The Effect of a Health Belief Model Based Education Program to Prevent Diabetes Complications on Dietary Behaviors of Indonesian Adults with Type 2 Diabetes Mellitus

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Thesis Title   The Effect of a Health Belief Model Based Education Program to Prevent Diabetes Complications on Dietary Behaviors of Indonesian Adults with Type 2 Diabetes Mellitus

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ABSTRACT

The purposes of this quasi-experimental research, on Indonesian adults with type 2 diabetes mellitus (T2DM), were to: (a) compare dietary behaviors before and after attending a Health Belief Model (HBM) based education program; and, (b) to compare dietary behaviors between those who received the program and those who received routine diabetic health education.

Purposive sampling was used to recruit forty adults with T2DM who attended at the outpatient department of Arifin Achmad Hospital Pekanbaru, Indonesia. The forty subjects were divided into control and experimental group. The control group received routine diabetic health education, while the experimental group received routine diabetic health education and a HBM based education program. The research instruments consisted of Demographic and Health Information Form, Health Belief Form, and a Dietary Behaviors Questionnaire. The questionnaires were validated by three experts and tested for reliability with Cronbach's alpha coefficient. The reliability of the Dietary Behaviors Questionnaire $\alpha = .97$. Descriptive statistics, independent and paired t-tests were employed to analyze data.

The results revealed that after attending the HBM based education program, the experimental group's dietary behavior scores were higher than the scores they obtained prior to attending the education program ($p<.001$), and their dietary behavior scores were higher than the dietary behavior scores obtained by the control group subjects ($p<.001$). Therefore, the HBM based education program was found to be an effective strategy for changing the dietary behaviors of Indonesians adults with T2DM.

My Dedication

To:

Allah S.W.T for giving me the miracle in my life
Prophet Muhammad s.a.w as my true role model
My Mother and Father for their tenderness
My husband and my daughter who giving me happiness
My best teacher who inspires me to be a good teacher
and taught me 'wisdom'
My family and friends who giving me spirit

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CHAPTER 1

INTRODUCTION

Background and Significance of the Problem

Diabetes mellitus (DM) is one of the most common medical problems in the world. Worldwide, it is estimated that 150 million people has lived with DM, and by the year 2025, this number will reach at least 300 million, if the successful strategies will not meet the expected outcomes for the prevention and control. By 2025, approximately 75% of people with DM will be in the developing countries (Aghamolaei et al., 2004).

Indonesia is a developing country with population of 234, 9 million growing annually by 1.5 %, and it is the fourth country having the largest population in the world (Culture Grams World Edition, 2005). The World Health Organization also revealed that Indonesia is the fourth country having the largest number of diabetic patients in the world preceded by India, China and the USA (WHO, 2005). A Diabetic Federation estimated that at least 8.4 million Indonesians were suffering with DM, in 2000 and this number will reach at least 21.3 million by 2030, if people will not change their life styles (Health Department of the Republic Indonesia, 2005).

In the Pekanbaru, the capital city of the Riau Province, one of the 33 provinces in Indonesia, 6,018 patients (5387 outpatients and 631 inpatients) attending medical care at Arifin Achmad Hospital Pekanbaru were diagnosed with DM in 2007 (Medical Record of Arifin Achmad Hospital, 2007). The cause of diabetes disease in Indonesia is life style (rarely carried out the physical activity, often consumed sweet, commonly cooked with coconut milk and oily food). Sweet food increases the level of blood sugar and oily food draught of fat triggered increased the body weight. Increasing of body weight will reduce the sensitivity of insulin, so the level of blood sugar increased (Inti Sari, 2008). The two ethnic groups with the highest prevalence of DM in Pekanbaru, Indonesia are the Minangnese and the Melayunese. Both of these ethnic groups usually have their dishes predominantly

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with high fat foods, spicy foods, and foods commonly cooked with coconut milk, they are also very fond of fried foods (Culture Grams World Edition, 2005). These factors are believed to lead an increasing prevalence of diabetes in Pekanbaru.

Increasing prevalence of diabetes can lead incidence of complications if diabetic patients do not control their disease. The prevalence of microvascular and macrovascular complications was higher in Asians when compared to Europeans (Chowdhary & Lasker, 2002). In Java, Indonesia the highest diabetes complications was sexual dysfunction (50, 9%), followed by retinopathy diabetic (45, 6%), neuropathy (damage to the nerves) (30, 6%), Tuberculosis (15, 3%), hypertension (12, 8%), coronary heart disease (10%), and gangrene diabetic (3, 5%) (Inti Sari, 2008).

Common risk factors such as greater duration of diabetes, hypertension, poor metabolic control, smoking, obesity, and dyslipidemia were more prone to develop diabetic complications. Primary prevention, healthy diet and regular physical activity, protects susceptible individuals. It has an impact by reducing or delaying diabetes complications (WHO, 2006). The morbidity and mortality caused by diabetes mellitus can be reduced by secondary prevention through regular screening, early detection, and appropriate treatment of chronic complications (Yadav, Tiwari, & Dhanaraj, 2008). Furthermore, diabetic patients have to control their disease routinely and dietary adherence to prevent diabetic complications since diagnosed because uncontrolled DM is associated with an increased prevalence of microvascular and macrovascular complications. Uncontrolled DM indicated with a level of patients' blood sugar just over an acceptable level by their current routine treatments (Texas Department of State Health Services, 2002). Long-term sequel of DM complications may include retinopathy, with potential loss of vision, and nephropathy, which leads to renal failure. Hypertension, hyperlipidemia, atherosclerotic cardiovascular disease, peripheral vascular disease, and cerebrovascular disease are also common threats for the people with DM. Some people experience peripheral and autonomic neuropathies, such as numbness and tingling of extremities, oral paresthesia, and burning. People with uncontrolled DM also have impaired wound healing and increased susceptibility to infections (Lalla & D'ambrosio, 2001). If diabetic patients perceived threats (susceptibility and severity) of uncontrolled DM, the patients will have low risk of diabetic complications. Increase the perceived benefits and reduce perceived barriers are also essential part to

prevent diabetic complications by diabetic diet management.

Contributing factors to uncontrolled DM include patients, who are lack of knowledge, no skills to carry out the self-care activities, unconfident to carry out self-care activities, and unaware that self care activities will benefit for them, patients perceived the costs that greater than the benefits, inadequate reinforcements for patients (pay-off) to meet short-term goals and patients' experience of a lack of social support (Speers & Turk, 1982 cited by Snoek, Van der Ven, & Lubach, 1999). Wint et al (2006) studied about knowledge, motivations, and barriers to diabetes control in adults in Jamaica. They found that factors contributing to uncontrolled DM included cultural beliefs and lack of education. People with DM generally have poor knowledge of care and there is usually no consistency in the ways information delivered to them.

Knowledge and beliefs are two important factors that contribute to control DM. Educating diabetic patients is one of the diabetic management to increase patients' knowledge of diabetes, diabetic diet management, and preventing diabetes complications. The potential benefits of diabetes knowledge include a sense of empowerment and improved quality of life (Bruce, Davis, Cull, & Davis, 2003). Diabetic education can promote patients with diabetes to prevent chronic complications, such as neuropathy, nephropathy, and retinopathy. Diabetic education also helps patients to maintain healthy life style and control blood glucose. Many studies tested the effect of education program in Type 2 Diabetes Mellitus (T2DM) on dietary behaviors and found significant change in their knowledge and behaviors (Albarran, Ballesteros, Morales, & Ortega, 2006; Gillibrand & Stevenson, 2006; Hazavehei, Sharifirad, & Mohabi, 2007). Therefore, diabetic education is a significant approach to change dietary behaviors of patients. Albarran, Ballesteros, Morales, and Ortega (2006) studied dietary behavior and type 2 diabetes care. They found a significant increase of nutritional knowledge among the subjects who were attending program regarding diabetic diet ($p = .013$) and diet-health awareness ($p = .001$).

Dietary behaviors are very essential for diabetic management with T2DM patients (Kapur et al., 2008). Education program can improve dietary behaviors by teaching them the concepts of T2DM and four concepts of Health Belief Model which includes perceived susceptibility, perceived severity, perceived benefits, and perceived barriers.

The Health Belief Model, social learning theory, self-efficacy, and locus of control all have been applied with varying success to problems of explaining, predicting, and influencing behavior (Rosenstock, Strecher & Becker, 1994). HBM was used to guide designing the education program, focusing on understanding patients beliefs and trying to modify their dietary behaviors and life style. Hazavehei, Sharifirad, and Mohabi (2007) studied about the effect of education program based on Health Belief Model on diabetic foot care in Kermanshah, Iran resulted in a better foot care in T2DM. This convinces that the HBM promoted self-care behaviors on foot care in patients with T2DM. Another study also showed consistent results that the extended HBM to study the experience of diabetes in young diabetics. They found that HBM explained 12% variance in the young diabetic's adherence to diabetes self-care regime. The extended HBM was a significant model for promoting the socio-psychological factors in the young diabetic's appraisal of their diabetes, which supported adherence to the diabetes self-care regime (Gillibrand & Stevenson, 2006).

According to the HBM, the likelihood of someone will take action to prevent illness depends on the individual's perception that: they are personally vulnerable to the condition; the consequences of the condition would be serious; the precautionary behavior effectively prevents the condition; and, the benefits of reducing the threats of the condition exceed the costs of taking action (Redding, Rossi, Rossi, Velicer & Prochaska, 2000). This study mainly focused on four concepts of the HBM, which include: (1) perceived susceptibility; (2) perceived severity; (3) perceived benefits; and (4) perceived barriers.

In a literature review of HBM studies published from 1974-1984, identified that, across study designs and populations, perceived barriers was the most influential variable for predicting and explaining health-related behaviors. Perceived barriers are one of the crucial variables of HBM an important role to prevent diabetes complications among type 2 diabetic patients. Wdowik, Kendall, Harris and Auld (2001) applied expanded HBM to predict diabetes self-management in college students. They found that the HBM (perceived susceptibility, perceived severity, perceived benefits, and perceived barriers) could predict the diabetes self-management in college students.

According to HBM, the possibility of patients with T2DM to change their behaviors is determined by four factors, which include perceived susceptibility, perceived severity, perceived

benefits, and perceived barriers. In Arifin Achmad Hospital Pekanbaru Indonesia, more than 50% diabetic patients did not get enough health education and preventive knowledge, especially in dietary behaviors (Medical Record of Arifin Achmad Hospital, 2007). Although there is a diabetic education program, which is provided by the doctors and nursing staff in medical wards of the local hospital, it is not presented regularly and it does not cover dietary behaviors and evaluation of patients' behaviors. Besides, they did not perceived threats of DM, misbelieve of diet (dishes predominant with high fat foods, commonly cooked with coconut milk, they like fried foods, fewer vegetable) and most of them did not change their life style since diagnosed T2DM. They are also unaware about the potential benefits of diabetic diet management. They apparently need diabetic education program to change their behaviors for preventing diabetes complications.

Furthermore, HBM has been accepted as an effective education program in enhancing the knowledge of diabetes to change their behaviors. The education program in this study provided concept of T2DM, perceived threats of uncontrolled DM, perceived benefits and perceived barriers of diabetic diet management to improve the patients' awareness to prevent diabetes complications. The program was provided with leaflet, picture of food for diabetic patients, picture of diabetic complications, and sample food for diabetic patient. This study was used several methods to increase the awareness of T2DM patients include: (1) group lecture; (2) group discussion; (3) practice to serving meal according to diet recommendation for diabetes people; (4) use of questionnaires to evaluate the perceptions of subjects. This study examined the effect of HBM based education program to prevent diabetes complications on dietary behaviors of Indonesia adults with T2DM because the patients with T2DM in Pekanbaru, Indonesia needed education of diabetic diet to increase their awareness T2DM patients to change their behaviors and prevent diabetes complications.

Objectives

1. To compare dietary behaviors of Indonesian adults with T2DM receiving HBM based education program before and after attending the education program.

2. To compare dietary behaviors between Indonesian adults with T2DM receiving HBM based education program and those who receive routine diabetic health education.

Research Questions

1. Is the dietary behaviors score of Indonesian adults with T2DM after receiving HBM based education program higher than the score before attending the education program?

2. Is the dietary behaviors score of Indonesian adults with T2DM receiving HBM based education program higher than the score of those receiving only routine diabetic health education?

Conceptual Framework

This study applied Health Belief Model (HBM) to guide the conceptualization of the studied variables (Rosenstock, Strecher & Becker, 1994). The key variables of the HBM included perceived threats (perceived susceptibility and perceived severity), perceived benefits and perceived barriers. Perceived susceptibility is a person's perception or opinion of the chances of getting a certain condition and perceived severity is a person's perception or opinion of the seriousness of illness. Perceived benefits is a person's perception or opinion of the effectiveness of some advised actions to reduce the risk or seriousness of the impact and perceived barriers is a person's perception or opinion of the concrete and psychological costs of these advised actions (Katz, Peberdy & Douglas, 2000).

The conceptual framework of this study consisted of two part, including: 1) teaching the concept of T2DM disease which encompasses definitions, causes, signs and symptoms. The methods for teaching concept of T2DM disease were used by group lecture and group discussion; 2) teaching four concepts of HBM for helping T2DM patients to change perception and beliefs of T2DM patients, such as:

1. Perceived susceptibility of uncontrolled DM (risk factors of diabetes complications)

2. Perceived severity of uncontrolled DM (severity for having diabetes complications)

The methods for teaching perceived threats was used by group lecture, group discussion, asking questions to evaluate the perceptions of subjects, and the picture of diabetic complications.

3. Perceived benefits of diabetic diet management (management of diabetic diet, pharmacological, and non pharmacological management).

4. Perceived barriers of diabetic diet management (the possible barriers of diabetic diet management).

The methods for teaching perceived benefits and perceived barriers of diabetic diet management were used by group lecture, group discussion, practice to serving meal according to diet recommendation for diabetes patients, asking questions to evaluate the perceptions of subjects, identify the possible barriers of diabetic diet management, and how to face the problems. The education program helped the subjects in continuing diabetic diet control to change dietary behaviors. The program was used for teaching the patients to increase the awareness of perceived susceptibility and severity of uncontrolled DM and to identify perceived benefits and perceived barriers of diabetic diet management (Figure 1). Based on literature review, dietary behaviors refer to selecting healthy diet, arranging meal plan, and accounting food calories (Tjokroprawiro, 2007). In this study, the diabetic dietary behaviors included three dimensions: selecting healthy diet, arranging meal plan, and recognizing the amount of food calories. Figure 1 presents the conceptual framework of the study:

The Health Belief Model based education program		
Concepts	**Strategies**	

1. Concept of T2DM
 	
2. Threats of diabetes
  - Susceptibility of uncontrolled DM
  - Severity of uncontrolled DM
 	
3. Benefits of diabetic diet management
 	
4. Possible barriers of diabetic diet management
	1. Assessing the perception and beliefs of T2DM patients by using Health Belief Form (22 items)
	
	2. Lecture the concept of T2DM
	  - Group lecture, group discussion, asking questions, slide, and leaflet
	
	3. Susceptibility and Severity
	  - Group lecture, group discussion, asking questions, presenting several pictures of diabetic complications, slide, and leaflet
	
	4. Benefits and Barriers
	  - Group lecture, group discussion, asking questions, practice serving an appropriate diabetic meal according to food pyramid, slide, and leaflet
		Dietary Behaviors
		
		1. Selecting healthy diet
		
		2. Arranging meal plan
		
		3. Recognizing the amount of food calories

Figure 1. Conceptual framework of HBM based education program to prevent diabetes complications on dietary behaviors of Indonesians adults with T2DM.

Hypothesis

1. After attending HBM based education program, the dietary behaviors score of Indonesian adults with T2DM is higher than the score before attending the education program.

2. Dietary behavior score of Indonesian adults with T2DM receiving HBM based education program is higher than the score of those who receiving only routine diabetic health education.

Definition of Terms

HBM based education program is an education program guided by HBM to increase the awareness and change the beliefs of Indonesian adults with T2DM to change their dietary behaviors for preventing diabetes complications. HBM based education program covers the teaching plan by using the method of group lecture, group discussion, and practice to serving meal according to diet recommendation for diabetes people, use of questionnaires to evaluate the perceptions of subjects, and show the picture of diabetic diet and diabetic complications. The teaching plan includes concept of T2DM, susceptibility and severity of uncontrolled DM and also covers the benefits and barriers of diabetic diet management.

'Perceived susceptibility of uncontrolled DM 'means diabetic patients' perception or belief that they are at high risk to diabetic complications due to their uncontrolled DM; 'perceived severity of uncontrolled DM 'refers to knowledge and beliefs of the consequences of having diabetic complications, including acute and chronic complications; 'perceived benefits of diabetic diet management' refers to diabetic patients' perception or belief of benefits of diet management that absolutely have an effect on a person to maintain dietary behaviors in the lifestyle such as selecting healthy diet, arranging meal plan, and recognizing the amount of food calories, and perceived barriers of diabetic diet management' refers to perceived obstacles in management of diabetic diet for T2DM'.

'Dietary behaviors' refers to desired behaviors of patients with T2DM in selecting healthy diet, arranging meal plan, and recognizing the amount of food calories. Dietary behaviors were measured by the Dietary Behaviors Questionnaire, which was modified from Nutritional Health Promoting Behavior Questionnaire created by Sukmarini (2007).

Routine diabetic health education is a health education of T2DM, which is provided for Out Patient Department (OPD) in diabetes clinic of Arifin Achmad Hospital depending on the availability of staff. The doctors or nurses give routine diabetic health education based on the following contents: dietetic control, exercise, use of medication, personal hygiene, foot care, and prevention of complications. As this program depends on availability of staff, it affects its maximum utilization for patients with T2DM.

Significance of the Study

Health professionals, particularly nurses and doctors can apply HBM in structured dietetic education for T2DM. The results of this study provided evidence based nursing, which can be applied in similar population and reference for further research in dietetic management of T2DM.

CHAPTER 2

LITERATURE REVIEW

This chapter presents review of literature relevant to this study as follows:

1. Overview of T2DM

    A. Definition

    B. Causes

    C. Signs and symptoms

    D. Pathogenesis

    E. Risk factors of diabetic complications

    F. Complications

    G. Management of diabetic diet

    H. Management of T2DM

        - Pharmacological management

        - Non-pharmacological management

2. Health Belief Model (HBM)

3. Health Belief Model based education program in T2DM patients

    A. Threats of diabetes

        - Susceptibility of uncontrolled DM

        - Severity of uncontrolled DM

    B. Benefits of diabetic diet management

    C. Possible barriers of diabetic diet management

4. Dietary behaviors

5. Indonesian diet behaviors

6. Other factors influencing dietary behaviors in patients with T2DM

Overview of T2DM

Definition

T2DM is the most common form of diabetes, in which either the body does not produce enough insulin or the cells ignore the insulin. T2DM refers to non-insulin dependent DM, or adult onset DM. Body undergoes a metabolic disorder, which pancreatic gland produces insufficient insulin (Mathur, 2003). Its effect can be tested with a series of blood glucose tests to determine T2DM. Normal fasting plasma glucose levels are less than 100 milligrams per deciliter (mg/dl). Fasting plasma glucose levels of more than 126 mg/dl on two or more tests on different days indicate that an individual has diabetes. A random blood glucose test can also be used to diagnose diabetes. A blood glucose level of 200 mg/dl or higher (11.1 mmol/l), displays classic symptoms of DM, such as polydypsia, polyuria, polyphagia, and weight loss, has a FPG (fasting plasma glucose) $\geq$126 mg/dl (7.0 mmol/l), indicates that someone has T2DM (WHO, 2002).

Causes

T2DM is probably caused by a complex interaction of environmental factors and predisposing genetic factors. Causes of T2DM include genetic and environmental conditions, such as diet and activity levels, aged pregnancy from 24 to 28 weeks, endocrine conditions which can indirectly change the production and action of insulin and lead to diabetes (American Diabetes Association, 2002), Cushing's syndrome, acromegaly, pheochromocytoma, hyperthyroidism, and polycystic ovarian syndrome (PCOS) (McCulloch, 2008).

Signs and symptoms

The signs and symptoms of diabetes commonly include excessive thirst, frequent urination, increased appetite, weight loss, blurred vision, fatigue, headache, occasional muscle cramp and poor wound healing (Porth & Kunert, 2002).

Pathogenesis

T2DM results from a decreased sensitivity to insulin known as insulin resistance or a decreased amount of insulin production (Port & Kunert, 2002). T2DM occurs when the pancreatic, an organ in the abdomen produces insufficient amount of the insulin hormone and or

the tissues become resistant to normal or even high levels of insulin. This leads high blood glucose levels, which can cause a number of complications if not treated well (McCulloch, 2006).

Risk factors of diabetes complications

There are many risk factors of diabetes complications in T2DM. According to Ellm (2006) studied factors that lead uncontrolled DM, in an outpatient clinic setting. Factors that develop diabetes complications include: (1) poor glucose control; (2) poor dietary adherence; (3) depression and stress can lead to hyperglycemia and an increased risk of micro and macrovascular complications (Lustman, Anderson, Freedland, de Groot, Carney, Clouse, 2000; Black, Markides, & Ray, 2003). Lustman and Clouse (2005) conducted a meta-analysis of a published literature that looked for an association between depression and hyperglycemia, and concluded that a strong correlation existed between them (Lustman et al., 2005); (4) obesity is closely related medical conditions. Published clinical trials showed a strong link between an increased BMI and an increased HbA1c (Bo, Gentile, Cavallo-Perin, Vineis, & Ghia, 1999; Grylls, McKenzie, Horwath, & Mann, 2003; El-Kebbi, Cook, Ziemer, Miller, Gallina, & Philips, 2003); (5) lower socioeconomic status negatively affects access to medical care and medications, and patients quality of self-care, and (6) hypertension may increases the risks of developing long-term diabetes complications.

Complications

The complications of DM are classified into two types: acute and chronic types. Acute complications include diabetic ketoacidosis, hyperglycemic hyperosmolar state, and malignant hyperthermia-like syndrome with rhabdomyolysis (Hamiel & Zeitler, 2007). Pitzer et al (2001) stated that acute complications include hyperglycemia those in which the blood sugar is high and hypoglycemia in which the blood sugar is low. Hypoglycemia is a common acute complication. Hypoglycemia is a clinical syndrome which occurs when a blood glucose level lessen than 40–50 mg/dL (2.2–2.7 mmol/L).

Hyperglycemia as high blood glucose is a serious health problem of diabetes mellitus. Hyperglycemia develops when there is excessive sugar in the blood. In people with diabetes, there are two specific types of hyperglycemia that occur: (1) fasting hyperglycemia as defined

with a blood sugar greater than 90-130 mg/dL (milligrams per deciliter) after fasting for at least 8 hours; (2) post-prandial or after-meal hyperglycemia as defined with a blood sugar greater than 180 mg/dL. In who are not diabetic post-prandial or post-meal sugar levels rarely go over 140 mg/dL, but occasionally after one-two hour a large meal, post-meal glucose level can reach at 180 mg/dL. Consistently elevated high post-meal glucose levels indicate that a person is at a high risk of T2DM (Pearson & Lancet, 2006).

Chronic complication can cause vascular disease. Chronic elevation of blood glucose level leads to damage of blood vessels (angiopathy). As a result, the problems are grouped into two types: microvascular disease and macrovascular disease. Microvascular disease causes the damage of small blood vessels and macrovascular disease results in arterial damage (LeMone & Burke, 2000). The damage of small blood vessels leads to a microangiopathy, which can cause one or more of the following: diabetic retinopathy, diabetic neuropathy, and diabetic nephropathy.

Diabetic foot often results due to combinations of neuropathy and arterial disease; it may cause skin ulcer, infection, necrosis, and gangrene in serious cases. Diabetic encephalopathy leads the cognitive decline and risk of dementia in adults with DM. Various mechanisms can alter the vascular supply of the brain and the interaction of insulin with the brain itself.

Management of diabetic diet

The goal of management of T2DM is to improve glycemic control. Diabetic diet plays a significant role in controlling blood glucose levels. Main objective of diabetic diet is to maintain ideal body weight by providing an adequate nutrition with normal blood sugar levels (American Diabetes Association, 2000). The most important objective in the dietetic management of diabetes is to control total calorie intake to attain or maintain a reasonable body weight and to control of blood glucose levels. Controlled calorie diets can be used by calculating the individual's calorie requirements (Smeltzer & Bare, 2000).The diet plan for diabetic person is considered with his/her height, weight, age, sex, physical activity, and nature of diabetes. While planning a diet, diabetic patient has to consider complications of diabetes, such as high blood pressure and high cholesterol levels etc.

Diet and physical activity are obviously important for the management of the HbA1c, blood pressure, and cholesterol of T2DM. Delahanty and McCulloch (2008) stated that loss of

body weight from 5 to 10% of total body weight could help the body activate and use insulin more efficiently. Eating low calories can reduce blood glucose levels before the first pound is lost. According to Nuse (2007), diet and daily exercise could control weight with a low fat and low carbohydrate.

The basic elements of diabetes diet include: (1) consumption of proteins to result amino acids which require for tissue repair, maintenance of the glucose levels during the absorption process, and composition of calories less than fats; (2) consumption of carbohydrates to prevent ketosis; (3) avoidance of saturated fat and rich cholesterol foods; and (4) consumption of fiber which is as an essential nutrient to reduce the glucose absorption, the blood sugar rise, the urinary glucose excretion, the process of emptying stomach, and to delay the intestinal passage time (Smeltzer & Bare, 2000).

The nutrient recommendations for adults with DM are:

1. Carbohydrates are the main nutrients in food, which influence the blood glucose levels (Smeltzer & Bare, 2000) and provide 4 kcal per gram. This group of nutrient is made up of plant foods (grains, fruits, and vegetables), milk, and some dairy products. Carbohydrates can be divided into simple sugars and complex carbohydrate.

2. Protein intake is ranging from 10% to 20% of the total daily calories. Protein provides energy of 4 kcal per gram. Sources of protein should be low in fat, saturated fat, and cholesterol. Nuttall and Gannon (2004) studied metabolic response of people with T2DM to a high protein diet resulted in increasing the protein in the diet on the expense of reducing carbohydrate which integrated plasma glucose concentration at least 5.

3. Fats should be low in both saturated fat and cholesterol. Fats are restricted to less than 10% of the total kcal consumed per day. Fat has 9 kcal per gram. The sources of different types of fat are: (1) saturated fat produced from animal meat, butter, lard bacon, cocoa butter, coconut oil, palm oil, and hydrogenated oils; (2) poly unsaturated fat resulted from oil of corn, safflower, sunflower, soybean, sesame seed, and cottonseed; and (3) mono saturated fat derived from peanut oil, olive oil, and canola oil (LeMone & Burke, 2000). Within the fat allowance, cholesterol should not exceed 300 mg daily. Limiting fat and cholesterol intake may help prevent or delay the onset of atherosclerosis, a common complication of DM.

4. Fiber plays important roles in lowering total cholesterol and low-density lipoprotein cholesterol in the blood and decreases blood glucose levels. The mechanism of action of soluble fiber is thought to be related to the formation of a gel in the gastrointestinal tract. This gel slows the emptying of stomach and the movement of food through the upper digestive tract. The potential glucose-lowering effect of fiber is caused by the slower rate of glucose absorption from food that contains soluble fiber. The ideal level of fiber has not been determined, but an intake of 20 to 35 grams per day is recommended (Smeltzer & Bare, 2000).

5. Salt should be consumed in limited amount, only 6 gram per day. The primary concern about salt is its relationship with hypertension, as a common health problem in people with T2DM (Dyson, 2004).

6. Alcohol consumption may result in the hypoglycemic effects of insulin and oral agents. Men with diabetes can consume no more than two drinks and women with diabetes can consume only one drink per day (American Diabetes Association, 2000).

In general, most of T2DM in Indonesia consume food quite similar to people who not suffer from diabetic. The recommendation of diet for diabetic patients in Indonesia based on Tjokroprawiro (2007) includes:

Morning (06:30 AM): rice 60 g, meat 25 g, vegetables 125 g, and oil 5 g

Fruits (09:30 AM): banana 100 g

Lunch (12:30 PM): rice 70 g, tempe 25 g, vegetables 150 g, and oil 5 g

Fruits (3:30 PM): papaya 100 g

Dinner (6:30 PM): rice 70 g, tempe 25 g, vegetables 150 g and oil 5 mg

Snack (9:30 PM): fried potato 100 g or fruit (apple 100 g).

The total of calorie is 1100 calorie which consist: (1) protein 36.49 g; (2) fat 22.81 g; (3) carbohydrate 179.35 g; (4) cholesterol 93.25 mg. Usually, this recommendation is given to diabetic patients who do not have severe complications such as congestive heart failure, COPD, and renal failure (Tjokroprawiro, 2007).

Management of T2DM

1. Pharmacological management

The treatments for T2DM include pharmacological interventions with an oral medication

(Gagarina, 2007; American Diabetes Association, 1998). Medications needed to control blood sugar in T2DM are as follows:

1.1.Sulfonylureas (Glimepiride: Amaryl, Glipizide: Glucotrol, Glipizide ER: Glucotrol XL and tolazamide) increases insulin secretion and promote insulin actions on the liver and peripheral tissues (increase insulin production). Route of the drug is oral. These drugs are generally taken one to two times a day before meal. All sulfonylurea drugs have similar effects on blood glucose levels, but they differ from side effects depending on how often they are taken, and their interactions with other drugs.

1.2. Biguanides (Glucophage: Metformin, Glucophage XR) decrease hepatic glucose production, increase glucose uptake, and possibly decrease appetite. Biguanide also helps to decrease blood glucose levels by making muscle tissue more sensitive to insulin, so glucose can be absorbed (decreasing glucose from digestion). Route of the drug is oral. Biguanides are usually taken 2-3 times a day, except XR, which is taken once a day. A side effect of metformin is diarrhea, but this can be eliminated when the drug is taken with food.

1.3. Alpha-Glucosidase Inhibitors (acarbose) slow down absorption of carbohydrates. Route of the drug is oral. These drugs help the body decrease blood glucose level by blocking the breakdown of starches, such as bread, potatoes, and pasta in the intestine. They also slow down the breakdown of some sugars, such as table sugar (slow digestion, slow glucose production). Their action slows the increase of blood glucose levels after a meal. They should be taken with the first bite of a meal as taken before each meal. Their side effects include gas and diarrhea.

1.4. Thiazolidinediones (Rosiglitazone: Avandia and Pioglitazone: ACTOS) decrease insulin resistance. These drugs help insulin to work better in the muscle and fat and also reduce glucose production in the liver by lowering the glucose production. Route of the drug is oral. They are usually taken once daily either with or without food. As a precaution, Rosiglitazone and Pioglitazone need to be monitored closely for liver problems. Both drugs appear to increase the risks of heart failure in some people and Rosiglitazone may debatably contribute to increase risk of heart attack. Both drugs are effective at reducing blood glucose and generally have few side effects.

1.5. Meglitinides (Prandin and Starlix) increase insulin production. Route of the drug is oral. They are usually taken within 5-30 minutes before meal.

1.6. DPP-4 Inhibitors (Januvia) lower glucose by blocking an enzyme. Route of the drug is oral. It is usually taken 100 mg once a day.

1.7. Incretin Mimetic (Byetta) helps the pancreas producing insulin, slowing digestion. Route of the drug is injection. It is taken 10 mcg within an hour before meals.

1.8. Anti-hyperglycemic (Symlin) controls postprandial blood glucose. Route of the drug is injection. It is usually taken 15 mcg before major meal.

2. Non-pharmacological management

Besides pharmacological therapies and diabetic diet management, there are also other non-pharmacological therapies to control blood glucose in T2DM, such as exercise and stress management (American Diabetic Association, 2002).

2.1. Exercise helps to control T2DM by improving the tissues' use of insulin and burning excess body fat by decreasing and controlling weight, decreasing body fat. Exercise also helps for improving insulin sensitivity and muscle strength, increasing bone density and strength, lowering blood pressure, avoiding heart and blood vessel diseases by lowering LDL cholesterol and increasing HDL cholesterol, improving blood circulation and reducing the risk of heart disease. Besides, exercise can increase energy level, enhance work capacity, reduce stress, and promote relaxation, releasing tension and anxiety (Seibel, 2007; American Diabetic Association, 2002).

According to Mathur (2002), a major benefit of exercise is its effect on the heart activities. Exercise also benefits to muscle insulin sensitivity. Aerobic exercise considerably improves blood cholesterol levels and control blood pressure. These benefits occur regardless of weight loss. Patients with T2DM who participated in three months exercise program reduced their triglyceride levels by 20% and increased their good cholesterol (HDL) by 23%. Diabetic patient who exercised had an overall decrease of 0.6% of HA1C levels and also lost body fat. For diabetes control, diabetic patients need to walk about 38 minutes or 4400 steps per day to achieve an improvement of HA1C levels (Bumgardner, 2006).

Zinker (2005) studied about effect of nutrition and exercise in individuals with diabetes. The study concluded that fuel mobilization is increased during exercise to meet the energy needs of working muscle. The needed elevation in substrate metabolism is controlled by a coordinating

endocrine response. Thus, carbohydrate consumption may need to be modified for compensate the potential glycemic effects of mismatched insulin levels. In diabetic individuals with complications related to the disease, a further increase in the difficulty to exercise is possible.

3.1. Stress management is one of the ways to control blood glucose. Patients with T2DM may increase health risks resulted from the stress. Stress may alter blood sugar levels in two ways. Firstly, stressful times may cause some people to stray from their usual routines and instead turn to poor eating and exercise habits. Secondly, stress causes a physiological reaction that can influence blood sugar levels. According to Survit (2002), experiencing stress is associated with the release of hormones that leads to energy mobilization known as the fight or flight response. Key to this energy mobilization is the transport of glucose into the bloodstream resulting in elevated glucose levels, which is a health threats for people with diabetes. Complementary therapies can be applied in stress management, which include yoga, meditation, acupuncture, homeopathy, and various forms of Chinese traditional medicine (Camastra, Bonora, DelPrato, Rett, Weck, & Ferrannini, 1999).

Health Belief Model (HBM)

The HBM is a psychological model that attempts to explain and predict health behaviors by focusing on the attitudes and beliefs of individuals. The HBM was developed in the 1950s as a part of an effort by the social psychologists in the US. Public health service is lack of public participation in health screening and prevention programs e.g., a freely and conveniently located tuberculosis screening project. Since then, the HBM has been adapted to explore a variety of long-term and short-term health behaviors (Rosenstock, Strecher & Becker, 1994).

Many previous studies used the HBM for changing behavior. Abood, Black, and Feral (2006) studied nutrition education worksite intervention for university staff by applying the HBM. The results showed that perceived benefits of healthy nutrition practices and knowledge helped to improve cardiovascular disease and cancer significantly among the treatment group participants ($p < .001$). They also significantly reduced total calories, fat, saturated fat, and cholesterol intake by consistently following the nutrient recommendations.

Another educational program based on HBM studied about understanding the intention of low-income pregnant women to permanently follow a high folate diet found consistent

correlations between the perceived susceptibility, perceived severity, perceived benefits, perceived barriers, self efficacy and cues to action constructs, and participants' intention to permanently follow a high folate diet (folate intention) (Kloeblen & Batish, 1999). The HBM offered an effective foundation for development of tailored educational interventions promoting permanent consumption of a high folate diet among low-income pregnant women (Kloeblen & Batish, 1999).

The key variables of the HBM are as follows (Rosenstock, Strecher & Becker, 1994):

1. Perceived threat consists of two parts: perceived susceptibility and perceived severity of a health condition.

   1.1. Perceived susceptibility is subjective perception of the risk of health condition.

   1.2. Perceived severity regards to feelings of concerning the seriousness contracting an illness or leaving it untreated. This can be used for evaluations of both medical and clinical consequences and possible social consequences.

2. Perceived benefits refer to the believed effectiveness of designed strategies to reduce the threats of illness.

3. Perceived barriers mean the potential negative consequences that may result from taking particular health actions including physical, psychological, and financial demands.

4. Cues to action mean events or strategies that increase individual motivation.

5. Self-efficacy means individual's confidence about his/her ability to take action.

The HBM focuses on two aspects of a person's conceptualization of health and health behavior, which include four concepts: threat perception, which depend on perceived susceptibility of illness, anticipated severity of the consequences; behavioral evaluation, which concerns the benefits of a health behavior and barriers to enacting the behaviors (Rosenstock, Strecher & Becker, 1994). These four factors, which influence by mediating variables, indirectly influence the probability of performing protective health behaviors by influencing the perceived threat of the illness and expectations about outcome (Redding, Rossi, Rossi, Velicer & Prochaska, 2000).

Hanson and Benedict (2002) studied use of the HBM to examine older adults' food-handling behaviors. The objective was to measure the association between HBM variables and

safe food-handling behaviors among older adults. This study concluded that the HBM is a useful framework for examining food-handling behaviors among older adults.

The HBM has been used for intervening with health screening, illness, sick role, and precautionary behaviors. The model has undergone some modifications since its original formulation. The HBM is most commonly described as four concept models. The model's four key components are conceptualized as perceived susceptibility, perceived severity, perceived benefits, and perceived barriers (Janz & Becker, 1984).

Kartal and Özsoy (2007) measured the validity and reliability of the HBM Scale in diabetic patients in the Turkish population. The tool internal consistency reliability subscales, Cronbach alpha coefficient values were ranged from 0.73 to 0.86. According to factor analysis, the tool contains five subscales of perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and recommended healthy behaviors. The HBM Scale in diabetic patients determined to be valid and reliable for use in the Turkish population (Kartal & Özsoy, 2007).

Health Belief Model (HBM) based education program for T2DM patients

The HBM research has been used to explore a variety of health behaviors of various populations. Previous studies of HBM based education in diabetic patients found that after health education about diabetic knowledge, individuals with T2DM significantly changes their knowledge of nutrition and a healthy diet (Albarran, Ballesteros, Morales, & Ortega, 2006; Gillibrand & Stevenson, 2006; Hazavehei, Sharifirad, & Mohabi, 2007). HBM has been found to be a useful and applicable framework for the planning and implementation of programs to encourage healthy behaviors.

Daniel and Messer (2002) applied HBM to study about the perceptions of disease severity and barriers to self-care predict glycemic control in aboriginal people with T2DM. They concluded that perceived severity and perceived barriers were related to glycemic status at baseline and follow up, and they predicted reduction in HbA_{1c} ($p < 0.05$). Support a therapeutic emphasis on belief in the severity of diabetes complications, and the complementary belief that barriers to therapeutic behavior can be overcome in efforts to support Aboriginal people with diabetes to manage their disease.

Gillibrand and Stevenson (2006) applied the extended HBM to study the experience of diabetes in young diabetics. Objective of the study was to investigate the experience of diabetes in young diabetics to adherence the self-care regime of applied HBM. The result was high internal locus of control beliefs and high levels of self-efficacy predicted the benefits of young diabetic adherence to the self-care regime of diabetes.

The HBM was developed as a framework for predicting health behaviors. The model seeks to explain individual characteristics and experiences, as well as how behavior-specific cognition influences these behavioral outcomes. Health promoting behaviors are a desired outcome of providing client care and education. Health promoting behaviors may be defined as actions toward attaining positive health outcomes, such as well being, personal fulfillment, and quality live (Tomey & Alligood, 1998; Srof & Velsor-Friedrich, 2006).

The HBM is a useful model for evaluating diabetic individuals' health behaviors and their beliefs and attitudes about illness. The HBM Scale in diabetic patients has shown statically acceptable levels of reliability and validity for use in the Turkish population (Kartal & Özsoy, 2007).

The present study was focused on four dimensions of HBM (Rosenstock, Strecher & Becker, 1994). According to HBM, the possibility of patients with T2DM to change their dietary behaviors is determined by four factors such as: (1) perceived susceptibility, refers to the perception of vulnerability to diabetes. This includes at what extent persons perceive that they may have a chance for developing risk due to diabetes; (2) perceived severity, is the perception of diabetes as a serious illness, ranging from perceiving few complications to viewing diabetes as a life-threatening disease; (3) perceived benefits, mean the perception that the diabetic diet management is advantageous to prevent diabetes complications; the diabetic patients can improved blood glucose control by taking action; (4) perceived barriers, refer to the perceived obstacle of diabetic diet management which mean perceive that the diabetic diet management to be inconvenient.

This study was applied educational program based on HBM to improve dietary behaviors of T2DM patients by using following methods:

1. The method of teaching concept of T2DM was included group teaching, group discussion, use of questionnaires to evaluate the perceptions of subjects. The concept of T2DM consisted of

definitions, causes, pathogenesis, signs, and symptoms. It was used to teach the patients and to increase the awareness and the perception of T2DM patients about diabetes mellitus disease.

2. The method of teaching perceived susceptibility and perceived severity of uncontrolled diet was included group teaching, group discussion, use of questionnaires to evaluate the perceptions of subjects, and picture of diabetes complications. Perceived susceptibility of uncontrolled diet is diabetic patients' perception or belief that they are susceptible (high risk) to diabetes complications if they will not control their diet, and perceived severity of uncontrolled diet is a knowledge and belief of the consequences of having diabetes complications, including acute and chronic complications.

3. The method of teaching perceived benefits and perceived barriers of diabetic diet management was included group teaching, group discussion, practice to serving meal according to diet recommendation for diabetes people, use of questionnaires to evaluate the perceptions of subjects, and picture of diabetic diet. Perceived benefits is diabetic patients' perception or belief of benefit of diet management that absolutely have an effect on a person to maintain dietary behaviors in the lifestyle such as selecting healthy diet, arranging meal plan, and recognizing the amount of food calorie. Perceived barriers, refers to the perceived obstacle of diabetic diet management.

Sukmarini (2007) studied influencing factors of nutritional health promoting behaviors among adults with T2DM in Jakarta, Indonesia. Pender's Health Promotion Model was used in this study for changing behaviors of diabetic patients. Pender's comprehensive model of health promotion is one of the explanatory nursing models, which focus on predicting the health behavior. Pender's model included two concepts, perceived benefits and perceived barriers, which were used in NHPB for measuring nutritional health promoting behaviors. These two concepts are equivalent with the HBM concepts such as perceived benefits and perceived barriers. This study used NHPB questionnaire to measure nutritional health promoting behavior with slight modification.

The NHPB questionnaire consists of 21 items. The dimensions of selecting healthy diet comprise of 10 items, arranging meal plan consists of 7 items, and recognizing the amount of food intake consists of 4 items. Each item is scored with 4-points Likert-like scale: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree. Therefore, the total score of NHPB ranges

from 4 to 84.

The validity of NHPB was examined by three experts including an academic staff of the Faculty of Nursing Prince of Songkla University, Thailand, who is an expertise in instrumentation, a diabetes nurse practitioner in Theptharin Hospital-Bangkok, and a diabetologist at Songklanagarind Hospital-Hatyai, Thailand. The reliability of the NHPB Questionnaire was .72.

Dietary behaviors

The consistent diet can help to control blood glucose levels, reduce blood cholesterol, maintain an ideal body weight, and prevent the complications of diabetes (Mathur, 2005). Diet therapy is tailored for each person. A successful diet will ideally take into consideration of the person's ethnic background, financial situation, and lifestyle. Dietary behavior is not simple, since it is more difficult to stick to diet plans with complex food exchanges.

Dietary behaviors can be changed by educational program. Using HBM can increase the awareness and knowledge of diabetic patients and shape the opinion/perceptions of dietary behaviors. The impact of education program in diabetic patients can maintain blood glucose levels and can prevent both acute and chronic complications of DM.

The concept of dietary behaviors is very complex. Dietary behaviors as multitude of behaviors refer to selected diabetic diets as recommended for diabetes people, such as consuming low fat, low glycemic index foods, and eating rich fiber foods, arranging appropriate meal plan, which is able to serve variety of foods, eating consistently on the same time, and having the amount of food calories how much calorie in each meal that the subjects consumed (Tjokroprawiro, 2007).

1. Selecting healthy diet

Healthy diet is a fundamental approach as a part of diabetic diet management and has benefits on weight, metabolic control, and general well-being of diabetes patients having a healthy diet means eating pattern to reduce the risks of complications of diabetes. Healthy diet involves eating a wide variety of foods containing various nutrients such as vegetables, whole grains, fruits, non-fat dairy products, beans, lean meats, poultry, and fish (Reddy, 2007).

Patients with T2DM can follow Diabetes Food Pyramid, which divides foods into six groups. The food groups of grains or other starches include vegetables, fruits, meat/fish, milk, and fats. By following Diabetes Food Pyramid, T2DM patients will be able to maintain the same carbohydrate content per serving. Paying attention to serving diabetic diet is integral to maintain normal blood glucose levels (Smeltzer & Bare, 2000).

The recommended servings of menu per day are as follows:

1.1. Grains and starches 6 to 11 servings per day.

1.2. Vegetables at least 3 to 5 servings per day include spinach, chicory, broccoli, cabbage, carrot, tomato, cucumber, and lettuce.

1.3. Fruits: 2 to 4 servings per day. The American Diabetes Association emphasizes on strawberry, orange, apple, banana, pear, and grapes

1.4. Milk: 2 to 3 servings of non-fat milk per day.

1.5. Meat and meat substitutes: 4 to 6 ounces per day, divided between meals. This is equivalent to ¼ cup cottage cheese, 1 egg, 1 tbsp peanut butter, or ½ cup tofu. Meat replacements include tofu, egg, dried bean, cheese, cottage cheese, and nut butter.

1.6. Fats, sweets, and alcohol: Potato chip, candy, cookie, cake, cracker, and fried food belong to this group.

2. Arranging meal plan

A diabetes meal plan is a guide that explains how much and what kind of food needs to be chosen to eat at meal and snack times. A good meal plan should fit with the schedule and eating habits. The proper meal plan will help diabetic patients improve the blood glucose, blood pressure, and cholesterol numbers and also help keep the weight on track (American Diabetes Association, 2000).

Most meal plans begin with estimation of the amount of calories an individual needs to achieve a realistic weight. Then, 55-65% of the total daily calories are allotted to complex carbohydrates; 20% to protein rich food; and 15-30% to fatty foods. After these proportions have been estimated, the size, time, and number of meals may be determined. For example, six small meals are easier to digest and assimilate than three larger meals (American Diabetes Association, 2002; LeMone & Burke, 2000).

2.1. Exchange list: one of the important things for meal plan of diabetic patients is reading food labels. Food labels can be an essential tool for diabetes meal plan (American Diabetes Association, 2002). Reading food labels, which can help diabetic patients make the best choices are, as follows: list of ingredients, consider carbohydrate in context, put sugar-free products in their place, and beware of fat-free products, know what counts as a free food, do the math (the serving sizes listed on food labels may be different from the serving sizes in meal plan).

Foods are placed on the six lists based upon their predominant nutrient content. Portion and sizes are also indicated to keep caloric value very close for foods on the list. The six lists are starch/bread, meat /substitutes, vegetables, fruit, milk, and fats. A meal plan will likely indicate how many choices taken from a list of a meal or a snack. Arrangement of foods should afford a well-balanced diet while regulating blood glucose levels still.

2.2. Carbohydrate counting: carbohydrate counting is a method of achieving diet plan, which is responsive to effective glucose control as well as offering tremendous varieties of food choices. Plans are drawn up, which indicates suggested amount of carbohydrates and calories for a meal or snack. Once choices are made to fulfill the optimal carbohydrate amount, the remainder of the calories is allotted for protein and fat.

2.3. Fats: fats restriction is very important for the person with diabetes for reduction of fat consumption diabetic patients should avoid fried food rather than bake, broil, steam or poach food. They should have low fat or skim milk dairy products and lean meat, and consider fish as a replacement of meats. However, avoidance of smoked fish and the dark fatty sections of some fish is recommended.

2.4. Reduce salt intake: reduction of salt intake is very important to prevent high blood pressure. Diabetes patients tend to develop hypertension, which threatens the kidney functions and the circulatory system.

2.5. Increase fiber intake: there are numerous benefits in replacing animal protein-saturated foods with rich fiber plant foods. The possible benefits of increased fiber diet are improved digestion and elimination, lower blood cholesterol, lower blood pressure, weight loss and increased sensitivity to insulin.

3. Recognizing the amount of food calories

Based on Tjokroprawiro (2007), the amounts of calories consumption diabetes diet are divided as follows: diet for diabetes patient who obese, diet for diabetes patient who have normal body weight, and diet for diabetes patient who are thin in juvenile diabetics, diabetes with complications or pregnant diabetics. American Diabetes Association determines BMI (Body Mass Index) considering the body size of a person whether underweight, normal, overweight, or obesity, as formulation in order: BMI = body weight (kg)/height (cm)^2.

BMI < 18.5   = underweight

BMI 18.5-24.9   = normal

BMI 25-29.9   = overweight

BMI of 30 or greater   = obesity

Indonesian diet behaviors

Indonesians have three meals and several snacks throughout the day. Rice is the main staple food of the Indonesians. They have fresh fruits as dessert. Coconut milk as known as *santan* is usually used for many dishes by Minangnese and Melayunese ethnics (Culture Grams World Edition, 2005). The Minangnese and the Melayunese are the dominant ethnics in Pekanbaru, who their main ingredients of dishes are fish, green leafy vegetables and chili. Their meat consumption is very limited; they eat meat only on the special occasions. Beef and chicken are the most common dishes in their parties (Wikipedia, The Free Encyclopedia, 2008). Both ethnics consume predominantly high fat, fried foods and they consume fewer vegetables.

Regarding Javanese, they have high fat foods, and they also predominantly have sweet drinks on the contrary. Conversely, the Sundanese have fresh vegetables known as *lalapan,* such as papaya leaves, cucumber, eggplant, and bitter melon (World cultures, 2008). Lalapan has high fiber, which Sundanese like most that benefits for people with T2DM. High fiber plays a role in lowering total cholesterol and low-density lipoprotein cholesterol in the blood. High fiber can also decrease blood glucose levels (Smeltzer & Bare, 2000).

Others factors influencing dietary behaviors in patients with T2DM

Many factors influence dietary behaviors, which is essential component for management of T2DM based on literature review. The influencing factors of dietary behaviors of people with T2DM can be described as follows:

1. *Age* associates with dietary behaviors. Age influences a person in selecting the healthy diet. The older diabetics are more capable to self-care of diet than the younger diabetics are. Young diabetics, perhaps due to busy lifestyles, find it difficult diabetics due to follow regimented inflexible printed diet charts. On the other hand, the elderly diabetics due to less activity find it easy to follow regimented plans (Kapur et al, 2008).

2. *Gender* contributes to dietary behaviors. Women participate in dietary behavior programs more than men do. Men significantly like to eat meat and poultry products, especially duck, veal, ham, and shellfish such as shrimp and oysters. On the other hand, women like eating vegetables, especially carrots, tomatoes and fruits, such as strawberries, blueberries, raspberries, and apples. Women also prefer to have dry foods, such as almonds and walnuts. They like consume higher amount of eggs and yogurt compared with men (American Society for Microbiology, 2008).

3. *Ethnic* is one of the considerable factors that influence dietary behaviors. Ethnic groups and the cultural values in certain ethnic group may build specific dietary behaviors that will influence significantly in performing health-promotion behaviors (Pender et al., 2002).

4. *Level of education* may contribute with dietary behaviors. According to Chernoff (2006), level of education may influence nutritional intake. Giskes, Lenthe, Brug, Johannes, and Mackenbach (2004) studied about dietary intakes of adults in the Netherlands by childhood and adulthood socioeconomic position. The study founded that males with lower levels of education had moderately higher energy intakes than their more educated counterparts. Regarding females, the less educated group had marginally higher intakes of total and monounsaturated fat than the more educated group, and their fruits consumption was very less.

5. *Socioeconomic* may relate to the individual for preparation of meal. Individual with low socioeconomic status are considerable to consume meals low in fat, and micronutrient density and to have low intakes of fruits and vegetables (Inglis, Ball & Crawford, 2008)

6. *Family support* may contribute to the individual dietary behaviors. According to Albaran et al (2004), the family dietary behaviors were challenges for people with diabetes, because of

family member's dietetic preferences and food preparation. A reluctance to follow dietetic recommendations was found within the family, since they were considered to be only for diabetic concerns. People with diabetes are influenced by family interaction concerning disease control, such as lack of support for medical control, stress, mood changes, and excessive or deficient food consumption.

Some studies have demonstrated that strong family and social support appears to have a positive impact on glycemic control and/or self-management behaviors (Wen, Sepherd & Parchman, 2004). The family dietary behaviors were challenges for people with diabetes, because of family members' dietetic preferences and food preparation.

Summary

T2DM significantly accounts for at least 90 percent of the diabetic population. Poor eating habits, weight gain, and sedentary lifestyle considerably cause T2DM. The Minangnese and the Melayunese are frequently found as diabetic. Management of diabetic diet is very important for the patients with T2DM. If diabetes is not treated well, it will lead complications, such as blindness, kidney failure, heart disease, and nerve damage. Many previous studies have determined that educational program of T2DM was able to promote the behavioral changes. The most important treatment of T2DM diet is the strict diabetic diet, which can manipulate intake of food. Therefore, the educational program of T2DM by applying HBM on dietary behaviors may effectively enhance the awareness of diabetic patients to follow diabetic diet. The educational program based on HBM applied to prevent diabetes on dietary behaviors consists of teaching plan of the concept T2DM in order to increase the awareness of perceived susceptibility and perceived severity of uncontrolled diet. The program also teaches perceived benefits and perceived barriers of diabetic diet management, which include management of diabetic diet, of pharmacological and non-pharmacological management. This study was examined the effect of HBM based education program on dietary behaviors to prevent diabetes complications in Minangnese and Melayunese adults with T2DM in Pekanbaru, Indonesia.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter describes the research design, population and setting, sample and sampling, instrumentation, ethical consideration, data collection procedure, and data analysis that were used in the proposed study.

Research Design

A quasi-experimental, 2-group pre-test post-test design was conducted in this study (Figure 2, page 38). The purpose was to examine the effect of educational program based on HBM to prevent diabetes complications on dietary behaviors of adults with T2DM. The research design was as follows:

	Pre-test		Pos-test
Control group	O_1 ——— X_0	——→	O_2
Experimental group	O_1 ——— X_1	——→	O_2
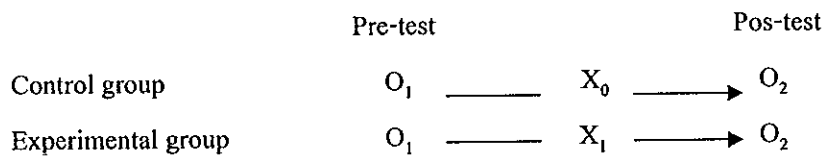
O_1: Pre-test

O_2: Post-test (after fourth week)

X_0: T2DM patients who received only routine diabetic health education

X_1: T2DM patients who received routine diabetic health education with the HBM based education program

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Population and Setting

The target population in this study was Indonesian adults who had been diagnosed as Type 2 DM not more than 3 years and attended at the Out Patient Department (OPD) in the diabetes clinic of Arifin Achmad Hospital, Pekanbaru which was selected as the research setting based on the following reasons. Arifin Achmad Hospital is located in the central part of Pekanbaru Indonesia. It is the largest hospital and teaching hospital in Pekanbaru. Arifin Achmad Hospital has a high number of case referrals from the public hospitals in the area.

Sample and Sampling

Sample Size

Power analysis was used to estimate the number of subjects in this study. There were three components to estimate the required sample size: alpha ("α", level of significance), 1 - beta ("1 – β", the power of test), and gamma ("γ", population effect or effect) (Polit & Hungler, 1999). The estimated effect size for two groups situation in which mean differences were of interest by using Cohen's *d*.

The estimated population effect size was based on available evidence from previous study. Aghamolaei (2004) studied the effects of a health education program on the behavior, HbA1C and health-related quality of life in diabetic patients. The aim of this study was to evaluate the efficacy of an interactive health education program on knowledge, behavior, HbA1c and health-related quality of life (HRQOL) of diabetic patients. Eighty patients were randomly selected and assigned to two groups, 40 to the intervention and 40 to the control group. The effect of health education program on behavior was d = .80 (*p* = 0.000). Suppose the results were as follows:

$\overline{X}1$ (control group) $= 4.51 \pm 5.5$

$\overline{X}2$ (experimental group) $= 7.7 \pm 1.07$

SD $= .80$

Thus, the estimated value of d would be .80

$$d = \frac{\mu 1 - \mu 2}{\sigma} = \frac{4.51 - 7.7}{\sqrt{\dfrac{(5.5)^2 + (1.07)^2}{2}}} = \frac{-3.19}{\sqrt{15.7}} = \frac{-3.19}{3.96} = .80$$

This study was used the effect size of .80 (γ), α level of .05 and power of .80. Therefore, an adequate sample size of this study was 40 patients. From previous study, the sample size was 80 patients. The researcher decided that for present study an adequate sample size was 20 patients per group because the present research was an initial study new population in Indonesia.

Sampling method

Purposive sampling was used for recruiting eligible subjects in this study. The inclusion criteria of the sample included:

1. Adults aged more than 18 years old

2. Had been diagnosed with Type 2 DM not more than 3 years

3. The ethnicity: Minangnese and Melayunese

Instruments

Three instruments were used to gather data: the Demographic and Health Information Form, the Dietary Behaviors Questionnaire and the Health Belief Questionnaire. It took each subject approximately 15-20 minutes to complete all three instruments. The researcher developed Demographic and Health Information Form requested information on: gender, age, level of education, religion, marital status, types of oral hypoglycemic medication used, duration of diabetes, body mass index and the last fasting blood glucose level. Subjects completed all components for the questionnaire, with the exception of the body mass index and the last fasting blood glucose. These data were obtained, by the researcher, from the subjects' medical records.

The Demographic and Health Information Form

This form was a list of several items consisting of open-ended and close-ended questions. It was designed by the researcher to assess patients demographic data and health information such as age, gender, ethnic, religion, level of education, marital status, occupation, income, experience of received diabetes education, responsibility of cooking, medication, duration of illness, members in family, Body Mass Index (BMI), and last fasting blood glucose level (BGL).

The Dietary Behaviors Questionnaire

The Dietary Behaviors Questionnaire, a modified version of the Nutritional Health Promoting Behavior Questionnaire (NHPB) created by Sukmarini (2007), consists of 21 items within three content dimensions: selecting a healthy diet, arranging a meal plan and assessing caloric count of food choices. The researcher made revisions to Sukmarini's version of the NHPB, so that the items were more reflective of the Indonesian culture. Seven items were added to the instrument, some modification in wording was made, and some alterations in food item selections were added. Thus, the final version of the instrument, used in this study, consisted of 28 items.

The dimension of selecting a healthy diet was comprised of 16 items. The dimension of arranging meal plan consisted of 7 items, while the dimension of assessing the caloric count of food choices consisted of 5 items. Each questionnaire item requested a response indicating how well the subject performed good dietary behaviors for an individual with T2DM. Each item was scored on a 4-point Likert-like scale: 1 = never to 4 = routinely. Scores for each of the three domains were obtained by summing the subjects' responses to the respective questions in each domain. To obtain a total score, the scores for each of the domains were summed. The possible range for the total score was from 28 to 112. The ranges of scores for each of the domains were as follows: selecting a healthy diet (16 – 64); arranging a meal plan (7 – 28); and, assessing caloric count of food choices (5 – 20). To determine the levels of behavior for each of the domains, as well as the total score, mean scores for each of the domains and the total score were calculated. The level of each behavior, as well as the total score, was then categorized as follows: 1.00 – 2.00 = low level; >2.00 – 3.00 = moderate level; and, >3.00 – 4.00 = high level. A low score indicated poor dietary behaviors, while a high score indicated good dietary behaviors. The content validity index, of the instrument, was assessed by three experts and found to be .98. The instrument's Cronbach's alpha coefficient was found to be .97.

The Health Belief Form

Health Belief Form consisted of 22 items addressing the four concepts of the Health Belief Model: perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. Responses to each question required a "yes," "no" of "I don't know" response. Scores for each of the 22 questions

were obtained by calculating the percentage of "yes," "no" or "I don't know" responses for each question. Only subjects in the experimental group completed this questionnaire, since it was used to guide the instructional content presented during the HBM based education program.

Quality of the Instruments

The content validity of the Dietary Behaviors Questionnaire and teaching plan of HBM based education program was examined by three experts. Among them, one expert was from academic staff of the Faculty of Nursing Prince of Songkla University, Thailand. Two experts were from Indonesia. One was a nutritionist and another was a medical physician. The researcher modified the instruments based on experts' recommendations. Then content validity index was .98.

Reliability of Instruments

The Dietary Behaviors Questionnaire was administered to the fifty Minangnese and Melayunese subjects for testing its reliability. The Cronbach's alpha coefficient computed to assess internal consistency of the questionnaire. The Cronbach's alpha coefficient of the Dietary Behaviors Questionnaire was .97.

Translation of Instruments

The instruments initially were developed in English language. However, to be applied in the data collection process in Indonesia, the instruments were translated into Indonesian language. The first bilingual translator translated the English version instrument into Indonesian version. The second bilingual translator back translated the instruments from Indonesian version into English version. The third bilingual translator then, clarified and identified the differences in all items of both versions. The modifying words added to instruments that were needed in order to find the same meaning and within acceptable limits.

Ethical Consideration

This study was conducted with the intention of protecting the human rights of all subjects. Following approval of the Research Ethics Committee and Institutional Research Board (IRB) of Faculty of Nursing, Prince of Songkla University, Thailand, the permission for data collection in this study was obtained from the Director of Arifin Achmad Hospital, Pekanbaru Province, Indonesia. The subjects who were willing to participate in this study were asked to sign a consent form. They were assured that they have a right to refuse to participate in the study at any time. Identities of all subjects were coded in order to keep confidentiality and anonymity.

Data Collection Procedure

Data were collected from December 2008 and February 2009, with the help of a research assistant who was obtained for the researcher by the head nurse of the Out-patient Clinic of the hospital used for data gathering. Once a potential subject was identified, he/she was approached and invited to take part in the study. Each subject was told: the purpose of the study, what was involved in taking part in the study, that confidentiality and anonymity would be maintained, and that they had the right to withdraw at any time without negative repercussions. Subjects consenting to take part in the study were asked to sign a consent form. The data collection procedures were divided into two phases:

1. Preparation phase

1.1. Asked for permission to collect data by submitting a letter from Faculty of Nursing Prince of Songkla University, Hatyai, Thailand and informed to the Director of Arifin Achmad Hospital, Pekanbaru Province, Indonesia about the objectives and data collection procedures.

1.2. Asked the head nurse of outpatient clinic at Arifin Achmad Hospital to find research assistants.

1.3. Prepared informed consent, leaflet, the Demographic and Health Information Form and the Dietary Behavior Questionnaire

1.4. Explained to the research assistants about the objectives, instruments, outcomes of the study, and to select the target subjects. The Researcher assistant and the researcher distributed

questionnaires to the subjects and explained the ways to complete questionnaire, and collected it back after its completion.

1.5 Before HBM based education program, the pilot study was applied by 4 persons of T2DM in the OPD of Arifin Achmad Hospital Pekanbaru, Indonesia.

2. Implementing phase

1.1. Included forty subjects of type 2 DM in this study from the OPD of Arifin Achmad Hospital.

1.2. The instruments used for data collection were Health Information Form, Health Belief Questionnaire and the Dietary Behaviors Questionnaire. The instruments were administered for pre-test of the control and experimental groups. Each subject was given 15-20 minutes to complete the two questionnaires.

Control Group

For subjects assigned to the control group, once they consented to take part in the study, they were asked to complete both the Demographic and Health Information Form, and the Dietary Behaviors Questionnaire. Both research instruments were completed by the subject while in the Diabetic Clinic. Once the subjects returned the completed questionnaires to the primary researcher/research assistant then an appointment was made for each subject to return to the Diabetic Clinic in four weeks, at which time the Dietary Behaviors Questionnaire was administered for a second time.

Experimental Group

For subjects assigned to the experimental group, once consent to take part in the study was obtained, each subject completed the Demographic and Health Information Form, the Health Beliefs Questionnaire and the Dietary Behaviors Questionnaire. If a subject was unable to read either the form or the questionnaire, due to visual impairment, they were read to the subject by the primary researcher or research assistant. Upon completion of the three research instruments, then the HBM

based education program was administered, once the number of participants for implementation of the intervention was achieved (8-12 persons). When an adequate number of subjects were obtained to implement the program, subjects were notified and an amenable date for the education program was established. So that subjects involved in the experimental group could receive adequate attention, during implementation of the education program, the program was administered in two groups. One group consisted of 12 subjects, while the second group had 8. Four weeks after the subjects completed the education program they were administered the Dietary Behaviors Questionnaire for a second time.

Intervention of the Health Belief Model Based Education Program

The HMB based education program was developed by the researcher and consisted of two sessions. The HBM based education program was administered only to subjects in the experimental group. The first session of the program addressed the definition, causes, and signs and symptoms of T2DM and involved the use of group lecture and discussion as the teaching methods. Participants were provided with an opportunity to ask questions related to the content presented. The session lasted approximately 30 minutes.

The second session of the program, which lasted approximately one hour and was carried out immediately after completion of the first session, consisted of providing instruction on the four concepts of the HBM: perceived susceptibility of uncontrolled diabetes; perceived severity of uncontrolled diabetes; perceived benefits of diabetic diet management; and, perceived barriers of diabetic diet management. The data obtained from the administration of the Health Beliefs Questionnaire was used as a guide for determining what content was needed for instructing the subjects on how to change their beliefs about uncontrolled diabetes, and the benefits and barriers of diabetic diet management.

The educational program was provided in medical meeting room of Arifin Achmad Hospital, Pekanbaru. This room is usually used by physicians, nurses, and nursing students for health education. This room is provided with LCD, white board, and microphone. The participants can consult about their problems, and ask any questions, including their needs related diabetic diet. The

contents of educational program were provided by using leaflets for subjects.

Data Analysis

Data were analyzed by using descriptive and inferential statistics, as follows:

1. The subjects demographic and health information data were analyzed and described in frequency, percentage, range, mean ($\bar{x}$) and standard deviation (SD).

2. The statistical assumptions were tested. The data were normally distributed and homogenous. Data of dietary behaviors before and after intervention were analyzed with paired t-test and the data between the experimental group and the control group were analyzed by using independent *t*-tests.

Patient with T2DM

Control group

Experimental group

1st week: Pre-test Questionnaire

■ The Demographic and Health Information
Form

■ The Dietary Behaviors Questionnaire

1st week: Pre-test Questionnaire

■ The Demographic and Health Information Form

■ The Dietary Behaviors Questionnaire

Routine diabetic health education

■ General assessing (assessment, measuring of
blood pressure, weighing)

■ Advising of dietetic control, exercise, take
medicine regularly, personal hygiene, foot care
and preventing diabetes complications

Routine diabetic health education

■ General assessing (assessment,
measuring of blood pressure, weighing)

■ Advising of dietetic control, exercise,
take medicine regularly, personal
hygiene, foot care and preventing
diabetes complications

1st session: 30 minutes

■ The Health Belief Form

■ Concept of Type 2 DM

2nd session: 1 hour

■ Perceived susceptibility and perceived severity
of uncontrolled DM

■ Perceived benefits and perceived barriers of
diabetic diet management

4th week: Post-test Questionnaire

■ The Dietary Behaviors Questionnaire

4th week: Post-test Questionnaire

■ The Dietary Behaviors Questionnaire

Figure 2. Intervention of the study

CHAPTER 4

RESULTS AND DISCUSSIONS

Results

  This chapter presents the results and a discussion of the results. This research was designed to examine the effect of HBM based education program to prevent diabetes complications on dietary behaviors of Indonesian adults with T2DM. Forty subjects were recruited from the Out Patient Department of Arifin Achmad Hospital Pekanbaru, Indonesia and equally divided into two groups (control group and experimental group). The control group received only routine diabetic health education and the experimental group received routine diabetic health education with a HBM based education program. The results of the study are presented under the following headings:

1. Demographic characteristics and health information of the Subjects
2. Dietary behaviors of Indonesian adults with T2DM
3. Comparison of dietary behaviors of the experimental group before and after attending HBM based education program (Hypothesis 1)
4. Comparison of dietary behaviors of the control and experimental groups after receiving HBM based education program (Hypothesis II)

Demographic Characteristics and Health Information of the Subjects

  Table 1 shows the demographic characteristics and health information of the subjects. Data of the control group revealed that the majority of the subjects (55%) were female, and the average age was 48.25 (SD = 13.05); all of the subjects were married, and their religion was Islam. Regarding their ethnic 60% of them was Minangnese and 40% were Melayunese; most of the subjects had finished high school and above. Most of them were government employees, and had an income about 1,100,000 – 2,000,000 IDR per month (equivalent 100-200 USD). More than half of the subjects reported that they never received diabetes education and 40% of the subjects received diabetes education by group teaching that was provided by the physicians,

nurses or nursing students. Most of the subjects (55%) had cooking responsibility. The majority of the subjects was living in extended family and using oral medication to control their diabetes.

In the experimental group, the gender of the subjects was female (60%), the average of age was 47.90 (SD=12.74). There were an equal number of status, religion, ethnic, education level, occupation, and income. More than a half (55%) of the subjects reported that they never received diabetes education and 45 % of the subjects received diabetes education by group teaching which provided by the physician, nurses or nursing students. More than a half (60%) of the subjects cooking by themselves, most of them was extended family and also controlled their diabetes by oral medication. Chi-square was applied to examine the significant difference between the control and experimental groups. The finding revealed that all demographic characteristics and health information between the control and experimental groups were not statistically significant difference at p > .05 (table 1).

Table 1

Frequency and percentage of demographic characteristics of the control and experimental groups (N = 40)

Characteristic	Control group (n = 20)		Experimental group (n = 20)		χ^2	p
	n	%	n	%		
Gender					.10	.74
Male	9	45	8	40		
Female	11	55	12	60		
Age					17.33	.83
18-35 years (early adulthood)	5	25	5	25		
>35-55 years (middle adulthood)	10	50	8	40		
> 55 years (late adulthood)	5	25	7	35		
(CG: M=48.25, SD=13.05)						
(EG: M=47.90, SD= 12.74)						

Table 1 (continued)

Characteristic	Control group (n = 20)		Experimental group (n = 20)		χ^2	p
	n	%	n	%		
Ethnic					.10	.74
Melayunese	8	40	9	45		
Minangnese	12	60	11	55		
Religion					**	**
Islam	20	100	20	100		
Level of education					2.92	.38
Junior High School	7	35	7	35		
Senior High School	7	35	7	35		
Diploma and above	6	30	6	30		
Marital status					**	**
Married	20	100	20	100		
Occupation					.36	.54
Government employee	12	60	13	55		
Non government employee	8	40	7	45		
Income					2.89	.23
< 1,000,000 IDR	6	30	2	10		
1,100,000 – 2,000,000 IDR	7	35	11	55		
2,100,000 – >4,000,000 IDR	7	35	7	35		
Received diabetes education					.10	.74
No	12	60	11	55		
Yes (Group teaching)	8	40	9	45		
Diabetes education which is provided by					1.15	.76
Physician	2	10	2	10		
Physician and nurse	1	5	3	15		

Table 1 (continued)

Characteristic	Control group (n = 20)		Experimental group (n = 20)		χ^2	p
	n	%	n	%		
Nurse and nursing student	5	25	4	20		
Responsibility of cooking					.10	.74
Self cooking	11	55	12	60		
family members	9	45	8	40		
Members in family					.12	.72
2 -4 persons	5	25	6	30		
5-6 persons	15	75	14	70		
Medications (OHA)	20	100	20	100	.53	.46
Glybenclamide 2 tabs/day	16	80	14	70		
Metformin 1 tab/day						
Glybenclamide 3 tabs/day	4	20	6	30		
Metformin 1 tab/day						

** = constant; CG = Control group; EG = Experimental group; OHA = Oral hypoglycemic agents

Table 2 shows that most of the subjects in both group (45% - 60 %) were diagnosed as diabetes for less than 1 year, twenty percent of the subjects were overweight (BMI: 25 – 29.9) and 10% - 15% were obese (BMI: >30). Thirty to forty percent of the subject had poor control of fasting blood glucose (>200 mg/dL).

T-test was applied to examine whether the control and the experimental groups had any difference in the three characteristics (duration of illness, BMI, and last fasting BGL). The findings revealed that the both groups were not statistically significant difference ($p > .05$).

Table 2

Frequency and percentage of health information of the control and experimental groups (N = 40)

Characteristic	Control group (n = 20)				Experimental group (n = 20)				t	p
	n	%	M	SD	n	%	M	SD		
Duration of illness			18.50	8.98			16.40	9.78	.70	.48
1-12 month	9	45			12	60				
13-24 month	7	35			4	20				
25-36 month	4	20			4	20				
BMI			23.92	3.65			24.64	3.63	.62	.53
< 18.5	1	5			-	-				
18.5 -24.9	13	65			13	65				
25 -29.9	4	20			4	20				
> 30	2	10			3	15				
Last fasting BGL									.65	.51
<135 mg/dL (good control)	3	15	193.10	63.22	5	25	180.25	60.18		
135-200mg/dL (average control)	11	55			7	35				
>200 mg/dL (poor control)	6	30			8	40				

Dietary behaviors of Indonesian adults with T2DM

Dietary behaviors were measured in three dimensions: selecting healthy diet, arranging meal plan and recognizing the amount of food calories. Table 3 shows that in post-test of the control group the mean scores of each item the dietary behaviors was decreased significantly (*t*=5.78, p<.001). Paired t-test was applied to examine the difference between the mean scores of pre-test and post-test of control group.

Table 3

Pre-test and post-test, mean scores and standard deviations on the total of dietary behaviors of the control group (N = 20)

Dietary behavior domains	Pre-test			Post-test			
	Mean	(SD)	Level	Mean	(SD)	Level	Paired-t
Selecting healthy diet	2.09	.30	Moderate	1.96	.28	Low	3.87***
Arranging meal plan	2.08	.37	Moderate	1.91	.35	Low	4.48***
Recognizing the amount of food choice	1.73	.42	Low	1.65	.39	Low	2.02***
Total	2.00	.28	Moderate	1.84	.26	Low	5.78***

*** p<.001

Table 4 shows that in post-test of the experimental group the mean score of each item of dietary behaviors was increased significantly (t=25.28, *p*<.001). Paired t-test was applied to examine the difference between the mean scores of pre-test and post-test of experimental group. The result revealed that every dimension of dietary behaviors had a significant difference in the mean scores (*t*=27.34, *p*<.001; *t*=17.88, *p*<.001; *t*=14.71, *p*<.001).

Table 4

Comparison of pre-test and post-test, mean scores and standard deviations on the total of dietary behaviors of the experimental group (N = 20)

Dietary behavior domains	Pre-test			Post-test			
	Mean	(SD)	Level	Mean	(SD)	Level	Paired-t
Selecting healthy diet	2.06	.19	Moderate	3.40	.12	High	27.34***
Arranging meal plan	2.08	.31	Moderate	3.22	.20	High	17.88***
Recognizing the amount of food choice	1.82	.24	Low	2.85	.27	Moderate	14.71***
Total	2.00	.19	Moderate	3.16	.15	High	25.28***

*** p< 001

Table 5 shows that there was no statistically significant difference between the pre-test mean scores of the control and experimental groups ($p > .05$). Independent t-test was applied to examine the difference between the mean score of the control group and experimental groups.

Table 5

Comparison of pre-test mean scores and standard deviations of the dietary behaviors between the control and experimental groups (N = 40)

Dietary behavior domains	Control group			Experimental group			t
	Mean	(SD)	Level	Mean	(SD)		
Selecting healthy diet	2.09	.30	Moderate	2.06	.19	Moderate	.34 [ns]
Arranging meal plan	2.08	3.7	Moderate	2.08	.31	Moderate	.07 [ns]
Recognizing the amount of food calories	1.73	.42	Low	1.82	.24	Low	.82 [ns]
Total	2.00	.28	Moderate	2.00	.19	Moderate	.24 [ns]

ns = no significant difference

Table 6 shows that the mean score of post-test of the control and experimental groups had higher significant statistical difference at the fourth week of post intervention. Independent t-test was applied to examine the difference between the mean score of the control group and experimental groups. The result showed that means score of post-test of the control and experimental groups were statistically significant difference at (t=19.59, p < .001).

Table 6

Comparison of post-test, mean scores and standard deviations on the total of dietary behaviors of the control and experimental groups (N = 40)

Dietary behaviors domains	Control group			Experimental group			
	Mean	(SD)	Level	Mean	(SD)	Level	t
Selecting healthy diet	1.96	.27	Low	3.40	.12	High	21.34***
Arranging meal plan	1.91	.35	Low	3.22	.20	High	14.20***
Recognizing the amount of food choice	1.65	.39	Low	2.85	.27	Moderate	11.18***
Total	1.84	.26	Low	3.16	1.5	High	19.59***

*** p < .001

Discussion

Discussion of the study findings is carried out in three parts. The first part is about characteristic of subjects, the second part is about dietary behaviors of T2DM patients, and the third part discusses the effect of HBM based education program to prevent diabetes complications on dietary behaviors.

Demographic Characteristics and Health Information of the Subjects

Demographic characteristics of the subjects with T2DM are summarized in Table 1. The subjects were Minangnese and Melayunese; all of the subjects were Muslims. Their marital status was married. The majority of the subjects in the control and experimental groups were

government employees because government employees get free the health services in the government hospitals like Arifin Achmad Hospital. As government employees, had monthly income about 1,100,000–2,000,000 IDR (equivalent 100-200 USD). In 2008, average income of people in Riau Province was approximately 833,000 IDR (76 USD) (Upah Minimum Provinsi, 2008). Most of the subjects perceived that they had adequate income (Table 1).

Most of the subjects were reported that they never received diabetes education (55% - 60%). This might be because routine diabetic health education that provided by the doctors or nurses in the OPD of Arifin Achmad Hospital is provided occasionally according to staff availability. The hospital has no system of management and follow up the attending diabetic patients and educator for diabetic health education. Consequently, these type 2 patients did not get diabetic health education. Besides, they did not perceive susceptibility, severity, and threats of DM. Whilst, over 40 % of the subjects in the control and experimental groups received diabetes education by group teaching which was provided by the physicians, nurses or nursing students at OPD of Arifin Achmad Hospital.

All of the patients were prescribed by oral hyperglycemic agents which are commonly used by patients with T2DM as mainly management (Cantrill & Wood, 2003). Metformin and glibenclamide were found as the drugs of choice for controlling blood glucose level of patients with T2DM. Seventy to eighty percent of the subjects were taking Glybenclamide 2 tablets per day; combine with Metformin 1 tab/day and 20% -30% were taking Glybenclamide 3 tablets per day, combine with Metformin 1 tab/day. Metformin can decrease hepatic glucose production, increases glucose uptake, possibly decreases appetite and helps to decrease blood glucose levels by making muscle tissue more sensitive to insulin. It is usually taken 2-3 times a day. Whilst, glibenclamide can increases insulin secretion and promotes insulin actions on the liver and peripheral tissues (increase insulin production). It has generally taken 1-2 times a day before meals (American Diabetes Association, 1998; Gagarina, 2007).

The characteristics of age, levels of education, and gender in the control and experimental groups were matched ($p > 0.5$) (Table 1). The subjects' of the control and experimental groups were in middle adulthood. WHO stated that T2DM mostly affected in the middle age (35-64 years old) (WHO, 2006). Physiological changes are associated with ageing,

such as changes in hormones, effect of high levels of free fatty acids and glucose, and also impairment of insulin secretion and action (Møller, Gormsen, Fuglsang, & Gjedsted, 2003).

Most of the T2DM patients in Arifin Achmad Hospital were females. It could be supported by the medical record data that the prevalence of female was higher than male (Medical Record of Arifin Achmad Hospital, 2007). Previous study has found that females were commonly suffering from T2DM (Rahman & Islam, 2008). Likewise, Daniel, and Messer (2002) found that prevalence of female with T2DM in the Canadian Aboriginal population 13% higher than male. In addition, Afridi and Khan (2003) studied 100 patients with T1DM and T2DM and among them 65 patients were females. It indicated that females commonly suffer from T2DM.

Findings of the study revealed that the education levels of the subjects were junior high school and above. It might be explained because of the majority of the subjects were government employees. Forty percent to sixty percent of patients had duration of illness less than 1 year and they did not attend regular teaching program because most of them rush to go back home after seeing a doctor. Seventy percent of the patients were living in extended family and 55% - 60% had cooking responsibility. Thus, they have more responsibilities for family. Twenty percent of the subjects in both group were overweight (BMI: 25 – 29.9) and 10% - 15% were obese (BMI: >30).

Comparison of dietary behavior of the experimental group before and after attending the HBM based education program (Hypothesis I)

Before entering HBM based education program, the experimental group was assessed their perceptions and beliefs by the Health Beliefs Form for determining what content was needed for instructing the subjects on how to change their beliefs about uncontrolled DM, and also the benefits and barriers of diabetic diet management . The data were used to guide the instructional content presented during the HBM based education program. Majority of the subjects did not perceive susceptibility and severity of uncontrolled DM. Few of the subjects, in the experimental group were aware that they were likely to develop diabetic complications, if their diabetes was out of control. After the researcher obtained the data from the Health Belief Form, the HBM based education program was provided consisted of providing instruction on the four concepts of

the HBM: perceived susceptibility of uncontrolled DM; perceived severity of uncontrolled DM; perceived benefits of diabetic diet management; and, perceived barriers of diabetic diet management. Throughout the HBM based education program, the subjects repeatedly asked about the risk factors and complications associated with diabetes, and how to prevent possible diabetic complications.

Regarding the comparison of dietary behaviors of the experimental group, before and after the HBM based education program, the findings suggested that significant increases occurred in all three dimensions of behavior (see Table 4). The results showed that after attending the HBM based education program, the experimental groups' mean scores for the three dietary behaviors were higher than the scores they obtained prior to attending the education program ($p<.001$), and their dietary behavior scores were higher than the dietary behavior scores obtained by the control group subjects who received only routine diabetic health education ($p<.001$) from the Out Patient Department of the hospital. It might be explained that the experimental group which received diabetic health education with HBM based education program the post-test total mean score of dietary behaviors increased significantly ($t=25.28$, $p<.001$) (Table 4). The experimental group received the HBM based education program by several methods e.g. group lecture, group discussion, practice serving an appropriate diabetic meal, according to the food pyramid, and presenting the pictures of diabetic complications. This method was able to increase the awareness of the subjects. Additionally, the researcher explained about the concept of T2DM, the higher chance to get diabetes complications of uncontrolled DM, the severity of diabetes disease of uncontrolled DM, the benefits of management diabetic diet and how to identify and solve the barriers of diabetic diet management. Besides, the program was provided with leaflet, and presenting sample foods for diabetes patients. The total mean score of dietary behaviors was at the highest level (M=3.16, SD =.15). The total mean score of selecting healthy diet was at a high level (M 3.40, SD=.12) followed by arranging meal plan (M=3.22, SD=.20). Two dimension of dietary behaviors had mean scores at a high level except recognizing the amount of food calories which had a mean score at a moderate level (M=2.85, S =.27) (Table 6).

Selecting healthy diet. In the control group after fourth week, the total mean score of selecting healthy diet was at a low level (M=1.96, *SD* =.28) (Table 6). The item with lowest mean score in selecting healthy diet was for item 1 (M=1.40, *SD* =.50) (Appendix C, Table C1); read the nutrition facts information on food label in packaged food such as the number of calories from fat, the amount of fat, cholesterol, sodium, and sugars. Mostly the subjects never read the nutrition facts information because they did not know the benefits of reading the nutrition facts information for their blood sugar.

Whilst, in the experimental group, after the fourth week the total means score of selecting healthy diet was at a high level (M=3.40, *SD* =.12) (Table 6). The item with highest mean score in selecting healthy diet was for item 5 (M = 3.95, *SD* =.22) (Appendix C, Table C1); avoid consuming high calorie fruits such as durian, rambutan, mango, or mangos teen. The lowest mean score in selecting healthy diet was for item 11 (M=2.70, *SD* =.571); eat baked, boiled or steamed foods. Commonly, the Minangnese and the Melayunese have dishes cooked with coconut milk and they like to have fried food (Culture Grams World Edition, 2005). Thus, it was not easy to change the predominant foods to baked, boiled, or steamed foods.

Arranging Meal plan. In the control group, after fourth week the total mean score of arranging meal plan was at a low level (M=1.91, *SD* =.35) (Table 6). The item with lowest mean score for arranging meal plan was for item 20 (M=1.45, *SD* =.60); use food exchange list in timing meals appropriately. More than 50% the subjects never use food exchange list. It can be explained because they did not have enough knowledge about food exchange list for T2DM patients. Consequently, they could not practice by using food exchange list to maintain their diet because they did not know the benefits of using food exchange list for their blood glucose level.

In the experimental group, the total post-test mean score arranging meal plan was at a high level (M=3.22, *SD*=.20) (Table 6). The highest mean score was for item 21 (M=3.90, *SD*=.30); eat 3 meals a day. After fourth week of intervention, the subjects were applied serving methods to eat 3 meals by regularly. Perceived benefits of the subjects were increase after attending education program. They aware that by eating 3 meals regularly they can maintain their blood sugar in normal range. The lowest mean score of arranging meal plan was for item 19 (M=2.70, *SD* =.47) (Appendix C, Table C1); use serving methods in arranging meal plan each

day. Mostly the subjects have problem to apply serving method each day because they could not control their diet. They also have inadequate knowledge about using serving methods to apply in their diet.

Recognizing the amount of food calories. Similar to selecting healthy diet and arranging meal plan, in the control group, after the fourth week the total mean score of recognizing the amount of food calories was at a low level (M=1.65, SD=.39) (Table 6). The lowest mean score was for item 27 (M=1.15, SD=.36) (Appendix C, Table C1); use the Body Mass Index (BMI) to estimate the amount of food. The majority of the subjects did not know how to calculate BMI. They lack of information about the benefits of using BMI to estimate the amount of food.

Every dimension of dietary behaviors in the experimental group after attending education program had mean scores at a high level except recognizing the amount of food calories (M=2.85, SD=.27) which had a mean score at a moderate level. The highest mean score was for item 24 (M=3.20, SD=.41) (Appendix C, Table C1); limit the calorie of food every day. The lowest mean score was for item 27, similar to the control group that the lowest mean score in recognizing the amount of food calories was for item 27 use the Body Mass Index (BMI) to estimate the amount of food. Almost all participants was not used to estimated the amount of food by using Body Mass Index even though they know the advantages of estimated the amount of food after attending the HBM based education.

Comparison of dietary behaviors of the control and experimental groups after receiving the HBM based education program (Hypothesis II)

The effect of the Health Belief Model (HBM) based education program was evaluated by change in dietary behaviors. The results of this study showed that the mean scores of dietary behaviors for selecting healthy diet, arranging meal plan, and recognizing the amount of food calories in experimental group after attending diabetic health education were significantly higher than those in the control group who received only diabetic health education from OPD Arifin Achmad Hospital (p<.001) (Table 6). The total mean score of dietary behaviors was at the highest level (M=3.16, SD=.15). The total mean score of selecting healthy diet was at a high level (M=3.40, SD=.12) followed by arranging meal plan (M=3.22, SD=.20). Two dimension of dietary

day. Mostly the subjects have problem to apply serving method each day because they could not control their diet. They also have inadequate knowledge about using serving methods to apply in their diet.

Recognizing the amount of food calories. Similar to selecting healthy diet and arranging meal plan, in the control group, after the fourth week the total mean score of recognizing the amount of food calories was at a low level (M=1.65, SD=.39) (Table 6). The lowest mean score was for item 27 (M=1.15, SD=.36) (Appendix C, Table C1); use the Body Mass Index (BMI) to estimate the amount of food. The majority of the subjects did not know how to calculate BMI. They lack of information about the benefits of using BMI to estimate the amount of food.

Every dimension of dietary behaviors in the experimental group after attending education program had mean scores at a high level except recognizing the amount of food calories (M=2.85, SD=.27) which had a mean score at a moderate level. The highest mean score was for item 24 (M=3.20, SD=.41) (Appendix C, Table C1); limit the calorie of food every day. The lowest mean score was for item 27, similar to the control group that the lowest mean score in recognizing the amount of food calories was for item 27 use the Body Mass Index (BMI) to estimate the amount of food. Almost all participants was not used to estimated the amount of food by using Body Mass Index even though they know the advantages of estimated the amount of food after attending the HBM based education.

Comparison of dietary behaviors of the control and experimental groups after receiving the HBM based education program (Hypothesis II)

The effect of the Health Belief Model (HBM) based education program was evaluated by change in dietary behaviors. The results of this study showed that the mean scores of dietary behaviors for selecting healthy diet, arranging meal plan, and recognizing the amount of food calories in experimental group after attending diabetic health education were significantly higher than those in the control group who received only diabetic health education from OPD Arifin Achmad Hospital (p<.001) (Table 6). The total mean score of dietary behaviors was at the highest level (M=3.16, SD=.15). The total mean score of selecting healthy diet was at a high level (M=3.40, SD=.12) followed by arranging meal plan (M=3.22, SD=.20). Two dimension of dietary

behaviors had mean scores at a high level except recognizing the amount of food calories which had a mean score at a moderate level (M=2.85, SD=.27) (Table 4).

The researcher was hypothesized that, after Health Belief Model based education program the mean score of dietary behaviors in the experimental group pos-test will increase significantly than those who received only routine diabetic health education. The findings indicated that HBM based education program improved all relevant aspects of dietary behaviors among Indonesian adults with T2DM. It might be explained that after pre-test until 4 week later, the control group did not get information and they did not know about diabetes complications. They did not know about selecting healthy diet, arranging meal plan, and recognizing the amount food calories. Even though, they received routine diabetic health education from the physicians, nursing staff or nursing students during visiting in the OPD. The education does not cover dietary behaviors or the evaluation of patients dietary practices, and it is not presented regularly; however, the physicians informed the patients in the short time of visiting in the OPD, depend on the staff availability, and they did not use the teaching plan to educate T2DM patients. Usually, the physicians and nurses focus on the patients problems at the time of visiting such as glucose level is high or low and the patients complain such as headache, weakness, or wound infection. Therefore, the control groups do not understand the risk factors associated with diabetes and thus, fail to adequately manage an appropriate diabetic dietary regimen. In post-test total mean score of dietary behaviors of control group was at a low level (M=1.84, SD=.26). The mean score of each item of dietary behaviors was also at a low level; selecting healthy diet (M=1.96, SD=.28) followed by arranging meal plan (M=1.91, SD=.35), and recognizing the amount of food calories (M = 1.65, SD=.39), respectively (Table 3).

The methods of instruction used may also have contributed to the success of the HBM based education program. For example, by presenting lecture content in a group setting, it is possible that the subjects, in the experimental group, gained comfort in obtaining new knowledge through shared peer learning. In addition, the opportunity for group discussion allowed the subjects the opportunity to reflect on their own problems; the barriers they each faced in managing their diabetic diets; and, what information they needed to learn. Having the opportunity to practice serving an appropriate diabetic meal, according to the food pyramid, no

doubt increased the confidence and skill of dietary management of the subjects in the experimental group. By presenting several pictures of diabetic complications, it is possible that the subjects, in the experimental group, were able to increase their sensitivity about how to prevent their own possible complications. The HBM based education program, in this study, demonstrated results similar to Abood, Black and Feral's (2006) findings, which noted that the use of a HBM based education program improved the nutritional practices and knowledge of patients with cardiovascular disease and cancer, as measured by the reduction in consumption of calories, fat, saturated fat and cholesterol.

Congruently, Sharifirad, Hazavehi, Baghianimoghadam, and Mohebi (2007) found that the effect of HBM based education program resulted in better foot care in patients with T2DM. Mahmoudin and Doya (2007) found the HBM based education with consume zinc sulfate could promote some preventive behaviors among hajj/pilgrimage travelers (spiritual travelers to Mecca for Muslims). In previous study, Power, Struempler, Guarino, and Farmer (2005) found that nutrition education program could improve dietary behaviors and increase nutrition knowledge of Second-Grade and Third-Grade Students. Such findings suggest that the HBM based education program improved all aspects of dietary behaviors among the subjects.

In summary, the findings of this study showed that after attending the education program based HBM, the dietary behaviors of Indonesian adults with T2DMwere improved compared to their dietary behaviors prior to receiving the program. In addition, the dietary behaviors of the subjects in the experimental group were better than the subjects in the control group, who did not receive the HBM based education program. In addition, significant differences were found between the experimental group and control group regarding all three dimensions of behavior, with the experimental group scoring significantly higher on all three dimensions compared to the control group (See Table 6). Thus, both hypotheses were supported.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This quasi-experimental research was designed to examine the effect of Health Belief Model based education program on dietary behaviors to prevent diabetes complications in Indonesian adults with T2DM mellitus. This study was conducted at OPD of Arifin Achmad Hospital, Pekanbaru, Indonesia from December to February 2009. Forty subjects were selected for this study and divided equally into two groups (control and experimental group). The control group received routine diabetes health education, while the experimental group received routine diabetes health education and the Health Belief Model based education program. Subjects were asked to respond to the instrument that included the demographic and health information form and the dietary behaviors questionnaire. Descriptive statistical analysis which included frequency, percentage, range, mean $(\bar{x})$ and standard deviation (SD) was used to describe the patients demographics and health information. Independent and paired *t*-test was used to test dietary behaviors of the control and the experimental group before and after intervention. This chapter presents the topics as follows:

1. Summary of the study results
2. Implications and recommendations
3. Limitation

Summary of the Study Findings

In this study, 40 patients with T2DM were selected as the subjects. The characteristics of age, level of education, and gender in the control and the experimental groups were matched. The majority of the subjects in the control and the experimental groups were in the range of >35-55 years old, half of them were females, had average education at junior and senior high school, and received monthly

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income about 1,100,000 – 2,000,000 IDR. Both of the groups had T2DM not more than 3 years. Some of the subjects were already received routine diabetic health education from the physician, nurses or nursing students. The control and the experimental groups received oral hypoglycemic agent (OHA). After four weeks of attending HBM based education program the results revealed that the experimental groups' dietary behavior scores (selecting a health diet, arranging a meal plan and recognizing of food calories) were higher than the scores they obtained prior to attending the education program ($p<.001$), and their dietary behavior scores were higher than the dietary behavior scores obtained by the control group subjects who received only routine diabetic health education. Therefore, the HBM based diabetic education program was found to be an effective means for changing the dietary behaviors adult Indonesians with T2DM.

Implications and Recommendations

The study findings presented the effect of Health Belief Model based education program on dietary behaviors to prevent diabetes complication in T2DM patients in Indonesia. Nurses should apply the Health Belief Model based education program for helping diabetes patients to change their dietary behaviors such as selecting healthy diet, arranging meal plan, and recognizing the amount of food choice.

Nursing practice

1. The findings of this study present some methods such as group lecture, group discussion, practice serving an appropriate diabetic meal according to food pyramid, presenting several pictures of diabetic complications, slide, leaflet, and asking questions to evaluate the perceptions of subjects. The nurses can use in OPD to increase patients with T2DM perception of diabetes complication such as group teaching, group discussion, and practice to serving meal according to diet recommendation for diabetes patients, using questionnaires to evaluate the perceptions of patients, and show the picture of diabetic diet and diabetic complications.

2. The effect of HBM based education program found that the experimental group was higher than control group after fourth week intervention. Two items of dietary behaviors of the

experimental group were at a high level; selecting healthy diet, and arranging meal plan was the highest, while recognizing the amount of food choice was at moderate level. Therefore, nurses have to encourage T2DM patients to participate in the HBM based education program and it should be conducted regularly in OPD.

Nursing education

The Health Belief Model based education program is able to integrate for guiding the students to increase teaching skill and to promote T2DM in the direction of diabetes complications in adult nursing.

Nursing research

The result of this study can be as a guideline for health professionals, particularly nurses and doctors by applying the HBM based education program in structured dietetic education for patients with T2DM. The results of this study also were provided evidence based nursing, which can be applied in similar population and reference for further experimental study that will aim to improve exercise, blood glucose level, and BMI of patients with T2DM.

Limitations

Since the subjects were all obtained from only one Diabetic Clinic, from one hospital, the findings have limited in generalization. In addition, the findings relate only to adults and not children or youth. Future studies need to be conducting using a large sample size, a more diverse population and an increased number of data gathering sites.

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APPENDICES

Appendix A

Informed Consent Form

Dear patients

My name is Yesi Hasneli Nazir, I am a nursing educator at Faculty of Nursing, University of Riau, Pekanbaru. Now, I am a Master student of Nursing Science in Prince of Songkla University, Thailand. I am conducting a nursing research project to examine the effect educational program based health belief model to prevent diabetes complications on dietary behavior of Indonesian adults with type 2 diabetes mellitus. If you agree to participate, you will be asked to complete the questionnaire within 25 minutes.

Your personal identity and all answers will be confidential. The information gathered will be revealed and remain anonymity and confidentiality. The benefit of the research is your awareness to threat of diabetes will increase and will prevent diabetic complication. You may withdraw from the research at any time if any potential harm without any effect on the treatment or nursing care for you. Your signature in this form will indicate that you understand this form and are willing to participate in this research.

Date ....

Patient   Researcher

(_____)   (_____)

Thank you very much for your participation. If you need information or have questions please contact me at Faculty of Nursing, Riau University, Pekanbaru (0761) 31162, mobile phone 085667646609 or email yesi_fik.unri@yahoo.com and yesi_zahra@yahoo.com.

Appendix B

INSTRUMENTS

Code : ....

Date/Time : ....

Demographic and Health Information Form

Direction: This form consist of demographic and health information data. Please answer and fill with putting mark " √ " in the box "☐ "

1. Age ....year

2. Gender ☐ (1) Male ☐ (2) Female

3. Ethnic ☐ (1) Minangnese ☐ (2) Melayunese

4. Religion ☐ (1) Islam ☐ (2) Christian

   ☐ (3) Hindu ☐ (4) Buddhist

5. Level of education ☐ (1) No formal education ☐ (2) Elementary School

   ☐ (3) Junior high School ☐ (4) Senior High School

   ☐ (5) Diploma or above

6. Marital status ☐ (1) Single ☐ (2) Married

   ☐ (3) Widowed ☐ (4) Divorced

   ☐ (5) Separate

7. Occupation ☐ (1) None ☐ (2) Government employee

   ☐ (3) Private employee ☐ (4) Self employee

   ☐ (5) Farmer ☐ (6) Retirement

8. Income/month ☐ (1) < Rp. 1000.000, 00

   ☐ (2) Rp. 1000.000, 00 – Rp. 2.000.000, 00

   ☐ (3) Rp. 2.000.000, 00 – > Rp. 4.000.000, 00

9. How long have you been diagnosed with diabetes? ....

10. Have you ever received diabetes education from health care providers?

☐ (1) Yes

- Physician

- Physician and nurse

- Nurse and nursing student

☐ (2) No

If yes, what kind of teaching do you received? ……………..

☐ (1) Group lecture

☐ (2) Group discussion

☐ (3) Practice to serving meal according to diet recommendation for diabetes people

☐ (4) Other

11. The responsible person in cooking for subjects and members in family: ……………

Item 13 – 15 filled by nurse

13. Type of medication and medication taken per day: ………...

14. Body weight ………kg   Height ………m   BMI ………kg/m2

15. Last fasting BGL …………. (Date: …………)

The Dietary Behaviors Questionnaire

Direction: The following items are used to measure your dietary behavior. Please signify the degree to which you agree or disagree with the statements by mark "√" choices: **Routinely, Often, Sometimes or Never.** There is no right or wrong answer. If you have a question, please ask the nurse who is giving you this questionnaire.

Table B1

The Dietary Behaviors Questionnaire

No	Statements	Routinely (4)	Often (3)	Sometimes (2)	Never (1)
1	**Selecting healthy diet** Read the nutrition facts information on food label in packaged food such as the number of calories from fat, the amount of fat, cholesterol, sodium, and sugars.				
2	Choose foods containing complex carbohydrate such as brown rice, beans, whole meal/brown bread, oats, and potatoes.				
3	Eat 3-5 servings of vegetables each day e.g. bayam, kangkung, cabbage etc.				
4	Eat 2-4 servings of fruits each day e.g. pear, papaya, banana, lemon, apple etc.				
5	Avoiding consume high calorie fruits such as durian, rambutan, mango, or mangos teen.				
6	Choose non-fat/low-fat milk.				
7	Eat only 2-3 serving from the meat, poultry, fish, dried beans, eggs, and nuts group each day.				
8	Reduce fatty fat food and fatty meats (e.g. rending, kalio, fried banana, bakwan etc).				
9	You or who prepare your food avoids use coconut milk in cooking.				

Table B1 (continue)

No	Statements	Routinely (4)	Often (3)	Sometimes (2)	Never (1)
10	You or who prepare your food use vegetable oils in cooking e.g. sunflower, soybean oil.				
11	Eat baking, boiling or steaming foods.				
12	Choose packaged food containing low sugar e.g. brown rice, wheat flour snacks, bran with fiber, or noodles/vermicelli.				
13	Avoid eat sweets or desert high in sugar e.g. kolak, lepat, cake, pudding.				
14	Limit use of sugar in your diet.				
15	Use artificial sweeteners such as saccharin, aspartame, and diet drinks.				
16	Reduce salt added in cooking.				
17	**Arranging meal plan** Arrange your right meal plan				
18	Use plate method in limiting overall caloric intake each day.				
19	Use serving methods in arranging meal plan each day.				
20	Use food exchange list in timing meals appropriately.				
21	Eat 3 meals a day.				
22	Eat meal in a same time every day.				
23	Eat a variety of foods in every meal daily including vegetables, whole grains, fruits, non-fat dairy products, beans, lean meats, poultry, and fish.				
24	**Recognizing the amount food calories** Limit the calorie of food every day.				
25	Limit and consume the same amount of food every day.				
26	Estimate the calorie of food every day.				
27	Use the Body Mass Index to estimate the amount of food.				
28	Estimate the calorie of food after exercise.				

Appendix C

Pre-test and Post-test Dietary Behaviors Scores

Table C1

Mean and standard deviations of pre-test and post-test dietary behaviors scores by item

No	Dietary Behaviors	Control group				Experimental group			
		Pre-test		Post-test		Pre-test		Post-test	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	**Selecting healthy diet**	1.25	.44	1.40	.50	1.35	.48	3.40	.50
	Read the nutrition facts information on food label in packaged food such as the number of calories from fat, the amount of fat, cholesterol, sodium, and sugars.								
2	Choose foods containing complex carbohydrate such as brown rice, beans, whole meal/brown bread, oats, and potatoes.	2.10	.85	1.95	.75	2.00	.45	3.20	.41
3	Eat 3-5 servings of vegetables each day e.g. bayam, kangkung, cabbage etc.	2.45	.51	2.20	.41	2.55	.51	3.70	.47
4	Eat 2-4 servings of fruits each day e.g. pear, papaya, banana, lemon, apple etc.	2.55	.51	2.20	.41	2.50	.60	3.65	.48
5	Avoiding consume high calorie fruits such as durian, rambutan, mango, or mangos teen.	2.30	.65	2.10	.55	2.25	.44	3.95	.22
6	Choose non-fat/low-fat milk.	1.95	.82	1.85	.67	1.90	.71	2.80	.41
7	Eat only 2-3 serving from the meat, poultry, fish, dried beans, eggs, and nuts group each day.	2.25	.55	2.15	.58	2.15	.36	3.30	.65
8	Reduce fatty fat food and fatty meats (e.g. rending, kalio, fried banana, bakwan etc).	2.20	.69	2.05	.60	2.20	.41	3.65	.48
9	You or who prepare your food avoids use coconut milk in cooking.	1.95	.68	2.00	.72	1.90	.78	3.60	.50

Table C1 (continued)

No	Dietary Behaviors	Control group				Experimental group			
		Pre-test		Post-test		Pre-test		Post-test	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
10	You or who prepare your food use vegetable oils in cooking e.g. sunflower, soybean oil.	2.00	.85	2.00	.79	2.10	.55	3.30	.47
11	Eat baking, boiling or steaming foods.	1.95	.68	1.90	.64	1.90	.30	2.70	.57
12	Choose packaged food containing low sugar e.g. brown rice, wheat flour snacks, bran with fiber, or noodles/vermicelli.	1.95	.82	1.90	.78	2.00	.32	3.05	.68
13	Avoid eat sweets or desert high in sugar e.g. kolak, lepat, cake, pudding.	2.20	.76	2.05	.60	2.10	.78	3.90	.30
14	Limit use of sugar in your diet.	2.55	.51	2.15	.67	2.30	.86	3.90	.30
15	Use artificial sweeteners such as saccharin, aspartame, and diet drinks.	2.05	.88	1.85	.81	2.15	1.04	3.45	.51
16	Reduce salt added in cooking.	1.70	.92	1.55	.75	1.60	.59	2.90	.71
	Arranging meal plan								
17	Arrange your right meal plan	1.80	.83	1.65	.74	1.70	.86	2.95	.22
18	Use plate method in limiting overall caloric intake each day.	1.85	.87	1.65	.74	1.95	.60	3.10	.71
19	Use serving methods in arranging meal plan each day.	1.80	.89	1.70	.80	1.80	.76	2.70	.47
20	Use food exchange list in timing meals appropriately.	1.30	.57	1.45	.60	1.55	.51	2.75	.44
21	Eat 3 meals a day.	2.80	.61	2.35	.81	2.65	.48	3.90	.30
22	Eat meal in a same time every day.	2.55	.51	2.40	.50	2.50	.51	3.80	.41
23	Eat a variety of foods in every meal daily including vegetables, whole grains, fruits, non-fat dairy products, beans, lean meats, poultry, and fish.	2.50	.51	2.20	.52	2.40	.68	3.35	.58

Table C1 (continued)

No	Dietary Behaviors	Control group				Experimental group			
		Pre-test		Post-test		Pre-test		Post-test	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
	Recognizing the amount food calories								
24	Limit the calorie of food every day.	2.00	.79	1.95	.68	2.10	.44	3.20	.41
25	Limit and consume the same amount of food every day.	2.40	.68	2.25	.71	2.40	.50	3.10	.55
26	Estimate the calorie of food every day.	1.80	.83	1.60	.75	2.00	.56	3.00	.56
27	Use the Body Mass Index to estimate the amount of food.	1.15	.37	1.15	.36	1.20	.41	2.20	.52
28	Estimate the calorie of food after exercise.	1.15	.36	1.30	.47	1.40	.50	2.75	.55

Appendix D

Pre-test, frequency, and percentage the Health Belief Form

Table D1

Pre-test, frequency and percentage the health belief model form of the experimental group (N = 20)

| No	ITEMS	Yes %	No %	Don't know %
	Susceptibility			
1	Do you think the people with type 2 diabetes have higher chance to get diabetes complications if uncontrolled diet?	10 (50)	2 (10)	8 (40)
2	Do you believe your diabetic diet in good control?		5 (25)	15 (75)
3	Do you believe, you are unlikely to develop diabetes complications			20 (100)
4	Do you think you will not get diabetes complications because your wound heals fast even though you are uncontrolled diet?	4 (20)	4 (20)	12 (60)
	Seriousness			
5	Do you think diabetes is a serious disease if uncontrolled diet?	9 (45)	2 (10)	9 (45)
6	Do you think diabetes complications will occur if uncontrolled diet?			
	Benefits			
7	Do you think management diabetic diet can help to prevent diabetes complications?	4 (20)	4 (20)	12 (60)
8	Do you think by following food pyramid helps to maintain your blood sugar?	5 (25)		15 (75)
9	Do you think arranging meal plan each day helps in diabetes control?	3 (15)		17 (85)
10	Do you think estimate the calorie of food every day helps in diabetes control?	1 (5)		19 (95)
11	Do you think control blood sugar helps to delay or prevent diabetes complications?	13 (65)	3 (15)	4 (20)

Table D1 (continued)

No	ITEMS	Yes %	No %	Don't know %
12	Do you think read the nutrition facts information on food label in packaged food is advantages for your blood sugar?	2 (10)	7 (35)	11 (55)
13	Do you think regular exercise helps to maintain blood sugar?	4 (20)	15 (75)	1 (5)
14	Do you think reduce weight helps overweight people with diabetes to delay or prevent complications?	1 (5)	7 (35)	12 (60)
15	(For men) Do you think, if you stop smoking helps to delay or prevent diabetes complications?		7 (35)	1 (5)
16	Do you think avoiding regular sweet intake helps in diabetes control?	17 (85)	3 (15)	
17	Do you think low fat diet helps to delay or prevent diabetes complications?		12 (60)	8 (40)
18	Do you think control blood pressure helps to delay or prevent diabetes complications?		18 (90)	2 (10)
19	Do you think reduce salt added in cooking helps to delay or prevent diabetes complications?		6 (30)	14 (70)
	Barriers			
20	What is your problem to control your diet?			
	- I have no problem	18 (90)		
	- Environment	2 (10)		
21	Can you identify what the barrier that you feel difficulty to change is?			
	- I have no barriers	18 (90)		
	- Environment	2 (10)		
22	Can you tell me what the potential way to solve your problems is?			
	- I don't know	18 (90)		
	- Change my dietary behaviors	2 (10)		

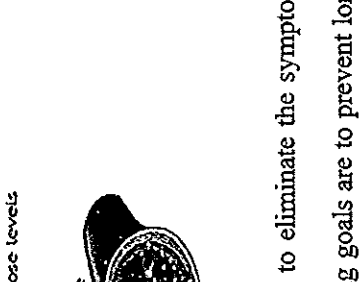**Appendix E**

TEACHING PLAN

The Effect of Educational Program Based Health Belief Model to Prevent Diabetes Complications

on Dietary Behaviors of Indonesian Adults with Type 2 Diabetes Mellitus
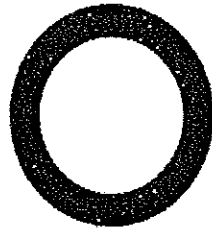
Maintain Healthy Diet, Control Weight and Live Happily

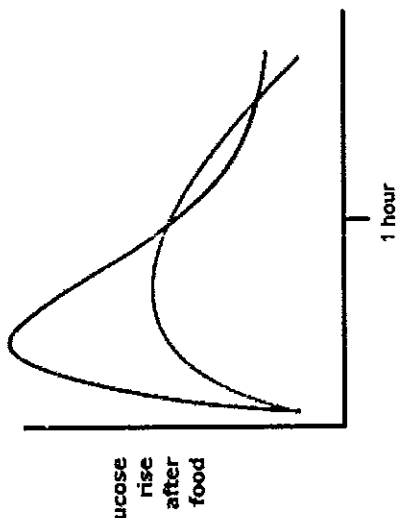Educational Program Based Health Belief Model to Prevent Diabetes Complications on Dietary Behaviors

Objectives	Concepts	Education program of management diabetic diet	Methods	Evaluations
1. To enhance the diabetic patients knowledge of Type 2 diabetes mellitus (T2DM) patients to improve the awareness to treat the disease.	Type 2 diabetes mellitus (T2DM)	Assalamualaikum Wr. Wb and good morning, thanks to participate in this program. In the first session I would like to emphasize on information of T2DM such as definition, causes, pathogenesis, signs and symptoms. In the second session I will explain about the risk factors for having complications, complication of T2DM if uncontrolled DM, benefits and possible barrier of management diabetic diet (management of diabetic diet, management of pharmacology and non pharmacology). This information will improve your dietary behaviors o prevent diabetes complications, and it will give you practice for controlling the disease. Practice of dietary behaviors according diabetic diet such as selecting healthy diet, arranging meal plan, and recognizing of food calories will help you to live healthy and improve your quality of life. **1. Type 2 diabetes mellitus (T2DM)** Before teaching process, educator will assess patient's background knowledge on diabetes, how are their perception of diabetic diet by using HBM questionnaire (22 items), how their diet after suffering of diabetic and what motivates them come to hospital and continue to explain the concept of T2DM.	■ Group lecture ■ Group discussion	■ Asking questions to evaluate the patient's understanding.

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		➤ **What is T2DM?** T2DM is a metabolic disorder which causes insufficient insulin production. The body does not produce sufficient insulin or the cells ignore the insulin. **Glucose in blood** Your goal is to maintain normal blood glucose levels Glucose in blood / Excessive blood glucose After being diagnosed with diabetes, the first goal is to eliminate the symptoms and stabilizing your blood glucose levels. The ongoing goals are to prevent long-term complications and prolong your life. The primary treatments for T2DM are diet and exercise. ➤ **What are the causes of T2DM?** T2DM is probably caused by a complex interaction of environmental factors and predisposing genetic factors, such as genetic and environment.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		➤ **What are the signs and symptoms of T2DM?**		
		The first sign of a T2DM symptom seems undisruptive at first, these signs may plague your health and body for many years without the clear indication that you are suffering a serious medical condition. Some of the common T2DM symptoms include:		
		• Increase in Thirst: As excessive amounts of sugar accumulate in the bloodstream, fluid is pulled from the tissues, often leaving a patient thirsty.		
		• Frequent Urination: As a T2DM patients becomes increasingly thirsty, they may drink water more than usual, which causes them to urinate more frequently.		
		• Increased Appetite: When T2DM causes a deficit in insulin (which is responsible for moving sugar into the cell), the organs and muscles in the body lose energy. This process causes an intense hunger to surface, which may continue even after a meal is eaten.		

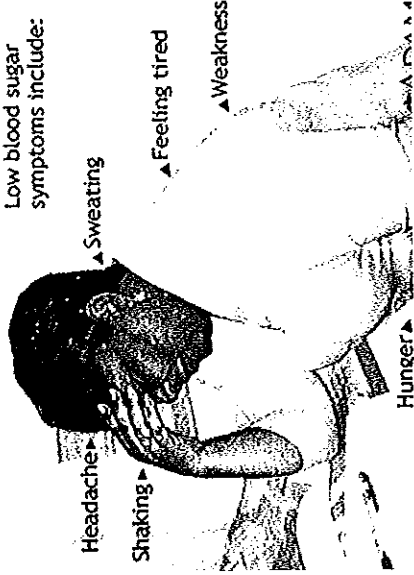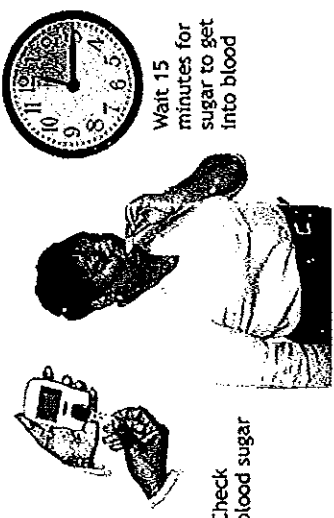| Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		• Weight Loss: T2DM are known to lose weight, even if they have increased the amount of food they eat on a regular basis. This diabetes symptom is caused when energy sugar supplies are so low that muscle tissues and fat storage shrinks. • Fatigue: When the cells lack a reasonable amount of sugar, an individual may become tired and cranky. • Vision Problems: T2DM may cause a blurring of the vision when blood sugar levels are too high and the fluid pulled from tissues affects the lenses of the eyes. Some victims are also unable to focus effectively as a result. • Infections and Slow-Healing Wounds: The ability to heal and combat infections is affected with T2DM. In women, they may suffer from bladder and vaginal infections. ➢ **What is the effect of blood sugar after eating?** After you eat, various foods are broken down in your gut into sugars. The main sugar is called glucose which passes through your gut wall into your bloodstream. However, to remain healthy, your blood glucose level should not go too high or too low.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		➤ **Glucose rise after eat** RED: high glycaemic index, sugar levels too high, harmful GREEN; low glycaemic index, sugar levels lower, healthy Ok everybody do you have any questions as far as this session is concerned? You can ask about the part that you find unclear in this session. I think it's enough for the first session, after break we will continue the second session about risk factors of diabetes complications, severity of diabetes, benefit and barriers of diabetic diet management. Thank you for your attention. Wassalammualaikum. Wr. Wb.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
2. To change the perception of T2DM patients that they have high risks of diabetic complications because of consuming predominantly high fat content foods, commonly having coconut milk in dishes, having fried foods, and fewer vegetables.	Risk factors of diabetes complication s	**2. Perceived susceptibility if uncontrolled diet** Assalamualaikum Wr. Wb. Let's continue our topic. I will explain what are the risk factors of having complications if uncontrolled diet. ➢ What are the risk factors of diabetic complications? Risk factors are factors which contribute to the risk of development of diabetes disease complications. Common risk factors of diabetic complications are : • Duration of diabetes (prevalence of retinopathy increases with increasing duration of the disease) • Hypertension (insulin resistant) • Poor metabolic control (can lead to heart disease, stroke, blindness, kidney disease, amputations, and dental disease) • Smoking (risk factor for developing vascular disease) • Obesity (being overweight is strongly associated with insulin resistance)	■ Group lecture ■ Group discussion	■ Diabetic patients able to explain what is their risks if uncontrolled DM. ■ Asking questions to evaluate the patient's understanding.

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		• Hyperlipidemia (elevated triglycerides and decreased HDL cholesterol levels) • Poor dietary adherence • Depression and stress can lead to hyperglycemia and an increased risk of micro and macrovascular complications. These factors were more prone to develop diabetic complications. The morbidity and mortality caused by diabetes mellitus can be reduced by secondary prevention through regular screening, early detection, appropriate treatment of chronic complications, exercise, and diet management. Obesity and poor dietary adherence were two of the causes of the diabetes complications. Therefore diabetic must control the body weight in order to prevent obesity or overweight. Even a small weight loss, especially round the abdomen, helps reduce your blood pressure, blood glucose and cholesterol levels. As we know Minangnese and Melayunese usually have dishes predominant with high fat foods, spicy foods, and foods commonly cooked with coconut milk; also very fond of fried foods, and fewer vegetables. T2DM patients have to consider management of diabetic diet for maintaining the body weight in normal level.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
2. To increase the belief of T2DM patients that consequences of uncontrolled DM will cause diabetic complications such as acute and chronic complications.	Severity of DM complications	**2. Perceived Severity** ➤ What are the diabetes complications? It is essential that diabetics are aware of the complications that can occur as a result of being diabetic, to ensure that the first symptoms of any possible illness are spotted before they develop. The main concern in T2DM is with regard to the risk of vascular complications. This form of diabetes carries a heightened risk of heart attacks, stroke and circulatory problems. Now, I will explain diabetic complications which include: **a. Acute complications** Acute complications include hypoglycemia, hyperglycemia, diabetic ketoacidosis, hyperglycaemic hyperosmolar state, and malignant hyperthermia. Hypoglycaemia is the low blood sugar. Hypoglycemia is a common acute complication. Hypoglycemia is a clinical syndrome that may be defined as a blood glucose level of less than 40–50 mg/dL. In people without diabetes postprandial or post-meal sugars rarely go over 140 mg/dL,	■ Group lecture ■ Group discussion ■ Show the picture of diabetic complications such as: gangrene, patient who amputation.	■ Diabetic patients able to explain what is the diabetic complications if uncontrolled DM. ■ Asking questions to evaluate the patient's understanding.

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		but occasionally, after a large meal, a 1-2 hour post-meal glucose level can reach 180 mg/dL. Consistently elevated high post-meal glucose levels can be an indicator that a person is at high risk for developing T2DM. ➤ Signs and symptoms of hypoglycemia Symptoms such as weakness, tiredness, shaking, sweating, headache, hunger, nervousness and irritability are signs that a person's blood sugar is getting dangerously low.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		A person showing any of these symptoms should check the blood sugar. If the level is lower 70 mg/dl, a sugar-taken from food should be eaten right away. ▶ **How to treat hypoglycemia?** **15/15 rule** Treat low blood sugar: 15:15 rule Check blood sugar Eat 15 grams of carbohydrate Wait 15 minutes for sugar to get into blood The 15/15 rule is applied to treat low blood sugar by eating 15 grams of carbohydrate and waiting for 15 minutes. The following foods contain 15 grams of carbohydrate:		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		• 3 glucose tablets		
		• Half cup (4 ounces) of fruit juice		
		• 6 or 7 hard candies		
		• 1 tablespoon of sugar		
		After the carbohydrate is eaten, the person should wait for 15 minutes for let the sugar to get into their blood. If the person does not feel better within 15 minutes more carbohydrate can be consumed. His/her blood sugar should be checked to make it sure that he/she within a safe range.		
		Hyperglycemia, or high blood glucose (sugar), is a serious health problem for diabetes. Hyperglycemia develops when there is too much sugar in the blood.		
		b. Chronic		
		Chronic complication can devastate vascular disease. Chronic elevation of blood glucose level leads to damage of blood vessels.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		➢ **How does diabetes affect the body? If the blood sugar (glucose) is not controlled, it can lead diabetes complications:**		
		• Eye problems		
		• Heart disease		
		• Stroke		
		• Kidney failure		
		• Nerve damage		
		• Loss of limbs and tooth/gum problems		
		Diabetes injures the blood vessels that serve a number of key body organs. This can go on to damage your vision, heart, and kidneys. It can delay or prevent tissues from healing. If wounds do not heal, it can lead to amputation.		
		Blood vessel injury can lead to:		
		• Heart attacks and heart failure		
		• Stroke		
		• Loss of vision, even blindness		
		• Poor kidney function, even kidney failure		

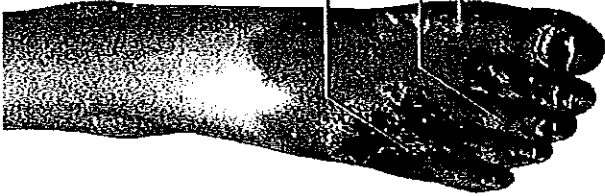| Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		• Poor wound healing, including minor injuries		
		• Poor circulation		
		• Amputation, usually of toes, feet or lower legs, can result from poor circulation and poor wound healing		
		• Poor circulation		
		• Poor circulation prevents nutrients and oxygen from reaching the cells to help heal wounds and infections.		
		• Cells die without oxygen or nutrients.		
		• The affected area becomes numb or tingly or sometimes painful.		
		• Sometimes the poor, slow circulation causes blockage in a blood vessel. Blood that cannot flow through an artery can become a clot which can cause a heart attack, stroke or other blockage.		
		Poor circulation and infections		
		• A cut or wound will not heal well or quickly if there is high blood sugar. The germs feed on the sugar and multiply.		
		• The damaged blood vessels become unable to transport enough infection-fighting cells, natural antibodies, antibiotic medicine or nutrition to the		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		wound to heal well. **Complications: Heart disease** Heart disease is one of the most common complications of diabetes. Diabetes causes increased risk of: • Chest pain (angina) • Coronary artery disease (blockages of arteries in the heart) • Heart attack • Congestive heart failure **Factors which increase the risk of heart disease in diabetics:** • High blood sugar • High blood pressure • High cholesterol **Diabetes and high blood pressure** • One of the common illnesses that develops when you have diabetes is high blood pressure.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		• The high pressure with each beat of the heart damages the heart and blood vessels.		
		• Eventually, it can weaken the heart muscle, causing congestive heart failure.		
		• If the pressure becomes really high, it can also cause a stroke.		
		Diabetes and cholesterol		
		Cholesterol damages arteries, too.		
		• It plugs them up with fatty deposits.		
		• This narrows the openings and slows down blood flow.		
		• This increases the likelihood of heart attacks, strokes and poor circulation to the legs.		
		• Smoking makes all of this worse by further narrowing the arteries.		
		Complications: Kidney		
		• The kidney acts as a blood filter by passing small waste into the urine and keeping large nutrients (protein and sugar) for body use.		
		• When blood sugar is not controlled, the high sugar in the blood damages		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		the kidneys, leaving holes in the tiny filters that make up the kidney.		
		• When filters are damaged, protein and sugar cells pass into the urine.		
		(The presence of protein in the urine means there is kidney damage).		
		Kidney failure		
		• End stage renal disease (ESRD) is the medical term for kidney failure		
		(when the kidneys can no longer function).		
		• Kidney dialysis is then used to get work formerly done by the kidneys.		
		• Many people with ESRD must use dialysis about three times a week to		
		clean their blood.		
		Renal (kidney) dialysis		
		• A special machine is used to remove waste from the blood like a kidney		
		does.		
		• Smaller machines might also be used at home by some patients who are		
		trained and can do their own dialysis.		
		• A family member might also be trained to do this dialysis at home.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		Complications: Vision • Retinopathy (blurred vision/blindness). • Weakened blood vessels can break and bleed, causing blindness. • Laser treatments are often used to repair weakened or broken blood vessels. • Timely eye exams and laser treatments can prevent blindness. **Complications: Nerve damage** • Neuropathy (damage to the nerves) is a common complication of diabetes, especially when the blood sugar is not controlled. • When blood vessels become damaged from the high sugar levels, oxygen and nutrients cannot be delivered to the cells that result in nerve cells damage. **Complications: Dental** • The poor circulation can also affect the blood vessels that supply oxygen and nutrients to the gums and bone which hold the teeth in place. • Gums and jawbone that are unable to get the nutrients and oxygen are more likely to develop infection or become loose.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		• Loose gums can mean teeth loss.		
		• Gum infections make blood sugar control very difficult.		
		Complications: Amputation		
		• Most amputations occur when wounds are not healing and become life threatening.		
		• It becomes life threatening because the infection can spread and affect the body's total blood stream and important organs like the heart, the brain, etc.		
		• When the wound becomes serious, tissues become damaged and infection can't be controlled, it becomes necessary to remove the affected part to save the life.		
		Amputations		
		• Depending on the size and location of the incurable infection or wound, the surgery may mean removing one toe or up to the ankle; it may mean removing the foot.		
		• Special shoes or a special prosthesis may be used to help for walking.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		• A wheel chair may be used if the amputation removes much of the leg and no artificial limb is possible for medical or personal reasons. **Gangrene** Gangrene is the death of tissue in part of the body Foul-smelling discharge Surface and subsurface discoloration		
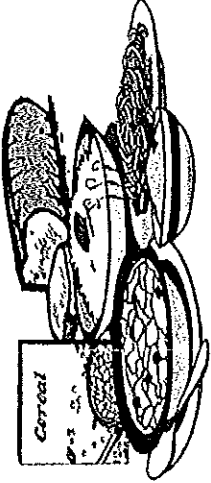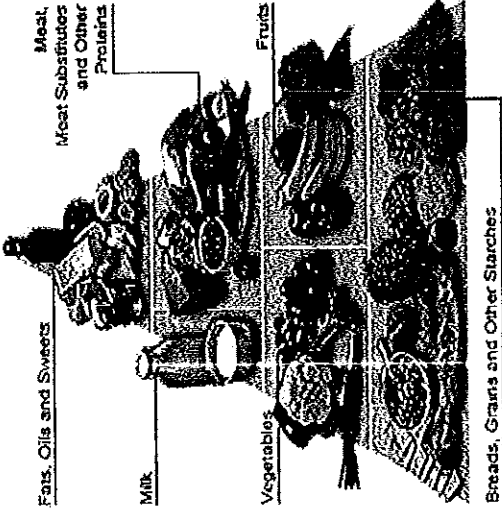
Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		Complications: Sexual dysfunction • Because nerves and blood vessels are damaged by high blood sugar, diabetes can lessen sexual desire. • Both men and women can be affected Diabetes can also lead to impotence **Complications and Smoking** • Smoking is a known cause of heart disease and stroke. • Smoking (nicotine) causes the small blood vessels everywhere in the body to constrict (get narrow), which decreases oxygen to tissues. • Smoking also makes the blood sludgy, making it more likely to clot and cause heart attacks and strokes. • Smoking (even without diabetes) also causes gum disease Smoking worsens all the negative effects of diabetes on the body.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
4. To increase perceived benefits of diet control that will improve the blood glucose and can prevent the diabetes complications whether acute or chronic complications. 5. To identify perceived possible obstacle of diabetic diet management to control their diet i.e. consuming predominantly high fat	Benefits and barriers of diabetic diet management	**Managements of T2DM** I would like continue the education program of management diabetic diet. I will explain about perceived benefits and perceived possible obstacle of diabetic diet management which include management diabetic diet and pharmacological and non-pharmacological management. In the first session, we already discussed about T2DM, First, I will explain about diabetic diet management, I hope it will increase your awareness, about the benefits of diet management, and it will also help you to identify your personal barriers to control your diet. The benefits of the dietary control include normal blood glucose that can prevent or delay diabetic complications. If the T2DM patients realize of these the benefits, the complications will be reduced. You have to find out what barriers are related to uncontrolled diet, such as consuming predominantly high fat content foods, commonly cooking with coconut milk, having fried food and fewer vegetables, identifying are the barriers that retrain them from exercise i.e. lack of time for exercise, have no money to buy shoes, have no friends to accompany for exercise etc.	■ Group lecture ■ Group discussion ■ Practice to serving meal according to food pyramyd ■ Show the food sample of diabetic diet	■ Diabetic patients able to explain what the benefits of management diabetic diet. ■ Asking questions to evaluate the patient's understanding.
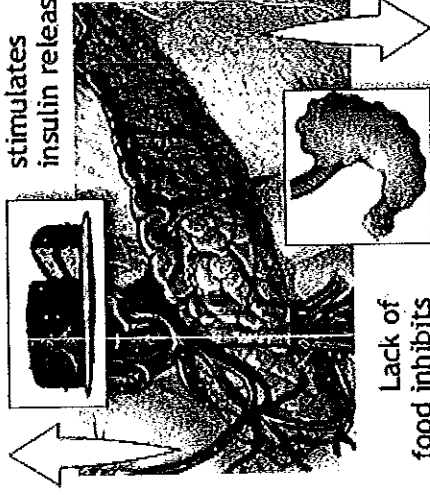
Objective	Concept	Education program of management diabetic diet	Method	Evaluation
content foods,commonly having coconut milk in dishes, cook the food by frying, and fewer vegetables) and also identify what is their barriers to do exercise (i.e., lack of time for exercise, no have money to buy shoes, no friends to accompany for exercise)		You should know unhealthy diet influenced by social environment, such as party known as *kondangan*, and get together. You should also find the ways to eliminate or overcome these barriers. All right, let us start about diabetic diet management. The goal of diet management for people with T2DM is to improve glycemic control. Diet plays a significant role in controlling blood glucose. Main objective of diabetic diet is to maintain ideal body weight along with normal blood sugar levels by providing adequate nutrition. The most important objective in the dietary management of diabetes is to control of total calorie intake, to maintain a reasonable body weight and to control of blood glucose levels. Diet is significantly important for the management of T2DM by controlling the bodyweight, losing 5 to 10% of total body weight, helping the body produce and use insulin efficiently. In fact, having fewer calories can also reduce blood glucose levels.		
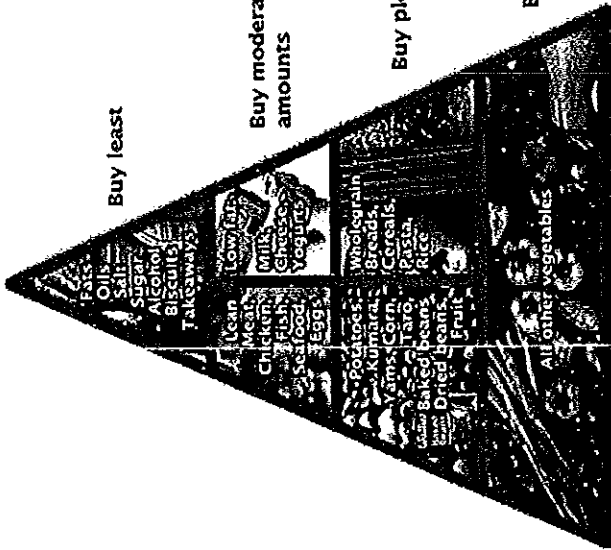
Objective	Concept	Education program of management diabetic diet	Method	Evaluation
Diabetic patients can explore the ways to eliminate or reduce the possible obstacle of diabetic diet management		The basic elements of diabetes diet are: (1) Proteins; (2) carbohydrates; (3) Avoidance of saturated fat and cholesterol completely; (4) Fiber is essential for reducing the rate of glucose absorption, increasing blood sugar, excreting urinary glucose, emptying of stomach, and delaying the intestinal passage time. The nutrient recommendations for adults with diabetes mellitus are based on Diabetic Food Pyramid: **1. Carbohydrate** Carbohydrates are the main nutrients in foods which influence blood glucose levels. Carbohydrates contain 4 kcal per gram. This nutrient is made of plant foods, such as grains, fruits, and vegetables, milk, and some dairy products. Carbohydrate can be divided into simple sugars and complex carbohydrate. The use of sucrose as a part of the total carbohydrate content in the diet does not alter blood glucose control in diabetic patients. Sucrose and sucrose-containing food must be substituted for other carbohydrates by gram for gram.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		Carbohydrate **Food pyramid** 		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		People with T2DM can follow Diabetes Food Pyramid, which divides food into six groups. The food groups of grains, vegetables, fruits, meat/fish, milk, and fats. By following Diabetes Food Pyramid, T2DM patients will have the same carbohydrate content per serving. Paying attention to serving sizes is integral for maintaining healthy blood glucose levels. **Starchy foods** Carbohydrate is nutrient of foods, which alter the sugar levels more than any		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		other types of food. Carbohydrates are found in starchy or sugary foods, such as bread, rice, pasta, cereal, potatoes, peas, corn, fruit, fruit juice, milk, yogurt, cookies, candy, soda, and other sweets. **2. Protein** The recommended daily protein intake is 10% to 20% of total daily kcal intake. Protein has 4 kcal per gram. Sources of protein should be low in fat, low in saturated fat, and low in cholesterol. **3. Fats** Dietary fats should be low in both saturated fat and cholesterol. Fats are restricted to less than 10% of the total kcal per day. Fat has 9 kcal per gram. Within the fat allowance, cholesterol should not exceed to 300 mg daily. Limiting fat and cholesterol intake may help prevent or delay the onset of atherosclerosis as a common complication of diabetes.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		Food and insulin release Food high in sugar stimulates insulin release. Lack of food inhibits insulin release. Insulin is a hormone secreted by the pancreas in response to increase levels of blood glucose.		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		Arranging Meal Plan Food Pyramid 		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		The recommendation of diet for diabetic patients (estimated calorie): **Morning (06.30 AM):** Rice 60 g Meat 25 g Vegetables 125 gram Oil 5 g Fruits (09.30 AM): banana 100 g **Lunch (12.30 PM):** Rice 70 g Tempe 25 g Vegetables 150 g Oil 5 g Fruits (15.30 PM): papaya 100 g		

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Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		Dinner (06.30 PM):		
		Rice 70 g		
		Tempe 25 g		
		Vegetables 150 g		
		Oil 5 mgr		
		Snack (09.30 PM):		
		Fried potato 100 g or fruit (apple 100 g).		
		The total of calorie is 1100 calorie which contain:		
		(1) protein 36.49 g		
		(2) fat 22.81 g		
		(3) carbohydrate 179.35 g		
		(4) cholesterol 93.25 mg.		

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Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		4. Fiber Fiber lowers total cholesterol and low-density lipoprotein cholesterol in the blood and improves blood glucose levels. Fiber slows the emptying of stomach and the movement of food through the upper digestive tract. The ideal level of fiber has not been determined, but an intake of 20 to 35 grams per day is recommended. **5. Salt** Salt should be consumed in limited amount, only 6 gram/day. The primary concern with salt is its association with hypertension, a common health problem in people with diabetes. Ok everybody, do you have any questions about this section? You can ask about the part that you find unclear in our topic. 		

Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		As the type 2 diabetic patients you should know the major causes of complications and also need to know how to select the proper and healthy food based on Diabetic Food Pyramid. Furthermore, you should have strong motivation to empower yourself for preventing diabetes complications. ➤ **How diabetes complications can prevent?** • When diabetes complications are found early, you should take medication to prevent progression of the disease. Only minor lifestyle changes may be necessary. For example, if you have early diabetic nephropathy, you can take medication to prevent further damage. Early treatment for a complication and keeping your blood sugar levels within a safe range can help to slow the progression of your complication and may prevent other complications from developing. ➤ **How diabetes complications are treated?** • Treatment of diabetes complications focuses on slowing the progression of the damage. That may include medication, surgery, or other treatment options.		

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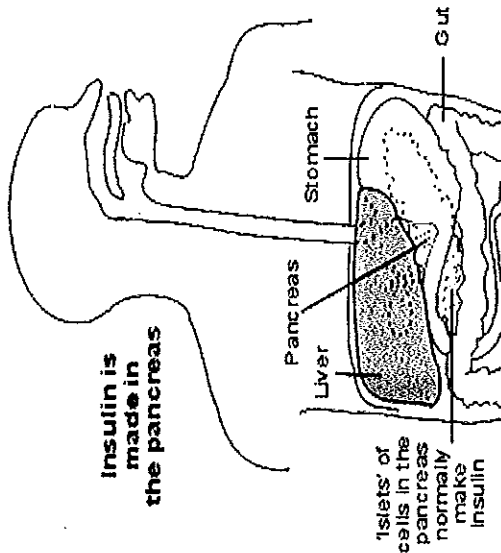| Objective	Concept	Education program of management diabetic diet	Method	Evaluation
		But the most important treatment to slow the progression of diabetes complications is to **keep your blood sugar levels tightly** for controlling and to treating high blood pressure and high cholesterol.		
		• Non-pharmacological therapies such as exercise and stress management can control blood glucose in T2DM.		
		TIPS FOR PREVENTING DIABETES COMPLICATIONS		
		1. Maintain your body weight		
		2. Do exercise regularly and stress management		
		3. Maintain your personal hygiene		
		4. Keep your blood pressure, cholesterol, and triglycerides at normal levels		
		5. If you smoke, quit; cease smoking		
		6. Check your feet daily for signs of infection such as redness or sores.		
		7. See an ophthalmologist (an eye doctor) at least once a year for early identification of diabetes retinopathy signs		
		8. Get early treatment of infections to prevent more serious complications.		
		9. See your dentist regularly to clean and check your teeth to prevent serious		

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dental problems.

If you will follow these tips in your daily life, Insya Allah diabetes complications can delay or prevent. You should be optimistic to get healthy life even though you are suffering from diabetes. Keep our iman for accepting everything that Allah S.W.T gives to us (ikhlas) so you will enjoy your life and happily.

I think it's enough for education program. I would like to say thank you very much for your participation and attention. I hope all of you can apply management diabetic diet and change your dietary behaviors to improve blood glucose and to prevent acute and chronic complications. Enjoy your life, always optimistic in the future, do exercise regularly. Please don't hesitate to contact me if you have any problems regarding diabetic diet management. You can call me on this number 085667646609 or send email to yesi_fik.unri@yahoo.com or yesi_zahra@yahoo.com. Insya Allah I will help you. Please read the leaflet that I already gave you to use at home. I hope it will be useful for you. Always keep your spirit by motto: **"Maintain Healthy Diet, Control Weight and Live Happily"**. Wassalamualikum Warohmatullahi Wabarokatuh.

Appendix F

Insulin is
made in
the pancreas

Gut

Stomach

Pancreas

Liver

'Islets' of
cells in the
pancreas
normally
make
insulin

Edukator : Yesi Hasneli Nazir
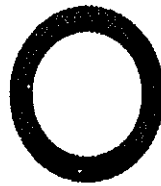
**Maintain Healthy Diet, Weight Control,
and Life Happily**

Apakah Diabetes tipe 2 ?

Diabetes tipe 2 adalah suatu kelainan metabolik di mana produksi insulin tidak mencukupi. Tubuh tidak bisa menghasilkan insulin.

Apakah penyebab Diabetes tipe 2 ?

- Obesitas
- Gaya Hidup
- Keturunan
- Lingkungan
- Kelainan Insulin
- Tidak effektifnya sekresi hormon diusus

Apaka gejala dan tanda DM tipe 2

- Peningkatan rasa haus
- Sering buang air kecil
- Sering lapar
- Berat badan menurun
- Pandangan kabur
- Mudah lelah
- Sering sakit kepala
- Otot kram
- Penyembuhan luka yang yang lama

Apakah Kemungkinan Komplikasi pada DM tipe 2

a. Komplikasi Akut
- Hypoglikemi
- Hypergliokemi
- Diabetic ketoacidosis
- Malignan hyperthermia.

Hypoglykemi adalah keadaan yang terjadi bila kadar gula darah terlalu rendah (gula dalam darah < 40 - 50 mg/dL)

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symptoms include:

▲Sweating

Headache▲

▲Feeling tired

▲Weakness

Shaking▲

Hunger ▲
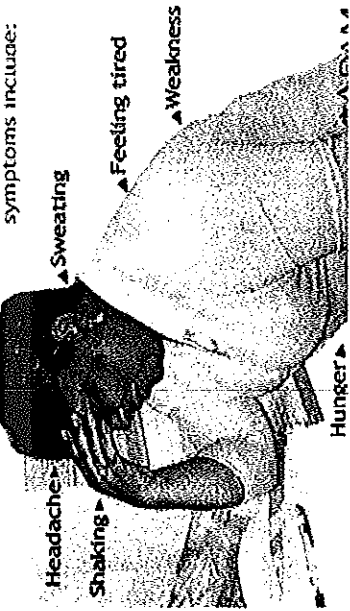
Hal ini disebabkan karena ketidak seimbangnya antara makanan yang dimakan, gerak badan dan obat yang digunakan . Gejalanya antara lain lemah, perasaan sangat lelah, gemetar, keringatan, sakit kepala, bingung, mata berkunang-kunang, rasa perih diulu hati seperti orang kelaparan

Bagaimanakah cara mengatasi hypoglykemi

Minumlah satu gelas teh manis/sirop manis atau makanlah satu sampai dua sedok makan gula pasir. Melaporlah segera kedokter anda.

Treat low blood sugar: 15:15 rule

Check
blood sugar

Eat 15 grams of carbohydrate

Wait 15
minutes for
sugar to get
into blood

b. Komplikasi kronik

Komplikasi kronik dapat merusak pembuluh darah seperti :

,- Atheroma (pengerasan pembuluh darah ateri)

,- Kerusakan ginjal

,- Masalah pada mata
,- Kerusakan persarafan.
,- Masalah pada kaki
,- Impoten

Apakah tujuan dari pengobatan

,- Untuk menjaga kadar gula dalam darah (dalam batas normal).
,- Untuk menurunkan faktor risiko terjadinya komplikasi
,- Untuk mendeteksi komplikasi secara dini.

Anda dapat menurunkan kadar gula dalam darah jika anda melakukan diet yang benar, menjaga berat badan dalam batas normal dan melakukan olah raga secara teratur.

Before
• Include 5 minute warm up
• Check blood sugar

After
• Include 5 minute cool down
• Check blood sugar
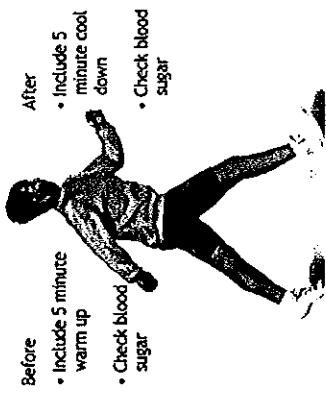
Bagaimanakah cara mencegah komplikasi diabetes ?

1. Perceived Susceptibility (meningkatkan kesadaran bahwa penderita DM berisiko tinggi terjadinya komplikasi)

2. Perceived Severity (meningkatkan kesadaran bahwa penderita DM akan mengalami komplikasi DM jika tidak mengontrol diabetes dengan baik)

3. Perceived Benefits (meningkatkan kesadaran bahwa dengan mengontrol DM dan olahraga teratur dapat mencegah komplikasi)

4. Perceived Barriers (menyadari bahwa banyak faktor di lingkungan dapat menjadi hambatan dalam mengontrol DM dan carilah pemecahan masalahnya)
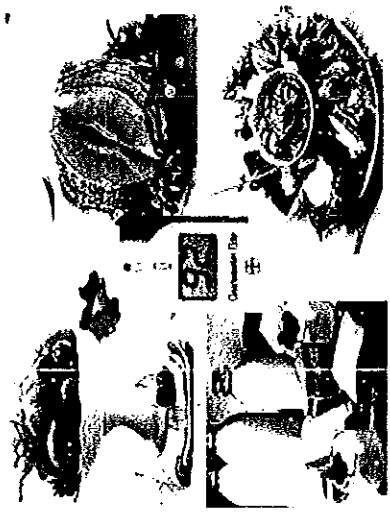
Terimakasih dan Wassalam

Maintain Healthy Diet, Weight Control

and Life Happily

Yesi Hasneli Nazir
Dosen Fakultas Ilmu Keperawatan UNRI
Universitas Riau Pekanbaru
Riau

and work on various parts of the body.

The nutrient recommendations for adults with diabetes mellitus are based on Diabetic Food Pyramid:

1. Carbohydrate

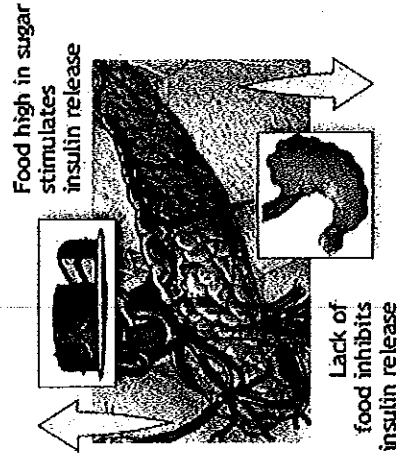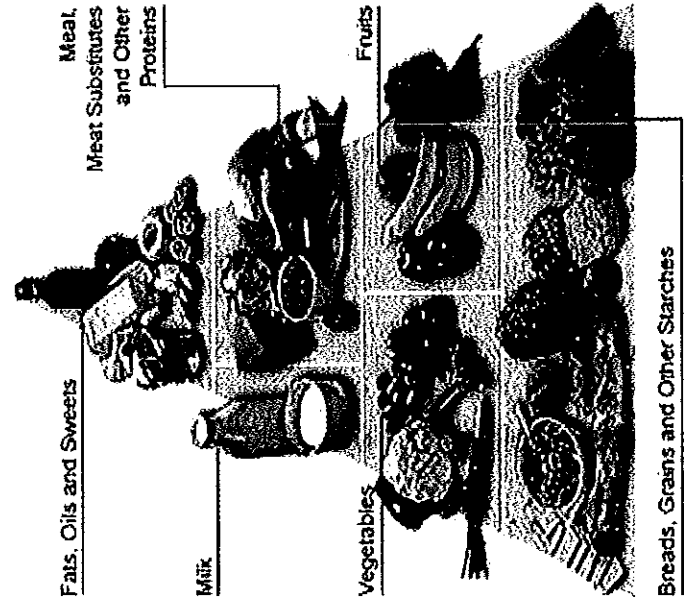Carbohydrates are the main nutrients in foods that influence blood glucose levels. Carbohydrates contain 4 kcal per gram. This nutrient is made of plant foods, such as grains, fruits, and vegetables, milk, and some dairy products. Carbohydrate can be divided into simple sugars and complex carbohydrate.

The use of sucrose as part of the total carbohydrate content in the diet does not alter

A diet for a diabetic person, with the aim of maintaining normal blood sugar levels.

Understanding blood glucose and insulin

After you eat, various foods are broken down in your gut into sugars. The main sugar is called glucose which passes through your gut wall into your bloodstream. However, to remain healthy, your blood glucose level should not go too high or too low.

So, when your blood glucose level begins to rise (after you eat), the level of a hormone called insulin should also rise. Insulin works on the cells of your body and makes them take in glucose from the bloodstream. Some of the glucose is used by the cells for energy, and some is converted into glycogen or fat (which are stores of energy). When the blood glucose level begins to fall (between meals), the level of insulin falls. Some glycogen or fat is then converted back into glucose which is released from the cells into the bloodstream.

Insulin is a hormone that is made by cells called beta cells. These are part of little 'islands' of cells
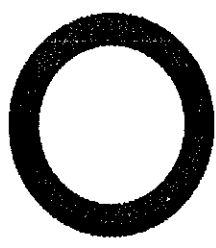

Educator: Yesi Hasneli Nazir

"Maintain Healthy Diet, Weight Control, and Life Happily"

People with type 2 diabetes mellitus can follow Diabetes Food Pyramid, which divides food into six groups. The food groups of grains, vegetables, fruits, meat/fish, milk, and fats. By following Diabetes Food Pyramid, type 2 diabetes patients will have the same carbohydrate content per serving. Paying attention to serving sizes is integral to maintaining healthy blood glucose levels.

2. Protein

The recommended daily protein intake is 10% to 20% of total daily kcal intake. Protein has 4 kcal per gram. Sources of protein should be low in fat, low in saturated fat, and low in cholesterol.

3. Fats

Dietary fats should be low in both saturated fat and cholesterol. Fats are restricted to less than 10% of the total kcal allowed per day. Fat has 9 kcal per gram.

4. Fiber

Fiber plays role lowers total cholesterol and low-density lipoprotein cholesterol in the blood and can improve blood glucose levels. The mechanism the emptying stomach and the movement of food through the upper digestive tract. The potential glucose-lowering effect of fiber may be caused by lowering the rate of glucose absorption from food that contains soluble fiber. The ideal level of fiber has not been determined, but an intake of 20 to 35 grams per day is recommended.

Salt

Salt should be consumed in limited amount, only 6 gram/day. The primary concern with salt is its association with hypertension, a common health problem in people with diabetes.

Dietary behaviors

The consistent diet can help to control blood glucose levels, reduce blood cholesterol, maintain an ideal body weight, and prevent the complications of diabetes.

1. Selecting healthy diet

Healthy diet involves eating a wide variety of foods containing various nutrients such as

2. *Arranging meal plan*

Most meal plans begin to estimate the amount of calories an individual needs to achieve a realistic weight. Then, 55-65% of the total daily calories are allotted to complex carbohydrates; 20% to protein rich food; and 15-30% to fatty foods.

3. *Recognizing the amount of food choice*

The amounts of calorie diabetes diet divide into various diets: diet for diabetes patient who obese, diet for diabetes patient who have normal body weight, and diet for diabetes patient who thin in juvenile diabetes, diabetes with complications or pregnant diabetes. American Diabetes Association determines BMI (Body Mass Index) considering the body size of a person whether underweight, normal, overweight, or obesity, as formulation in order:

$$BMI = body\ weight\ (kg)/height\ (cm)^2$$

BMI < 18.5   = underweight
BMI 18.5-24.9   = normal
BMI 25-29.9   = overweight
BMI of 30 or greater = obesity

You can calculate your BMI by yourself.

APAKAH TUJUAN DIIT DIABETES MELLITUS ?

Menyesuaikan makanan dengan kesanggupan tubuh untuk menggunakannya, sehingga membantu anda :
- Menurunkan kadar gula darah menjadi normal
- Menurunkan gula dalam urine menjadi negatif
- Mencapai berat badan normal
- Dapat melakukan pekerjaan sehari-hari seperti biasa.

Catatan : Untuk anak-anak mencapai pertumbuhan perkembangan yang normal

APAKAH PERBEDAAN DIIT INI DENGAN MAKANAN BIASA ?

1. Penggunaan Karbohidrat dibatasi
2. Jumlah makanan sehari dan pembagiannya perlu diatur dengan baik, khususnya pada diabetes yang belum terkontrol atau yang mendapatkan obat-obatan

MAKANAN APAKAH YANG MENGANDUNG BANYAK KARBOHIDRAT ?

1. Sumber karbohidrat kompleks, seperti nasi, lontong ketan, jagung, roti, ubi, singkong, talas, kentang, sagu, mie, bihun, makaroni, dan makanan lain yang dibuat dari tepung -tepungan.
2. Gula Murni dan makanan yang diolah dengan gula murni, seperti gula pasir, gula jawa, gula-gula, dodol, coklat, jam, madu, sirop, limun, coca-cola, susu kental manis, es krim, kue-kue manis, cake, buah dalam kaleng, dendeng, abon dsb.

BAGAIMANA MENGATUR DIIT INI ?

1. Makanlah secara teratur sesuai dengan jumlah dan pembagian makanan yang telah ditentukan oleh dokter atau konsultan gizi anda.
2. Gunakanlah daftar penukar bahan makanan sehingga anda dapat memilih bahan makanan yang di sukai dan menyesuaikan dengan menu keluarga.

3. Penggunaan gula murni dan makanan yang diolah dengan gula murni tidak diperbolehkan.
4. Batasilah penggunaan makanan sumber korbohidrat kompleks.
5. Makanlah sayuran dan buah sesuai petunjuk (lihat daftar penukaran)
   a. Sayuran kelompok A boleh dimakan sekehendak. Sayuran kelompok B hanya boleh dimakan menurut jumlah yang ditentukan.
   b. Semua macam buah boleh dimakan menurut jumlah yang ditentukan.

BAHAN APAKAH PENGGANTI GULA SEBAGAI BAHAN PEMANIS ?

Di apotik atau toko swalayan dapat dibeli bahan pengganti gula. Pemanis buatan ini dapat dibeli dalam bentuk tepung atau kemasan dalam sachet. Selain itu tersedia juga sirop dan kue-kue yang berkalori rendah. Penggunaan makanan tersebut diperbolehkan dengan memperhatikan keterangan pada tabel.

BAGAIMANA CARA MEMASAK YANG DIANJURKAN ?

1. Pada permulaan, anda dianjurkan menimbang makan sesuai dengan nasehat yang diberikan. Lebih-lebih bila penyakit belum terkontrol. Secara berangsur anda dapat menakar makanan dengan ukuran rumah tangga atau dengan pengamatan. Beberapa makanan perlu ditimbang sebelum dimasak seperti daging, ikan, tempe dan sayuran golongan B.
2. Bila penyakit anda sudah terkontrol, anda dapat makan dari menu keluarga , asal jumlah makanan ditakar dengan ukuran rumah tangga atau dengan pengamatan.
3. Cara memasak dapat dilakukan seperti untuk anggota keluarga lain.
4. Bila dilinginkan, pemanis buatan dapat di gunakan dengan ukuran sebagai berikut :
   1/2 sendok the /1 sachet / 1/2 tablet pemanis untuk 1 gelas cairan.

APAKAH YANG PERLU DILAKUKAN BILA ANDA MENGALAMI HIPOGLIKEMI

Hipoglikemi ialah keadaan yang terjadi bila kadar gula darah terlalu rendah. Ini disebabkan karena ketidak seimbangan antara makanan yang dimakan, gerak badan, dan obat yang digunakan. Gejalanya antara lain keringatan, dingin, gemetar, pusing, lemas, mata berkunang-kunang dan rasa perih diulu hati seperti orang kelaparan. Bila anda mengalami gejala ini. minumlah segera 1 gelas sirop atau makanlah 1-2 sendok makan gula pasir atau gula-gula.

Melaporlah segera ke dokter anda.

LAKUKANLAH GERAKAN BADAN SECARA TERATUR DI SAMPING BERDIIT

CONTOH MENU SEHARI

Pagi   : roti + margarine
                telur rebus
                lalap tomat
Pukul 10.00   : Pepaya
Siang   : nasi
                daging bumbu
                pecal
                cah sawi
                nenas
Pukul 16.00   : pisang
Malam   : kentang
                ikan goreng + tomat
                tahu bakso
                sla ketimun
                sup bayam
                pepaya

KETERANGAN LAIN

UKURAN RUMAH TANGGA

Untuk memudahkan penggunaan bahan makanan dalam daftar ini selain dalam ukuran gram juga dinyatakan dengan alat Ukuran Rumah Tangga (URT). Cara ini terbukti cukup baru dan praktis dalam penyusunan diet. Di bawah ini ketengan singkatan ukuran rumah tangga

bh = buah
bj = biji
btg = batang
btr = butir
bsr = besar
gls = gelas (240 ml)
g = gram
kcl = kecil
ptg = potong
sdg = sedang
sdm = sendok makan
sdt = sendok the

Bahan makanan pada tiap golongan dalam jumlah yang dinyatakan pada daftar, bernilai hampir sama, oleh karena itu satu sama lain dapat saling menukar. Untuk singkatnya, disebut dengan istilah 1 (satu) penukaran

GOLONGAN I
SUMBER KARBOHIDRAT

1 Satuan Penukaran = 175 kalori, 4 g protein 40 g karbohidrat

Bahan Makanan	URT	Berat (g)
Bubur	1/2 gls	50
Bubur beras	2 gls	400
Biskuit	4 bh.bsr	40
Havermout	51/2 sdm	50
Kentang	2 bj sdg	210
Krekers	5 bh.bsr	50
Makaroni	1/2 gls	50
Mi kering	1 gls	50

Mi basah	2 gls	200
Nasi	3/4 gls	100
Nasi tim	1 gls	200
Roti putih	3 ptg sdg	70
Singkong	1 ptg	120
Tepung sagu	7 sdm	40
Tepung Hunkwe	8 sdm	40
Tepung singkong	8 sdm	40
Talas	1 ptg	125
Tepung Terigu	5 sdm	50
Tepung Maizena	10 sdm	50
Tepung beras	8 sdm	50
Ubi	1 bj	135

GOLONGAN II
SUMBER PROTEIN HEWANI

1. Rendah lemak
1 satuan Penukar = 50 kalori, 7 g protein, 2 g lemak

Bahan Makanan	URT	Berat (g)
Ayam tanpa kulit	1 ptg sdg	40
Babat	1 ptg sdg	40
Daging kerbau	1 ptg sdg	35
Dideh sapi	1 ptg sdg	35
Ikan	1 ptg sdg	40
Ikan asin	1 ptg sdg	15
Teri kering	1 ptg kcl	20

2. Lemak sedang
1 satuan Penukar = 75 kalori, 7 g protein, 5 g lemak

Bahan Makanan	URT	Berat (g)
Bakso	10 bj sdg	170
Daging kambing	1 ptg sdg	40
Daging sapi	1 ptg sdg	35
Hati Ayam	1 bh sdg	30
Hati sapi	1 ptg sdg	35
Otak	1 ptg bsr	65
Telor ayam	1 btr	50
Telor bebek	1 btr	55
Udang segar	5 ekor sdg	35
Usus sapi	1 ptg bsr	50

3. Tinggi Lemak
1 satuan Penukar = 150 kalori, 7 g protein, 13 g lemak

Bahan Makanan	URT	Berat (g)
Ayam dengan kulit	1 ptg sdg	40
Bebek	1 ptg sdg	45
Corned Beaf	3 sdm	45
Daging	1 ptg sdg	50
Kuning telor ayam	4 btr	45
Sosis	1/2 ptg sdg	50

GOLONGAN III
SUMBER PROTEIN NABATI

1 satuan Penukar = 75 kalori, 5 g protein, 3 g lemak, 7 g karbohidrat

Bahan Makanan	URT	Berat (g)
Kacang hijau	2 sdm	20
Kacang Kedelai	2 1/2 sdm	25
Kacang merah segar	2 sdm	20
Kacang tanah	2 sdm	15
Keju kacang tanah	1 sdm	15
Kacang tolo	2 sdm	20
Oncom	2 ptg kcl	40
Sandele bubuk	21/2 sdm	185
Tahu	1 bj bsr	110
Tempe	2 ptg sdg	50

GOLONGAN IV
SUMBER SAYURAN

Sayuran A
Bebas dimakan, kandungan kalori dapat diabaikan

Baligo	Lobak
Gambas (oyong)	Lettuce
Jamur Kuping segar	Slada air
Ketimun	Slada
Labu air	Tomat

Sayuran B
1 Satuan Penukar ± gls (100 gram) = 25 kalori, 1 g protein, 5 g karbohidrat

GOLONGAN VII
MINYAK
1 Satuan penukar = 50 Kalori, 5 g lemak

1. Lemak tidak jenuh

Bahan Makanan	URT	Berat (g)
Alpukat	1/2 bh bsr	60
Kacang Almon	7 bj	25
Margarine jagung	1 sdt	5
Minyak bunga matahari	1 sdt	5
Minyak jagung	1 sdt	5
Minyak kedele	1 sdt	5
Minyak kacang tanah	1 sdt	5
Minyak zaitun	1 sdt	5

2. Lemak jenuh

Bahan Makanan	URT	Berat (g)
Kelapa	1 ptg kcl	15
Kelapa Parut	2 1/2 sdm	15
Lemak babi sapi	1 ptg kcl	5
Mentega	1 sdm	15
Minyak kelapa	1 sdm	5
Minyak inti kelapa sawit	1 sdm	5
Santan	1/2 gls	40

GOLONGAN VIII
MAKANAN TANPA KALORI

Agar-agar	gula alternatif	aspartam
Air kaldu		sakarin
Air mineral	Kecap	
Cuka	Kopi	
gelatin	The	

Kemang	1 bh bsr	105
Kurma	3 bh	15
Lyhee	10 bh	75
Mangga	3/4 bh bsr	90
Melon	1 ptg bsr	190
Madu	1 sdm	15
Nenas	1/4 bh sdg	95
Nangka masak	3 bj sdg	45
Pisang	1 bh	150
Pepaya	1 ptg bsr	190
Peach	1 bh kcl	115
Rambutan	8 bh	75
Sawo	1 bh sdg	55
Semangka	1 bh bsr	150
Sirsak	1/2 gls	60
Salak	2 bh sdg	65

GOLONGAN VI
SUSU

1. Susu tanpa lemak
1 Satuan Penukar = 75 kalori, 7 g protein 10 g karbohidrat

Bahan Makanan	URT	Berat (g)
Susu skim cair	1 gls	200
Tepung susu skim	4 sdm	20
Yogurt Non fat	2/3 gls	120

2. Susu rendah lemak
1 Satuan Penukar = 125 kalori, 7 g protein, 6 g lemak, 10 g karbohidrat

Bahan Makanan	URT	Berat (g)
Keju	1 ptg kcl	35
Susu kambing	3/4 gls	165
Susu sapi	1 gls	200
Susu kental tak manis	1/2 gls	100
Yogurt susu penuh	1 gls	200

3. Susu Tinggi lemak
1 Satuan Penukar = 150 kalori, 7 g protein, 10 g lemak, 10 g karbohidrat

Bahan Makanan	URT	Berat (g)
Susu kerbau	1/2 gls	100

Bahan Makanan

Bayam	Kangkung
Bit	Kucai
Buncis	Kacang Panjang
Brokoli	Kecipir
Catsim	Labu siam
Daun Pakis	Labu walu
Daun waluh	Pare
Genjer	Pepaya muda
jagung Muda	Rebung
Jantung pisang	Sawi
Kol	Toge kacang hijau
Kembang Kol	Terong
Kapri muda	Wortel

Sayuran C
1 Satuan Penukar + gls (100 gram) =
50 kalori, 3 g protein, 10 g karbohidrat

Bahan Makanan

Bayam merah	Kacang Kapri
Daun katuk	Kluwih
Daun Melinjo	Melinjo
Daun pepaya	Nangka muda
Daun singkong	Toge kacang hijau
Daun talas	

GOLONGAN V
BUAH DAN GULA
1 Satuan Penukar 50 kalori, 12 g karbohidrat

| Bahan Makanan	URT	Berat (g)
Anggur	20 bh sdg	165
Apel	1 bh	85
Belimbing	1 bh sdg	140
Blewah	1 ptg sdg	70
Duku	16 bh	80
Durian	1 bj bsr	35
Gula	1 sdm	13
Jeruk manis	2 bh	110
Jambu air	2 bh	110
Jambu biji	2 bh bsr	100
Kolang kaling	5 bh sdg	25

Appendix G

LIST OF EXPERTS

Three experts examined the content validity of the instrument and teaching plan for type 2 diabetes patients, they were:
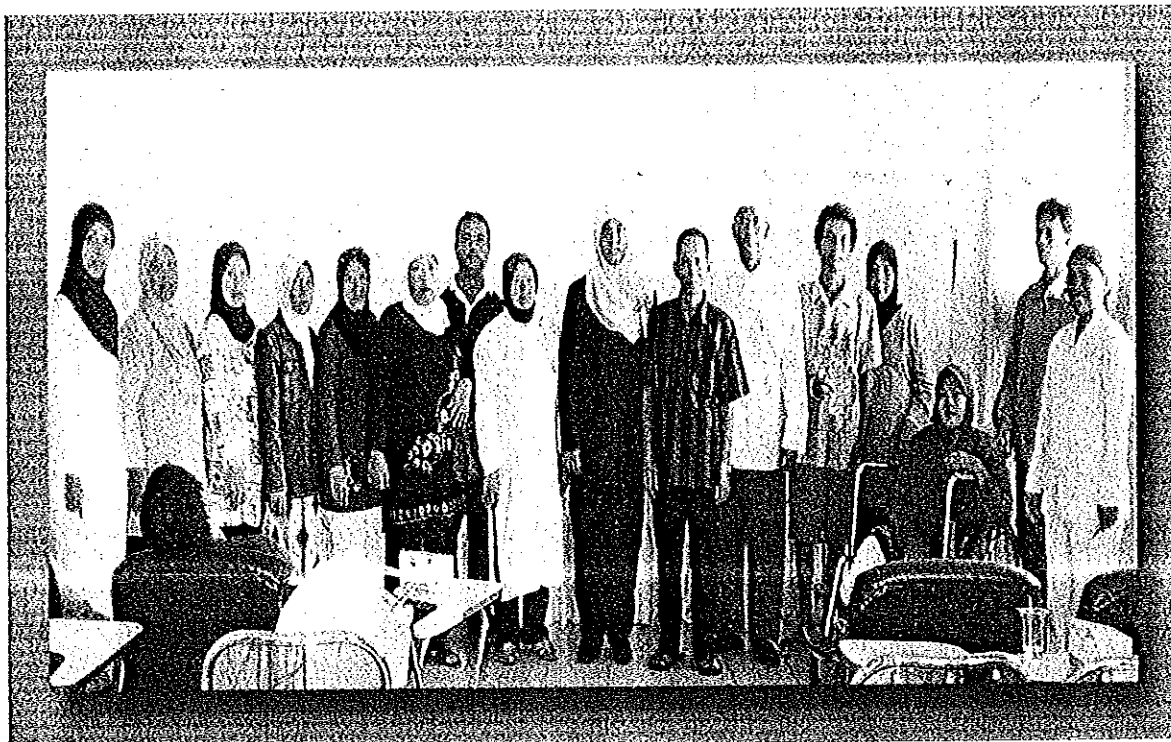
1. Assist. Prof. Piyanuch Jittanoon, Ph.D., RN

    Nursing lecturer, Faculty of Nursing, Prince of Songkla University, Thailand.

2. dr. Suwignyo

    Medical doctor of Harbor Health Office in Pekanbaru, Indonesia.

3. Budi Setiawan, SKM

    Nutritionist of Health Service Association in Pekanbaru, Indonesia.

Appendix H

Pictures of Activities

Group Lecture
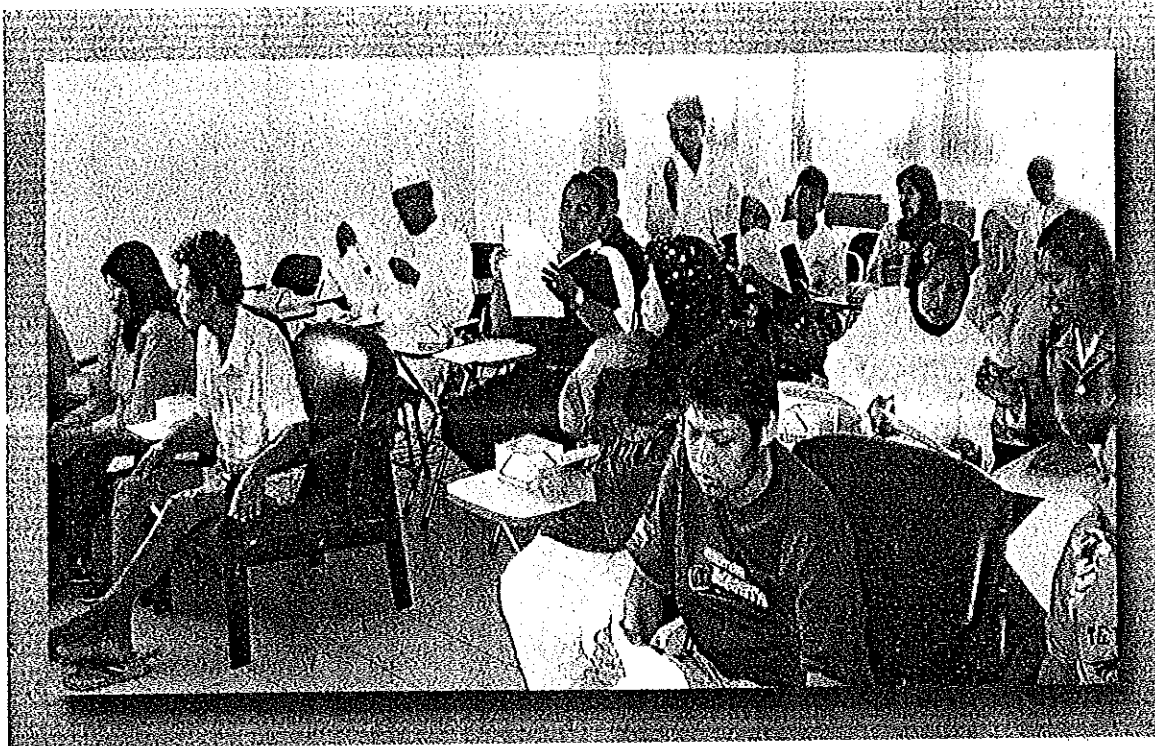
The participants of a Health Belief Model based education program

At Arifin Achmad Hospital Pekanbaru, Indonesia

VITAE

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