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KNOWLEDGE AND SELF-CARE ADHERENCE AMONG TYPE 2 DIABETES MELLITUS PATIENTS WITH SELF-INJECTING INSULIN AT KLINIK PAKAR PERUBATAN (KPP), HOSPITAL UNIVERSITI SAINS MALAYSIA (HUSM)

by

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LIST OF ABBREVIATIONS

Brief DKT	Brief Diabetes Knowledge Test
CPG	Clinical Practice Guidelines
DM	Diabetes Mellitus
T2DM	Type 2 Diabetes Mellitus
HbA1C	Glycated Hemoglobin A1C
HUSM	Hospital Universiti Sains Malaysia
KPP	Klinik Pakar Perubatan
OHAs	Oral Hypoglycaemic Agents
SDSCA	Summary of Diabetes Self-Care Activities
SMBG	Self-Monitoring Blood Glucose
WHO	World Health Organization

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ABSTRACT

Diabetes is one of the most common chronic diseases and of the top ten leading causes of death. Adequate glycemic control is vital in diabetes management to prevent complications secondary to uncontrolled diabetes. However, majority of diabetes patients were still not in satisfactorily controlled. Many type 2 diabetes mellitus (T2DM) patients delay or discontinue the use of insulin, even insulin use is required to achieve adequate glycaemic control. Complicating issues and lifestyle changes associated with self-injecting insulin diabetes patients make the issues of adherence to prescribed diabetes management plan more difficult than other illnesses. Level of diabetes knowledge had influences on the optimal diabetes care. Thus, ojectives of this study were to examine the knowledge and self-care adherence among T2DM patients with self-injecting insulin. A quantitative study had been carried out on 40 T2DM patients at HUSM, Kelantan, Malaysia. Validated Brief DKT with reliability Cronbach's alpha 0.70 and SDSCA with reliability Cronbach's alpha for each of the regimen areas, (1) Diet: α=0.70, (2) Exercise: α=0.71, (3) Self-Monitoring Blood Glucose: α=0.89 and (4) Medication: α=1.00 was used to assess the knowledge and self-care adherence respectively in this study. Ethical clearance was obtained from the Ethical and Research Committe

(Human) of USM. Duration of data collection was from January 2011 to February 2011. Data were analyzed via Chi-Square and One-Way Analysis of Variance (ANOVA) Test. Generally more than half of the respodents (52.5%) had poor level of overall diabetes knoweldge and general diabetes knowledge respectively and 62.5% had poor level of insulin knowledge. Socio-demographic factors were found significantly associated with overall diabetes knowledge; gender (ρ= 0.027), level of education (ρ=0.002), and income (ρ= 0.004), however there was no significant association between overall diabetes knowledge level with age (ρ= 0.269), ethnic (ρ= 0.342), marital status (ρ= 0.168), duration of diabetes (ρ= 0.920), duration of injected insulin (ρ= 0.979) and frequency of insulin injection in one day (ρ= 0.495). On the other hands, there was no significant association for all of the four self-care regimen areas (1) Diet (ρ= 0.063), (2) Exercise (ρ= 0.302), (3) Self-Monitoring Blood Glucose (ρ= 0.089) and (4) Medication (ρ= 0.097) with overall knowledge level were found in this study. However, different level of self-care adherence was observed between different levels of knowledge groups. Respondents who had poorer level of overall diabetes knowledge group had poorer mean of self-care adherence. Majority of the respondents had low adherence to exercise and self-monitoring blood glucose, moderate adherence to diet and good adherence to medication. In conclusion, the findings of this study will provides a guideline for health care providers to improve the diabetes knowledge and self-care practices among type 2 diabetes mellitus patients with self-injecting insulin.

PENGETAHUAN DAN KEPATUHAN PRAKTIS JAGAAN DIRI DALAM KALANGAN PESAKIT DIABETES JENIS 2 DENGAN SUNTIKAN KENDIRI INSULIN DI KLINIK PAKAR PERUBATAN (KPP), HOSPITAL UNIVERSITI SAINS MALAYSIA (HUSM)

ABSTRAK

Diabetes merupakan salah satu penyakit kronik yang merupakan 10 daripada penyebab utama kepada kematian. Pengawalan paras gula dalam darah adalah penting dalam pengurusan diabetes bagi mengelakkan komplikasi daripada diabetes yang tidak terkawal. Akan tetapi, kebanyakkan pesakit diabetes masih dalam paras kawalan yang tidak memuaskan. Ramai pesakit diabetes jenis 2 menangguhkan atau menghentikan pengunaan insulin walaupun insulin diperlukan untuk pengawalan paras gula dalam darah yang optima. Isu yang komplek serta perubahan cara gaya hidup pada pesakit yang menggunakan suntikan insulin membuatkan pengurusan diabetes lebih rumit dibandingkan dengan penyakit lain. Tahap pengetahuan diabetes mempengaruhi pengurusan diabetes yang optima. Oleh sebab itu, objektif kajian ini adalah untuk mengenal pasti pengetahuan dan kepatuhan praktis jagaan diri dalam kalangan pesakit diabetes jenis 2 dengan suntikan kendiri insulin. Pendekatan kuantitatif digunakan dalam kajian ini dengan melibatkan 40 pesakit luar diabetes di HUSM, Kelantan, Malaysia. Brief DKT yang disah dengan kebolehpercayaan alfa 0.70 dan SDSCA yang disah dengan kebolehpercayaan alfa bagi setiap komponen; (1) Pemakanan: α=0.70 (2) Senaman: α=0.71 (3) Pemeriksaan Gula Dalam Darah: α=0.89 (4)

Ubat-Ubatan Kencing Manis: α=1.00 digunakan dalam kajian ini untuk mengkaji pengetahuan dan kepatuhan praktis jagaan diri. Kelulusan etika telah diperolehi daripada Jawatankuasa Etika dan Kajian (Manusia) USM. Tempoh yang digunakan dalam pengumpulan data adalah dari Januari 2011 hingga Febuari 2011. *Chi-Square* and *One-Way Analysis of Variance (ANOVA) Test* digunakan dalam menganalisa data untuk kajian ini. Secara umumnya, masing-masing (52.5%) peserta mempunyai pengetahuan diabetes secara keseluruhan dan pegetahuan am diabetes yang rendah dan 62.5% peserta mempunyai pengetahuan insulin yang rendah. Kajian ini menunjukkan jantina (ρ= 0.027), tahap pendidikan (ρ=0.002) dan sumber pendapatan (ρ= 0.004) mempunyai hubungan yang nyata dengan pengetahuan diabetes secara keseluruhan, akan tetapi umur (ρ= 0.269), bangsa (ρ= 0.342), status perkahwinan (ρ= 0.168), jangka masa diabetes (ρ= 0.920), jangka masa suntikan insulin (ρ= 0.979) dan kekerapan suntikan insulin yang diambil setiap hari (ρ= 0.495) tidak mempunyai hubungan yang nyata dengan pengetahuan diabetes secara keseluruhan. Selain daripada itu, kepatuhan praktis jagaan diri bagi setiap komponen; (1) Pemakanan: (ρ= 0.063), (2) Senaman: (ρ= 0.302), (3) Pemeriksaan Gula Dalam Darah: (ρ= 0.089) , (4) Ubat-Ubatan Kencing Manis: (ρ= 0.097) didapati tiada hubungan yang nyata dengan pengetahuan diabetes secara keseluruhan, akan tetapi, terdapat perbezaan diantara kepatuhan praktis jagaan diri dengan kumpulan pengetahuan kumpulan peserta. Kumpulan peserta yang mempunyai pengetahuan yang rendah mempunyai kepatuhan praktis jagaan diri yang lemah. Majority peserta dalam kajian ini mempunyai kepatuhan praktis jagaan diri yang rendah untuk senaman dan pemeriksaan gula dalam darah,

kepatuhan praktis jagaan diri yang sederhana dalam pemakanan dan kepatuhan praktis jagaan diri yang baik dalam ubat-ubatan kencing manis. Secara kesimpulanya, diharapkan hasil kajian ini dapat dijadikan panduan kepada ahli professional kesihatan untuk mempertingkatkan pengetahuan dan kepatuhan praktis jagaan diri dalam kalangan pesakit diabetes jenis 2 dengan suntikan kendiri insulin.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Diabetes is one of the most common chronic diseases. Globally there is a rising trend in the prevalence of diabetes. Diabetes, cardiovascular disease, cancer, mental health problems, accidents and injury are the major causes of burden of disease (Manderson, Zaliha, Rameezan, Nooreini, Soh & Disbler, 2006). The global prevalence of diabetes in 2002 was estimated to be 2.8% and is projected to rise 4.4% in 2030 (Sanjay et al, 2010). More than 220 million people worldwide have diabetes (WHO, 2009) and it is estimated that there will be around 300 million diabetics by 2025 (Salmiah, 2009).

Chan et al (2009) stated that more than 60% of the world's population with diabetes will come from Asia and more than 110 million individuals that were living with diabetes, with a disproportionate burden among the young and middle aged. In 2003, with the total of 39.3 million (5.6%) number of people with diabetes in South East Asia Region , International Diabetes Federation (IDF) predicts by 2025, it would have an estimated diabetes prevalence of 7.5% (81.6 million) (IDF Diabetes Atlas, 2003). The increasing trend in prevalence of diabetes will burden the health care system and individual patients (New Straits Times Press, 2005).

Diabetes is one of the top ten leading causes of death in many countries around the world (Tan, 2009) and Malaysia is of no exception with 4000 deaths causes by diabetes and its related complications in year 2002 alone. On the other hand, Malaysia was listed in the top 10 countries in Asia with the highest number of person with type 2

diabetes (WHO, 2006). With the total number of 1530,000 type 2 diabetes in 2007, it is estimated that the figure will be increases to 2743,000 in 2025 (Chan et al, 2009).

Uncontrolled diabetes has led to an increase in complications, disability, reduced life expectancy and increase health care cost (Amos, McCarty & Zimmet, 1997). WHO (2006) reported average life expectancy of individuals with diabetes is shortened by 10-15 years. Adequate metabolic control is vital in diabetes management to prevent complications secondary to diabetes (Eid, Mafauzy, & Faridah, 2003) such as coronary heart disease, hypertension, stroke, kidney failure, and amputation. Measurement of glycated hemoglobin A_{1c} (HbA_{1c}), is a standard routine and widely used for evaluating metabolic control, goal of insulin therapy and diabetes management in diabetics patient. Reduced HbA1c levels shown to lower the incidence of microvascular complications of diabetes and is associated with decreased risk of myocardial infarction and fatal cardiovascular events (Spellman, 2007).

A national survey reported by the American Association of Clinical Endocrinologists (AACE), (2005) found a disappointing 67% of persons with Type 2 diabetes unable to meet the recommended target value of HbA1c < 7 as recommended by American Diabetes Association (ADA), (2003). In a study of sociodemographic determinats of glycaemic control, 926 patients were recruited from seven health centres throughout Peninsular, the overall glycaemic control, as assessed by HbA1c was poor. Majority of patients (61.1%) had HbA1c greater than 8% (Ismail et al, 2000). The Diabcare-Asia project done in 2003 also found that majority of Malaysian diabetic patients were still not in satisfactorily controlled with only 41.0% of the patients had HbA1c < 7% and this was associated with a high prevalence of complications among diabetics in Malaysia (Mafauzy, 2006).

The main treatment goal in managing patients with type 2 diabetes is to achieve good glycemic control; thus preventing or minimizing the long-term complications of hyperglycemia (Pan, Sinnassamy, Chung & Kim, 2007). Once type 2 diabetes had been diagnosed, treatment plan usually will through diet and lifestyle change. When diet and lifestyle change were not effective in controlling the high blood glucose levels, patients are then will be managed through oral hypoglycemic agents (OHAs) (Aziz & Shareen, 2007). Insulin treatment is needed to all patients with Type 1 diabetes as they do not produce enough insulin to sustain life, and in patients with Type 2 diabetes, insulin is required when the efficacy of oral agents decreases and poor glycaemic control (Pfutzner, Asakura, Sommavilla & Lee, 2008).

Initiation of insulin therapy, before oral agents fail and glycaemic control deteriorates, may be necessary to reduce the risk of developing microvascular complications (Korytkowski, Niskanen & Asakura, 2005). Benefits from the early addition of insulin with OHAs on type 2 diabetes mellitus patients in their therapeutic regimen have becoming increasingly apparent (Pan et al, 2007). Average 2-3 of type 2 diabetes mellitus patients will receive education at diabetic centre HUSM due to newly use of insulin as part of their diabetes treatment. In 2009, total of 257 type 2 diabetes mellitus patients who attended to KPP received education at diabetic centre and in January to May of 2010, 184 of type 2 diabetes mellitus had receive education in diabetic centre by trained diabetes educator on diabetes knowledge and usage of insulin (Diabetic Centre KPP, 2010).

The success of diabetes management depends largely upon patient adherence with the prescribed management plan (Kamel, Badawy, El-Zeiny & Merdan, 1999). Many patients with Type 2 diabetes mellitus delay or discontinue the use of insulin, even when insulin use is required to achieve adequate glycaemic control (Oliveria, Menditto, Marianne, Koo, Wells & McCarthy, 2007). The complicating issues and lifestyle changes associated with self-injecting insulin diabetes patients such as the need to change their

daily food habits and physical activities, learn how to deal with diabetes medications, how to deal with complications and how to monitor blood glucose level (Al-haddad, 2008) make the issue of adherence more difficult in diabetes than in other chronic diseases (Pfutzner et al, 2008). Many factors are strongly related with the adherence to prescribed management plan, these are: social, healthcare provider, demographics, psychological, disease and treatment related factors (Delamater, 2006). Patient's knowledge about the disease and its management plays a role in adherence to planned diabetes management. Lack of knowledge of self-care skills, and misinformation and or misunderstanding of the management plan were a major aspect of involuntary non-adherence (Kamel et al, 1999).

1.1.1 Summary

Effective diabetes management improves the overall clinical outcomes of diabetic patient. Hence, determination of diabetes and its management knowledge is importance as adherence to prescribed management plan is influence by an individual knowledge toward their condition and its management. Complicating issues and lifestyle changes on diabetes management make self-care adherence more difficult. Hence, this study that will be carried out by researcher is to determine level of knowledge and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at HUSM.

1.2 Problem Statements

Diabetes mellitus is the most common health problem and covering the highest total numbers of outpatients attended to Klinik Pakar Perubatan (KPP) in HUSM with 3842 patients followed by cardiovascular (2039 patients), neurology (1254 patients), respiratory (1238 patients), nephrology (1064 patients), gastrology (588 patients) and haematology (585 patients) from January to May 2009 (Figure 1.1). On the other hand, outpatient of type 2 diabetes mellitus who are receiving care in KPP, HUSM are increasing from 2005 to 2009 (Figure 1.2). Hence, this study will be focus on type 2 diabetes mellitus outpatients attending to KPP, HUSM.

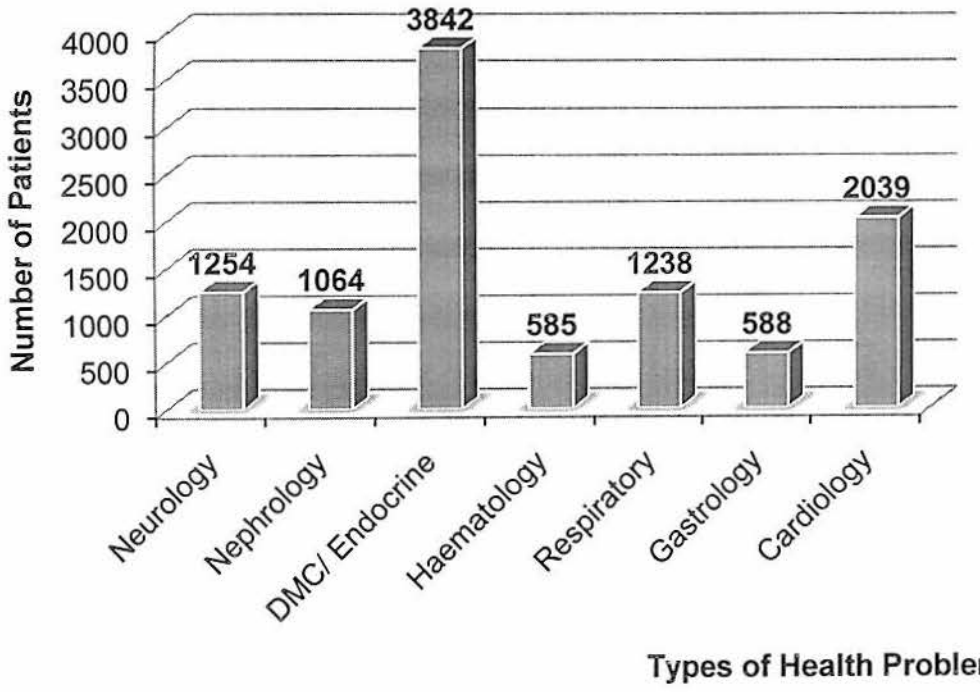

Figure 1.1: Number of Patients in Klinik Pakar Perubatan (KPP) HUSM according to Types of Health Problem from January 2009 to May 2009.

(Diabetic Centre KPP, 2010)

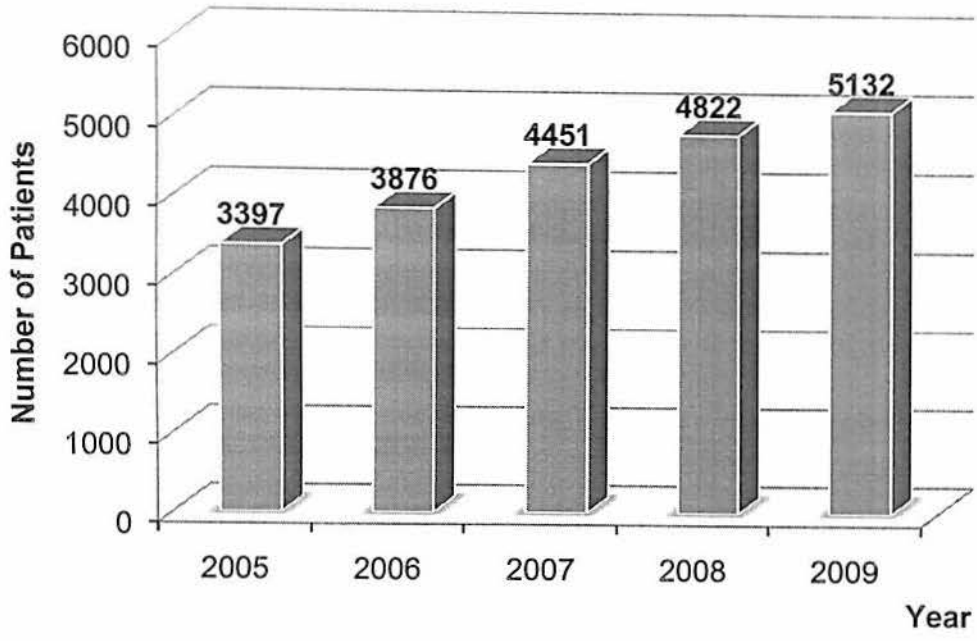

Figure 1.2: Number of Type 2 Diabetes Mellitus (outpatient) in KPP HUSM from 2005 to 2009

(Medical Record HUSM, 2010)

Study carried out by Mafauzy (2005) in 49 private clinics throughout peninsular Malaysia found that 3.5% of the patients were on insulin either alone or in combination with oral agents. On the other hands, study done by Mustaffa, Wan Mohamad, Chan, Rokiah, Mafauzy & Kuman (1998) in public hospitals in Malaysia shown higher percentage of diabetic patients on insulin either alone or in combination with oral agents (16.2%). In year 2006, the prevalence of insulin used among diabetic patients in public hospitals in Malaysia is 28.1%. Of these, 12.7% of the patients were on insulin alone and 14.4% were on combination of insulin and OHAs (Mafauzy, 2006). The lower percentage of patients on insulin in private clinics setting could be due to the fact that the patients is refer to hospitals to receive insulin treatment where the specialist is available (Mafauzy, 2005). In Kelantan, study done by Eid et al (2003) among type 2 diabetes mellitus outpatients

attending the diabetes clinic, HUSM found that only 8.5% were on insulin either alone or in combination with OHAs.

Diabetes patients accounted 39% of direct medical costs, have longer hospital stay and direct in-patient costs and have more readmissions than non-diabetic patients (Carral, Aguilar, Olveira, Mangas, Domenech & Torres, 2003). 14% to 23% of the total numbers of type 2 diabetes mellitus inpatients in HUSM from 2005 to 2009 (Figure 1.3) are hospitalize due to the diabetes related complications such as diabetic retinopathy, diabetic foot (gangrene), diabetic nephropathy and with multiple complications (Medical Record HUSM, 2010). Hospitalization due to developing of diabetes-related complications implied that diabetes was not well controlled and managed. Hence optimal diabetes care is important in diabetes management to prevent the risk of developing diabetes-related complications, indirectly decrease disability, increase life expectancy and decrease health care cost.

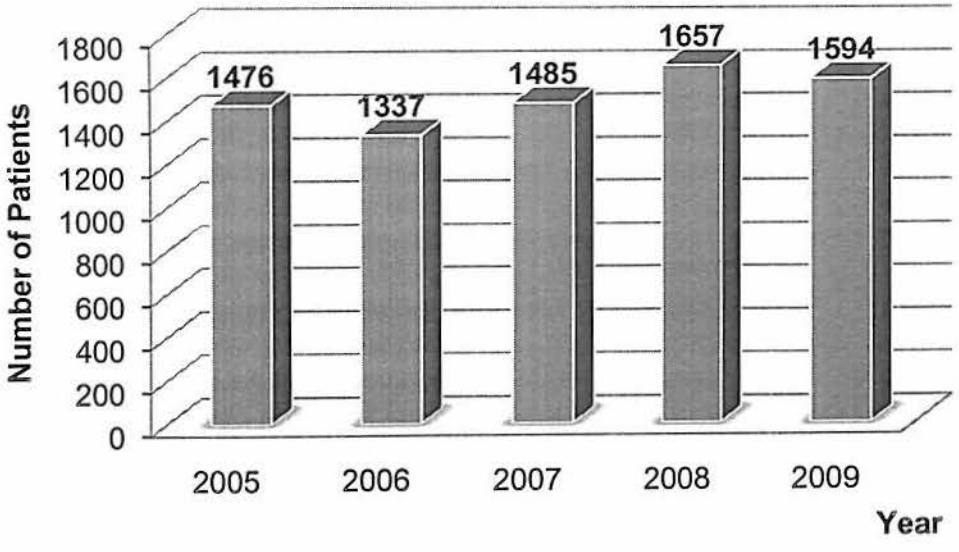

Figure 1.3: Number of Type 2 Diabetes Mellitus (inpatient) HUSM from 2005 to 2009

(Medical Record HUSM, 2010)

According to Simmon (2001) there are many factors which act as barriers for optimal diabetes care. One of the barriers is low diabetes knowledge (Al-haddad, 2008). In another study done by Wint, Duff, Anderson, Connor, Bailey & Wright (2006) showed cultural belief and lack of education are the factors which contribute to poor control of diabetes mellitus. 80% respondents demonstrated inadequate knowledge of diabetes mellitus. For instance, many were unable to define the word "diabetes" and some believed that diabetes could be cured (18%). Majority of the respondents (71%) reported the need for more education.

In Egypt, Kamel et al (1999) found that 90.0% of the diabetics patients had poor knowledge about the disease, 83.7% had poor knowledge about the complications associated with diabetes and 96.3% had poor awareness of how to control the disease. In Malaysia, study done by Tan (2009) found that sixty-seven subjects (53%) scored below 50% in their diabetes-related knowledge. Only 6%, 61%, 64%, 34% and 79% of them achieved above 50% scores in diet, medication, exercise, self-monitoring blood glucose (SMBG) and diabetes complication knowledge assessment respectively. The poor level of knowledge that diabetics have about their disease and management suggested a discrepancy between diabetes education and self-care practice (Tan, 2009) and the need of health care providers to be trained in the areas of information, education and communication (Kamel et al, 1999).

Knowledge of the disease and its complications increases self-care adherence behaviours which plays a critical role for successful diabetes management (Ranjita & Julie, 2008) in which the patient works to maintain and improve their health and as a preventive measure to avoid or delay complications (Toljamo & Hentinen, 2001). However, most people with diabetes do not have the advantage of having continuous assistance and supervision from health professionals as they spend more than 95% of their life at home to manage self-care (Catherine, 2007). Diabetes self-care management: dietary intake,

activity level, medication adherence and SMBG are all self-initiated behaviors (Loring & Gray, 2006).The purpose of this study, therefore, was to determine whether type 2 diabetes mellitus with self-injecting insulin therapy have sufficient knowledge to manage their disease and assume responsibility and to perform most of their diabetes self-care management.

Since 1998, the Ministry of Health, has taken major steps to improve the management and care of diabetic patients in its clinics and hospitals including the setting up of Diabetes Resource Centres in many hospitals, training of more diabetic nurse educators, and implementing standardized follow-up protocols (Tan & Magarey, 2008). In Diabetic Centre, KPP, HUSM variety of interventions also had been carried out in helping diabetic patients in achieving optimal control of diabetes throughout these years. Activities that carry out by diabetic unit in HUSM generally divided into six main components, these include: personal teaching or education, monthly diabetes talk, aerobic three times in a week, proper dietary intake, annual public forum and follow up visiting (Maznah, 2006).

1.2.1 Theoretical and Conceptual

Conceptual framework in this study is adapted from the study of perception of seriousness and preventive health actions of patients with type 2 diabetes by Wright et al (2009) using Theoretical framework of Pender, Murdaugh & Parsons (2002) Health Belief Model. This model outlined the compliance/ adherence behaviors of an individual toward their treatment is influenced by individual perceptions of susceptibility, perceptions of severity and perceptions of benefits over perceptions of barriers toward their disease/ condition. These perceptions are then influenced by several modifying factors such as demographic characteristics, psychological factors, and structural variables. In this study, researcher will be studying on socio-demographic characteristics and structural variables (knowledge) to form the conceptual framework of this study.

1.3 Objectives of the Study

1.3.1 General Objective: To examine knowledge and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

1.3.2 Specific Objectives:

1.3.2.1 To identify the level of knowledge among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

1.3.2.2 To identify the score of self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

1.3.2.3 To determine the association between knowledge and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

1.3.2.4 To determine the association between socio-demographic factors and knowledge among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

1.4 Research Questions

1.4.1 What is the level of knowledge among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM?

1.4.2 What is the level of self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM?

1.4.3 What is the association between socio-demographic factors and knowledge level among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM?

1.4.4 Is there any association between knowledge and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM?

1.5 Research Hypothesis

1.5.1 Null Hypothesis, H_O: There is no significant association between socio-demographic factors and knowledge level among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

Alternative Hypothesis, H_A: There is a significant association between socio-demographic factors and knowledge level among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

1.5.2 Null Hypothesis, H_O: There is no significant association between knowledge level and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

Alternative Hypothesis, H_A: There is a significant association between knowledge level and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin at KPP, HUSM.

1.6 Definition of Terms (Conceptual and Operational)

1.6.1 Knowledge

Knowledge among type 2 diabetes mellitus patients in this study refers to the (1) general diabetes knowledge such as; blood glucose testing knowledge, foot care knowledge, and complications of diabetes knowledge, (2) insulin and its management knowledge such as; knowledge in insulin reaction time, knowledge in adjusting insulin with diet and knowledge in adjusting insulin with exercise.

In this study, knowledge among type 2 diabetes mellitus patients with self-injecting insulin will be measure with Brief Diabetes Knowledge Test (Brief DKT). Patient have good knowledge if the total mean test score greater than 17, moderate knowledge if the total mean test score is in between 11 to 17 and poor knowledge if the total mean test score is

less than 11. For general diabetes knowledge, patient have good knowledge if the mean test score greater than 11, moderate knowledge if the mean test score is in between 7 to 11 and poor knowledge if the mean test score is less than 7. Lastly for insulin knowledge, patient have good knowledge if the mean test score greater than 7, moderate knowledge if the mean test score is in between 5 to 7 and poor knowledge if the mean test score is less than 5 (Al-Adsani, Moussa, Al-Jasem, Abdella & Al-Hamad, 2009).

1.6.2 Diabetes self-care

Diabetes self-care increase patient's skills and confidence in managing their health problems, hence the term 'self-care' and 'self-management' are used interchangeably. Diabetes self-care or self-management behavior is an active, cognitive process in which individuals with diabetes adhere to treatment regimens, exercise, preventive measures to avoid or delay complications and to improve general well-being (Tan, 2009).

Adherences in this study therefore refer to the frequency in days of respondents in performing and follow the recommended self-care such as how many days does the respondents followed recommended eating plan, how often does the respondents test their blood sugar level and how many days does the respondents take their recommended medications. Patient diabetes self-care adherence in this study will be measure with the Summary of Diabetes Self-Care Activities (SDSCA), that measure the patient's self-reported frequency with which a patient followed and completing recommended diabetes self-care activities over past 7 days in four domains: diet, exercise, SMBG and medication (Dickerson et al, 2005).

1.6.3 Type 2 Diabetes Mellitus

Type-2 diabetes mellitus is also known as adult-onset diabetes, is a non-insulin-dependant diabetes mellitus results when the insulin secretion from beta-cell of pancreas is insufficient to maintain glucose homeostasis secondary to dysfunction of the beta-cell and leads to high glucose in the blood (hyperglycemia). Diet, exercise, OHAs and/ or insulin may require in maintaining glycemic control in type 2 diabetes mellitus (Lemone & Burke, 2008).

In this study, type 2 diabetes mellitus refer to the individual which was diagnosed as type 2 diabetes mellitus with the current treatment mode of self-injecting insulin.

1.6.4 Self-injecting Insulin

In this study, self-injecting insulin refer to the type 2 diabetes mellitus patients which uses self-administered insulin by pen or using syringe and vial as one of their diabetes treatment plan.

1.7 Significance of Study

People with diabetes must acquire the knowledge and skills through diabetes education to provide daily self-care in diabetes management which involves maintenance of healthy living, recognition and management of diabetes problems when they arise and taking preventive measures (John, Catherine & Edward, 2004). Improving patients' knowledge of diabetes through educational efforts could lead patients to take an active role in obtaining necessary preventive care (Lai, Yahaya, Noorizan, Ahmed & Rozina, 2007).

Like some other chronic diseases, diabetes requires the integration of a daily regimen of self-care activities to achieve desired clinical outcomes. Self-care in diabetes management and clinical outcomes are constantly influenced by many factors. It is important for health professionals to understand the factors that influence the self-care behaviors in order to ensure people with diabetes able and successful to carry out the complex management (Tan, 2009).

Diabetes adherence is not an easy task since the chronic nature of the disease, the daily decisions patients need to take, the difficulty of diabetes management and the serious complications of the disease (Al-Haddad, 2008). Patients must be able to plan for their objectives and take daily effective decisions that meet their values and lifestyles to manage their diabetes successfully. Therefore, health professionals' responsibility is to help patients to take decisions that meet with their goals and overcome barriers through professional advices, education and support (Funnell & Anderson, 2004).

Bruce, Davis, Cull & Davis (2003) also concluded that diabetes education programmes are important sources of improving knowledge, giving advices and provide information about diabetes in patient with type 2 diabetes. Unfortunately, Ismail et al (2000) found that there are very few diabetes centres or diabetes specialists in Malaysia. The

facilities for specialized diabetes care vary between States. The number of trained personnel for diabetes is also concentrated in a few teaching hospitals.

Thus, formulation of this study is to provide awareness among health care professionals, especially nurses work in diabetes field on the important of diabetes education programmes in increasing diabetic patients knowledge on it disease and also its management. Researcher hopes to determine the level of knowledge and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin in HUSM. By assessing the degree of patients' knowledge level and self-care adherence status, it provides the baseline to the factors in optimal diabetes management, so that suitable interventions can be made. Apart from that, it provides the status of diabetes care and current education programme which is important in providing baseline to evaluate and improve the quality of diabetes management. Indirectly it can reduce the risk of developing diabetes-related complications and produce good clinical outcomes among type 2 diabetes mellitus patients.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the context and focus of the knowledge and self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin are presented in detail. These are: an overview of diabetes mellitus, knowledge among type 2 diabetes mellitus patients, measurements of knowledge level among type 2 diabetes mellitus patients with self-injecting insulin, measurements of self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin and theoretical and conceptual framework.

In overview of diabetes mellitus, literature review will be made on 3 parts that is (1) definition of diabetes mellitus, classifications of diabetes mellitus; (2) epidemiology, etiology, diagnostic and clinical manifestation of diabetes mellitus and (3) complications and management of diabetes mellitus.

In knowledge among type 2 diabetes mellitus patients, literature review will be made on association between knowledge and socio-demographic factors, and the association between knowledge and self-care adherence.

In measurement of knowledge level among type 2 diabetes mellitus patients with self-injecting insulin, literature review will be made on comparison between different research using the same instrument (Brief DKT) and more information about measurement that will be use in this study.

In measurement of self-care adherence among type 2 diabetes mellitus patients with self-injecting insulin, literature review will be made on comparison between different research using the same instrument (SDSCA), and more information about measurement that will be use in this study.

2.2 Definition and Classifications of Diabetes Mellitus

Glucose or simply known as blood sugar is the main source of energy for the cells of our body, and it's carried to each cell through the blood stream. Diabetes mellitus is "a group of metabolic diseases characterized by high glucose in the blood (hyperglycemia) resulting from the impairment of pancreas in the secretion of insulin, the action of insulin, or both" (Lemone & Burke, 2008).

There are four major types of DM. Type 1 diabetes, also known as juvenile-onset diabetes or insulin-dependent diabetes mellitus (IDDM). It is an autoimmune disease in which the body does not produce any insulin .Type 2 diabetes, an adult-onset diabetes or non insulin-dependent diabetes mellitus (NIDDM) result's from defect in insulin secretion along with insulin resistance (Eid et al, 2003). The other major types are gestational diabetes, diagnosed during pregnancy and other specific types of diabetes that may occur as a result of genetic defects in beta-cell function, diseases of the pancreas, or disease induced by drugs (Black & Jane, 2008).

2.3 Epidemiology, Etiology, Diagnostic and Clinical Manifestation of Diabetes Mellitus

Type 2 diabetes affected approximately 135 million of individuals worldwide in the year 1995 (Mafauzy, 2006); in the year 2000, it was 171 million and is estimated to be 366 million by the year 2030 (Lai et al, 2007). Diabetes is the fifth leading cause of death by disease in United States (US) and it's estimated that 20.8 million people was affected with

diabetes in October 2005 with an increase of 2.8 million from 2003. In every 24 hours, 4100 new diabetes cases are diagnosed in the US, at least 810 people die, 230 undergo amputation, 120 learn they need kidney dialysis or transplant, and 55 go blind (Al-Haddad, 2008).

In Malaysia, survey done by National Health and Morbidity involved subjects above 30 years showed that the prevalence of diabetes has increased steadily from 6.3% in 1986 to 8.3% in 1996 and 14.9% in 2006. Unlike in the west, where older populations are most affected, 95% of Malaysian diabetic population is type 2 diabetes mellitus and are diagnosed at a younger age (Ismail et al, 2000). Younger age group patients had significantly higher mean blood glucose than elderly patients which may lead to an increase in mortality and morbidity for this group (Eid et al, 2003).

The increase of prevalence of type 2 diabetes mellitus are mainly due to changes in lifestyle, increasing prevalence of obesity, and aging of populations. Type 2 diabetes is results from the interaction between genetic predispositions and modifiable risk factors such as obesity and physical inactivity are the main non-genetic determinants of diabetes (Sanjay et al, 2010). Catherine (2007) also stated that both Type 1 and Type 2 diabetes is originate from a milieu of lifestyle and genetic factors. Nearly 30% of the population at the time of the National Health and Morbidity Survey 1997 were obese or overweight and less than 12% of the population aged 18 years or older had "adequate" physical exercise. In a study in Kelantan, 38.4% of diabetics were either obese or overweight (Mafauzy, 2006). Obesity leads to insulin resistance and hence complicates the control of type 2 diabetes (Azimah, Radzniwam, Zuhra & Khairani, 2010).

Diabetes Mellitus is diagnosed when fasting plasma venous glucose is more or equal to 7.0 mmol/L and random venous plasma venous glucose is more or equal to 11.1mmol/L. (Clinical Practice Guidelines, 2009). A post prandial blood glucose level can also been drawn and used to diagnose diabetes mellitus. Postprandial blood glucose

samples are drawn 2 hours after a standard meal and reflect the efficiency of insulin-mediated glucose uptake by peripheral tissues. Normally, blood glucose level should return to fasting levels within 2 hours (Black & Jane, 2008). A 2 hour postprandial glucose level greater than 11.1 mmol/L during an oral glucose tolerance test (OGTT) is confirmation for a diagnosis of diabetes mellitus (Clinical Practice Guidelines, 2009). Diabetes could be symptomatic like polyuria, weight loss, thirst, polydipsia, nocturia, malaise/fatigue and altered vision while it could be asymptomatic. Being symptomatic or asymptomatic depends on the severity of the metabolic abnormalities (Al-haddad, 2008).

2.4 Complications and Management of Diabetes Mellitus

Optimal control of blood glucose is important in diabetes management to prevent and reduces the incidence of macrovascular and microvascular complications disorders in both type 1 and type 2 diabetes (Salmiah, 2009) which has a significant impact on the patient's quality of life due to the increase of morbidity and mortality ratios (Wint et al, 2006). High risk of microvascular disorders, such as retinopathy and kidney failure are results from poorly managed Type 2 diabetes. The United Kingdom Prospective Diabetes Study (UKPDS) demonstrated that tight glycemic control, as measured by HbA1c, was associated with a significant decrease in diabetes mortality and morbidity. Overall, for every 1% decrease in HbA1c level, reflecting a normalizing of mean blood glucose, an associated 35% decrease in risk for diabetes complications was reported (Catherine, 2007).

In Kelantan, study done by Eid et al (2003) found that out of 211 type 2 diabetes patients, 153 (73%) of type 2 diabetes patients has out of normal range for HbA1c. New Straits Times Press reported that in 2005, Malaysia ranked as number one in kidney failure secondary to diabetes. With 43 of Malaysians suffering from end-stage renal failure in 1980, these figure increases to 12,000 in 2005 (Salmiah, 2009). These implied that

diabetes was not well controlled in Malaysia. Further, poor glycaemic control is associated with increased costs of medical care (Ismail et al, 2000) and risk factor for premature mortality, disability, and loss of productivity (Lai et al, 2007) for patients with diabetes.

Management for diabetes mellitus includes diet therapy, physical activities, SMBG and the use of OHAs and insulin to restore and maintain the blood glucose level to as near normal as possible (Catherine, 2007). Initial as well as ongoing health education is important in helping the patient manage this chronic condition. Interventions is individualized to the patient's goals, age, lifestyle, nutritional needs, activity level, occupation, type of diabetes mellitus, and ability to independently perform the skills required by the management plan (Black & Jane, 2008).

2.5 Knowledge of type 2 Diabetes Mellitus Patients with Self-Injecting Insulin

Disease knowledge has been shown to positively influence diabetes treatment plan adherence and health status (Catherine, 2007). Effective diabetes self-management with optimal glycaemic control is to be achieved through adherence to lifestyle modification recommendations and pharmacologic therapy. In pharmacologic therapy, patients with type 2 diabetes mellitus are usually treated initially with OHAs, but as the disease progresses with poor glycemic control, patient required exogenous insulin to maintain glycemic control (Bethel & Feinglos, 2005). However, better glycemic control was obtained when insulin was not used in Malaysian Population (Ismail et al, 2000).

In a study by Cramer (2004), adherence to insulin therapy among patients with type 2 diabetes was found to be only 62% to 64%. This is probably due to the used of self-injecting insulin is both relatively complex and invasive (Davis, Clifford & Davis, 2001). Marrero (2007) stated that, almost half of the diabetics patients believed that insulin therapy would restrict their lives and that they were not capable of managing the demands of the regimen. Insulin therapy can be overwhelming for patients when they are faced with

the prospect of determining dosages, handling syringes and vials, administering the medication at specific times, and monitoring blood glucose levels.

The ability of individuals with diabetes to understand and manage their disease is one of the most important components of successful long-term therapy. However, several studies have determined that many individuals with diabetes do not possess the knowledge and skills necessary for adequate self-management and most of the patient hospitalizations for uncontrolled diabetes are often attributed to deficiencies in these area (Martinez et al, 1999).

Hence, diabetics with self-injecting insulin have to be educated on a considerable amount of new information and learn many new skills such as to optimize glucose levels by adjusting insulin dose, correcting diet, and increasing physical activity. Educational interventions have been shown to increase patients' knowledge of diabetes and self-care activities (Persell et al, 2004). Misperceptions on insulin therapy may delay therapeutic intervention, increase symptom severity and microvascular complications (Spellman, 2007). Regular assessment and reinforcement of patients' skills and knowledge are necessary, any misconception has to be corrected. This indirectly will ensure the success of the self care management of diabetics (Azimah et al, 2010).

In India almost 66.7% of the diabetic patients received diabetic information from health-care professionals (Kamel et al, 1999). This is of no exception in Malaysia, where 54.17% diabetic patients received diabetic information from health-care professionals such as medical officers, pharmacists and nurses (Lai et al, 2007). Access to a nurse diabetes educator was a major independent determinant of diabetes clinical outcomes, knowledge and capable of diabetes self-management on diabetic patients (Ismail et al, 2000). Thus, data which will gain from this study is mainly to improve nurses in diabetes education.

Study done by Bruce et al (2003), involving sample of type 2 patients from an urban Australian community setting, provides evidence that formal diabetes education, as

well as dietetic advice and instruction on SMBG, contributes significantly to patient knowledge about the condition and its management. An increased diabetes-related knowledge is associated with better adherence and adjustment to any diabetes treatment plan (Lerman, 2005). Hence, nurses are important to overcome the knowledge deficit of type 2 diabetes mellitus patients with self-injecting insulin toward better adherence to prescribed treatment plan.

2.5.1 Association between Knowledge and Socio-Demographic Characteristics

Women demonstrated a higher level of knowledge than men in the study of Wint et al (2006). On the other hands, although not statistically significant, there was a trend for higher diabetes knowledge score found for males compared to female subjects by Tan, 2009. However there was no association between knowledge and gender found in the study of Lai et al (2007) & Azimah et al (2010).

Knowledge scores were found to be inversely associated with age, and positively associated with time since diagnosis (duration of diabetes) and respondents' level of education (Wint et al, 2006). Medium inverse relationship between the age of subjects and their level of diabetes knowledge indicating younger subjects knew more about diabetes than older subjects. Statistically significant difference showed that subjects at 40 years of age and younger had a mean score of 10.64, when compared to subjects more than 60 years old with a mean score of 6.31 (Tan, 2009).

The positive correlations between knowledge scores, duration of illness since diagnosis and educational level suggest that those with a higher level of education were able to understand better their disease and that their knowledge accumulated over the span of their illness (Wint et al, 2006). Subjects with highest educational level had the highest level of awareness on diabetes mellitus (66.7%), followed by those with secondary

education (27.8%) and poor educational background (5.6%) (Ayiesah, Nur Hidayah, & Nor Azura, 2010). There was also a statistically significant relationship between the level of education and diabetes knowledge of subject in the study done by Tan & Magarey (2008). But, there were no significant associations found between the total knowledge score and the patients' level of education, and duration of illness (Azimah et al, 2010).

In the study of level and determinants of diabetes knowledge in Kuwait adults with type 2 diabetes, subjects who had limited family income achieved statistically significantly lower overall diabetes knowledge, general diabetes knowledge and insulin knowledge scores (Al-Adsani et al, 2009). Income was the most significant predictor of knowledge of the disease. There were significant differences of overall diabetes knowledge score associated with income level. Mean of total knowledge score were lower that is 24.67 in subjects which income level less than RM1000 when compared with the mean total knowledge score in subjects which income level more than RM3000 that is 28.00.

There was no significant difference associated with race, or marital status found (Lai et al, 2007). There were also no significant association between the total knowledge score and the patients' race found in the study by Azimah et al (2010). On the other hands, there was a significant association between total knowledge score with duration of injected insulin and frequency of insulin injection in one day found in the study by Al-Adsani et al (2009).

2.5.2 Association between Knowledge and Self-Care Adherence

Behavioral changes are fundamental to the treatment of chronic illness. Lack of adherence to treatment plan is a common problem and many patients drop out of care prematurely (Lerman, 2005). Self-care account for 98% of diabetes care and is crucial for diabetic patients, because most of diabetes care is carried out by patients and their families. Adherence to self-care prevent the complications associated with diabetes, to

maintain or achieve a good quality of life and moreover, to achieve subjective well-being and a sense of control over diabetes (Toljamo & Hentinen, 2001). Hence adherence to self-care is vital important in overall diabetes treatment management.

Although adherence to a self-management regimen improves quality of life and is recommended by the American Diabetes Association (2003), it involves complex changes in lifestyle, and many diabetic patients struggle with adherence behaviors. Analysis of self-care behaviors in the study of predictors of quality of life among adults with type 2 diabetes mellitus showed that adherence to diet and physical activity were perceived as the most difficult, and that medication compliance were perceived as easy to perform. Participants reported that if perceived barriers are at the minimum by their disease, then they will be perceived less difficulty with adherence to medication and to self-care schedule (Ranjita & Julie, 2008).

Perceived barriers of an individual may influence by modifying factors such as knowledge (Pender et al, 2002). Study done by Persell et al (2004) found that a one-point increase in the knowledge scale was associated with following any diabetes-specific diet, exercising at least three times per week and SMBG at least several times per week. On the other hands, Lerman (2005) also found out that, the non-practice of SMBG is more common in patients with lower diabetes-related knowledge and increased reported barriers for diabetes care. However, there was no significant relationship between diabetes knowledge of subject and physical activity, medication intake, SMBG and dietary intake were found in the study done by Tan (2009). No significant linear association was also found between the overall knowledge level and the behavior related diabetes management in the study done by Kamel et al (1999).