- Lebih dari $\frac{1}{2}$ masa
- Kira-kira $\frac{1}{2}$ masa
- Kurang dari $\frac{1}{2}$ masa
- Tiada

2. Berapa lama masa anda peruntukkan untuk berdiri?

- Tiada
- Kurang dari $\frac{1}{2}$ masa
- Kira-kira $\frac{1}{2}$ masa
- Lebih dari $\frac{1}{2}$ masa
- Sepanjang masa

3. Berapa lama anda mengambil masa untuk berjalan?

- Tiada
- Kurang dari $\frac{1}{2}$ masa
- Kira-kira $\frac{1}{2}$ masa
- Lebih dari $\frac{1}{2}$ masa
- Sepanjang masa

4. Adakan anda mengangkat atau membawa barang yang berat?

- Tiada
- Jarang-jarang
- Selalu
- Hampir selalu
- Sepanjang masa

5. Bagaimana anda pergi ke tempat kerja atau bersiar atau ke kolej?

- Lain-lain (**sila nyatakan**) _____
- Kereta/ motosikal
- Bas / keretapi
- Basikal/ berjalan* (**pergi ke soalan 6 atau 7**)

6. Jika anda berbasikal untuk pergi dan balik dari tempat kerja, pasar, bersiar atau kolej, berapa lamakah anda berbasikal?

- 0-5 minit
- 6-15 minit
- 16-30 minit
- 31-45 minit
- >45 minit

7. Jika anda berjalan pergi dan balik dari tempat kerja, pasar, bersiar atau kolej, berapa lamakah anda berjalan?

- 0-5 minit
- 6-15 minit
- 16-30 minit
- 31-45 minit
- >45 minit

B) Aktiviti masa lapang

8. Berapa kerap anda berjalan di sekeliling rumah atau apartment anda ketika waktu lapang?

- Tidak pernah
- Jarang-jarang
- Kadang-kadang
- Hampir selalu
- Sepanjang masa

9. Berapa kerap anda berkebun seperti memangkas atau menggali tetapi bukan menyiram tanaman ketika masa lapang

- Tidak pernah
- Jarang-jarang
- Kadang-kadang
- Hampir selalu
- Sepanjang masa

10. Berapa kerap anda membaca buku/ majalah/ surat khabar, menonton TV, bermain atau menggunakan komputer ketika masa lapang?

- Sepanjang masa
- Hampir selalu
- Kadang-kadang
- Jarang-jarang
- Tidak pernah

11. Adakan anda mempunyai program senaman yang tetap?

- Tidak (**pergi ke bahagian IV**) Ya

12. Jika ya, senaman apakah yang anda lakukan?

- Senaman ringkas (kesan yang minimal)

(Contoh seperti yoga, golf, berjalan santai, Tai Chi, seni senaman Cina, memancing ditepi sungai, memanah)

- Senaman Sederhana (Sedikit kenaikan pada degupan jantung atau pernafasan)

(Contoh: berjalan cepat, berbasikal, bola tampar, badminton, ping pong, berenang santai, tarian poco-poco, bowling)

- Senaman berat (Degupan jantung dan pernafasan laju)

(Contoh: berlari, jogging, bola sepak, skuash, bola keranjang, berenang lasak, berbasikal jarak jauh, tenis)

13. Pada minggu lepas, berapa harikah anda melakukan senaman?

- 0 1 2 3 4 5 6 7

14. Jika anda melakukan senaman minggu lepas, secara purata setiap kali senaman berapa lamakah masa yang diambil?

- 0-5 minit

- 6-15 minit

- 16-30 minit

- 31-45 minit

- >45 minit

IV) Pemeriksaan sendiri

1. Adakah anda menguji paras glukos dalam darah di rumah atau di antara lawatan ke klinik?

Tidak Ya (**pergi ke Soalan 2 dan 3**)

2. Pada minggu lepas, berapa kali anda menguji paras glukos dalam darah anda?

0 1 2 3 4 5 6 7 atau lebih (sila nyatakan: _____ kali)

3. Pada minggu lepas, berapa kali anda mengubah pelan perubatan anda seperti mengubah pergambilan diet atau aktiviti fizikal atau ubat berasaskan kepada paras gula dalam darah anda?

0 1 2 3 4 5 6 7 atau lebih (sila nyatakan: _____ kali)

BAHAGIAN 4: DATA DEMOGRAFI/LATAR BELAKANG

NO I/C: _____ Hospital: _____

Umur: _____ tahun

Tempoh Diabetis (Kencing Manis): _____ tahun

***Sila tandakan (✓) untuk jawapan bagi soalan-soalan dibawah**

Jantina: Lelaki Perempuan

Bangsa: Melayu Cina India Lain-lain

Taraf Perkahwinan: Bujang Berkahwin Bercerai Berpisah Balu

Pendidikan: Tidak Pernah Sekolah Rendah Sekolah Menengah Kolej Universiti

Status Pekerjaan Sekarang: Belajar Bekerja Belajar dan Bekerja

Tinggal bersama: Ahli Keluarga Kawan-kawan Seorang Lain-lain

***Untuk diisi oleh penyelidik**

Keputusan HbA1C:	Tarikh:
------------------	---------

Sila kembalikan soalselidik ini kepada penyelidik setelah anda selesai menjawab

TERIMA KASIH DI ATAS PENYERTAAN ANDA

APPENDIX 2: INFORMATION SHEET (ENGLISH VERSION)



School of Nursing,
Queen's Medical Centre,
Derby Road,
Nottingham,
NG7 2UH

PARTICIPANT INFORMATION SHEET

Study title

Self-care practices, health beliefs and glycaemic control in young adults with type 1 diabetes

Introduction

Health beliefs have been known to influence patients' self-care behaviours. Diabetes education that targetting on patients' health beliefs has improved patients' self-care practices. However, little is known about health beliefs in young adults. This study aims to identify health beliefs in young adults and examine the relationships with self-care practices and glycaemic control.

What would this involve?

There is a questionnaire about Diabetes Knowledge, Health beliefs, Self-care activities and demographic data that you need to answer during your clinic appointment. In addition to the questionnaire, the HbA1C results will be obtained by the researcher from your clinical record. These measurements will be again collected at 6 months after the first administration. A short message (SMS) will be sent to your mobile phone a week before your clinic appointment at 6 month of the study in order to remind you about the study appointment/ follow-up.

The benefits

The finding of this research will contribute to the improvement of diabetes self-management education specifically for young adults. It will benefit us in terms of understanding what problems that you face to accomplish self-care activities and thus may help diabetes educators to implement effective education and appropriate strategies to support you and other people at your age to improve the adherence level to self-care activities.

The risks

There are no additional risks involved as the study only uses questionnaires for data collection and HbA1C is part of the management of the patient for every three months.

Confidentiality

The result of the data obtained will be reported in a collected manner with no reference to a specific individual. Hence, the data from each individual will remain confidential. As a patient only you have the right to know the results of the analysis.

Do I have to take part?

The participation into this study is voluntary. If you prefer not to take part, you do not have to give reason and your doctor will not be upset and your decision will not affect the treatment given. You may also withdraw at any point in time during the study.

If I have any questions, whom can I ask at any time point of the study?

Aishairma Aris (PhD student at the University of Nottingham United Kingdom)

Lecturer, Department of Nursing, Faculty of Medicine, UKM,56000 Cheras

Tel: 03- 91456256

H/P: 0126569142 or 00447903176947 (UK)

Email: arisaishairma@yahoo.com

APPENDIX 2: INFORMATION SHEET (MALAY VERSION)



The University of
Nottingham

School of Nursing,
Queen's Medical Centre,
Derby Road,
Nottingham,
NG7 2UH

MAKLUMAT UNTUK PESERTA KAJIAN

Tajuk Penyelidikan

Praktis penjagaan sendiri, kepercayaan terhadap kesihatan dan kawalan paras glukos dalam darah bagi pesakit dewasa muda yang menghidapi diabetis (kencing manis) kelas 1

Pengenalan

Kepercayaan terhadap kesihatan telah diketahui mempengaruhi pelakuan pesakit dalam praktis penjagaan sendiri. Pendidikan diabetis yang mensasarkan ke atas kepercayaan terhadap kesihatan telah membantu meningkatkan praktis penjagaan sendiri pesakit-pesakit. Walaubagaimanapun, hanya sedikit yang diketahui mengenai kepercayaan kesihatan pesakit dewasa muda. Projek ini bertujuan untuk mengkaji kepercayaan terhadap kesihatan dikalangan pesakit dewasa muda dan memeriksa hubungan di antara kepercayaan terhadap kesihatan dan praktis penjagaan sendiri dan kawalan paras glukos di dalam darah.

Apa yang akan dilakukan

Anda dikehendaki menjawab satu soalan kaji selidik menegenai pengetahuan tentang diabetes, kepercayaan terhadapan kesihatan, praktis penjagaan sendiri dan demografik data semasa sesi temujanji klinik anda. Manakala keputusan HbA1C anda akan diperolehi daripada klinikal rekod anda oleh penyelidik. Pada bulan ke 6 kajian, anda sekali lagi akan diminta untuk menjawab soalan kaji selidik tersebut dan keputusan HbA1C juga akan direkodkan oleh penyelidik untuk anda. Satu mesej ringkas (SMS) akan dihantar ke telefon bimbit anda seminggu sebelum tarikh temujanji klinik anda pada bulan ke 6 untuk mengingatkan anda tentang temujanji kajian.

Faedah penyelidikan

Penyelidikan yang dilakukan akan menyumbang kepada penambahbaikan pendidikan penjagaan sendiri bagi pesakit diabetis khas untuk golongan dewasa muda. Ia akan memberi faedah kepada kami dalam memahami faktor-faktor yang menyebabkan anda bermasalah dalam mematuhi penjagaan sendiri dan mungkin boleh membantu pengajar diabetis dalam melaksanakan pendidikan yang efektif dan stategi-strategi yang bersesuaian untuk membantu anda dan mereka-mereka yang sebaya dengan anda untuk meningkatkan tahap kepatuhan anda dalam penjagaan sendiri.

Risiko

Tiada risiko tambahan kerana kajian ini tidak melibatkan prosedur tambahan dan HbA1C adalah sebahagian dari rawatan piawai anda.

Kerahsiaan

Keputusan yang diperolehi akan dimaklumkan secara keseluruhan (kolektif) dan tidak akan merujuk pada nama individu pesakit. Justeru maklumat dan keputusan dari setiap pesakit adalah sulit. Sebagai pesakit anda berhak mengetahui keputusan anda sahaja.

Perlukah saya mengambil bahagian?

Penglibatan dalam penyelidikan ini adalah secara sukarela. Sekiranya anda tidak setuju, anda tidak perlu memberikan sebab dan ini tidak menjelaskan rawatan yang akan diberikan. Anda juga boleh menarik diri pada bila-bila masa sahaja.

Jika saya ada sebarang pertanyaan, siapa boleh saya hubungi?

Aishairma Aris (Pelajar PhD, University of Nottingham, United Kingdom)

Pensyarah, Jabatan Kejururawatan, Fakulti Perubatan, UKM, 56000 Cheras

Tel: 03- 91456256, 0126569142 or 00447903176947, Email: arisaishairma@yahoo.com

APPENDIX 3: CONSENT FORM (ENGLISH VERSION)

Title of project:

Self-care practices, health beliefs and glycaemic control in young adults with diabetes

Consent:

I have read the information on the research project that will be conducted and have also been given the explanation by the researcher about purpose of this document. I understand the objectives of the study. I also understand that I may withdraw at any time. I also have the right to know about the research conducted and information on the results of the research.

I _____

(IC Number: _____ H/P. No: _____) agree/disagree to participate in this research.

Signature:.....

Date:.....

Witness

Name:

IC:

Signature:

Date:

Reseacher

Name:

IC:

Signature:

Date:

APPENDIX 3: CONSENT FORM (MALAY VERSION)

Tajuk Penyelidikan

Praktis penjagaan sendiri, kepercayaan terhadap kesihatan dan kawalan paras glukos dalam darah bagi pesakit dewasa muda yang menghidapi diabetis (kencing manis)

Memberikan persetujuan:

Saya telah membaca maklumat tentang kajian yang akan dijalankan dan juga telah diberikan penerangan oleh penyelidik tentang tujuan dokumen ini. Saya juga faham akan tujuan penyelidikan ini. Saya juga berhak untuk mengetahui tentang penyelidikan yang dijalankan termasuklah maklumat tentang hasil penyelidikan tersebut.

Saya _____

(No.Kad Pengenalan: _____ No. Tel. Bimbit:
_____ bersetuju/tidak bersetuju untuk menyertai kajian ini.

Tandatangan:

Tarikh:

Saksi:

Nama : _____

Penyelidik:

Nama : _____

No. K/P: _____

No. K/P: _____

Tandatangan: _____

Tandatangan: _____

Tarikh : _____

Tarikh : _____

APPENDIX 4: INTERVIEW PROTOCOL

The Educator backgrounds

1. Tell me a little bit about yourself. Prompt for diabetes education experience (full time or part time) and qualification
2. Do you obtain regular continuing education in the field of diabetes management and education? If so what are they?
3. What is your role in the program? Prompt for supervisor, educator or coordinator

Structure

Organization of the program

1. What is the goal of your diabetes education program?
2. Who else involves in the program? Prompt for other educators, co-ordinator, advisor
3. How often the program is conducted?
4. Who is the target population of the diabetes education program? Prompt for type of diabetes, glycaemic status
5. How long the education is given? Prompt for the initial counselling and follow-up

Process of diabetes education

Curriculum

1. Is there a standard written curriculum for the program? If no, go to question no 5
2. If yes, who develop the curriculum?
3. (If you design) How do you develop it? Prompt for any framework, theory, current evidence and practice guideline
4. Do you use the curriculum to guide your teaching?
5. *What do you use to guide your teaching?

Assessment

1. Do you conduct a thorough, individualized assessment of the person with diabetes? If yes, what aspects do you assess? Prompt for:
 - Health and medical history: Clinical, weight
 - Knowledge
 - Previous diabetes education attended
 - Actual knowledge and
 - Self-management behaviour
 - Nutrition history and practices
 - Physical activity and exercise behaviours
 - Prescribed, over-the-counter medications, complementary and alternative therapies and practices (adherence to the prescription)
 - self-adjusting and treatment plan experience
 - Skills
 - Ability to use diabetes-related equipment such as monitoring and injection devices
 - Insulin injection technique
 - Factors that influence learning
 - education and literacy levels
 - perceived learning needs
 - motivation to learn
 - health beliefs
 - Physical factors
 - including age, mobility, visual acuity, hearing, manual dexterity, alertness, attention span, and ability to concentrate or special needs or limitations, requiring accommodations or adaptive support, and use of alternative skills
 - Psychosocial concerns, factors, issues including family and social supports
 - Current mental status
 - depressed
 - History of substance use including alcohol, tobacco and recreational drugs

- Occupation, vocation, educational level, financial status, and social, cultural and religious practices
 - Access to and use of health care resources
 - Government or paid
2. How do you obtain information for the assessment? Prompt for the source of assessment such as patients, patients' families, patients' medical records and referring health care providers (doctors) or referring letters
 3. Do you have standard assessment forms?
 4. Do you record the assessments? If so, where do you record? Prompt for standard forms, patients' folders or computer system

Goals/outcomes targeted for each patient

1. What outcomes do you target for your patients to achieve following the diabetes education session? Prompt for knowledge, self-management behaviour and skills, clinical outcomes, diabetes complications and quality of life.
2. How do you develop the outcomes? Prompt based on the assessment, consistent with accepted diabetes practice guidelines, discussion with patients, considering the known and perceived risks and benefits of the proposed outcome e.g. SC benefit reduces HbA1C, risk-complications, hyperglycaemia, DKA. Perceived-barriers: time, financial benefit-perceived
3. Do you explain to each patient about the outcomes in clearly defined measurable terms? If yes, how do you express the outcomes? Prompt for patients' age, education level, understanding, language use.

Plan to achieve patients' goals/targets

1. What plan do you develop in order to ensure patients can achieve the outcomes? Prompt for what to teach, how to teach
2. Do address specific desired outcomes?

3. Do you identify specific instructional strategies to be used? Prompt for discussion, demonstration, role-playing and simulations, based on patient's needs, skills, learning style and preferences
4. Do you consider the patient's culture, lifestyle and health beliefs when planning the diabetes education?
5. Do you describe the process to be used for evaluation of effectiveness to the patients?
6. What terms do you use to plan the diabetes education for each patient? Prompt for measurable, behaviourally focused
7. Is the plan reflects inevitable changes in patients' needs and goals?
8. Do you consider patient's changing needs, desires and abilities?

Implementation

1. How do you conduct your diabetes education session? Prompt for group or one-to-one
*If one-to-one, go to question no 5
2. What criteria would you consider in order for patients to be in a group?
3. How many educators involve in a group diabetes education session?
4. How long do you take for educating one group?
5. How long do you take for educating one patient? Prompt for newly diagnosed patients, new referrals, follow up patients
6. What is the main topic/content that you address when educating your patients? Prompt for:
 - Diabetes knowledge
 - Describing the diabetes disease process and treatment options
 - Self-management skills
 - Incorporating nutritional management into lifestyle
 - Meal planning
 - Carbohydrate exchange
 - Carbohydrate counting
 - Incorporating physical activity into lifestyle. Prompt for recommendation
 - Type of exercise

- Intensity
- Frequency
- Duration
- Using medication(s) safely and for maximum therapeutic effectiveness

Prompt for

 - Correct dosage, frequency, method of administration
 - Specific skills for insulin treated-patients
 - Adjusting treatment regimens (insulin and oral diabetes medications)
- Monitoring blood glucose. Prompt for
 - recommendation
 - performing SMBG
 - Interpreting results
 - Using results for self-management decision making
- Acute complications
 - Preventing
 - Detecting
 - Treating
- Chronic complications
 - Preventing
 - Detecting
 - Treating
- Developing personal strategies to address psychosocial issues and concerns
- Developing personal strategies to promote health and behaviour change

7. Do you reinforce about diabetes education content and behavioural goals of other aspects that outside of your area or expertise? If so, could you tell me about it? Prompt for as mentioned above.
8. What instructional strategies that you frequently use to deliver the content? Prompt for discussion, demonstration, role-playing and simulations.
9. What strategy do you use to give the diabetes education? Prompt for interactive and patient-centred (acquisition of knowledge), creative, patient-centred experience-based (to support informed decision-making and behaviour change)

9. What materials that you frequently use to assist the diabetes education?
10. Do you use the same materials for all patients? Prompt for patient's age, culture, learning style and abilities
10. Do you document what have been taught to patients?
11. Do you develop a follow up plan with the patient? Prompt for reassessment of the method use to follow up-web based, telephone, face-to-face).
12. Do you provide ongoing diabetes self-management support for each patient? Prompt for (Educational, behavioural, psychosocial or clinical).
13. If yes, what strategy or method that you use for providing support to your patients? Prompt for (e.g. nurse case manager/case management-reminders about needed follow up care and tests, medication management, education, behavioural goal-setting and psychosocial support/ connection to community resources-sport centre; disease management, trained peers and health community workers, community-based programs, use of technology, ongoing education and support groups, and medical nutrition therapy)
14. Do you record all the plans? If so, how do you record? Prompt for standard forms, patients' folders or computer system

Outcomes

Evaluation of the effectiveness of diabetes education on patients' defined- goals/targeted outcomes

1. How do you evaluate patients' defined-goals/targeted outcomes? Prompt for the outcomes that previously developed
2. If providing group session, how do you evaluate outcomes group education session?
3. How often do you evaluate patients' outcomes?

Evaluation of the effectiveness of diabetes education on the diabetes education process

1. Do you evaluate the effectiveness of your diabetes education process? If so, how do you evaluate?

APPENDIX 5: RISK ASSESSMENT



Risk Assessment Form

Activity/Project name: Aishairma Aris PhD Data Collection

Assessment carried out by: Dr. Gary Adams, Dr. Holly Blake and Aishairma Aris

Date of assessment: 21/04/2010

What are the hazards?	Who might be harmed and how?	What are you already doing?	With precautions in place, high, medium or low risk of occurrence?	With precautions in place, high, medium or low risk to the individual(s) health and/or safety?
Aishairma will need to travel to Malaysia	Aishairma – travel problems or accidents. She needs to travel twice: for data collection at baseline and 6 months follow-up	Aishairma is a Malaysian student who came to study in the UK in January 2009. All our overseas students are responsible for arranging and financing their travel between the UK and their home country. Flights booked in accordance with UoN travel policy, also ensure that insurance cover adequate – this is not a holiday	Low	Low
Aishairma will need to live in Malaysia	Aishairma may become ill	Aishairma is an experienced and qualified nurse and nursing lecturer. Aishairma is aware of all the required vaccinations and will be able to access health services as a Malaysian national in her own country	Low	Low
Participants are distressed by the approach to take part in the project	Participants become distressed	Explain clearly, in the written material provided and verbally about the value of the research and also explain clearly that participation is voluntary.	Low	Low

Participants are distressed by the data to be collected	Participants become distressed	Explain clearly that all data will be treated confidentially and anonymously. Only the researcher and the academic supervisors will have access to the data. Explain that blood taking will not involve in this study as HbA1C results will be obtained from patients' clinical records. The HbA1C test is part of patients' diabetes clinic routines for every three months	Low	Low
Aishairma may travel to meet with research participants in the diabetes clinics	Aishairma- RTAs and accidents; as travelling is never risk free,	Aishairma will be travelling to the study settings using the methods that she normally uses when she lives and works there	Low	Low

Introduction

This guidance is designed to reflect good practice and aims to promote an awareness of the issues and risks encountered by staff who could either frequently or occasionally be classified as a 'Lone Worker'. This guidance cannot cater for every situation and working environment but seeks to outline some of the measures that can be used to protect workers and reduce the risks associated with lone working. The guidance focuses on staff who undertake research activities such as one-to-one interviews and focus groups, which may involve working off-site in unfamiliar surroundings. Those who work in these situations, without colleagues, security staff etc near by to them face higher risks from violence, verbal abuse or theft of either personal, or University or NHS property.

The term 'Lone Worker' is used to classify a wide range of different roles and covers all staff who work either regularly or occasionally on their own. This term covers staff who work on-site but have occasion, either due to their role or the environment they work in, to work alone and staff who regularly travel off-site for example conducting home visits or visits to other care services. Lone working is not unique to any particular working environment or groups of staff. Whilst it is very important to raise awareness of the higher risks faced by lone workers these should not be over-exaggerated as increased fear may have a detrimental impact upon individuals and therefore be counter-productive.

Areas of Responsibility

Below are areas of priority and commitment towards creating a preventative risk environment by the School, the Principal Investigator and Individual Researchers.

The School of Nursing, Midwifery and Physiotherapy (SNMP)

The SNMP is required to:

- Encourage staff to follow clear robust procedures to identify potential risks and to deal with incidents when they occur.
- Takes responsibility for, and supporting the need to operate, systems, procedures and technology provided for staff's enhanced protection.
- Sharing of information from within the Queens Medical Centre and other relevant outside organisations on identified and potential risks and sharing good practice.
- To support the provision of good quality training of staff, when required, in order to prevent and manage violent situations, or to use procedures, systems or devices provided for their security and safety, to their best effect.
- Follow University procedures and mechanisms in order to support staff who has been subject to an abusive or violent incident.
- Will provide a supportive pro-security culture for staff.

Principal Investigator

The principal investigator is required to:

- The Principal Investigator of a research project who co-ordinates researchers activities will endeavour to identify the risks associated with undertaking the research and ways in which these risks could be reduced.
- In consultation with the research team develop appropriate procedures as necessary in line with the identified risks associated with undertaking the project.
- Consider the need for purchasing appropriate technology, for example mobile phones for off-site working, and ensure that all the research team is confident with using it.
- Encourage team members to share good practice and experiences and concerns.
- Provide clear instructions to the research team that they should not feel pressured into entering into lone working situations where they feel that their safety or the safety of their colleagues may be compromised.

Staff Undertaking Research

Individual staff members undertaking research are required to:

- Follow the guidelines and procedures agreed with the Principal Investigator.
- Report any incidents, or potential risks to the Principal Investigator.
- Make use of any technology provided as appropriate and take responsibility for ensuring they know how to use it properly.
- Take responsibility for their own safety.
- Undertake any safety training recommended by the Principal Investigator if at all possible.

Examples of Good Practice

The following are a range of examples of good practice, this is not an exhaustive list and is intended to provide some suggestions of ways of working that could reduce the increased risk of lone working. Please consult the list of sources of information provided at the end of this document for additional ideas. This is not a comprehensive list and should be read in junction with 'Not Alone. A Guide for the Better Protection of Lone Workers in the NHS.'

Communication:

- A system needs to be agreed that ensures that someone knows where lone workers are. For example the use of work diaries and information boards.
- Sharing experiences and concerns. This should happen between employees and between other relevant organisations.
- Liaison with police and local PCTs. The police and PCTs can help by providing advice on personal safety and related issues; helping with specific visits or incidents; and also providing local knowledge of the area.

Other organisations have found the following practices helpful:

- Use an early warning or flagging system. This alerts colleagues about potentially violent clients, or problem areas.
- Talk about specific concerns and incidents. Organisations believed that relevant and practical solutions can be more easily found when problems and ideas are shared.
- Report all incidents. This helps management to evaluate and monitor the true scale and nature of violence and abuse incidents and so help to develop an effective policy to deal with the problem.

Work equipment:

- Use of mobile phones or other communication device. Lone workers need to be able to call for help if needed and to let others know where and how they are.
- Personal alarms. These are popular and help staff feel more confident about their safety.

Job design:

- For example doubling-up. Some organisations send two people to carry out a job if there is thought to be a possible risk of violence or if the employee has particular concerns.
- Self risk assessments. Lone workers should be encouraged to regularly assess the situation they are in and the risks to which they are exposed.

Training:

- Personal safety or violence prevention training.

What to do if employees feel uncomfortable in a client's house, or place of work? As part of the project you are involved in you may need to develop some suggestions of good practice, for example:

- 'Keep your wits about you';

- Do not sit down;
- Do not spread belongings out;
- Make excuses to get out if you feel at risk, eg needing something from the car;
- Keep escape routes clear. Ensure you can get to the door quickly.
- Telephone a colleague and report to them that you have arrived at clients and that you will get back to them after you have left. This acts as both an information call and a deterrent.

Information Sources.

There are number of sources of information and help that can be accessed.

- "Not Alone. A Guide for the Better Protection of Lone Workers in the NHS." NHS March 05. Available on-line www.cfsms.nhs.uk
- "A Professional Approach to Managing Security in the NHS." NHS Available on-line www.cfsms.nhs.uk
- HSE (Health and Safety Executive); Web address <http://www.hse.gov.uk/>
- the Suzy Lamplugh Trust;
- local Social Services;
- liaison with other University Departments;
- the Police;
- the Home Office;
- articles in health and safety magazines.



Pn Aishairma Aris
Department of Nursing
UKM Medical Centre
Cheras

Dear Pn.,

Approval to conduct research in UKM

Title : *'Self-Care Practices, Health Beliefs and Glycaemic Control in Young Adults with Type 1 Diabetes'*

Project Code : **FF-204-2010**

With reference to the above, the Research Committee, Universiti Kebangsaan Malaysia Medical Centre (UKMMC) has approved the following research proposal:

Duration of Study : July 2010 until June 2011

Financial Support : RM 3,077.80 from UKMMC Fundamental Research Fund

- *Deal with UKMMC Financial Department for claims*

Please submit any **Adverse Events Report, Progress Report every 6 months and Final Report** upon completion of the research to the Medical Research Secretariat. Please also complete the online registration on '**National Medical Research Register**' at www.nmrr.gov.my.

Thank you.

Yours truly,

Professor Dr. Rohaizak Muhammad
Deputy Dean (Research & Industry)
UKM Medical Centre
& Chairman
PPUKM Research Committee
Cheras

Cc.

- *Circulation file
FF-204-2010*

APPENDIX 7: ETHICAL APPROVAL (THE MINISTRY OF HEALTH)



PEJABAT TIMBALAN KETUA PENGARAH KESIHATAN
OFFICE OF THE DEPUTY DIRECTOR-GENERAL OF HEALTH
(PENYELIDIKAN & SOKONGAN TEKNIKAL)
(RESEARCH & TECHNICAL SUPPORT)
KEMENTERIAN KESIHATAN MALAYSIA
MINISTRY OF HEALTH MALAYSIA
Aras 12, Blok E7, Parsel E, Presint 1
Level 12, Block E7, Parcel E, Precinct 1
Pusat Pentadbiran Kerajaan Persekutuan
Federal Government Administrative Centre
62590 PUTRAJAYA

Tel : 03 88832543
Faks : 03 88895184

MEDICAL RESEARCH & ETHICS
COMMITTEE
MINISTRY OF HEALTH MALAYSIA
c/o Institute for Health Management
Jalan Rumah Sakit, Bangsar
59000 Kuala Lumpur

Puan Aishairma binti Aris
Faculty of Medicine and Health Sciences
University of Nottingham

Our ref : (2)dlm.KKM/NIHSEC/08/0804/P10-240
Date : 31 May 2010

NMRR-10-538-5482

Self-care practices, health beliefs and glycaemic control in young adults with type 1 diabetes

Project Location: Hospital Kuala Lumpur/ Hospital Pulau Pinang/ Pusat Perubatan Universiti Malaya/ Pusat Perubatan Universiti Kebangsaan Malaysia

With reference to your application , the Medical Research & Ethics Committee (MREC) of the Ministry of Health (MOH) Malaysia takes note this project is a requirement in the fulfilment of your PhD from University of Nottingham and has been approved by the University.

The MREC has no objection from the ethical aspects to the conduct of this study and hope that the findings of this study can be shared and made known to the Ministry of Health Malaysia.

You are requested to submit end of project report and a copy of any publication arising from this project to the MREC.

Thank you.

Yours sincerely,

(DATO' DR CHANG KIAN MENG)

Chairman

Medical Research & Ethics Committee
Ministry of Health Malaysia



UNIT PERANCANG EKONOMI

Economic Planning Unit

JABATAN PERDANA MENTERI

Prime Minister's Department

BLOK B5 & B6

PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN

62502 PUTRAJAYA

MALAYSIA



Telefon : 603-8888 3333

Ruj. Tuan:

Your Ref.:

UPE: 40/200/19/2601

Ruj. Kami:

Our Ref.:

14 April 2010

Tarikh:

Date:

Aishairma Aris
No 95 Jalan Dayang 24/8
Bandar Mahkota Cheras
Cheras,
56000 Kuala Lumpur.
Email: arisaishairma@yahoo.com

APPLICATION TO CONDUCT RESEARCH IN MALAYSIA

With reference to your application, I am pleased to inform you that your application to conduct research in Malaysia has been *approved* by the **Research Promotion and Co-ordination Committee, Economic Planning Unit, Prime Minister's Department**. The details of the approval are as follows:

Researcher's name : **AISHAIRMA ARIS**

Passport No. / I. C No: **761030026014**

Nationality : **MALAYSIAN**

Title of Research : **"SELF-CARE PRACTICE, HEALTH BELIEFS AND GLYCAEMIC CONTROL IN YOUNG ADULT WITH TYPE 1 DIABETES"**

Period of Research Approved: **12 MONTH**

2. Please collect your Research Pass in person from the Economic Planning Unit, Prime Minister's Department, Parcel B, Level 4 Block B5, Federal Government Administrative Centre, 62502 Putrajaya and bring along two (2) passport size photographs. You are also required to comply with the rules and regulations stipulated from time to time by the agencies with which you have dealings in the conduct of your research.

3. I would like to draw your attention to the undertaking signed by you that you will submit without cost to the Economic Planning Unit the following documents:

- a) A brief summary of your research findings on completion of your research and before you leave Malaysia; and
- b) Three (3) copies of your final dissertation/publication.

4. Lastly, please submit a copy of your preliminary and final report directly to the State Government where you carried out your research. Thank you.

Yours sincerely,



(MUNIRAH ABD. MANAN)
For Director General,
Economic Planning Unit.
E-mail: munirah@epu.gov.my
Tel: 88882809
Fax: 88883961

ATTENTION

This letter is only to inform you the status of your application and **cannot be used as a research pass.**

Cc:

Ketua Setiausaha
Kementerian Kesihatan Malaysia
Bahagian Dasar dan Hubungan Antarabangsa
Aras 6, 8 & 11, Blok E7, Kompleks E
Pusat Pentadbiran Kerajaan Persekutuan
62590 Putrajaya.