CHAPTER I

INTRODUCTION

Background and Significance of the Research Problem

Diabetes Mellitus (DM), a metabolic disorder characterized by hyperglycemia from defects of insulin secretion, insulin action, or a combination of both, has been identified as a leading cause of death and disability globally (King, Aubert, & Herman, 1998). Rates of diabetes are increasing rapidly. Predictions compiled by the World Health Organization (WHO) indicated that the number of people with all types of diabetes will rise to 300 million by the year 2025, that is a 122.22 % increase from 1995 (135 million)(Cockram, 2000). Type 2 diabetes is the most prevalent form of this disease. The number of people with type 2 diabetes will be at least 350 million people worldwide by the year 2030, which is double of the current number. Similarly, diabetes mellitus is a common health problem in Thai people. The prevalence of diabetes in Thailand increased from 33 cases per 100,000 in 1985 to 147 cases per 100,000 in 1997 (Bureau of Health Policy and Plan, Ministry of Public Health, 2000). The national prevalence of diabetes in Thai adults was 9.6% in 2000 (2.4 million people), while that of the Impaired Fasting Glucose (IFG) was 5.4% (1.4 million people), and still half of all cases are undiagnosed (Aekplakorn et al., 2003). It is estimated that the number of Thai people with diabetes could double in the next decade (Cockram, 2000). Importantly, type 2 diabetes accounted for 97.4 % of all

diabetic patients in Thailand (Benjasuratwong, Suthijumroon, Nitiyanant, & Tandhanand, 1999).

Higher levels of blood glucose are associated with an increase in acute and chronic complications, which affect the patient and their families' financial status, and have been shown to contribute to a decrease in the quality of life (Jacobson, Barofsky, Cleary & Rand, 1988; Ronald, Barbara, & Klein, 1998). Acute complications which include ketoacidosis, hyperosmolar hyperglycemia, and hypoglycemia (American Diabetes Association [ADA], 2003) may lead to death if not properly treated. Furthermore, uncontrolled blood glucose causes damage to various organs including: eyes, kidneys, nerves, heart, and blood vessels, resulting in chronic complications (ADA, 2003; Nathan, 2000). Cardiovascular disease that was accounted for 65% of deaths in people with type 2 diabetes (Gavin, Peterson, & Warren-Boulton, 2003). Chronic complications commonly reported among Thai people with type 2 diabetes include hypertension (22.2%), coronary heart disease (22.2%), cerebrovascular disease 8.2%, peripheral vessel disease (21.3%), large vessel disease (34.8%), small vessel disease (34.3%), and retinopathy (12.5%) (Bhuripanyo et al., 1992). In addition, the quality of life of these patients decreases as complications become more severe (Jacobson et al, 1988; Ronald et al., 1998). The prolong duration of illness not only affects the patient's general health, but also influences their quality of life.

In Thailand, diabetes also affects the patients' family. Some family members have to spend more time taking care of the patients, or leave their jobs to take full responsibility for the patients care. The more severe the complications, the higher the expense for treatments (Chumchia, 1998). The average cost for medical care of Thai people with diabetes was $ 370 per case per year in 2002 (Pornlertwadee, 2002). The

out of pocket cost per visit to an out-patient department was $ 8.40 for diabetic patients without complications, $15.80 for diabetics with hypertension and $ 18.70 for diabetics with heart disease. The annual costs per person per year of out-patient visits for diabetic patients without complications, for diabetics with hypertension, and for diabetics with heart disease were $60.3, $128.9 and $157.37, respectively (Chumchia,1998). In addition, the average health related financial expenditure for patients with diabetes mellitus was $150.46 per year. The expenditure also varied according to the type of treatment (tablets: $135.73 per year, insulin: $261.48 per year, and mixed treatment: $251.23 per year). This expenditure increased with FBG. Financial expenditure related to health problems of people with type 2 diabetes was 127 times higher than health problem related expenditure of general people (Putsuk, 1999). Diabetes mellitus, therefore, affects the physical, psychological and economic health of patients and their families.

Generally, diabetes management aims at glycemic control, prevention of acute and chronic complications, and enhancing quality of life (de Weerdt, Visser, & van der Veen, 1995). Good glycemic control will help preventing complications especially, related to blood pressure control and lipid control. Diabetes management, therefore, encourages people with diabetes to achieve normal or near normal blood glucose and blood pressure. Research findings show that lower blood glucose levels reduce the incidence of microvascular complications, delay or decrease cardiovascular (CHD) risks, and also prevent other complications (Beaser, Garbus, & Jacobson, 1996). Also, the National Diabetes Education Program (NDEP) has begun promoting the "ABC" of diabetes care: A_{1c} level, ***B***lood pressure, and ***C***holesterol level in order to improve outcomes among Americans with diabetes (Gavin et al., 2003). The results

of the tight blood pressure control (< 150/85 mmHg) in patients with hypertension and type 2 diabetes showed a clinically significant reduction in the risk of death related to diabetes, and a delay or decrease in coronary heart disease (CHD), microvascular complications and reduced costs of complications (Grassi, & Monza-Milan, 2004; Turner et al.,1998). To achieve diabetes management, people with type 2 diabetes require effective medical treatment and diabetes self-management that includes behavior changes in dietary planning, exercise and physical activity adjustment, taking medication, and stress reduction (Beaser et al., 1996).

Self-management is widely recognized as a necessary method for maintaining and improving patients' health behavior and health status (Dongbo et al., 2003). Self-management is a learning process that changes behavior (Browder & Shapiro, 1985) and assumes preventive or therapeutic health care activities, particulary in collaboration with health care professionals (Holroyd & Creer, 1986). Effective programs in chronic care included collaborative problem definition, targeting, goal setting, a continuum of self-management training and support services, and active as well as sustained follow up (von Korff et al., 1997). Research findings reported that diabetes self-management education is associated with decreased hospitalizations for diabetes-related problems, and with reduced health care costs (Clement, 1995). In addition, self-management training for patients with diabetes showed positive effects on knowledge, accuracy of self-monitoring of blood glucose, self-reported dietary habits, and glycemic control (Norris, Engelgau, & Narayan, 2001). One important goal of self-management is to enhance the belief that one can perform effective self-management skills (Holroyd & Creer, 1986).

Increasingly it has been recognized that a patient-centered approach is appropriate in lifestyle behavior change and optimal diabetes self-management. Several educational strategies were created for incorporation of knowledge into patient self-management practices. Although many research finding revealed that the level of blood glucose was affected positively by health education (Sanuan, 2000; Uddin, Ahmad, Rahman, & Iftikhar, 2001), other findings showed some patients who, though they had a good knowledge of diabetic diets, could not improve glycemic control (Arunneatara, 1998; Opasanun, 2000). Consequently, focusing on knowledge alone is not enough to influence diabetic control (Coate & Boore, 1996; Moens, Grypdonck, & van der Bijl, 2001). People with type 2 diabetes must have responsibility for the daily management of a condition which affects their health, make appropriate decisions, and manage their daily activities.

Self-efficacy, one's confidence in being able to produce desired self-management behaviors, is a significant factor in promoting behavior change and the ability to perform daily activities that are required to reach a desired health outcome (Bandura, 1977, 1984). Self-efficacy has been shown to be an important variable in improving health behaviors (Moens et al., 2001). It enhances problem-solving techniques to plan realistic and achievable self-management goals. Self-efficacy can empower, encourage, and improve a person's belief in their ability to achieve such goals (Bandura, 1994). Increasing one's confidence can result in an increased motivation for behavioral efforts (Maibach & Murphy, 1995). The strength of self-efficacy determines how much effort one will expend and how long one will persist in their efforts (Bandura, 1977). Previous studies reported that individuals with high confidence in their abilities to adhere to diet and exercise behaviors achieved more

expected outcomes than those who had less self-efficacy (Hickey, Owen, & Fromen, 1992). Therefore, self-efficacy promotes diabetes self-management skills that are needed to assist diabetic patients to make appropriate decisions and adjust aspects of their care to attain glycemic control.

Numerous studies have demonstrated that diabetic patients are capable of obtaining appropriate self-management skills. Results from a systematic review of randomized control trials based on an educational focus (Norris et al., 2001) supported the effectiveness of self-management training in type 2 diabetes on knowledge, frequency and accuracy of self-monitoring of blood glucose, self-reported dietary habits, and glycemic control, particularly in the short term follow-up (< 6 months). However, effects of interventions on lipids, physical activity, weight, and blood pressure were variable and more likely to be positive with interactive or individualized, repetitive interventions. With longer follow up, interventions that used regular reinforcement throughout follow-up seem to be effective in improving glycemic control, especially educational interventions that involved patient participation and collaboration which seemed to produce more favorable effects on glycemic control, weight loss, and lipid profiles than didactic education. In addition, group education is more effective for lifestyle interventions. Findings from an integrative review of diabetes self-management intervention in people with type 2 diabetes conducted by Wattana (2004) showed that interventions used multiple approaches in an intermediate period (6-12 months) had positive effects on HbA_{1c} and had greater significance in decreasing CVD risk factors than those conducted in a short term (< 6 months) and long term period (> 12 months). Although evidence supports the effectiveness of self-management programs in type 2 diabetes, research to assess the effectiveness of

diabetes self-management interventions on sustained glycemic control, decreased CVD risk, and improved quality of life is still needed.

A review of nursing research regarding diabetes mellitus in Thailand revealed that the most common nursing interventions for diabetic patients focused on health education. Other interventions used many strategies to promote glycemic control included mutual goal setting between nurse specialist and diabetic patients (Tongsawatwong, 1990), planned instruction and home visiting (Poomiwisate, 1994; Samana, 1998), group process (Arunneatara, 1998), collaborative symptoms management between nurse and patient (Navicharern, 1999), empowerment in self-care (Suwannaruk, 1999), health behaviors modification (Yodprasit, 1998), and exercise program (Prongpanom, 2002). Result from meta-analysis on diabetic education program provided evidence of the effective of the programs in increasing self-care abilities, knowledge, positive belief and attitude toward disease and improved glycemic control (Likitratcharoen, 2000). Most of the programs followed up after a short term ($\leq$ 4 months). Although many interventions showed statistical significance in reducing blood glucose after entering the program, clinically 45% of the patients still could not control their disease (Hanucharurnkul, 2002). Barriers to blood glucose control in diabetic patients included the difficulty with making food choices every day, difficulty with food preparation, and limiting the quantity of desserts (Sanpaung, 2000). Other barriers found in these patients were lacking in general diabetes knowledge (Puavilai, 1996) and cannot maintain proper dietary control and regular exercise (Wattana & Pothiban, 2003). It can be concluded that effective diabetes management programs should be non-complex, individualized to a person's lifestyle, and reinforced overtime. Additionally, behavior change strategies were much more

effective than didactic methods and diabetes education seemed to be more effective when combined with reinforcement of educational messages.

From available literature, a study that investigated the effects of self-management program on cardiovascular risks and quality of life in Thai people with diabetes was not found. Although evidence showed some success in self-management interventions for people with diabetes in western countries, this program is needed for testing among Thai people. A diabetes self-management program based on the self-efficacy theory (Bandura, 1997), therefore, will be conducted to fill this gap. This program is expected to increase knowledge and diabetic control skilled behaviors, thereby increase glycemic control, decreased cardiovascular risk, and increase quality of life of people with diabetes.

Objectives of the Study

The purposes of this study were to examine the effects of a diabetes self-management program on knowledge of diabetes, glycemic control, cardiovascular risks, and quality of life among people with diabetes.

Research objectives were:

1. To compare knowledge of diabetes, glycemic control, cardiovascular risk, and quality of life of people with diabetes between before and after entering the program.

2. To compare knowledge of diabetes, glycemic control, cardiovascular risk, and quality of life between people with diabetes receiving the Diabetes self-management program and people with diabetes receiving usual care.

Research Hypotheses

1. People with diabetes receiving the Diabetes self-management program will have better knowledge of diabetes than before entering the program.

2. People with diabetes receiving the Diabetes self-management program will have better glycemic control than before entering the program.

3. People with diabetes receiving the Diabetes self-management program will have lower cardiovascular risk than before entering the program.

4. People with diabetes receiving the Diabetes self-management program will have better quality of life than before entering the program.

5. People with diabetes receiving the Diabetes self-management program will have better knowledge of diabetes than people with diabetes receiving usual care.

6. People with diabetes receiving the Diabetes self-management program will have better glycemic control than people with diabetes receiving usual care.

7. People with diabetes receiving the Diabetes self-management program will have lower cardiovascular risk than people with diabetes receiving usual care.

8. People with diabetes receiving the Diabetes self-management program will have better quality of life than people with diabetes receiving usual care.

Definition of Terms

Diabetes self-management program is an intervention based on the self-efficacy and self-management model to promote a set of skilled behaviors which includes: meal planning; physical activity; symptom monitoring; medication taking; management

of acute and chronic complications; and stress reduction. The Diabetes self-management program was operationally defined as an intervention for rural Thai people with type 2 diabetes developed by the researcher with the intention of promoting a person's belief in his or her own ability to perform specific tasks with the intent of achieving in normal plasma glucose control.

Knowledge of diabetes is the patient's cognitive level pertaining. Knowledge of diabetes was operationally defined as the self-report of understanding about diabetes that is measured by the modified Diabetic Knowledge Scale developed by Arunneatara (1998).

Glycemic control is the stage of controlling glucose level in an individual. Glycemic control is operationally defined by the level of fasting plasma glucose and HbA_{1c}.

a) Fasting plasma glucose is a measure of an individual's blood glucose level after eight hours without food or drink, except water. Fasting plasma glucose is operationally defined by the level of blood glucose as no caloric intake for at least eight hours. The normal fasting glucose test is < 100 mg/dl, abnormal glucoses are: stage 1 (Impaired Fasting Glucose [IFG]) = 100 - 109 mg/dl; stage 2 IFG = 110 - 125 mg/dl, diabetes mellitus = 126 mg/dl (ADA, 2003; Nichols & Brown, 2005).

b) Glycosyluated hemoglobin (HbA_{1c}) is a measure of the degree to which hemoglobin is glycosylated in erythrocytes. It is expressed as a percentage of total hemoglobin concentration that reflects the exposure of erythrocytes to glucose. HbA_{1c} levels is operationally defined as an indication of the average blood glucose

concentration during the preceding 2-3 months measured by high-performance liquid chromatography; the normal range is 4.0 - 6.0 % (Polonsky et al., 2003).

Cardiovascular risk (CVD risk) is the condition associated with an increased potential for developing heart or blood vessel disease that include high serum lipid level (total cholesterol, and LDL-cholesterol), and low serum HDL-cholesterol level, high blood pressure level (BP), advancing age (year), and cigarette smoking. In this study, CVD risk was operationally defined by coronary heart disease (CHD) risk in the next 10 years. The total risk scores were evaluated by sum of points for each risk factor and estimated for CHD risk using the formula from the Framingham Heart Study Coronary Heart Disease Risk Prediction Chart (Anderson, Wilson, Odell, & Kannel, 1991; Grundy et al., 1999), and American Heart Association's guideline (Scott, Beaven, & Stafford, 1999).

Quality of life (QOL) is the self-evaluation of a patient's life and health. It includes both negative and positive aspects of one's life. Quality of life was operationally defined as self - reporting of the perception of people with diabetes on their health and their lives. It was measured by SF-36 (Ware, & Sherbourne, 1992) and translated to Thai by Methakanjanasak (2005).

People with diabetes were people aged 35 and older diagnosed with type 2 diabetes and having a fasting plasma glucose level of more than 140 mg % for at least two follow-up visits.