SELF-MANAGEMENT FOR BLOOD SUGAR CONTROL AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS

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MRS. PUSSADEE SRATHONG : SELF-MANAGEMENT FOR BLOOD SUGAR CONTROL AMONG PATIENTS WITH WITH TYPE 2 DIABETES MELLITUS**. ADVISOR :** ASST. PROF. AREEWAN OUMTANEE, Ph.D.,RN.**, CO-ADVISOR :** RUNGRAWEE NAVICHARERN, Ph.D.,M.N.S.,RN., 115 pp.

The purpose of this study was to describe self-management for controlling blood sugar in patients with type 2 diabetes mellitus. Participants were all able to control their blood sugar. Their HbA1c was less than 7 for at least 1 year before becoming research participants. Eighteen patients with type2 diabetes were selected to this study. Data were collected during in-depth interviews between August 15, 2011 to December 6, 2011. Each interview lasted 30 minutes for each subject. In-depth interviews allowed the researcher to access to a wide variety of ideas, views, and experiences on diabetes self-management. Qualitative data were analyzed by using a content analysis.

Results showed that self-management for blood sugar control among patients with type 2 diabetes mellitus. consisted of 7 categories: (1) changing behavior from high to low calorie diet, (2) increasing physical activity, (3) coping with stress, (4) keeping doctor's appointments, (5) taking medicine regularly, (6) having self regulation and (7) Receiving social support from family and others. All participants began the self-management by setting limitations on their food both in quantity and types of food. Then they began to exercise in their own various ways. They tried to keep their stress under control. As for appointments and medication, they followed the doctor's order strictly because they believed that this would prevent complications.

Recommendations: Diabetic health care team should care for patients individually in order to determine the need of each patient and to prescribe proper self-management.

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CHAPTER I

INTRODUCTION

BACKGROUND

Type 2 diabetes mellitus (DM) is a major chronic disease and public health issue now facing a great number of countries in all regions of the world (World Health Organization, 2012). The World Health Organization estimated that in 2011, 347 million people worldwide had type 2 DM and predicted that this number would more than double by the year 2030 (WHO, 2012). Moreover,the number of adults with type 2 DM in developing countries is expected to increase by 70 percent while those in the developed countries will increase by 20 percent between 2010 and 2030 (Shaw et al., 2010).

The WHO (2009a) indicates that ninety percent of people with diabetes around the world suffer with type 2 DM whose prevalence continues to increase with ever greater numbers of patients at risk of serious diabetes-related complications. Type 2 DM doubles the risk of myocardial infarction and quadruples the risk of suffering a stroke. In addition, it is a leading cause of blindness, limb amputation and kidney failure (WHO, 2009b) as well as heart disease and stroke (National Diabetes Information Clearinghouse, 2011).

Diabetes leads to diabetic complications and decreased mobility. Cubbon et al. (2007) suggest that the risk of serious complications increases with the length of time blood glucose remains uncontrolled (UK Prospective Diabetes Study, 1995). Jonsson (2002) reports that type 2 DM has become one of the major causes of premature illness and death in most countries in the Pacific and the Middle East. Type 2 DM is also a major cause of death around the world (Centers for Disease Control and Prevention, 2011) with estimated global healthcare expenditures for treatment and prevention of at least 376 billion US dollars (USD) in 2010. By 2030, this number is projected to exceed some 490 billion USD. These costs are mainly due to treatment of concomitant cardiovascular disease(CVD) (National Center for Chronic Disease, 2011).

As in the rest of the world, the prevalence of type 2 DM has increased rapidly in Thailand. In 1997 approximately 4.4 percent of Thais suffered from type 2 DM, while in 2009 that percentage rose to 6.9 (Aekplakorn, 2011; Aekplakorn, Klafter, et al., 2007; Bureau of Policy and Strategy, Ministry of Public Health, 2009). Aekplakorn (2011) reports that data from a national physical examination conducted from 2008 to 2009 show 6.9 % of Thais aged 15 and over have diabetes while a further 10.7 % are pre-diabetic. Given that these patients have inadequate control of the disease and other risks it is clear that there is a need for a system to improve care for diabetic patients.

Thus, many complications in people with type 2 DM suffer for example hypo-hyperglycemia, atherosclerotic diseases, diabetic retinopathy, foot ulcers and nephropathy (Johnstone et al.,1993; ADA (2008). Moreover, patients with type 2 DM suffered not only physical but also psychological and social problems (Anderson, Grigsby, Freedland, et.al.,2002); however many suffer emotionally without receiving basic psychosocial support (ADA, 2008). In additional there are increasingly pay medical expenses and hospitalization for the patient and their families (Hixenbaugh and Warren, 1999; National Center for Chronic Disease, 2011).

To prevent diabetic complications, the patatient with type 2 DM must control their blood sugar and having diabetes self-management as the goal of the diabeties self-management. Hixenbaugh and Warren (1999) point out that type 2 DM patients must make psychological, social, and physical adjustments in lifestyle and thus, effective self-management in these patients could lead to more positive health outcomes.

Self-management is the foundation of diabetes management. Kate et al. (2001) defined self-management as processes that involve patients taking responsibility and making decisions about their own health. According to Norris, et al. (2002), self-management for diabetics is defined as behaviors that people with diabetes perform to control their blood sugar level. Effective self-management is essential for people with diabetes to live well as it enables them to make informed decisions and to assume responsibility for the day-to-day management of their disease.

Moreover, Thoman (2009) described some of the processes individuals engage in to manage their disease. The diagnosis of type 2 diabetes and subsequent self-management skills and training (DSMT) are considered an evolving process, referred to as chronic, complex, and having no end point. The psychosocial process is considered an "Evolving Diabetes Self" which patients with type 2 DM use in dealing with and responding to their psychosocial problems.

Several studies in patients with type 2 diabetes in Thailand found that Panlamlert (2009) compared HbA1cand blood pressure level of diabetic older people with high risk diabetic retinopathy in the experimental group and also compared the experimental group with that of control group. Rudkhong (2006) conducted quasi-experimental research and compared HbA1c and quality of life of elderly people with diabetes in the experimental group and also compared control group with that of experimental group at diabetic clinic at Khuankanun, Thailand. Navicharern (2009) examined the effects of multifaced nurse coaching intervention on diabetic complications and satisfactions in people with type 2 DM using experimental and control groups. Diabetes self-management can reduce the causes and severity of complications, as well as the cost of care and standardize practices which can control blood sugar. DSM thus improves quality of life and contributes to the prevention of complications. Althouth many program were conduct the result but for the longterm sustainability did not found.

Moreover, in a recent pilot study at Chulalongkorn hospital in Bangkok, the researcher interviewed 10 patients with type 2 DM and found that some had successfully controlled their blood sugar level while some had not. It was found that while most type 2 DM patients with treated at one of tertiary hospital were happy and took good care of themselves, the latter did not follow the instructions of doctors or nurses and had no support network. Thus, the researcher began a pilot study at this hospital starting from the research question: "How do patients with type 2 DM manage their diabetes in daily life?" The subjects were 10 type 2 DM patients selected by purposive sampling, who were being treated at Chulalongkorn Hospital in Bangkok. The research tool used was in-depth interview lasting 30 - 40 minutes, conducted at a meeting room near the diabetes mellitus out-patient department (OPD). The data were taped and transcribed and analyzed using content analysis. The results of the pilot

study were as follows. The patients stated that, despite suffering with the disease, they lived happily for two main reasons: 1) Physical Care: patients monitored and maintained their health behaviors correctly. They followed appropriate diets for diabetics and did their exercises as prescribed for 30 minutes a day; 2) Mental Care: patients were able to manage their stress. They did this through networks of friends they could talk with and ask for advice and who supported and encouraged them. Patients joined and have maintained their participation in groups for recreation and sharing.

To explore diabetes self-management in patients with DM. Qualitative research was required to describe how type 2 DM patients can learn to manage their health and the disease appropriately in order to live independently and effectively. The knowledge of the way these patients, in the context of a selected hospital in Ratchaburi Province manage their daily lives to control their blood sugar may be used to create an understanding that could be applied on a larger scale within the healthcare framework. Patients need self-management strategies such as diet control, regular exercise, medication regimens, and foot care in order to prevent complications and live with their disease.

The above results had inspired the researcher to go further, so the research results can be used for type 2 DM patients all over the country. Thus, the researcher had done a qualitative study in self-management of Thai adult patients with type 2 DM in a Thai context which could be used to develop guidelines for other Thai patients to take care of and manage themselves appropriately. As will be shown in the literature review, no study had been conducted to identify self-management processes from perspectives of Thai adult patients with diabetes mellitus being treated at a general hospital in Thailand. Thus, this study would provide valuable insights by describing how type 2 DM patients could control their blood sugar.

Purpose of the Study

The purpose of the study was to describe self-management to assist patients with type 2 diabetes to control their blood sugar.

Research Questions

How can patients type 2 diabetes mellitus with control their blood sugar?

Definitions

Patients with Type 2Diabetes Mellitus (Type 2 DM) refered to individuals who have been diagnosed with type 2 diabetes.

Diabetes self-management (DSM) refered to the strategies used by patients with type 2 diabetes, whose HbA1c is less than 7 or whose fasting blood sugar is 70-120 mg/dl, to control their blood sugar. They consist of dietary control, regular exercise, medication compliance and stress management.

Blood sugar control refered to patients with HbA1c of less than 7 or a fasting blood sugar of 70-120 mg/dl which has been stable for more than 1 year.

CHAPTER II

LITERATURE REVIEW

This chapter presents the main areas of literature reviewed to examine studies and background relevant to the aim of describing self-management methods of patients with type 2 diabetes to control blood sugar.

1. Type 2 Diabetes mellitus

- 1.1 Incidence of type 2 DM
- 1.2 Risk factors for type 2 DM
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2. Diabetes self-management

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1. Type 2 diabetes mellitus

Type 2 DM is a chronic disease marked by high blood sugar levels in the blood stream (Misa et al., 2011). Type 2 DM is actually a group of metabolic disorders characterized by a chronic hyperglycemic condition resulting from impairment of pancreatic β-cell function which notably, progresses over time. The main pathophysiological features of type 2 diabetes, which represents a great majority of diabetic cases, are impaired insulin secretion and increased insulin resistance (Weyer, Bretschneider&Vasier, 1999).

Type 2 DM is caused by a combination of genetic factors related to impaired insulin secretion and insulin resistance as well as environmental factors such as obesity, overeating, lack of exercise, and stress, and aging (Combell, 1993). It is typically a multifactorial disease involving multiple genes and environmental factors to varying extents. A fact considered important in pathogenesis is that lower insulin secretory capacity after sugar loading suggests smaller potential for pancreatic β-cell function in the people who may develop diabetes (WHO, 2011).

1.1 Incidence of Type 2 DM

The World Health Organization estimated that in 2011 there were 347 million people worldwide who have type2 diabetes and predicted that this number would more than double by the year 2030 (WHO, 2012). The number of adults with type 2 diabetes in developing countries is expected to increase by 70 percent and that in developed countries by 20 percent between 2010 and 2030 (Shaw et al., 2010). Similarly, in 2000, the estimated prevalence of diabetes in Thai people was 9.6% of which 95% have type 2 DM. 50% of people who have Type 2 DM have been diagnosed while the other 50% are unaware of the disease and remain undiagnosed (Aekplakorn et al., 2003).

1.2 Risk factors for Type 2 DM

Risk factors are important in those who may develop diabetes. Several risk factors exist including genetics, gender, increasing age, diabetes duration, diabetes

medication, knowledge of diabetes, a family history of diabetes, obesity, hypertension, race and ethnic background, and a history of gestational diabetes.

1.2.1 Genetics

Type 2 DM develops in families due to the inheritance of certain genes. The link to genetics seems stronger in type 2 than in type 1 diabetes. If a person with Type 2 DM is an identical twin, there is a 60 to 75 percent chance that the other twin will develop diabetes (American Association of Clinical Endocrinologists, 2007; Malik,2013).

1.2.2 Gender

Most diabetics are female (Siriwattanaponkul et al, 2007; Akepalakorn, 2010) who tend not to exercise and have higher levels of abdominal adiposity than males (Narenpitak, 2008).

1.2.3 Increasing age

Increased age is a factor associated with diabetic problems including the duration of diabetes. People who have had diabetes for a long time are at greater risk than those who have had it for less time (Bowes, 2003). Further, the ADA (2008) reports that people 45 years and over in Thailand suffer from diabetic retinopathy with type 2 diabetes. While age is the strongest risk factor for diabetic problems (Chowdhury & Lasker, 2002) macrovascular complications often develop in early life, and become more severe with advanced age. In addition, many diabetic complications develop in the elderly for example, foot ulcers are common in patients between 45-64 while being uncommon in those under 45 (Johnstone et al.,1993).

According to research by Siriwattanaponkulet al., (2007) on factors associated with the blood sugar in type 2 diabetics, seniors have most difficulty controlling blood sugar levels. This in turn affects the ability to control HbA1c because the body of older patients are more resistant to insulin (Himatongkam, 2011).

1.2.4 Durationof Diabetes

The study by Siriwattanaponkul et al. (2007) shows that patients with early stage diabetes experience difficulty controlling blood sugar levels because

of inappropriate personal habits, but this is more pronounced in those who have had the disease longer due to loss of beta-cells (Nitiyanant et al., 2007).

1.2.5 Diabetes medications

Treatment for patients with type 2 diabetes includes not only a balanced diet and exercise, but oral medicatations to aid in lowering the blood sugar levels. A variety of diabetes medicines are available depending on the severity of the condition. Such medications are able to reduce HbA1C levels 0.5-2 % (Benjasuratwong, 2010). The patients must be aware of the proper use and side effects to achive the greatest efficiency and safety in lowering HbA1C levels.

1.2.6 Knowledge of diabetes

Patient knowledge is important to understand how to control levels of HbA1C, therefore, it is necessary that patients be correctly educated, advised and guided by an expert or doctor. Keeratiyuttawong (2005) has stated the importance for patients to have sufficient knowledge of the disease and how to take care of themselves from a health officer in order to lower HbA1C levels.

1.2.7 Family history of diabetes

The International Diabetes Federation (2011) has indicated that family history reflects genetic susceptibility and may be a useful public health tool for disease prevention. The analytical and clinical validity and utility of using family history as a screening tool is evident.The use of epidemiologic evidence to evaluate family history is a promising new public health tool to fight the growing epidemic of diabetes.

The CDC (2011) has pointed out that Type 2 DM runs in families, especially first or second degree relatives. This inclination is due in part, to children learning bad dietary and sedentary habits in the family. In general, the risk of a child getting diabetes is 1 in 7 if a diabetic parent was diagnosed before age 50 and 1 in 13 if diagnosed after 50.

Hariri et al. (2006) evaluated the use of self-reported family medical history as a possible screening tool to identify people at risk of diabetes. It found a positive familial risk of diabetes identified 73% of all participants with diabetes and correctly predicted diabetes prevalence in 21.5% of respondents. The

study showed that family history of diabetes is not only a risk factor for the disease but is also positively associated with risk awareness and risk-reducing behaviors. Thus, it may be a useful screening tool for detection and prevention of diabetes.

1.2.8 Obesity

Aekplakorn, Loomis, Vichit-Vadakan, Shy, and Plungchuchon (2003) point out that obesity means having a body weight more than 20 percent above desirable body weight. It appears to be the most important environmental trigger of type 2 diabetes. The rate of obesity has been climbing steadily over the last several years. Carrying extra weight increases the chances of developing serious health problems such as heart disease, stroke, and certain kinds of cancers, as well as diabetes. The rate of obesity in Thailand has increased with 29.3% of adults aged 35 and older currently being either overweight or obese.

Kahn et al. (2006) explained that in obese individuals, adipose tissue releases increased amounts of non-esterified fatty acids, glycerol, hormones, pro-inflammatory cytokines and other factors that are involved in the development of insulin resistance. Abnormalities in β-cell function are therefore critical in defining the risk and development of type 2 diabetes. Van Gaal1 (2006) states that obesity increases the risk of cardiovascular disease and premature death. Adipose tissue releases a large number of bioactive mediators that influence not only body weight homeostasis but also insulin resistance as well as alterations in lipids, blood pressure, coagulation, fibrinolysis and inflammation, leading to endothelial dysfunction and atherosclerosis.

According to Hjartaker, Langseth, and Weiderpass (2008) the prevalence of overweight (body mass index, or BMI, between 25 and 30 kg/m^2) and obesity (BMI of 30 kg/m^2 or higher) is increasing rapidly worldwide, especially in developing countries and countries undergoing economic transition to a market economy. One result of obesity is an increased risk of developing type 2 diabetes. Overall, there is considerable evidence that overweight and obesity are associated with risk of some of the most common cancers.

1.2.9 Hypertension

Hypertension, or high blood pressure, is extremely common in patients with diabetes mellitus.Hypertension develops in people with type 2 DM at twice the rate of non-diabetic patients (Sowers, 1995). Hypertension can cause atherosclerotic diseases and nephropathy or renal failure (Petrie, 2000) and theMayo Clinic (2012) has stated that hypertensives often have diabetes for years without any symptoms.

1.2.10 Race and Ethnic background

Insulin, a hormone produced by the pancreas, helps the body absorb excess sugar from the bloodstream. In a study done in the US, Perneger, Brancati, Whelton, and Kiag (1994) state that when blood sugar levels fluctuate in healthy people it is due to food intake, and exercise. The study further found that the risk of diabetes is greater for the black population than the white population. For example, 10.8 percent of non-Hispanic blacks, 10.6 percent of Mexican Americans, and 9.0 percent of American Indians have diabetes, compared with 6.2 percent of whites.

1.2.11 History of gestational diabetes

Buchanan and Xiang, (2005) explain that gestational diabetes is glucose intolerance detected in women during pregnancy. Pregnant women are screened for clinical risk factors and, among at-risk women, abnormal glucose tolerance is usually mild and asymptomatic. Gestational diabetes provides a unique opportunity to study the early pathogenesis of diabetes and to develop interventions to prevent the disease.

O'Sullivan and Mahan, (1964) found that the amount of glucose intolerance for the duration of gestation was associated with the threat of diabetes after pregnancy. The study offered standards for the understanding of oral glucose tolerance tests (OGTTs) during pregnancy.

1.2.12 Health behavior adjustment

This refers to the dietary habits that follow the nutritional principles together with the appropriate physical activities and should include good

health practices which consequently reduce levels of HbA1C (Diabetes Association of Thailand, 2011). The activities conducted to promote positive behavior adjustment among diabetic patients are known as 3C meaning Class, Camp, and Club (Himatongkam, 2011: 198).

The goal of diabetes treatment for patients without frequent hypoglycemia or severe hypoglycemia, for healthy senior patients, or patients without other disease is to strictly control HbA1C levels at <7.0% (ADA, 2011). In cases of seniors who cannot take care of themselves as well as patients with coronary disease, heart failure, cerebrovascular disease, epilepsy, liver disease, and end-stage kidney disease, the control of HbA1C is not strictly applied because low plasma glucose levels could lead to dangerous health effects (Diabetes Association of Thailand, 2011).

Himatongkum (2011) indicates the HbA1C test is an indicator of the plasma glucose control over an eight week period. The follow-up pursued depends on the severity of the disease and treatment method. Initially, patients may see a doctor every 1-4 weeks. The doctor will instruct these patients on diabetes in order for them to take care of themselves for instance, by letting them know that plasma glucose and/or the HbA1C test should be performed before and after meals (Diabetes Association of Thailand, 2011). Additionally, the doctor can follow up patients' plasma glucose levels and adjust doses of medicine untilthey eventually reach the goal of plasma glucose level control in 3-6 months. In the later period, doctors follow up every 1-3 months in order to evaluate whether patients are within the prescribed range.

The objectives and goals of treatment of diabetics are set by the Diabetes Association of Thailand (2011). They include the following.

Four objectives of treatment for diabetes are specified as follows: 1) Treat symptoms caused by hyperglycemia. 2) Prevent and treat acute complications. 3) Prevent or delay chronic complications. 4) Provide for a quality of life for patients as close as that of normal people. 5) Manage the growth and development of children and teenagers pertinent to their ages to avoid diabetes (Diabetes Association of Thailand, 2011).

Goals of Treatment for Diabetes.The Diabetes Association of Thailand (2011) specifies goals for blood glucose control of adult patients to accomplish the above objectives. It provides for both care and cure of diabetes patients as soon as they

are diagnosed with the disease. They attempt to reach the goals of treatment quickly by setting goals for each patient as follows: 1) Monitoring blood sugar levels so they are strictly controlled and maintained at close to normal levels (HbA1c< 6.5%) for young diabetic adults with recent onset with no complications or comorbidity. 2) Monitoring blood sugar levels to strictly control it (to HbA1c< 7.0%) in patients who are often hypoglycemic or experience severe complications, and in older patients who are healthy with no comorbidity. 3) Monitoring the level of blood sugar that is not strictly controlled (to HbA1c< 7.0%) for older patients who are not able to take care of themselves and who have the following diseases: coronary and other heart diseases, heart failure, cerebrovascular disease, epilepsy, liver diseases, and terminal stages of kidney diseases. 4) Monitoring blood sugar levels of children and teenagers according to goals of treatment relevant to age.

The Diabetes Association of Thailand (2011) recommends screening all diabetes patients with classic symptoms of hyperglycemia, hyperglycemic crisis, random plasma glucose of 200 mg/dl and FPG of 126 mg/dl. Fasting glucose is defined as no caloric intake for a maximum at least 8 hours or plasma glucose of 200 mg/dl with a minimum of 2 hours fasting and during OGTT.

Rodaree et al. (2003) conducted a study from a multicenter registry in diabetic clinics. The data showed that 38.9% of patients had diabetes for more than 10 years, and almost 80% were non-smokers. More than half of participants had inadequate control: 61.8% had fasting plasma glucose > 130 mg/dl and 69.34% had HbA1C> 7%. The data also showed the prevalence of retinopathy of various degrees in 23.3%, but 24.4% of the registry members did not receive medical evaluation.

1.3 Diabetic Complications

Type 2 DM is a chronic disease occurring at escalating rates around the world. The WHO (2012) reports in its fact sheets on diabetes that 347 million people worldwide have diabetes and more than 80% of people with diabetes live in low and middle-income countries. Hyperglycemia (elevated blood sugar) is a common effect of uncontrolled diabetes that leads to the damage of body systems particularly the nerves and blood vessels which may also cause psychiatric problems.

Further, diabetic complications take a heavy toll in terms of patient care. Rodaree et al. (2003) demonstrated that long-term microvascular and macrovascular complications lead to increased medical expenses, hospitalization and death in patients with diabetes.

Diabetic complications can be divided into acute or short-term and chronic or long-term complications. The former include hyperglycemia, hyperosmolar nonketotic coma (HHNC) and hypoglycemic unawareness while the latter include macrovascular and microvascular complications.

1.3.1. Short-term Complications

Short term or acute complications include hypoglycemia and hyperglycemia (Ezenwaka and Eckel, 2011; IDF, 2011).

1.3.1.1 Hypoglycemia: Hypoglycemia is a clinical syndrome that results from low blood sugar (Ignatavicius and Donna, 1995). Low blood sugar is observed among people with type 2 DM under most intensive therapeutic protocols with target glucose levels near the normal range (Leese,2003). This complication produces a variety of effects from an inadequate supply of glucose as fuel to the brain, resulting in impairment of function (neuroglycopenia). The effects range from feeling bad to seizures, unconsciousness, and permanent brain damage or death.

Amiel, Dixon, Mann, and Jameson (2008) explain the main reason for the occurrence of glycemiahypoglycemia in patients with type 2 DM is the diabetes medication taken, including sulphonylureas and exogenous insulin which increase insulin levels thus reducing blood glucose levels below target. The risk of glycemiahypoglycemia is increased in older patientswith longer duration of diabetes. The study further states that different definitions, data collection methods, drug typeand patient populations make comparing rates of glycemiahypoglycemia difficult.

1.3.1.2 Hyperglycemia**:** Manzella (2008) states that hyperglycemia is a condition that happens when there is too much glucose circulating in the blood. In a person without diabetes, this condition doesn't occur because insulin produced by the pancreas lowers blood glucose levels. Hyperglycemia occurs in diabetics because the insulin that is produced is ineffective in helping cells to metabolize glucose (type 2 DM). Other signs including increased thirst, increased

urination, increased hunger, blurred vision, fatigue, weight loss, poor wound healing, dry mouth, dry skin and itchy skin, accompany long-term hyperglycemia.

Stoner (2005) explained that blood sugar must be checked regularly in order to avoid hyperosmolar hyperglycemicnonketotic coma or HHNC. Many diabetics check their blood sugar numerous times a day including before or after meals. Patients should talk with health care team about when to check blood sugar levels and what the numbers mean. They should also talk with their health care team about their target blood sugar range and when to call the health professional if their blood sugars are outside target range.

1.3.2. Chronic or Long-term complications

People with high blood glucose levels are prone to a number of chronic complications (WHO, 2011) that are responsible for illness and deaths associated with diabetes. There are two major categories of diabetic complications, namely macrovascular, and microvascular.

1.3.2.1 Macrovascular Complications: According to Leung and Lam (2000), macrovascular disease is responsible for more than 50% of all deaths in people with type 2 diabetes. Macrovascular problems in people with type 2 DM develop a number of years before the inception of clinical diabetes (Funnell, 1996).The diseases are characterized by bonds of lipids within the inner layers of the vessel walls. Macrovascular diseases are further divided into three categories including:

1) Coronary heart disease: this is a main cardiovascular risk in people who have early onset (<40 years) type 2 diabetes (Funnell and Anderson, 2002). The word cardiovascular means of the heart and blood vessels. Cardiovascular complications include angina, heart attack, stroke, and poor circulation. Cardiovascular disease is the most common complication in patients with type 2 diabetes. Diabetics consequently have high risk of cardiovascular disease. The WHO (2011) indicates that diabetes increases the risk of heart disease and stroke. At least 50% of people with diabetes die from cardiovascular diseases (primarily heart disease and stroke).

2) Stroke: this is a stop page of blood supply to any part of brain and causes cerebrovascular incident. This is also known as cerebrovascular disease (CVD).

3) Peripheral vascular diseases (PVD): these diseases are characterized by a lower extremity pulse index of <0.8 due to decreased blood flow in peripheral vasculature. This is associated with higher risk of lower extremity arterial crisis.

1.3.2.2. Microvascular Complications: According to Cypress and Tomky (2006), these conditions refer to high blood glucose levels that create changes in the eyes, kidneys, and nerves leading to diabetic retinopathy and diabetic nephropathy. They further explain that these complications cause damage to the gingival and cutaneous tissues.

1) Eye problems: diabetes causes eye problems that include minor problems such as the premature development of cataracts, and various degrees of retinal damage or diabetic retinopathy.

Cataracts: A cataract is a clouding of the lens in the eye. It is a very common problem in older people including those with no history of diabetes. However, when people live with diabetes for an extended period of time, sugar begins to build up in the lens of the eyes leading to cataracts.

Diabetic Retinopathy: Retinopathy means disease (damage) of the retina, which is the delicate membrane that lines the inside wall of the eyes. The retina responds to light and receives the image formed by the lens. When it becomes seriously damaged, blindness may result. In fact, retinopathy is the most frequent cause of vision loss in Americans aged 20 to 74 years old. Diabetic retinopathy is caused by changes or abnormalities in the small blood vessels of the retina, which takes years to occur. Experts estimate that 6,000 people a year develop retinopathy. Fortunately, early diagnosis and prompt treatment can often prevent blindness. The WHO (2011) has stated that diabetic retinopathy is an important cause of blindness that occurs as a result of long-term accumulated damage to the small blood vessels in the retina. After 15 years of diabetes, approximately 2% of people become blind, and about 10% develop severe visual impairment.

2) Nephropathy: nephropathy is a type of kidney disease that leads to kidney failure. Nephropathy tends to develop in people who have had diabetes for 20 years or more. People with type 2 DM develop nephropathy infrequently. About 10-20% of people with diabetes die from kidney failure. The WHO (2011) reports in its fact sheet on Thailand that the majority of people with diabetes in the record had unsatisfactory control of diabetes and other risk factors leaving them vulnerable to the development of long-term complications. Screening for early retinopathy and nephropathy was also found to be insufficient (Rodaree et al., 2003).

3) Neuropathy: neuropathy is nerve damage that may be irrevocable and permanent. This is a long-term complication of diabetes with symptoms that can appear and disappear in a short period of time. It also varies in intensity, ranging from mild discomfort to severe disabling pain. In combination with reduced blood flow, neuropathy in the foot increases the chance of foot ulcers and eventual limb amputation. Diabetic neuropathy affects up to 50% of people with diabetes.

The WHO (2011) has stated that although many different problems occur as a result of diabetic neuropathy, common symptoms are tingling, pain, numbness, loss of sensation and weakness in the feet and hands.

According to Hutchinson et al. (2000) another major complication associated with diabetes is peripheral vascular disease. The study found that this can cause poor circulation resulting in pain and predisposing patients' feet to ulcers. This can lead ultimately to amputation.

4) Foot Problems: cardiovascular complications damage blood vessels and diminish blood flow to the legs and feet. This damage is added to that of nerves in the legs and feet from neuropathy. The National Institute for Clinical Excellence (2009) reported that foot complications are common in diabetics. Overall, 20–40% of people with diabetes have neuropathy and 20–40% suffer peripheral vascular disease. These estimates depend on the measurements and definitions used.

The National Institute for Clinical Excellence (2009) further reported that around 5% of people with diabetes may develop foot ulcers.

However, amputation rates are often around 0.5% per year. Where neuropathy and ischemia lead to ulceration (especially with poor glucose control), the foot can become infected by polymicrobial invasion and may need to be amputated if the infection is not managed appropriately.

1.4 Prevention of type 2 DM complications

Wilson et al. (2005) reported that long-term reduction of means and decreased heath expenditures are associated with diabetic complications from type 2DM. Type 2 DM can affect various parts of the body leading to serious complications. The CDC (2011) suggested people with type 2 DM and their health care providers try to prevent such complications by controlling levels of blood glucose, blood pressure, and blood lipids.

The CDC (2011) recommended three modes of measurement including: 1) improved glycemic control to benefit patients with type 1 or type 2 diabetes. In general, for every 1% reduction in levels of HbA1c in blood tests (e.g., from 8.0 to 7.0%), the risk of developing microvascular diabetic complications (eyes, kidney, and nerve disease) is reduced by 40%; 2) Blood pressure control can reduce cardiovascular disease (heart disease and stroke) by approximately 33 to 50% and can reduce microvascular disease (eyes, kidney, and nerve disease) by approximately 33%. In general, for every 10 millimeters of mercury (mm.Hg) reduction in systolic blood pressure, the risk for any complication related to diabetes is reduced by 12%. Improved control of cholesterol and blood lipids (for example, HDL, LDL, and triglycerides) can reduce cardiovascular complications by 20% to 50% and 3) Skyler, (2004), explained that preventive care practices for eyes, kidneys, and feet are feasible. Detecting and treating diabetic eye diseases with laser therapy can reduce severe loss of vision by an estimated 50 to 60%. Comprehensive foot care programs can reduce amputation rates by 45 to 85%. Detecting and treating early diabetic kidney disease by lowering blood pressure can reduce decline in kidney function by 30 to 70%. Treatment with ACE inhibitors and angiotensin receptor blockers (ARBs) is more effective in reducing the decline in kidney function than other blood pressure lowering drugs (Wilson et al., 2005).

In contrast, only a small proportion of the risk of death from ischemic heart disease was attributable to HbA1c. Despite evidence of the benefit of glycemic control, a large proportion of people with diabetes have poor glycemic control. Mean concentrations of HbA1C in younger-onset and older-onset groups at three time points dropped slightly between the first two intervals (1980-1982 and 1984-1986), but there was very little additional decrease between the second and third interval (1984-1986 and 1990-1992) with stabilization at slightly less than 10% (Wilson et al., 2005).

2. Diabetes Self-Management

Self-management has become a popular term for behavioral interventions as well as for health behaviors especially for people with chronic conditions. This is an important concept and is a core component of interventions to improve outcomes for people with chronic disease (Lorig & Holman, 2003). Moreover, Yates, (1986) mentions that the philosophical basis of self-management is the responsibility to perform activities. The self-management philosophy is based on the belief of each person as an intelligent human being in making choices. Furthermore, patients learn to maintain their own minds and bodies, their own affective and psychological processes (Baumeisteret al.,1994 ;Creer,2000; Nakagawa-Kogan,1996). In order to understand the concept of self-management better, it will help to define it more clearly as follows:

2.1 Definition of diabetes self-management

A variety of definitions of self-management have been provided by a number of experts. A useful definition for self-management was given by Clark et al. (1991) as the daily activities individuals must engage in to control or decrease the impact of disease on health status, including contending with the psychosocial difficulties caused or intensified by the disorder.

Lorig et al. (2001), add that self-management is enabling people “to make informed decisions, to adopt new perspectives and generic skills that can be applied to new problems as they arise, to practice new behaviors and to maintain or regain emotional stability.”

Barlow et al. (2002) defined self-management as "the individual's ability to manage the symptoms, treatment, physical and psychological consequences and lifestyle change inherent in living with a chronic condition".

Richard and Shea (2011) defined self-management as “the ability of the individual, in conjunction with family, community, and healthcare professionals, to manage symptoms, treatments, lifestyle changes, and psychosocial, cultural, and spiritual consequences of health conditions”. Bourbeau et al. (2004) defined it as a set of skilled behaviors and the various tasks that a person carries out for management of their condition.

From those definitions, self-management can be summarized as the ability of the individual to emphasize procedures of self-management in the routines of daily life, as well as being involved in taking responsibility for making decisions about one’s health to manage the symptoms, treatment, physical and psychological consequences.

Clinically, effectiveness of self-management manifests as better outcomes, greater cost effectiveness, and improved relationships between health care providers and patients. Firstly, several studies indicate that patients benefit from performing self-management courses which provide knowledge, include performance of self-management behaviors, self-efficacy, and other aspects of health status (Barlow et al., 2002). Patients in a number of different settings who completed the self-management program showed a sustained benefit of primary outcomes (Barlow et al., 1998).

According to Barlow, Wright, Sheasby, Turner and Hainsworth (2002) diabetes is a disease whose treatment is based on early instruction and effective management which can lead to a normal life span and quality of life. Large numbers of diabetics are not able to deal with issues associated with diabetes,especially relating to the performance of daily routines, through self-management. Thus, Barlow, Wright, Sheasby, Turner and Hainsworth (2002) indicate that self-management refers to the individual’s ability to manage symptoms, treatment, physical and psychosocial consequences and lifestyle changes inherent in living with a chronic condition.

Self-management for people with diabetes is defined as behaviors to control their blood sugar level. Effective self-management is essential for people with

diabetes to live well. It enables them to make informed decisions and to assume responsibility for the day-to-day management of their disease. Diabetes self-management education (DSME), also called diabetes self-management training, provides diabetics with the knowledge, skills, and tools they need to effectively manage their diabetes. Ongoing support is critical to help these patients cope with daily demands and live successfully with diabetes.

The goals of diabetes education are to optimize metabolic control, prevent acute and chronic complications, and optimize quality of life while keeping costs acceptable. However, Norris (2002) concluded that self-management education also improves HbA1c levels at immediate follow-up. Further, diabetes care should develop to become a collaboration between equals that includes: (1) Professionals sharing knowledge and expertise about diabetes and its treatment, and patients sharing their experience of their lives and what treatment choices work best for them. (2) The need for patient education designed to promote informed decision making, and providers need to practice in ways that support patient efforts to achieve effective self-management.

However, a systematic review titled Effectiveness of Self-management training in Type 2 DM by Norris et al. (2001) argued that knowledge levels do not correlate well with control of blood glucose. Furthermore, Norris et al. (2001) recommend that it is necessary to assess the effectiveness of self-management interventions on sustained glycemic control, cardiovascular disease risk factors and ultimately, micro-vascular and cardiovascular disease and quality of life. Therefore, it is necessary to consider the processes of self-management rather than the results of self-management alone. Schulman-Green et al. (2012) reported that the processes involved in self-management consist of three components: focusing on illness needs, activating resources, and living with a chronic illness.

Funnell and Anderson (2003) explain that diabetes education has changed a great deal and diabetes self-management education (DSME) programs have become more patient-centered and theoretically based, and there is a greater emphasis on providing on-going support to maintain the gains made by patients through self-management as a result of education. Based on the framework of self-determination and autonomy, empowerment has served as the philosophical basis for diabetes self-

management education for more than 15 years. This study defines the development of empowerment-based programs from DSME to on-going diabetes self-management support and provides practical strategies for educators to use in the development of these programs.

The overall goal of diabetes management is to help individuals with diabetes and their families gain the necessary knowledge, life skills, resources and support needed to achieve optimal health. Diabetes self-management training has been considered an important part of clinical management since the 1930s (Norris, 2002). Funnell and Anderson (2003) state that diabetes self-management education is also necessary for patients to effectively manage diabetes and make informed decisions.

American Diabetes Association (ADA) nutrition recommendations include weight loss or energy restriction; monitoring of carbohydrate intake, a high fibre intake, limitation of saturated fat, trans fat, cholesterol, and sodium; and consumption of fish twice per week (ADA, 2008).

The American Diabetes Association (2004) states that primary treatment goals for diabetics include achieving blood glucose levels that are as close to normal as possible and the prevention of diabetic complications. Other goals are normal growth and development, maintaining normal body weight, the avoidance of sustained hyperglycemia or symptomatic hypoglycemia, the prevention of diabetic ketoacidosis and nonketotic acidosis, and the immediate detection and treatment of long-term diabetic complications.

The following section will describe ecological models for health behavior including community policy, group culture, organizations, family, friend, small group and individual, biological and psychological factors.

2.2 Ecological models of health behavior

McLeroy, Bibeau, Steckler, and Glanz (1988) provide an ecological model of health behavior which comprises five components: public policy, community, institutional factors, interpersonal processes and primary groups, and intrapersonal factors. Five components of outcomes of the ecological model of health behavior include:

2.2.1 Public policy: public policy is based on local, state, national, and global laws and policies including polices that allocate resources to establish and

maintain a coalition that serves as a mediating structure connecting individuals and the larger social environment to create a healthy polity.

2.2.2 Community: community is defined by relationships between organizations, institutions and informational networks within boundaries that include location in the community, built environment, neighbourhood associations, community leaders, on/off-campus housing, businesses, commuters, transportation, walkability, and parks.

2.2.3 Institutional factors: this component includes formal and informal rules and regulations for operations that include campus climate, class schedules, financial policies, competitiveness, lighting, unclean environments, distance to classes and buildings, noise, availability of study and common lounge spaces, air quality, and safety.

2.2.4 Interpersonal processes and primary groups: these are formal and informal social networks and social support systems, including family, colleagues, and friendship networks including roommates, supervisors, resident advisors, rituals, customs, traditions, economic forces, diversity, athletics, recreation, intramural sports, and clubs.

2.2.5 Intrapersonal factors: these are characteristics of the individual such as knowledge, attitudes, behavior, self-concept, skills, and developmental history that include gender, religious identity, racial/ethnic identity, sexual orientation, economic status, financial resources, values, goals, expectations, age, genetics, resiliency, coping skills, time management skills, health literacy and accessing health care skills (McLeroy, Bibeau, Steckler & Glanz, 1988, p. 355).

2.3 Process of diabetes self-management

There are many definitions of diabetes self-management process (Tobin et al., 1986) state that consist of the following:

1) Self-monitoring is to observe and record the factors that affect the patients' problems. It comprises four processes. 1.1) Physiological process such as physical or sickness symptoms according to the diseases. Examples of these symptoms are physical changes such as withered arms, withered legs, and weight loss. 1.2) Stimulation from the environment and the society is a stimulator of other symptoms

such as stress condition due to the psychosocial factors. 1.3) Cognitive process for specifying ways or patterns of self-management. 1.4) Behaviors for reducing risk factors and symptom management, which involve observation and recording which will help the patients to analyze and distinguish causes of illness. The patients then are able to manage their own sickness appropriately.

2) Self-instruction is a method to help the patients to do activities or to behave in order to reduce risk factors or ease symptoms.

3) Adjustment of self-stimulating factors as well as controlling a stimulator or avoiding a stimulant.

4) Changing the self-response factors including reinforcement and punishment methods as well as rewarding and adapting techniques

5) Applying various kinds of relaxation.

6) Making decision is important to conduct the self-management intervention of which there are various activities designed to suit the particular patients.

Moreover, Kanfer (1975, as cited in Jittima Charoonsit, 2002) decribe self-management process as follows:

1) Self-monitoring is a method that the patients notice and record the factors affecting their health. Noticing and recording are necessary for some or every process of self-monitoring. Self-monitoring is involved in behavioral, social and environmental, cognitive, and physical processes which affect health and self-care.

2) Self-instruction is the information that the patients provide themselves for controlling, adding, maintaining, or reducing responses appropriately.

3) Self-induced stimulation change for adjusting the environment which affects the illness.

4) Self-induced response change is the behavioral change which could be either reinforcement or punishment. These responses affect the health. Relaxation is an example of process which is meant to control the body in symptom management.

5) Decision making is to decide about problems in everyday life. Decision making is one of the important components of self-management.

Inaddition, Creer (2000, as cited in Jittima Charoonsit, 2002) decribed self-management process as follows:

1) Goal setting: People must be educated on the chronic sickness. Examples of educating methods are giving information and training skills of self-management. Educating people could help them to manage the changes of oneself for creating a better health condition. Goal selecting is an activity conducted between the patients and those who provide health care. After selecting the goal, there will be discussion, negotiation, and eventually making decision.

2) Information collection: This involves self-monitoring or self-observing and then recording the information of oneself. Self-monitoring is basically important for reaching the goal and succeeding in self-management.

3) Information processing and evaluation: These skills are to collect information about changes of oneself. The individuals can learn and evaluate the changes. They consequently can make decision.

4) Decision making: Decision making is the most important aspect of self-management. The decision will be made after the patients gather, analyze, and evaluate information of the sickness.

5) Action: Taking action expresses the ability of self-management in controlling the chronic sickness or health condition. This immediately leads to the management of chronic sickness.

6) Self-reaction: This is self-evaluation on the ability.

Moreover, Schulman-Green et al. (2012) reported that the processes of self-management consist of three categories, including focusing on illness needs, activating resources, and living with a chronic illness. Engelgau et al. (2000) points out that people with diabetes should receive medical care from a physician-coordinated team.

To sum up, the ADA (1995) has recommended four specific goals of diabetes management including: (1) keeping up normal blood glucose level based on food intake along with diabetes medication and exercise; (2) controling optimal serum lipid levels based on cholesterol, LDL cholesterol, HDL cholesterol and triglycerides; (3) providing sufficient calories to people with diabetes in order to achieve a healthy weight; and (4) decreasing nutritional habits related to risk factors including obesity, dyslipidemia, and hypertension.

2.4 Components of diabetes self-management

The American Diabetes Association (2011) has indicated that physician-coordinated teams of health care professionals are needed to provide diabetics with medical care. Such teams are comprised of physicians, nurses and nurse practitioners, physicians' assistants, dietitians, pharmacists, and mental health professionals with expertise and a special interest in diabetes. It is due to a collaborative and integrated team approach that individuals with diabetes can undertake a dynamic role in their care. The management plan should be framed as a collective therapeutic association between the patient and family, the physician, and other members of the health care team. Nathan, Buse, Davidson, et al. (2009) indicate that prior expert consensus statements have suggested approaches to management of hyperglycemia in individuals with type 2 diabetes. However, lifestyle changes (MNT and exercise) and continuing timely augmentation of therapy with additional agents (including early initiation of insulin therapy) is effective to attain and preserve suggested levels of glycemic control (i.e., HbA1c 7% for most patients). This is further categorised into four aspects that include: (1) food exchange, (2) physical activity, (3) medical therapy, and (4) psychological support.

2.4.1 Food exchange

A food exchange is a useful tool for calculating and planning any diet in which control of the energy-yielding nutrients is required. Control of the total calories obtained per day is the goal of the food exchange (Williams and Schlenker, 2003). Food exchange lists, containing five groups of food, aim to help meal planning and match carbohydrate intake to medications. Fadupin (2009) states that food exchange lists are also widely used by healthcare professionals and efforts have been made to update the tool to better manage nutrition-related chronic diseases.

To sum up, Friesen, (1997) suggested that diabetic patients need care providers to set certain goals by collaborating, implementing and evaluating meal plans based on individual lifestyle, ethnic or cultural food issues, financial consideration and beliefs. Meal plans are based on assessment of dietary history and needs of diabetic patients. Further, to maintain ideal weight, Friesen (1997) recommended consumption of 20-35 grams of fibres, 0.8 grams of protein per

kilogram of body weight, the least possible amount of saturated fats including butter, beans, coconut oil, palm oil and hydrogenated oils.

Individualized Menus: According to Green Pastors (2004), many patients need examples to follow when setting up meal plans. The menu describes in writing what foods and in what quantities should be consumed over a period of days. A dietitian creates a personalized set of choices based on the nutritional prescription plan.

Guideline Approaches

The American Diabetes Association (2006) has suggested guideline approaches that make food choices less complex. These approaches offer basic nutrition information sufficient to change the dietary habits of some patients with diabetes. Guideline approaches focus on making healthy food choices without weighing or measuring foods, using exchanges, or counting calories, fat or carbohydrate. Used alone, or in combination with a specific meal plan, guidelines are a good choice for beginning education about nutrition (ADA, 2010). According to Green Pastors (2004), diabetes nutrition guidelines illustrate the connection between diabetes and nutrition in a simplified format. Green Pastors (2004) suggested that patients need appropriate food choices that include, (1) healthy food choices as a guide for the early stage of diabetes meal planning comprising an outline of diabetes nutritional management within the charter of simple eating guides in order to transition the patient toward deeper management, (2) an improved food plan used as a 'view alone' guideline for a patient unable to meet with dieticians, (3) diabetes resources literature including diabetes associated topics intended to be shared with the emphasis on problem solving and setting goals, and (4) the diabetes plate method based on awell-made, deeply covered, 11" by 17" place mat that is used over and over to apply the diabetic's meal plan.

Glycemic Index

Rezabek (2001) explained that the glycemic index (GI) is a tool used to measure carbohydrate-rich foods that raise blood glucose levels, in order to identify and classify over 600 foods and their blood glucose raising potential. It has been demonstrated that high fiber, low glycemic index foods can help delay the absorption of glucose into the bloodstream, consequently helping to control blood glucose levels.

As a rule, refined grain products and potatoes have a higher GI, while legumes and whole grains have a moderate GI, and non-starchy fruits and vegetables have a low GI (Rezabek, 2001).

The ADA (2006) suggested that the GI of a food can be influenced by many factors, such as methods of cooking, physical state of the food, and how much fat and protein are consumed with that food. It is important that persons with diabetes who want to use the GI to better manage their glucose control be taught how specific foods and meals affect their own blood glucose levels, rather than adhering only to the existing GI.

Diabetic food is categorized in a system to make meal planning easier for diabetics. The system groups foods according to their nutritional values, helping diabetic individuals eat carbohydrate-containing nutritionally balanced meals to achieve glucose (blood sugar) control and overall good heath (American Diabetes Association, 2012). Craig and Mangels (2009) devised a method that categorizes foods into three groups based on carbohydrate content, namely carbohydrate group, meat and meat substitute group, and fat group. In addition, foods can be categorized into six groups based on their nutritional value, namely starch/bread, fruit, milk, vegetables, meat and meat substitutes and fat. Each exchange (serving) of food within a food group has roughly the same amount of carbohydrates. The amounts of protein, fat and calories can vary. Patients on special diets can use these food groups to swap foods within the same list knowing that each food will have roughly the same effect on their glucose level.

A diabetic diet categorizes foods into groups that share similar carbohydrate content. Calories, protein content and fat content can vary. This can help people with diabetes in planning a variety of well-balanced meals that can help maintain glucose (blood sugar) levels within the normal range.

To conclude, dietary management based on flexible recommendations can be included as a factor in diabetes management. Similarly, diet education is based on basic nutrition and goal oriented treatment plans for diabetics in order to supply calories and nutrients safely (Friesen, 1997).

2.4.2 Physical activity

Physical activity refers to a person's movement, for example walking, working or dancing (American Diabetes Association, 2010). A person with type 2 DM can be physically active without joining a gym or playing sports in order to decrease glycemic levels and minimize LDL and increase HDL cholesterol (Firdaus, 2006). Further, Kirk et. al. (2003) have suggested increasing physical activity in order to decrease insulin resistance, building up more muscle cells and minimizing fat cells. Exercise also decreases blood glucose levels by making insulin more effective.

The ADA (2011) reports that people with diabetes who experience heart problems must engage in aerobic physical activity for at least 150 minutes per week and that they must be advised to include resistance activities at least twice a week. The American Diabetes Association (2012) further suggests that adults over 18 must do 150 minutes of physical activity per week with normal intensity or 75 minutes per week of strong aerobic physical activity while patients over 65 with disabilities should pursue physical activity according to their strength and capability.

According to the ADA (2012), a meta-analysis shows that the effect of exercise interventions with a mean number of of 3-4 sessions per week and a mean duration of 49 minutes per session has a beneficial effect on glycemia in people with pre-diabetes. Further, resistance exercise improves insulin sensitivity in older men with type 2 DM to the same or even greater extent as aerobic exercise.

Exercise has long been recognized as an essential component of diabetes management. Diabetes health care practitioners have established exercise as one of the four cornerstones of care along with diet, medication, and blood glucose monitoring. Exercise also appears to aid in the loss of visceral fat and recent research suggests that exercise may exert favourable effects on emerging vascular disease risk factors.

Exercise may also play a protective role by increasing patient resilience to the emotional stress and depression often experienced by diabetics (Zacker, 2004). Body Mass Index (BMI) and body fat distribution are both recognized as strong predictors of obesity-related health risks, notably type 2 diabetes. The BMI scale is used to classify whether individuals are underweight (<18.5), normal weight

(18.5 - 24.9), overweight (25.0 - 29.9), or obese (30 or greater) (Lau, 2007). Nearly 90% of individuals with type 2 DM are overweight or obese.

Exercise is an essential component of diabetes management. Regular exercise aids in the control of blood glucose, lessens cardiovascular risk factors, aids weight loss, and develops general good health. Additionally, regular exercise prevents the development oftype 2 DMin high risk individuals (Pan, et al., 1997). Controlled exercise mediations of at least 8-weeks duration have been shown to lower HbA1c by an average of 0.66% in patients with type 2 diabetes, even with no significant change in BMI (Normand et al., 2001). The higher the level of exercise engaged in, the greater the positive effect on developments in HbA1c and fitness (Boulé, Haddad, Kenny, Wells, Sigal, 2003).

Physical activity is critically important in the management of HbA1c, blood pressure and cholesterol patients with type 2 DM. The ADA (2011) described the characteristics and benefits of physical activity as follows.

2.4.2.1 The benefits of physical activities for diabetes patients include: helping to keep blood glucose, blood pressure, HDL cholesterol and triglycerides on target; lowering the risk for pre-diabetes, type 2 diabetes, heart disease or stroke, relieving stress; strengthening the heart, muscles, bones; improving blood circulation and toning muscles as well as keeping the body and joints flexible.

2.4.2.2 Kinds of physical activities: There are four kinds of recommended physical activities, namely general activities, aerobic exercise, strength training, flexibility exercise (ADA, 2011).

1) General activity: walking, using the stairs, moving around throughout the day.

2) Aerobic exercise: An activity such as brisk walking, swimming, and dancing makes heart and bones strong, relieves stress, and improves blood circulation. It also lowers risk for type 2 diabetes, heart disease, and stroke by keeping blood glucose, blood pressure, and cholesterol levels on target. Patients should aim for about 30 minutes a day, at least 5 days a week. People who are trying to lose weight may want to aim for more than 30 minutes a day. If people have no time, they can start out with 5 or 10 minutes a day then gradually increase the time each week. They may also split up the activity for the day for example, by taking a brisk 10-minute walk three times each day. Some ways to get aerobic exercise include:

(a) a brisk walk every day, (b) dancing or dance aerobics classes, (c) swimming or water aerobics, and (d) a bicycle ride outdoors or use of a stationary bicycle indoors (ADA, 2011).

3) Strength training: Strength training helps build strong bones and muscles and makes everyday chores like carrying groceries easier. With more muscle mass, people burn more calories, even at rest. Some ways to do strength training are as follows: Lift light weights at home; join a class that uses weights, elastic bands, or plastic tubes to provide resistance.

4) Flexibility exercises**:** Flexibility exercises, also called stretching, help keep joints limber and lower the chances of getting hurt. Gentle stretching for 5 to 10 minutes helps the body warm up and get ready for activities and cool down afterwards (ADA, 2011).

However, for patients taking insulin, physical activity can cause hypoglycemia if the dosage of medication is not adjusted. Similarly, moderate or vigorous aerobic exercise should not be taken by those with long-term complications of diabetic retinopathy, presence of proliferative diabetic retinopathy (PDR) or severe non proliferative diabetic retinopathy (NPDR) (ADA, 2011).

2.4.3 Medical therapy

As diabetes is a progressive condition, the healthcare team working with the patient must determine which medications help and how they work most effectively. The team can demonstrate how to inject insulin or explain how diabetes pills work and when patients have to take them. The combination of effective drug therapy and healthy lifestyle is able to lower blood glucose levels to reduce the risk of complications, and to produce other clinical benefits. Patients tend to take medication properly when they are knowledgeable about each medication, including its intended actions, side effects, efficacy, toxicity, prescribed dosage, appropriate timing and frequency of administration, effect of missed and delayed doses, and instructions for storage, travel, and safety. Medication therapy can be divided into two types: modern medicine and Traditional medicine.

Medication management for patients with type 2 DM is indispensable when changing the patient's way of life cannot be effective. If diet and exercise are not effective to control their blood sugar within normal levels, oral hypoglycemic agents, and insulin can be used (Gaede, 2003).

Sulfonylureas: Sulfonylureas arouse the discharge of insulin by binding to the ATP-sensitive potassium channel receptors (SUR subunit) on the pancreatic beta-cell surface. These agents have a peripheral effect on insulin sensitivity in patients with type 2 DM in combination with other hypoglycemic agents or insulin. The combination of sulfonylureas with short acting meal time insulin has no physiologic basis and is not advisable owing to the increased risk of hypoglycemia.

Thiazolidinedione: Thiazolidinedione includes pioglitazone and rosiglitazone. They improve insulin sensitivity by activating certain genes involved in fat synthesis and carbohydrate metabolism. Thiazolidinedione can have serious side effects. It can increase fluid build-up which can cause or worsen heart failure in some patients. In combination with insulin, it increases risk therefore it is not recommended for patients with heart failure. People with risk factors for heart failure should use these medicines with caution.

Alpha-Glycosidase Inhibitors:Alpha-glycosidase inhibitors reduce glucose levels by interfering with the absorption of starch in the small intestine. Alpha-glycosidase inhibitors are not as effective alone as other single oral medications, but in combination for instance with metformin, insulin, or a sulfonylurea, they have increased effectiveness. Alpha-glycosidase inhibitors do not cause hypoglycemia when used alone. To conclude, alpha-glycosidase inhibitors can affect the small intestine to decrease the breakdown of carbohydrates into absorbable monosaccharides. It is effective in slowing postprandial glucose without causing hyperinsulinemic side effects that include abdominal pain, diarrhea, and flatulence.

2.4.4 Psychological support

Anderson, Grigsby, Freedland, et al.(2002) have described how psychological problems can weaken the diabetic's or their family's capability to manage diabetes care and effectively negotiate their health status. The clinician must judge psychosocial status of the diabetic patien in a timely and proficient method so

that transfer to appropriate facilities can be accomplished. Further, Anderson, Grigsby, Freedland, et al. (2002) report that an organised analysis and meta-analysis have shown that psychosocial mediations can modestly but significantly improve HbA1c (standardized mean difference 20.29%) and mental health outcomes. The ADA(2008) has described the main factors to be used for screening of psychosocial support based on diagnosis, during regularly scheduled management visits, during hospitalizations, and at the time of discovery of complications.

Enhanced psychological care: Although many people with diabetes learn to cope and live normal, healthy lives, far too many suffer emotionally without receiving basic psychosocial support (ADA, 2008). Improved access to health care professionals and psychologists trained in identifying patients' needs and providing counseling and psychosocial support to people with diabetes is needed in order to diminish the psychological burden of living with diabetes and overcome the psychological barriers to effective disease self-management (ADA, 2008).

2.4.4.1 Self Regulation

Kanfer (1991) showed that self-regulation is an integrated process, consisting of the development of a set of constructive behaviors that affect one's behavior. The processes are planned and adapted to support the pursuit of personal goals in changing environments. Self-regulation enables people to alter their behavior in order to follow rules, plans, promises, ideals, and other standards. When it fails, a number of problems and misfortunes can arise.

Kopp (1982) referred to self-regulation as self-control, self-management, anger control and impulse control. However, self-regulation is defined as "the ability to attain, maintain and change arousal appropriately for a task or situation".

Several theories discuss the development of self-regulation. Developmental problems of self-regulation in the individual are understood when children have difficulties with self-regulation from infancy as infants and small children are considered as dependent on external regulators that include their caring parents. Bronson, (2000) states that it is during early childhood that children make significant gains in regulating arousal, emotional responses, exercise control over their mental processing such as problem solving, and motivational patterns. According to

Bronson (2000) the field of self-regulation includes "phases of control" which explains the gradual transitions that build upon each other in order to achieve self-regulation.

Oetter, Richter, and Frick (1993) offered another theory of self-regulation that is based on sensory integration theory and practice. The researchers organized the development of self-regulation into three functional levels that include: 1) self-regulation during infancy when automatic functions of the body develop as the autonomic nervous system, reticular system and limbic system in the brain mature. 2) self-regulation in the child as he develops organized outputs ranging from selective attention, vocalization, visual pursuits, movement patterns, and the ability to maintain and adapt states of arousal that are appropriate to different situations based on sensory-motor input and feedback; they also note that adults continue to use similar strategies to aid in self-regulation, such as biting on pens, fidgeting with keys, or swinging their foot. 3) Self-regulation skills that emerge later in childhood. Higher level cognitive skills develop that allow the child to self-monitor, recognize when their state of arousal needs to be adjusted, organize language for functional use, sustain attention and tap into working memory.

Baumeister et al. (1999) defined self-regulation as the self altering its own responses and inner states. Self-regulation is one the self's major executive functions. The executive function of the self refers to its active, intentional aspects (Gazzaniga, Ivry, &Mangun, 1998) and may be thought of as that part of the self which is ultimately responsible for the actions of the individual. The other major executive function of the self is choice. Not only may a self initiate behavior or control it, but a self also is responsible for deliberating and making choices from among the universe of possible options. Higgins et al. (2007) state that the self does not regulate itself directly, but it may control behaviors, feelings, and thoughts that comprise it. In this sense, self-regulation refers to the regulation of processes by the self.

Self-regulation is the most important function of the human self. Higgins refers to the "sovereignty of self-regulation," that refers to its pre-eminent importance as compared with many of the other everyday activities of the self (Higgins et al., 2007). However, Self-theory is incomplete without self-regulation. Baumeister et al. (1999) presented three dimensions in order to include the activities and functions of the self that include: 1) Awareness (knower): Awareness is directed toward its source in order to make people aware of and learn about the world and

about themselves. The ultimate effect is a body of knowledge and belief about the self which is known as the self-concept. 2) Relatedness (belonger): Interpersonal relatedness is considered a root of self-knowledge and an important goal of most human social functioning. People survive and reproduce by means of their interpersonal connections. Baumeister et al. (1999) explain that the "need to belong" is a powerful and pervasive human motivation that encourages people to build relationships. Thus, the self is a dynamic tool for connecting with others. 3) Agent (doer): in this role, the self has executive function acting as agent. The self applies control over its environment including the social environment in which people make decisions. Thus, self-regulation can be understood in connection with the self's executive function.

Components of Self-Regulation**:** There are three components of self-regulation. They are as follows. 1) Executive Function: According to Lewis and Todd (2007), executive function is a cognitive process that is involved in the conscious control of thoughts and actions. When executive functions are working appropriately, the child will be able to demonstrate better skills through self-regulation. 2) Emotional Regulation: Leibermann et al. (2007) mention that there are two processes that constitute self-regulation: executive function and emotional regulation. They define emotional regulation as processes (intrinsic and extrinsic) that are responsible for controlling emotional reactions in order to meet one's goal. This would include monitoring, evaluating, and modifying the intensity and temporal features of one's emotional response. The emotional regulation component includes certain sub-functions: self-regulation of motivation and drive, a capacity for objectivity, the self-regulation of arousal and social perspective taking. Social perspective taking is also commonly referred to as "theory of mind". 3) Sensory Integration: Ayres (1979) introduced the theory of sensory integration and defined it as "the organization of the senses for use" (p. 5). In order to integrate sensory information, one first must register the information. Sensory registration refers to the threshold that needs to be reached so the central nervous system can respond and decide whether to act. Sensory integration automatically develops in typical developmentally normal children, however, when a brain is not able to make sense of or organize sensory input, the child will experience sensory integrative dysfunction.

Types of self-regulation: There are three components of self-regulation.

1) Commitment to Standards: Self-regulation cannot proceed without a standard. Thus, it attempts to alter one's behaviors in order to meet a standard. Higgins et al. (2012) explain that standards are concepts of possible and desirable states. They include ideals, expectations, goals, values, and comparison targets. Self-regulation is a matter of changing the self but problems with standards can contribute to failure of self-regulation. Baumeister et al. (1994) state that conflicting standards is one important source of self-regulatory breakdown. However, Higgins et al. (2012) explain that some people are typically promotion focused which means they are motivated to achieve desirable outcomes using approach oriented strategies; other people are prevention focused using avoidance oriented strategies.

2) Monitoring of relevant behavior: Monitoring one's behavior is an indispensable prerequisite to regulating it. Carver and Scheier (1981) write that feedback-loop theory was originally developed for the psychology of self-regulation of human behaviors. Powers, (1973) pointed out that the core concept of the feedback circle involves a sequence of steps under the acronym for test, operate, test, and exit (TOTE). The test phases consist of comparing the self's current status against the relevant standards. The operation phase consists of attempts to alter discrepancies between the perceived aspect of self and the relevant standards. During or after these operations, the self may perform additional tests to see whether the discrepancy has been resolved. The exit phase terminates the process when the self has met the relevant standards and there is no need for further operations and the self can turn its attention to other issues. The feedback loop is a cognitive theory, but of course, emotion is a powerful feedback system in the human psyche, and emotion does influence self-regulatory processes. Higgin et al. (2012) distinguish different types of standards and propose that different categories of emotion are linked to different kinds of discrepancies but success is more likely when people observe their own behaviors.

The capacity for principal responses (The strength model): Self-regulation depends on "willpower" as an important ingredient in self-control. The term "willpower" implies strength to bring about the changes that the self seeks. Baumeister et al. (1999) conclude that self-regulation seems to operate as if it depended on a limited resource resembling strength or energy. This would provide a useful explanation for a range of

empirical findings and informal observations pointing to the apparent pattern of changing behavior after people apply self-control. The following are some important factors for principal responses according to the strength model. First, acts of self-regulation consume limited resources. Second, when the resource is depleted, then the person will be less effective at other self-regulatory tasks. Third, the resource is used for a wide range of self-regulatory activities. Fourth, as with strength, the resource can be restored via rest and possibly other mechanisms. Fifth, also as with strength, regular exercise can increase it over the long term. Thus, although the immediate result of exercising self-control is to reduce the person's capacity for more self-control, the long term effect is the opposite, namely to increase the capacity for self control. Sixth, the self may begin to alter its responses long before the resource is fully depleted.

Self-regulation in diabetes patients: Leventhal and Diefenbach (1991) explain that the overriding goals of diabetes self-regulation are to empower individuals to avoid the short-term risks and long-term complications associated with diabetes as well as to maintain a good quality of life. This follows because individuals often make their own health care decisions. Cognitive representation of illness can be defined as the psychological parameters in which an individual conceptualizes his or her illness. Leventhal and Diefenbach (1991) suggested five basic components in the cognitive representation of illness: disease identity, consequences, timeline, cause, and controllability.

Lau, Bernard, and Hartman (1989) support for the utility of these components in predicting illness outcomes has been documented. Overall, cognitive representation of illness allows the individual to organize illness information and to guide symptom monitoring, actions, and consequences (i.e. to know what to expect or look for when experiencing illness). Although Leventhal and Diefenbach's (1991) model of illness self-regulation has been extensively cited in the health literature, applications to diabetes have been few. In studies by Hampson et al. (1990), "Consequences" and "Timeline" constructs were combined to form a single construct ("Seriousness") that was predictive of a variety of self-management behaviors. Likewise, Glasgow et al. (1997) found that "Control" (termed "Treatment

Effectiveness") also predicted self-regulation behaviors (e.g., diet, exercise, and self-monitoring of blood glucose).

In short, Leventhal and Diefenbach's (1991) self-regulatory model of diabetes management suggests that more accurate and developed cognitive representations of diabetes are predictive of increased involvement in diabetes-specific health behaviors relevant to the self-management of the disease and improved quality of life. Leventhal and Diefenbach (1991) explored cognitive representations predicting diabetes-specific health behaviors and quality of life in a heterogeneous sample of people with diabetes. Specifically, they examined the relationships between cognitive representation, diabetes-specific health behaviors, and quality of life using a theoretical model informed by the process of illness self-regulation.

2.4.4.2 Self awareness

People with type 2 DM should be encouraged to identify their symptoms as they may indicate levels of glycemia that are different from classical textbook symptoms. Even people with no awareness of their own hypoglycemia may learn to recognize unique cues to replace the autonomic ones they have lost.

Fenigstein, Scheier, and Buss (1975) refer to the self becoming the object of one's own attention. This takes place when an organism focuses on the external environment and the internal milieu. The person becomes a reflective observer, processing self-information. The organism becomes aware that it is awake and actually experiencing specific mental events, expressing behaviors, and possesses unique characteristics. Thus, Fenigstein, Scheier, and Buss (1975) state that a language-competent creature may thus verbalize "I feel tired," "I've been working for three hours," or "I am a good-looking, intelligent person."

Self-awareness comprises two components that include: 1) private self-aspects, and 2) public self-aspects. Private self-aspects include externally unobservable events and characteristics that such as emotions, physiological sensations, perceptions, values, goals, and motives. Public self-aspects are visible attributes such as behavior and physical appearance. Past research reliably shows that people differentially focus on private and public self-characteristics, leading to distinct motivational, cognitive, social, and behavioural effects (Buss, 1980). The same observation applies to consciousness and self-awareness as well: both states produce

unique effects, suggesting that these two terms should not be equated (Carver &Scheier, 1981).

2.4.4.3 Stress and Coping

Lazarus and Cohen, (1977) describe stressors as demands made by the internal or external environment that upset balance or homeostasis by affecting physical and psychological well-being and requiring action to restore balance or equilibrium. Further, they explain that stress can contribute to illness through direct physiological effects or indirect affects via maladaptive behaviors including smoking, poor eating habits. Carver and Antoni, (2004) point out that stress does not affect all people equally. Some people encounter threatening experiences yet manage to cope well and not get ill. However, support from friends, family, and health care providers influence psychological and physical outcomes significantly. Carver and Antoni, (2004) further explain that reactions to stress may also promote healthy practices and encourage the adoption of habits that promote health. Researchers indicate that when the data is assessed in the context of a large meta-analysis, the evidence indicates that modification of stress can cause a modest reduction in hyperglycemia. This theory has led to an examination of possible buffering and in particular, to a focus on the role of social support in the context of diabetes management (Cohen and Wills, 1985).

According to Lazarus and Folkman (1984) the functional effects of primary and secondary appraisals are mediated by actual coping strategies based on two dimensions: (1) problem management: problem-management strategies are directed at changing the stressful situation by active coping, problem solving, and information seeking. (2) Emotional regulation: emotion-focused coping efforts are directed at changing the way one thinks about stressful situations. These strategies include seeking social support and venting feelings, as well as avoidance, and denial.

When a stressor is perceived as highly threatening and uncontrollable, a person may be more likely to use disengaging coping strategies (Taylor, 2006). Each of these strategies shifts attention away from the stressor. This intentional shift may allow individuals to minimize their initial distress by avoiding thoughts and feelings about the stressor (Fletcher, 1980).

Pearlin and Schooler, (1978) (cited in Grey, 2000) defined coping as behavior that protects people from being psychologically harmed by problematic social experiences. Coping is actually an activity to seek and apply solutions to stressful situations or problems that emerge because of stressors (Sincero, 2012). Coping serves a protective function that can be exercised in three ways: (1) by eliminating or modifying stressful conditions, (2) by perceptually controlling the meaning of the stressor, and (3) by keeping emotional consequences in bounds.

2.5 Factors contributing to diabetes self-management

Several factors contribute to diabetes self management. The U.S. Department of Health and Human Services (2007) points out that health status is expected to worsen, especially in vulnerable, high-risk populations including African Americans, Hispanics, American Indians and Alaskan Natives, Asians or other Pacific Islanders, elderly persons, and economically disadvantaged persons. It is crucial for individuals living with diabetes to adhere to a recommended self-care regimen in order to maintain proper metabolic control of the disease. The following examples from the literature illustrate the relationship between various determining factors and adherence to health promoting behaviors involved in type 2 DM self-management.

2.5.1 Individual Factors

According to Pender (2002) individual factors are considered as biological, psychological, or sociocultural. Individual factors like age can affect diabetes care treatment, especially in older patients. Older individuals with diabetes often have a poorer socioeconomic situation, experience greater social isolation, have a higher frequency of depression, and are often more vulnerable to episodes of glycemiahypoglycemia. Age is also associated with worsening complications as aging eyes become more impaired with diabetic retinopathy, and aging feet become more impaired with diabetic neuropathy. Trief et al. (2011) explain that psychosocial changes associated with aging include older individuals dealing with multiple losses of family and friends, and changes in function and roles. This can cause diabetes self-management to be more challenging for older patients.

Vincze, Barner, and Lopez (2004) explored the relationship between individual factors and adherence to blood glucose monitoring. The individual factors

included age, length of diabetes diagnosis, and perceived health status. No significant relationship was found between these individual factors and adherence to blood glucose monitoring. Studies by Rhee et al. (2005) and Lee et al. (2009) explored the relationship between individual factors and glycemic control based on HbA1c levels.

Rhee et al. (2005) explored the relationship between age, length of diabetes diagnosis, and HbA1c levels. This study had a sample size of 1560 and obtained significant results. The length of diabetes diagnosis was found to be positively related to HbA1c level such that the longer the diagnosis, the higher the HbA1c level. Age was negatively related to HbA1c level, indicating that the older the individual, the lower the HbA1c level.

Conversely Lee et al. (2009) explored the relationship between the same variables (age, length of diabetes diagnosis, and HbA1c levels) but no significant relationship was found. However, this study had a smaller sample size of 55. This demonstrates that personal factors can be valid predictors of health outcomes.

2.5.2 Interpersonal factors

According to Pender et al. (2002) interpersonal factors are cognitions relating to the behaviors, beliefs, or attitudes of others. These perceptions may or may not correspond with reality. Primary sources of interpersonal factors are family, peers, and health care providers. Pender et al. (2002) state that these interpersonal processes affect the predisposition to engage in health-promoting behaviors and are generally defined as social support. Nicklett and Jersey (2010) explored the relationship between social support, treatment observance, and health outcomes. Treatment specific support was provided to participants including assistance with diet, exercise, and blood glucose monitoring. Although a significant positive relationship was found between support and regimen adherence, there was no significant relationship was found between support and health outcomes. The researchers concluded that, although illness-related support was significantly related to adherence, this did not necessarily translate to improved or maintained health outcomes.

Ruggiero et al. (2010) compared HbA1c levels between groups of individuals with diabetes where one group received additional support from medical

assistance coaches while the other group received the usual treatment intervention. No significant differences were observed in HbA1c levels between the two groups.

Sacco et al. (2009) explored the relationship between a telephone social support intervention and both health-promoting behaviors and health outcomes. Diet and exercise adherence were the health-promoting behaviors at issue in this study, while HbA1c and BMI were the health outcomes. Social support intervention was found to have a significant positive relationship on adherence behaviors in diet and exercise, but there was no significant relationship found between social support and health outcome variables of HbA1c and BMI. Although the Sacco et al. (2009) study was conducted over a six month period, there was no significant change in HbA1c levels or BMI for the experimental or the control groups.

Social support

Krause (2010) defined social support as dealing with cognitive, emotional and behavioral factors to understand behavioral change. Similarly, Bandura, (1986) described social cognitive theory as an internal mental process that may or may not be reflected in immediate behavioral change.

Types of social support: Barerra (1986) proposed three classifications of social support that include: 1) social surroundings, 2) received support, and 3) perceived support. Firstly, social surroundings refer to the proportion of interaction that an individual has with members of a social network. Secondly, received support includes the emotional and instrumental help that is actually provided by network members to an individual. Thirdly, perceived support is an individual's perception that support would be available from network members were it necessary. Krause, (2010) pointed out that perceived support exerts the strongest and most consistent effects on health and well-being in later life.

Cohen and Wills (1985) state that the stress-buffering model of social support has the potentiality to protect individuals from the negative influence of stressful events. Social support and self-management for diabetics has focused on social networks rather than perceived support.

Social Support in Diabetes patients: Surprisingly, little research has examined the relationships between social support and self-management among adults with diabetes. Trief et al. (2011) measured the areas in which individuals experienced

problems with self-care. The researchers also included a scale that measured potential physical and mental limitations an individual might experience due to their diabetes. They measured the psychological well-being of their participants. In their second study Damush (2010) utilized the same sample from the first study and found that those with high marital adjustment at time 1 had higher perceived intimacy and were more satisfied with aspects of adaptation to their illness 2 years later. However, the quality of the marital relationship was not significantly associated with glycemic control. Overall, the findings from both of these studies suggest that a high quality marital relationship (believed to include perceived support) results in better well-being.

However, social support is defined by Krause (2010) as dealing with cognitive, emotional and behavioral issues to accept behavioral change. Similarly, Bandura, (1986) explained social cognitive theory as an internal mental process that may or may not be reflected in immediate behavioral change. Barerra (1986) proposed three classifications of social support that include: 1) social surroundings, 2) received support, and 3) perceived support.

For Barerra (1986), social surroundings refer to the proportion of interaction that an individual has with members of a social network. Secondly, received support includes the emotional and instrumental help that is actually provided by network members to an individual. Thirdly, perceived support is an individual's perception that support would be available from network members were it necessary. Krause (2010) pointed out that perceived support has the strongest and most consistent effects on health.

The American Diabetes Association has stated that modest weight loss and reduced energy intake will help insulin-resistant individuals improve glycemic control. Boucher et al. (2007) state that achieving an ideal BMI has been recommended for patients with diabetes. Diet and exercise both contribute to the loss of weight, which reduces BMI (Franz, 2007). A weight loss of as little as 5-10% of initial weight can improve weight related complications such as hypertension, dyslipidemia, and type 2 diabetes, even if the person is still considered overweight. Unfortunately, dieters may not be satisfied with such modest goals and sometimes conclude that a desirable weight loss is unachievable (Kazaks & Stern, 2003).

Franz (2007) stated that although a reduction of BMI has been associated with an improvement in diabetes, it is unclear if the weight loss itself is associated with a reduction in HbA1c levels or if it is the result of dietary changes leading to a decrease in total energy intake. Plotnikoff et al. (2009) explored the relationship between dietary behaviors, BMI, and exercise. A statistically significant effect was found for both BMI and exercise for participants who reported more fruit and vegetable consumption. This dietary behavior was associated with a lower BMI and an increase in exercise frequency. This study demonstrated that the health-promoting behavior of diet can be related with another health-promoting behavior and a healthy outcome.

Castillo et al. (2010) explored the effect of a diabetes empowerment education program on diet, exercise, BGM, depression, and HbA1c levels. A significant effect was found on all the variables from the diabetes empowerment program. A significant increase in healthy dietary behaviors, exercise, and BGM was found while a significant decrease in reported in depression and HbA1c levels. Vallis et al. (2005) explored the effect of a diabetes self-management education program on BGM, diet, exercise, and HbA1c levels. A significant effect was found on all the variables specifically, there was a significant increase in BGM, healthy dietary behaviors, and exercise while significant decreases in HbA1c levels were noted.

2.5.3 Community factors

Community factors include the responsibilities and functions of health care workers in a specific assignment that includes activities based on a common role. A majority of diabetic patients receive diabetes care from their physicians. However, a role for non-physician health care professionals in the treatment of diabetes has emerged over the last 25 years. There are many community resources for diabetes care to help people with type 2 DM in order to limit diabetic complications (Loveman et al., 2006). Evidently, complications of diabetes are often found in the context of community care delivered as a form of general care (Zgibor, 2002). Community factors include education and counselling.

Education: Loveman et al. (2006) have indicated that education is the most important community related factor used to share information of disease control and lifestyle changes with diabetic patients.

Counselling: According to Brown (1988), community factors require patient counselling by the workers in order to provide proper guidance. People with type 2 diabetes need to understand the implications of a life-long disease and must accept lifestyle changes.

The following section describes ecological models for health behavior that include community policy, group culture, organization, family, friends, small group and individual, biological and psychological factors.

2.5.4 Policy factors

According to Brown (1988) improving access to databases in the institute through links with related agencies is a cost effective way to obtain important services such as nutrition counselling, and peer support groups. Similarly, negotiations with other health care organizations in the setting are often important to enhance continuity of care and expand services or to gather data useful to the registry. For example, ambulatory care organizations negotiated new relationships with neighbouring hospitals for specialized groups to gain access to self-management classes or educating services, or for links with their commercial laboratories to download laboratory data for their registry. Community linkages have been proven to be particularly useful in smaller organizations (Brown, 1988).

3. Qualitative analysis of content

A content analysis was used to manifest and organize the content of communication in form of text, written words, phrases, or symbols describing , action, and event in day-to-day life (Neuman, 2006). The definition of qualitative content analysis has been defined as: “a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns” (Hsieh & Shannon, 2005, p.1278). Moreover, Patton (2002) describe qualitative data reduction and sense-making effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings.

Qualitative content analysis involves a process designed to condense raw data into categories or themes based on valid inference and interpretation. Generating concepts or variables from theory or previous studies is also very useful for qualitative research, especially at the inception of data analysis (Berg, 2001). Hsieh and Shannon (2005) discussed three approaches to qualitative content analysis, based on the degree of involvement of inductive reasoning. The first is conventional qualitative content analysis, in which coding categories are derived directly and inductively from the raw data. This is the approach used for grounded theory development. The second approach is directed content analysis, in which initial coding starts with a theory or relevant research findings. Then, during data analysis, the researchers immerse themselves in the data and allow themes to emerge from the data. The purpose of this approach usually is to validate or extend a conceptual framework or theory. The third approach is summative content analysis, which starts with the counting of words or manifest content, then extends the analysis to include latent meanings and themes. This approach seems quantitative in the early stages, but its goal is to explore the usage of the words/indicators in an inductive manner.

The process of qualitative content analysis

The process of qualitative content analysis often begins during the early stages of data collection. This early involvement in the analysis phase will help you move back and forth between concept development and data collection, and may help direct your subsequent data collection toward sources that are more useful for addressing the research questions (Miles & Huberman, 1994). To support valid and reliable inferences, qualitative content analysis involves a set of systematic and transparent procedures for processing data. Some of the steps overlap with the traditional quantitative content analysis procedures (Tesch, 1990).

Trustworthiness

Validity, reliability, and objectivity are criteria used to evaluate the quality of research in the conventional positivist research paradigm. As an interpretive method, qualitative content analysis differs from the positivist tradition in its fundamental assumptions, research purposes, and inference processes, thus making the conventional criteria unsuitable for judging its research results (Bradley, 1993).

Recognizing this gap, Lincoln and Guba (1985) proposed four criteria for evaluating interpretive research work: credibility, transferability, dependability, and confirmability.

Credibility refers to the "adequate representation of the constructions of the social world under study" (Bradley, 1993, p.436). Lincoln and Guba (1985) recommended a set of activities that would help improve the credibility of your research results: prolonged engagement in the field, persistent observation, triangulation, negative case analysis, checking interpretations against raw data, peer debriefing, and member checking. To improve the credibility of qualitative content analysis, researchers not only need to design data collection strategies that are able to adequately solicit the representations, but also to design transparent processes for coding and drawing conclusions from the raw data. Coders' knowledge and experience have significant impact on the credibility of research results. It is necessary to provide coders precise coding definitions and clear coding procedures. It is also helpful to prepare coders through a comprehensive training program (Weber, 1990).

Transferability refers to the extent to which the researcher's working hypothesis can be applied to another context. It is not the researcher's task to provide an index of transferability; rather, he or she is responsible for providing data sets and descriptions that are rich enough so that other researchers are able to make judgments about the findings' transferability to different settings or contexts.

Dependability refers to "the coherence of the internal process and the way the researcher accounts for changing conditions in the phenomena" (Bradley, 1993).

Confirmability refers to "the extent to which the characteristics of the data, as posited by the researcher, can be confirmed by others who read or review the research results" (Bradley, 1993, p.437). The major technique for establishing dependability and confirmability is through audits of the research processes and findings. Dependability is determined by checking the consistency of the study processes, and confirmability is determined by checking the internal coherence of the research product, namely, the data, the findings, the interpretations, and the recommendations. The materials that could be used in these audits include raw data, field notes, theoretical notes and memos, coding manuals, process notes, and so on. The audit process has five stages: preentry, determinations of auditability, formal

agreement, determination of trustworthiness (dependability and confirmability), and closure. (Lincoln and Guba,1985).

4. Related literature

Miller et al. (2002) conducted a cohort study in the United States in order to evaluate the impact of nutrition intervention on blood glucose and lipoprotein levels for 92 type 2 diabetic patients aged more than 65 years old. The sample was randomized to an experimental and control group and introduced to a ten week nutrition education intervention. When the patients were evaluated, the experimental group showed a greater improvement in fasting plasma glucose ($p=0.05$) and glycosylated hemoglobin ($p< 0.01$) than the control group. It is clear that older diabetic patients need additional education to achieve metabolic control to reduce morbidity and mortality associated with diabetes (Miller et al., 2002).

Jermy et al. (2003) conducted a randomized controlled community-based study in rural Costa Rica with 75 adults with type 2 DM who were assigned to the intervention and control group and participated in a 12 week community-based intervention of nutrition classes and exercise. It was found that the intervention group lost 1 ± 2.2 kg while the control experienced weight gain of 0.4 ± 2.3kg ($p=0.028$). Fasting plasma glucose decreased 19 ± 55mg/dl in the intervention group and increased 16 ± 78 mg/dl in the control group ($p=0.048$). While glycosylated hemoglobin decreased $1.8 \pm 2.3\%$ in the intervention group and $0.4 \pm 2.3\%$ in the control group ($p=0.028$). Thus, these results show the glucose control of type 2 diabetic patients can be improved effectively in developing nations through community-based, group-centered, public health interventions addressing nutrition and exercise.

Hamdan (2007) conducted a study in order to evaluate the long-term effect of a diabetes education program to increase knowledge and promote healthy lifestyle behaviors in adult patients with type 2 diabetes. In this study, six patients enrolled in educationalprogram classes sponsored by Mountain State Health Alliance (MSHA) between October 2004 and October 2005. At the end of the program, results reported a good knowledge of diabetes management among the participants. In addition, a positive relationship between HbA1c and weight changes of all six participants was reported.

Stegall (2008) conducted a study in order to determine the feasibility of a paraprofessional-led multifaceted six-week education program for adult African Americans of lower income and educational level with type 2 diabetes. The results suggest that the paraprofessional model of nutrition education is an effective way to improve important health measurements and decrease diabetes related health costs to the community. A quasi-experimental design consisted of a control group and an experimental group with pre and post-test. The experimental group showed a significant decrease in systolic bloodpressure by 9.24mm./Hg., with a fasting blood sugar decrease of 25.6mg/dl., decrease in triglycerides by 32.29 mg/dl and decrease in cholesterol of 26mg/dl. These results suggest that such a program may lead to a reduction in complications among African Americans with type 2 diabetes.

Keeratiyutawong et al. (2005) tested the effect of a new self-management program on knowledge, self-care activities, quality of life, and glycosylated HbA1c in patients with type 2 diabetes. Eighty-one subjects with type 2 DM were assigned to either the self-management or the control group. The results show that the self-management group had higher mean scores of knowledge, self-care activities, and quality of life than the control group at three and six months. The mean GHb levels in the self-management group were lower than in the control group at three and six months but the differences were not statistically significant. The findings indicate the potential effectiveness of a diabetes self-management program for improving both physiological and psychological effects of the disease.

Panlamlert (2009) compared HbA1c and blood pressure levels in diabetic older people at high risk of diabetic retinopathy in an experimental and a control group. In this study the control group got traditional nursing care whereas the experimental group obtained eight weeks of care based on a self-management program. The findings show that the average HbA1c and blood pressure of older people with diabetic retinopathy after receiving the self-management program was lower than before.

Rudkhong (2006) conducted quasi-experimental research and compared HbA1c and quality of life of elderly people with diabetes in the experimental group and also compared control group with that of experimental group at diabetic clinic at Khuankanun, Thailand. The data was collected through questionnaires. The findings

showed that the HbA1c of elderly people with diabetes after received the program was significantly lower than those of receiving before; whereas the quality of life of elderly people with diabetes after received the program was significantly higher than those who received before.

Thongsalee (2007) conducted quasi-experimental research testing the effects of self management and yoga practices on plasma glucose and health levels in patients with type 2 diabetes. Questionnaires were used to collect data which showed that the posttest plasma glucose level score of the experimental group was lower than that in the pretest phase whereas the posttest mean score of well-being was higher than that in the pretest phase. However, the mean score of both plasma glucose and well-being in the experimental group were significantly higher than that of the control group.

Navicharern (2009) examined the effects of a multifaceted nurse coaching intervention on diabetic complications and satisfaction in people with type 2 DM using experimental and control groups. The researcher compared diabetic complications with patients' self perceptions and physiological variables including HbA1c level, blood pressure, LDL-C level and satisfaction. The findings show that people with type 2 diabetes who received the nurse coaching intervention possessed lower symptoms of diabetic complications in the 12^{th} week than those who did not receive the intervention.

Kongsakul (2009) conducted a study at a community hospital in Pathumtanee province, Thailand in order to determine the effects of self-management skill or a training program based on glycemic control and blood sugar level among patients with type 2 diabetes. The researcher used an evaluation form on self-management behaviors in order to measure glycemic control and fasting blood sugar level.

Sowattanangoon, Kotchabhakdi, and Petrie (2009) examined Thai patients who managed their diabetes. The study used face-to-face interviews at two public hospitals in Bangkok. The findings show that Thai patients manage their diabetes based on their beliefs that include both modern and traditional knowledge about diabetes. Some patients believed that their illness was caused by biomedical factors including genetics. The findings also revealed that some aspects of Thai life facilitate diabetes self-management while others hamper good control of the illness such as

Buddhist values of moderation that contribute positively to dietary change but may impede some self-management strategies.

Siriwatanamethanon and Buatee (2009) explored illness perception and management in older people living with diabetes mellitus. Fourteen older people with diabetes in the north eastern part of Thailand participated in this study through interviews. Data was collected in three categories including knowledge of diabetes mellitus, modification of lifestyle and networks for illness management that enabled older people to live with diabetes mellitus. The management program resulted in the desire to live with chronic illness with a maximum level of well-being, to be able to perform normal daily life functions and live with a good quality of life generally. The findings are significant for understanding older peoples' self-management. This understanding can support the appropriate healthcare focus on the needs and expectations of older people with diabetes mellitus to assist them to participate and cooperate in illness management.

Wattana (2006) investigated unrestrained diabetes as the most important health problem in Thailand. The objective of this study was to determine the effects of a diabetes self-management program on glycemia control, cardiovascular risk, and quality of life in 147 diabetic patients. Type 2 diabetic patients who met the research criteria were randomized into two groups for a period of 6 months: the experimental group received a diabetes self-management program and the control group received the usual nursing care. The findings indicate that the experimental group demonstrated a significant decrease in HbA1c level with an increase in quality of life compared to the control group.

To conclude from the previous studies of self management of type 2 diabetics found self mangement programs can reduce blood sugar levels and HbA1c (Navicharern, 2009; Kongsakul, 2009; Thongsalee, 2007; Venkat et al, 2003). In contrast, other studies reveal that plasma glucose levels and HbA1c in a treatment group was not significantly lower than those of a control group (Deesiang, 2006; Jaromsit, 2002; Keeratiyutawong, 2005; Konghan, 2010; Rudkhong, 2006; Panlamlert, 2009). These studies were conducted by healthcare providers in DM clinics at hospitals and did not address management from diabetic individuals' perspective.To provide meaningful information and understand what individual diabetics experience

as they live with the condition and how they manage their daily lives while trying to control blood sugar levels, prevent complications, and maintain quality of life, a qualitative inquiry is appropiate to explore the self management processes within natural contexts and to gain insight from diabetics'own perspectives on self-management. The research show the result is not sustain. Most of program finished within two-three month. There is not program to continue for a long time.There is no intervention to explore the real time of diabetes self-management.

CHAPTER III

RESEARCH METHODOLOGY

This qualitative study was carried out in a general hospital in Thailand. This chapter presents the methodology and procedures used in the study. This chapter is divided into seven sections: 1) research design, 2) research setting, 3) participants, 4) ethics approval, 5) research instruments, 6) data collection, and 7) data analysis.

1. Research Design

The purpose of this study was to identify issues around self-management from the perspective of Thai adult patients with type2 diabetes. In-depth interviews were used to describe self-management to control blood sugar by patients with type 2 DM who were treated at a selected hospital.

The researcher reviewed the literature for background knowledge of related research and used in-depth interviews to collect data. Open coding or substantive coding was used to conceptualize all trends in the data. To do so, the researcher compared data and put into new conceptual categories. After that, the researcher compared, renamed, and modified the concepts to sharpen the developing picture.

2. Research Setting

The research setting was a general hospital located in central Thailand. This hospital is under the authority of the Ministry of Public Health. The hospital employed 35 doctors and 287 nurses of which five medical specialists operated a diabetes mellitus clinic mornings (9 am-12 pm) Monday through Friday. The clinic had two advanced practice nurses (APNs) to take care of patients with diabetes mellitus: one was responsible for in-patients and the other for out-patients. Three general nurses (GNs) served to screen patients with diabetes mellitus (Selected Hospital Statistics, 2011).

Services provided at the diabetic clinic are as follows. The patients were screened by the GNs and those found to have secondary health problems such as foot, eye, kidney, or nerve conditions were transferred to the appropriate departments to receive more specialized care according to their complication or needs. The hospital provided a foot clinic operated by specialists, both physicians and nurses, so that patients with foot problems would be effectively taken care of effectively. The diabetic clinic offers the analysis of HbA1c for all patients with diabetes mellitus once a year in accordance with Health Insurance Policy.

In 2010, the population of Ratchaburi province where the study was conducted was 839,075, with 409,599 males and 429,476 females. The province had 25,339 patients with diabetes (Selected Provincial Health Office, 2010). The selected hospital reported there were 5,314 patients with type 2 diabetes, 12.58 % of whom (669) were able to control their blood sugar (HbA1c <7) (Selected Hospital Statistics, 2011).

As the duties of the GNs in the clinic included screening and transferring patients with type 2 diabetes, the researcher asked for their assistance in selecting patients with type 2 diabetes to participate in this research. The nurses consented to do so, and patients with type 2 diabetes were selected according to criteria set by the researcher.

3. Participants

The participants of the study were 18 patients with type 2 diabetes being treated at the selected hospital. The purpose of this study was to explore how they managed their health and the disease in order to control their blood sugar at least a year before taking part in the study. The criteria for selecting participants to the study were as follows.

Selection of Participants

Eighteen patients with type 2 DM voluntarily consented to participate in the study. All had been in controlling their blood sugar, with an HbA1c of less than 7, for at least 1 year before selection for the study. Most learned that they had type 2 DM as a result of complications which led them to their doctors While others learned incidentally during an annual physical examination. A few had discovered their

condition after being persuaded by health volunteers to have a check-up. All admitted that type 2 DM might be a cause of death and thus felt sad.

There were more males (10) than female (8) while the youngest participant was 41, and the oldest 59. Approximately half were aged 51-59 and married. Some participants were widowed. The lowest educational level was grade 4, and the highest was a bachelor's degree. Most met and spent some time each day with their friends and relatives with whom they shared their experiences of coping with their disease. They also sympathized and encouraged other participants to do as doctors and nurses suggested. Three of these participants are described below.

The youngest participant was female and had completed grade 6. She earned a modest income selling Thai food so she and her family had to be economical in all areas of life. She cooked for herself and her family. She exercised by walking 15-30 minutes a day. Her husband took care of her and reminded her to control her food consumption. As her mother had also had type 2 diabetes, she had learned about the disease from her mother's experiences. Her mother also gave her advice about how to take care of herself to prevent developing diabetes complications. She felt more confident that she could live happily despite having type 2 diabetes.

Two participants had taken early retirement. One had been in the military and was happily married for more than 25 years. His wife took good care of him and as she enjoyed cooking, she prepared food for him every day which they ate together. This led him to become overweight (68 kg, 172 cm). After retiring, he took up gardening which he found rewarding and he also had more time to do exercise. The other retired participant had been an irrigation worker as was his wife. He had a drinking problem and was hemiplegic due to stroke and hypertension. His condition was so bad that he had to be treated at the ICU. When he recovered, he took early retirement and stayed home which he thought allowed more time for recovery. He lived in subsidized housing provided by the Royal Irrigation Department. He tended to be alone during the day and tried to do minor housework such as sweeping and dusting. He walked for 15 minutes every evening. His friends and neighbors came to see him in the evening, and both he and his friends enjoyed talking and eating together.

After checking the database of the hospital, the researcher selected 60 participants to participate in this study. During follow-up at the diabetic clinic in the

Out Patient Department (OPD), nurses approached and invited them to participate in this study. The research project, objectives of the study, and what patients would be expected to do if they participated in this study were explained. The patients were also informed that if they joined this study voluntarily, their participation would not affect their health condition, treatment, or nursing care. When these patients agreed to join the research project, the nurses brought them to see the researcher at the meeting room, which was located next to the diabetes clinic. The researcher introduced herself to the patients, invited them to participate in the research project, and provided more information about the research project. When they agreed to participate, the researcher also asked patients to share their experiences of how they took care of themselves in order to control their blood sugar at the normal level (HbA1c less than 7).

Of the 60 patients selected, 10 did not want to participate in the study which left 50 participants who volunteered. The researcher started by interviewing three participants consecutively and individually on different dates and times. Then the details of the interviews and results of data analysis were shown to advisors for comments and suggestions before the rest were interviewed. After the researcher had interviewed 18 participants consecutively and individually on different dates and times, she found that the data they presented was unchanged so the researcher stopped collecting data. No interview was done with the other 32 participants.

Criteria for Participant Selection

1) Patients with type 2 DM and receiving treatment at the selected hospital.

2) Patients able to control their blood sugar for at least 1 year maintaining HbA1c of less than 7.

3) 40 – 60 years of age.

4) Patients who volunteered to take part in the study.

4. Ethics approval

This study was conducted with patients with type 2 diabetes so the IRB was done strictly. The IRB, number R2011-007, was granted from the selected hospital. The researcher submitted documents including the research proposal, research tool (semi-structured interview) and participant consent form to the IRB committee to ask for permission to conduct this study and cooperation collecting data. After the director gave permission, the researcher contacted the nurses at the diabetes clinic and asked for their help in selecting patients according to the research criteria, to participate in the study. The selected patients were also informed that if they joined this study voluntarily, their participation would not affect their health conditions, treatment, or nursing care. The researcher asked the selected patients to sign the consent form and a contract before collecting data. The patients were informed of the purpose of the study, the benefits of the study, the assurance of confidentiality, and the right to withdraw from the study at any time.

Moreover, the researcher gave subjects them additional information by phone after they had all participants of the study agreed to participate in the interviews. In addition, those who also, if they did not wishfeel free to discuss certainany topicss, they could refuse to answer or withdraw from the not to participate in the interviews at any time. See details of the consent form and the agreement contract are in Appendix B. The researcher asked these selected patients for prior permission to make audio recordings of do interviews and audio record before interview. The Eethical issues were considered throughout the whole process of theis study and all data collected were kept in confidence.

To maintain confidentiality, the researcher conducted all interviews by herself. The researcher kept all patients' responses confidential by collecting, transcribing, and keeping all data herself and when finished, kept the verbatim accounts in the researcher's safe box that only the researcher had access to. The identity of the participants was kept confidential so names and their family members were not mentioned anywhere. Five years after study completion, all data will be destroyed by the researcher.

5. Research Instruments

In-depth semi-structured interviews and triangulations were used to collect data. Interview guidelines were followed as detailed below.

The researcher interviewed and kept notes to collect data on participants herself. The study was designed and conducted according to the research purpose and methodology to obtain reliable results. For this purpose, the researcher did prior and concurrent reviews of related literature on qualitative research and self-management of patients with type 2 diabetes and related documents concerning type 2 diabetes, incidents, and complications.

5.1 Literature Review

The researcher reviewed the literature to identify the scope, range, and types of previous studies. Various articles and textbooks on type 2 diabetes were reviewed to discover new findings and ideas. For this purpose the researcher needed to create the research questions and methodology for the study which she did using the literature as guide to consider the main points of the data for systematic focus.

Additionally, the literature was applied to elaborate and confirm the categories of the findings. To be precise, the researcher reviewed literature relevant to qualitative research, research objectives, and research problems of this study i.e. self-management strategies of patients with type 2 diabetes. Sources used were books, journal articles, and websites. Literature related directly to self-management strategies of patients with type 2 diabetes and related incidents and complications were reviewed. The researcher applied this knowledge to conduct in-depth interviews with participants.

5.2 In-depth semi-structured interviews

The tools used to assist the researcher during in-depth interviews were as follows:

5.2.1 An audio-tape recorder was used to record interviews.

5.2.2 Semi-structured interview questions were created following guidelines developed according to the self-management strategies of patients with type 2 diabetes, its incidents and complications. The questions were formed from the review of literature. The questions were open-ended so participants would be able to

openly express their wants and feelings. The process of developing interview guidelines was as follows:

5.2.2.1 The researcher grouped each topic derived from the literature review to form questions for interviews. These questions were guidelines only so there were no fixed questions. In the real interview context, questions used were flexible therefore, participants were encouraged to speak freely about their daily life and ways used to control their blood sugar within normal levels. The interview guidelines were submitted to the advisor and co-advisor for verification.

5.2.2.2 The researcher trialed the interview guidelines with 3 participants. After completing the interview, the researcher transcribed from the tape recording, checking for accuracy and validity of content. The data were then submitted to the advisor and co-advisor for verification after which modifications were made on the interview questions.

5.2.2.3 The researcher consulted both the advisor and co-advisor throughout the process of conducting this research in all aspects including interview techniques, data content, and grouping.

The in-depth interviews were used mainly to probe the participants' perceptions, thoughts and feelings on how to manage type 2 diabetes to achieve effective blood sugar control. At the first stage of the interview process, the participants were asked to give their general understanding and opinions on type 2 diabetes. Then open-ended questions were employed to elicit meaningful answers using the participants' own knowledge, experiences, and practices on self-management strategies used to control their blood sugar. Open-ended questions typically began with words such as, "Why" and "How".

To conclude, in-depth interviews were used in this study and insightful and meaningful data were obtained.

5.3 Triangulation

Triangulation is a method used by qualitative researchers to check and establish validity in their studies by analyzing a research question from multiple perspectives. Patton (2002) cautions that it is a common misconception that the goal of triangulation is to arrive at consistency across data sources or approaches; in fact, such

inconsistencies may be likely given the relative strengths of different approaches. In Patton's view, these inconsistencies should not be seen as weakening the evidence, but should be viewed as an opportunity to uncover deeper meaning in the data.

Ever if triangulation is not a good fit with some forms of qualitative research, especially interpreter, there is still a need to conduct research in such a way that the consumer has some confidence in what you say. There are a number of ways to do that:

Member checks. A more interpretive approach to developing conclusions in called member checks.

Participatory research: An even more interpretive approach is generally used in the various forms of participatory research. The participants are not presented conclusions the research has formulated, however tentatively. They actively participate in the formulation of conclusions.

Extended experience in the environment: Another way of supporting hermeneutic (understanding) research is to spend time in the environment under study.

6. Data Collection

The purpose of this study was to explore patient self-management of patients with type 2 diabetes who were treated at the selected hospital to manage their health and control their blood sugar levels effectively. Data were collected by using in-depth interviews between August 15, 2011 and December 6, 2011. The interactive nature of in-depth interviews allowed the researcher to gain more details ofthe patients' experiences of diabetes self-management. In-depth interviews allowed the researcher to gain access to a wide variety of ideas, views, and experiences on diabetes self-management in each patient with type 2 diabetes. Data collection was done as follows.

6.1 Preparations for Data Collection

Prior to conducting the interviews and collecting the data, the researcher made certain preparations.

6.2 Researcher Preparation

6.2.1 The researcher prepared herself to conduct this qualitative research by attending an online qualitative research course provided by Assistant Professor Dr. Areewan Oumtanee with whom the researcher discussed methodology.

6.2.2 The researcher studied the theories, previous research, and related literature on self-management in people with type2 diabetes to provide guidelines for the researcher to develop interview questions. This information helped the researcher to obtain, interpret, and verify data which were presented by participants.

6.2.3 The researcher also developed her data collection skills through study with an advisor who was an expert in conducting qualitative research and by studying textbooks such as Qualitative Research in Nursing (Oumtanee, 2006). This included in-depth interview and listening skills. The researcher also studied relationship building skills. The researcher studied the techniques of interviewing and dealing with the reactions of participants. The researcher then did a trial with 3 participants from whom data were collected before interviewing the other 15.

6.2.4 The researcher realized that and collecting data from human subjects had to be done in strict confidentiality. The researcher treated participants as people without judgement or actions throughout the research process.

6.2.5 The researcher consulted the advisor and co-advisor throughout the process of the study regarding issues such as interview techniques, meaningful data, data grouping, and the subjects.

6.3 Data Collection Preparation

6.3.1 The researcher asked for permission to collect data from the director of the selected hospital. The request explained the objective of the research, data collection methods, and benefits of the study. After permission was granted, the

researcher asked for assistance from nurses at the diabetes clinic to identify patients with type 2 diabetes.

6.3.2 The researcher and the nurse recruited patients with type 2 diabetes to collect data.

6.3.3 The researcher collected data from participants at their convenient place.

6.4 Participant Preparation

The participants were prepared to be ready and confident to provide data, as well as express their ideas, or feelings.

6.4.1 The researcher asked participants to choose a convenient time and place for the interview.

6.4.2 The researcher explained the interview process and human rights to participants one more time.

6.5 Conducting In-depth Interviews

The researcher explained the objective of the study and rights to the participants who were willing to share their experiences. After the participants signed the consent form, the researcher began the interview using guideline questions. Each interview lasted 30-45 minutes. The researcher proceeded as follows.

6.5.1 The researcher observed participants' facial and emotional expressions, manner, actions, and reactions in the interview and modified the guideline questions were modified accordingly. The researcher took hand-written notes on main ideas and issues which came up during interviews.

6.5.2 The researcher used interviewing techniques such as probing and pausing to allow participants time to think, review and explain themselves in order to elicit data in the interviews. She paid attention to all feelings and emotions expressed by participants and led them to the research topic smoothly within the ethical guidelines. Interviews lasted an average of 30 minutes.

7. Data Analysis

Data analysis is the process that continue during data collections. Final analysis is mean the end of data collections. Oumtanee (2006) describe data analysis in qualitative research that the steps of analysis are consisted that follow:

7.1 Data checking: For test the data enough, creditable, and corrected.

This step combine of checking the tool for collecting data, checking the method for collecting data, and checking from peer person. Especially the researcher is the important tool for collecting data.

7.2 Arranging data: this step is separate data for data analysis.

7.3 Transfer relation: The researcher use analytical for taking data to be categories in the relationship.

7.4 Interpreting: The researcher had more data for understand the theme.

7.5 Conclusion: The researcher took the data from observation and interview for confirm analysis.

The researcher analyzed data using content analysis. Transcripts made from the audio tapes were read and reread and compared to the recordings by the researcher to check for the accuracy. The transcripts were then checked by the advisor and co-advisor. Thus, three people read and reread the transcripts many times to describe the patients' understanding and reasoning and to identify new research questions. Data were then organized into initial and higher themes. Data of similar types were combined in the same theme and data with differing meaning put into separate themes.

CHAPTER IV

RESULTS

This chapter presents the participants' demographic information and study findings. The objective of the study was to describe self-management processes to assist patients with type 2 diabetes to control their blood sugar. To meet this objective, in-depth interviews with audiotape recordings were used to gather relevant data from the participants. The findings are described as follows.

Participants' demographic information

Eighteen patients, 8 women and ten men, participated in this study. Most were over 50 (mean = 53.28), married, of low educational levels (Grade 4), and self-employed or had taken early retirement. Length of time since diagnosis was 4.44 years. Summaries of the demographic characteristics of the participants are shown in Table 1 and Table 2.