

CHAPTER 2

LITERATURE REVIEW

This chapter discusses about the relevant literature reviews that is presented as follows:

1. Overview of Type 2 Diabetes
2. The Pender's Health Promotion Model (HPM)
3. Nutritional Health Promoting Behaviors (NHPB) in Type 2 Diabetes Patients
4. Influencing Factors of Nutritional Health Promoting Behaviors among Type 2 Diabetes Patients

Overview of Type 2 Diabetes

Definition

Type 2 diabetes is a metabolic disorder caused by inherited and/or acquired deficiency in the production of insulin hormone by the pancreas, or by the ineffectiveness of the insulin produced. It can be referred to as adult-onset diabetes (American Diabetes Association, 1998); occurs most often in adults over the age of 40, commonly in overweight people (WHO, 2003). Person can be diagnosed with diabetes based on one of the following criteria (American Diabetes Association, 1998; WHO, 1999):

1. Random plasma glucose level greater than 200mg/dl (11.1 mmol/l) plus classic symptoms of DM, including polydipsia, polyuria, polyphagia, and weight loss.
2. Fasting Plasma Glucose (FPG) greater than 126 mg/dl (7.0 mmol/l)
3. 2-hours plasma glucose greater than 200 mg/dl (11.1 mmol/l) during an Oral Glucose Tolerance Test (OGTT).

For some patients who do not meet these criteria, but their test results are not completely normal, are classified as follows:

1. Those with fasting plasma glucose equal or greater than 110 mg/dl but less than 126 mg/dl are considered as impaired fasting glucose.
2. Those with 2-hours plasma glucose greater than 140 and less than 200 mg/dl are considered as impaired glucose tolerance.

Signs and Symptoms

The signs and symptoms which are well known as classic symptoms are including excessive urine production (polyuria), excessive hunger (polyphagia), excessive thirst (polydipsia), and glucose in urine (glycosuria). In addition, they may experience symptoms like recurrent infection or difficulty in healing from infections of the skin, gums, vagina, or bladder; easy fatigue, numbness, tingling, blurred vision, and pruritus. Moreover, type 2 diabetes is still asymptomatic because this type has such a gradual onset (Tamparo & Lewis, 2005).

Pathogenesis

Type 2 diabetes caused by insulin resistance and impaired insulin secretion. Insulin resistance occurs as the decreased tissue sensitivity to insulin that the insulin cannot transfer the glucose into target cells as a certain mechanism, thus blood glucose level increase (American Diabetes Association, 2001; Smeltzer & Bare, 2004). Impaired insulin secretion can happen when there is a reduction in islet cell volume that the beta cells fail to produce insulin sufficiently. Consequently, blood glucose rises and the person progresses to developing symptomatic diabetes (McDowell and Gordon, 1996).

Complications

The complications of this disease are classified as acute and late (Tamparo & Lewis, 2005). Acute complications include: firstly, diabetic coma or diabetic ketoacidosis. It results from an increased blood glucose level as high as 500 mg/dL. This condition leads to enhance fatty acid metabolism that creates an increase in ketone bodies production, then, inducing metabolic acidosis. Secondly, high blood glucose level promotes osmotic diuresis, leading to dehydration. Thirdly, insulin shock occurs when injecting too much insulin, inadequate food intake or

excessive exercise, resulting in low blood glucose level. (Bullock & Henze, 1999; Tamparo & Lewis, 2005).

Late complications occur after many years, affecting other body systems. They include arteriosclerosis, gangrene, coronary artery disease, kidney disease or nephropathy, retinopathy inducing blindness, damaged nervous system, and impaired immune response (Bullock & Henze, 1999; Tamparo & Lewis, 2005).

Study by Sutanegara et al. (2000) reported that in Surabaya, Indonesia, neuropathy was the most prevalent of chronic complications (51.4%), followed by sexual problems (such as erectile dysfunction or impotency) 50.9%, arthropathy 25.5%, cataract 16.3%, lung tuberculosis 12.8%, hypertension 12.1%, coronary artery disease (CAD) 10.0%, and others 12.5%.

Management

The management for type 2 diabetes aims to achieve improved glycemic control, achieve and maintain reasonable body weight, prevent complications, and obtain optimal overall health and well-being (American Diabetes Association, 1998).

The recommended treatment for type 2 diabetes includes pharmacologic intervention with an oral hypoglycemic agent and/or insulin, and non-pharmacologic intervention including dietary modification and exercise (American Diabetes Association, 1998).

1. Pharmacologic intervention

Medication for type 2 diabetes consists of two types: oral hypoglycemic agents and insulin (McDowell & Gordon, 1996; Franz et al., 2002). Oral hypoglycemic agents can reduce blood glucose levels, as it stimulates insulin release from the pancreatic beta cells, reduce glucose output from the liver, then increase the uptake of glucose in tissues. In type 2 diabetes, oral agents are increasingly being used in combinations, with many of the new oral agents working on different cell receptor sites. For example, Metformin and Acarbose can be added to Sulfonylurea with an additional 0.5-2% reduction in HbA1c level (Zimmerman & Hagan, 1998 as cited in Lutz & Przytulski, 2001).

Meanwhile, insulin is administered for type 2 diabetics when they continue to have poor blood glucose control in spite of lifestyle changes and taking oral hypoglycemic agent (MedlinePlus Medical Encyclopedia, 2006). Insulin can be injected either subcutaneously or intravenously, which is described based on the onset, peak, and duration of action. Ideally, the

medication is planned around the diet. Some patients with type 2 diabetes need combination of insulin and oral hypoglycemic agent when condition of beta cell dysfunction get worse over time (Votey & Peters, 2006).

2. Non-pharmacologic intervention

2.1. Diet management is the cornerstone of treatment for type 2 diabetes. For many cases diet is required only as a single treatment. The goals of diabetes diet management are to achieve and maintain normal blood glucose level, to prevent chronic complications of diabetes; to maintain an ideal weight. Additionally, it also addresses individual nutritional needs, considering of personal and cultural preferences and lifestyle (McDowell & Gordon, 1996; Franz et al., 2002). Basically, diet for type 2 diabetics is similar with type 1 diabetics. They should consume food in moderate amount; eat variety of foods regularly in the same time. The appropriate distribution of carbohydrate, fat, and protein is also important for persons with type 2 diabetes, such as 10% to 20% protein, 30% fat, and 50% to 60% carbohydrate. In addition, the importance of consuming rich fiber food and low glycemic index food in order to achieve the normal blood glucose level is recommended (Heins & Beebe, 1996).

2.2. Exercise or physical activity has an important role in the management of diabetes, particularly for type 2 diabetics. Physical activity increases the number and binding capacity of insulin receptors, assist in lowering blood glucose levels, and reduces insulin requirements in persons who use insulin. Improved blood lipid levels occur in some clients who engage in regular exercise (McDowell & Gordon, 1996; American Diabetes Association, 1998).

2.3. Stress management has a significant effect on improving glycemic control in patients with type 2 diabetes (Surwit et al., 2002; Madhu & Sridhar, 2005). Stress can raise glucose levels in type 2 diabetics since stress could activate the sympathetic nervous system, resulting in metabolic dysregulation, leading to increase blood glucose level. Stress management can reduce the sympathetic nervous activity that it can be applied through using behavioral stress management programs or through administering anxiolytic medications (Surwit, 2002).

The Pender's Health Promotion Model (HPM)

Health promoting behavior (HPB) can be described as any action or behavior carried out by the person in daily living that are contributing to health and well being in various socio-cultural and physical environments (DeSouza & Nairy, 2004).

The revised Health Promotion Model (HPM), proposed by Pender, describes five aspects of HPB including health responsibility, physical activity, nutrition, interpersonal relationship, spiritual growth, and stress management (Pender, 1996). This study will focus on dimension of nutritional health promoting behaviors among adult patients with type 2 diabetes.

An individual health promoting behavior can be affected by many factors. Pender's Model composes of factors influencing HPB that can be categorized into: (1) individual characteristics and experiences, (2) behavior-specific cognitions and affect, and (3) behavioral outcome. The model can be seen in figure 2.

The first category is individual characteristics and experiences which consist of prior related behavior and personal factors. Personal factors, in the revised of HPM, comprise: (1) biologic factors, such as age, gender, and body mass index; (2) psychological factors, such as self-esteem, self-motivation and personal competence; and (3) socio-cultural factors, such as race/ethnicity, acculturation, education and socioeconomic status (Pender et al., 2002). These factors can either directly affect the HPB or indirectly affect through the behavior-specific cognitions and affect.

The behavior-specific cognitions and affect, as the second category, has some components including perceived benefits of action, perceived barriers to action, perceived self-efficacy, activity-related affect, interpersonal influences, and situational influences.

The perceived benefits of action are the individual's perception or belief of benefit of a health promoting behavior that directly influencing a person to engage in the behavior. Benefits of the behavior may be intrinsic or extrinsic. Intrinsic benefits include the direct physical effects of performing the behavior. For instance, diabetic may feel increased alertness, healthier, and decreased feelings of fatigue since following diabetes diet management. Extrinsic benefits may be monetary or social interactions that may enhance person engaging in the behavior. Therefore, those will motivate person with diabetes to perform healthy eating behavior regularly.

Perceived barriers to action refer individual's perception of concerning the unavailability, inconvenience, expense, or difficulty that viewed as blocks, or hurdles of activity of particular behavior. When a barrier is high and the willingness is low, behavior rarely takes place. On the other hand, when the barrier is low and the willingness is high, behavior is likely to take place.

Perceived self efficacy refers a personal judgment of ability to achieve a performance. Feeling efficacious in one's performance is expected to encourage individual in performing

healthy behavior more frequently. The model explains that perceived self-efficacy either affect directly HPB by efficacy expectations or indirectly influencing perceived barriers and determining level of commitment to a plan of action.

Interpersonal influences, such as social support from family, peers/friends, and health providers, affect health promoting behavior directly or indirectly through social pressures, leading to perform health promoting behavior.

The third category is behavioral outcome. It consists of commitment to a plan of action, immediate competing demands and preferences, and health promoting behavior. Commitment to a plan of action initiates health promoting behavior. It involves fundamental cognitive processes, which are: (1) commitment to carry out a specific action at a given time and place, and with particular persons or alone, (2) identification of ultimate strategies for obtaining, carrying out, and strengthening the behavior. Commitment without ultimate strategies often results in intentions to a good plan only; but failure to perform a health behavior.

On the other hand, immediate competing demands or preferences oppose behaviors that interfere with the occurrence of the planned health promoting behavior. For instance, a diabetic person prefers to eat high fat food rather than low fat food because of taste or flavor preferences. Therefore, this person cannot control the competing preference, consequently the dietary adherence become poor. To overcome immediate competing demands and preferences, person need a strong commitment to a plan of action that can give direct affect on performance of the health promoting behaviors.

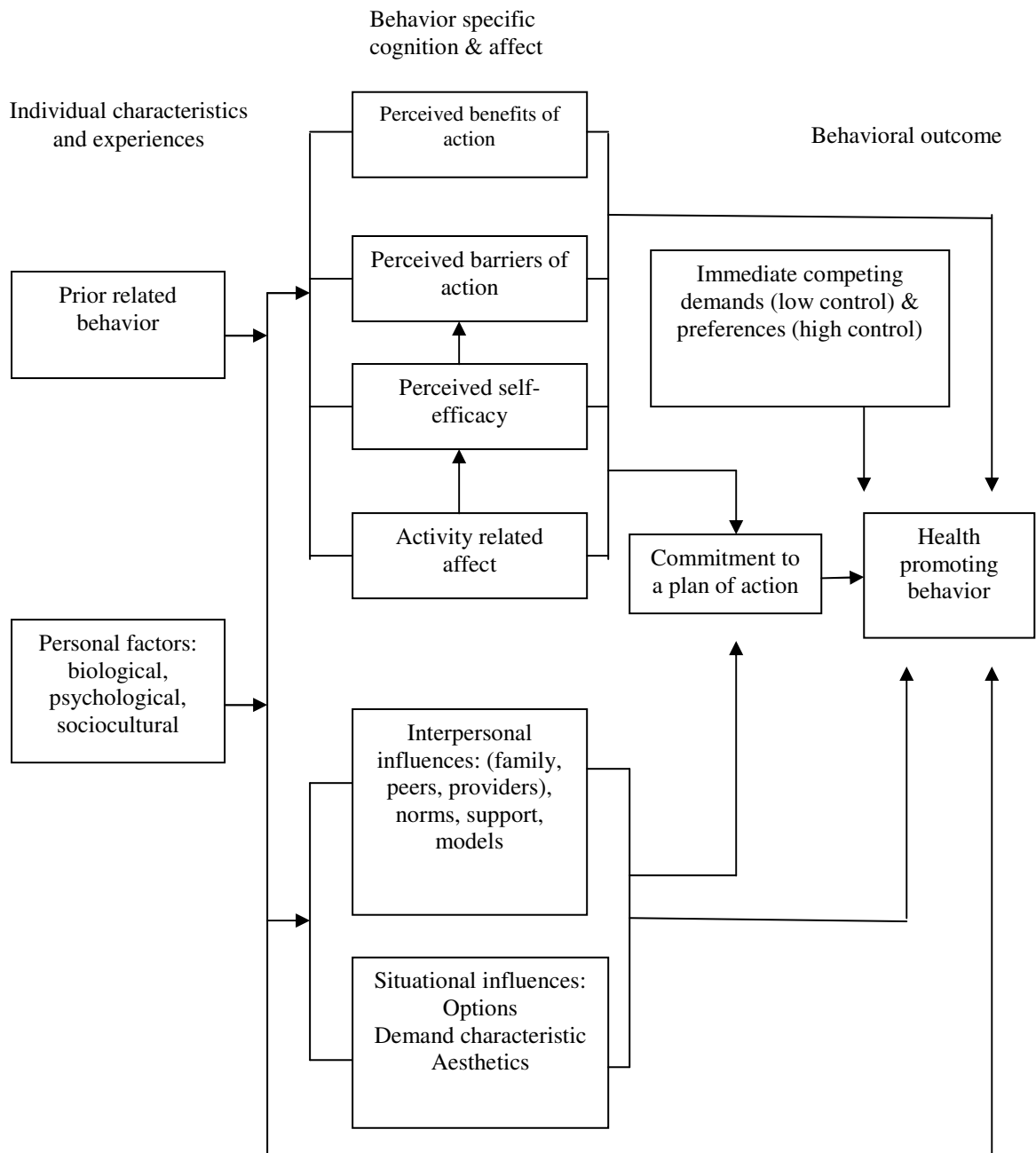


Figure 2. *The Revised Health-Promotion Model (Pender, Murdaugh & Parsons, 2002: 60)*

Nutritional Health Promoting Behaviors (NHPB) in Type 2 Diabetes Patients

Definition of NHPB

NHPB is a modification of eating behavior among type 2 diabetics in order to control blood glucose and prevent complications (Glasgow, 1987 as cited in Marzilli, n.d.). Through modification of eating behavior, expectedly, the improvement of general health of diabetic patients will be achieved. Therefore, type 2 diabetics should adopt a healthy diet and dietary changes including modifications in food habits and meal patterns on a life long basis.

The specific goal of nutritional management among type 2 diabetics focuses mainly on weight management and weight control, because most people with type 2 diabetes are overweight (Brown, 2002). Therefore, dietary management of diabetes is designed to fulfill one's total nutrient and health needs, not just, blood glucose needs.

Dimensions of NHPB

Nutritional health promoting behaviors in type 2 diabetics focus on three dimensions, which are: selecting healthy diet, arranging meal plan, and recognizing the amount of food calories (Tjokroprawiro, 2006; Anderson et al., 2006).

1. Selecting healthy diet

In selecting variety of healthy foods, type 2 diabetics can follow the food guide pyramid that focuses on variety and reducing the amount of additional fat and sugar in the diet. The Diabetes Food Pyramid divides food into six groups. The food group of grains, beans, fruits, and starchy vegetables should be eaten more than of any of the other foods because they supply important fiber, vitamin, minerals, and antioxidant. On the other hand, fat, sweet and alcohol are served very rarely (American Diabetes Association, 1998). The appropriate diet should compose of:

1.1. Carbohydrate is at least 50-60% of the total daily energy; in a complex form (polysaccharides) (American Diabetes Association, 1998; MayoClinic.com, 2005). A study by Tjokroprawiro presented the composition of a diabetes diet: 68% carbohydrates, 20% fat, and 12% protein. This composition differs from diabetes diets in western countries that usually consist of 40-50% carbohydrate, and 30-35% fat (Tjokroprawiro, 2006). It has become a guideline or standard diet by practitioners in many hospitals and other health institutions in Indonesia.

Different types of carbohydrate foods are digested at different rates and, thus, have varied effects in raising the blood glucose level after a meal. This condition is related to the glycaemic index (GI) that is contained in any food. The glycemic index (Choate, n.d.) is a ranking of carbohydrate-containing foods based on their effect on blood sugar levels. For diabetics, consumption of low GI food is beneficial on improved blood sugar levels, decreased blood fats, and reduced risk of obesity (Kabir et al., 2002; Jimenez-Cruz et al., 2003; Rizkalla et al., 2004). In order to distinguish the rating of GI of foods, they can be categorized into three levels, which are low GI (up to 55), medium GI (55–70), and high GI (above 70) (Diabetes.co.uk, 2006). For instance, white rice and white bread comprised high GI, whilst certain kinds of fruit had low GI (Murakami et al., 2006).

One form of carbohydrate is sugar or simple sugar, should be taken in moderate, because it has a great impact in increasing blood sugar levels. The alternative for diabetics in eating sugar or sugar-containing foods is using low calorie sweeteners such as saccharin, or aspartame (Powers, 2003).

1.2. Fiber is an important in a healthy diet since it is associated with a significant reduction in fasting blood glucose level, lipid level, and body weight in diabetic patients (Chandalia et al., 2000 as cited in Abate & Chandalia, 2003; McDowell & Gordon, 1996; Alters & Schiff, 2001). The recommendation for type 2 diabetics is about 20-35 gram/day (McDowell & Gordon, 1996; Cavallo-Perin, Bodoni & Marena, 1997; Anderson et al., 2006). High fiber food can be found in cereal or legumes, whole grain, or bran flakes. In addition, also fruits and vegetables are important sources for fibers. This group of food should be consumed 4-5 servings daily (American Diabetes Association, 2001).

1.3. Protein accounts for only 10-20% of the total daily calories. A reduction in dietary protein for type 2 diabetics may prevent or delay complication of renal disease (Zeller et al., 1991 as cited in McDowell & Gordon, 1996; Cavallo-Perin, et al., 1997; Fertig, Simmons, & Martin, n.d.; American Diabetes Association, 1998). For type 2 diabetics who demonstrate early sign of renal insufficiency, they should take intake protein less than 10% of total calories (Powers, 2003). In general, the required amount of protein for adults with diabetes is 0.8 g/kg/day (Heins & Beebe, 1996). The good quality protein sources for diabetics are including meat, poultry, fish, eggs, milk, cheese, and soy (American Diabetes Association, 2007).

1.4. Fat accounts for diabetes patient depends on the desired medical outcome for each individual patient (American Diabetes Association, 1998). Generally, the standard fat need for diabetic is around 30% of total calories (Whitney, Cataldo, DeBruyne, & Rolfes, 2001; Anderson et al., 2006). Consuming high fat increases risk of heart disease development as lipid abnormalities such as hypertriglyceridemia and low HDL cholesterol are common in type 2 diabetes (Heins & Beebe, 1996).

1.5. Salt should be consumed in limited amount, only 6 gram/day; it prevents from complication of hypertension. Person with diabetes should be observant when eating additional salt or in cooking, or when salt is added as a preservative or for its flavor-enhancing properties (Dyson, 2004).

1.6. Alcohol is acceptable for diabetics that no more than two drinks a day (Whitney et al., 2001). Consume much alcohol among those people has a further risk of causing hypoglycemia.

In addition, diabetics can select healthy diet by using nutritional labeling on food product which can give much useful information about the amount of calories, carbohydrates, proteins, or fats per serving. Thus, they can consume a portion suitable as their needs (Anderson et al., 2006).

2. *Arranging meal plan*

To manage the meal plan, diabetics can use some methods, such as exchange lists of foods, carbohydrates counting, and plate method (MayoClinic.com, 2006; Anderson et al., 2006).

2.1. *The exchange lists system* is grouping foods into categories, such as starches, fruits, meats and meat substitutes, and fats. One serving in a group is called an exchange, having about the same amount of energy (kcal) and energy nutrients (carbohydrates, protein, and fat), and having same effect on blood sugar levels. Any food on a list can be exchanged, or traded, for any other food on the same list without affecting a plan's energy balance. For instance, someone can exchange 1 starch (contain 15 g carbohydrate, 3 g protein, 0-1 fat, and 80 kcal) with 1 slice bread or 1/3 c cooked rice.

2.2. The second method is *carbohydrate counting*. This method is necessary for diabetics who take diabetes medications or insulin. Eating the same amount of carbohydrates at each meal or snack aims to control blood sugar level steadily during the day. Therefore, it is necessary for diabetics to consult with health care providers in managing their meal.

2.3. The third method is *plate method*. It is a simple method for teaching meal planning. Using 9-inch dinner plate serves as a pie chart to show proportions of the plate covered by various food groups. It contains vegetables covering half of the plate for lunch and dinner. The rest of the plate should be divided between starchy foods (such as bread, grains, or potatoes), and the meat group or its substitute. Fruit and milk are represented outside the plate (Diabetes.co.uk, 2006; Anderson et al., 2006).

3. *Recognizing the amount of food calories*

A diet for diabetes people has to consider on some aspects, which are: the amount of total calories that consumed daily, body weight, types of activity, any associated illness, and the kind or amount of food that have to be consumed. The total calorie needs for diabetic is individually determined.

Tjokrowiro (2006) developed guidelines to calculate the required daily calorie for diabetic who undertake common activities:

- Underweight person : body weight (BW) x 40 – 60 calorie
- Normal person : BW x 30 calorie
- Overweight person : BW x 20 calorie
- Obese person : BW x 10 – 15 calorie

In particular cases that have increased catabolic process, such as diabetics with tuberculosis, nephropathy diabetic, and cirrhosis hepatic; the total calories is high, over 2000 calories in a day.

To determine the body size of a person whether underweight, normal, overweight, or obese, using formulation of BMI (Body Mass Index) as follow:

$$\text{BMI} = \text{body weight (kg)} / \text{height}^2 \text{ (meters)}.$$

The categories of nutritional status based on BMI according to Himpunan Studi Obesitas Indonesia (HISOBI): BMI < 18.5 is underweight; BMI 18.5 – 22.9 is normal; BMI \geq 23 is overweight; BMI 23 – 24.9 is at risk for obese; BMI 25 – 29.9 is obese I; and \geq 30 is obese II (Tjokrowiro, 2006).

Generally, the physician should identify the requirement of total calories of the patient. For instance, if the diet order is prescribed for 2000 kcal, it can be calculated as follows (protein 10%, carbohydrate 60%, fat 30%):

Protein: $2000 \times 10\% = 200$ kcal (4 kcal/gram = 50 gram protein)

Carbohydrate: $2000 \times 60\% = 1200$ kcal (4 kcal/gram = 300 gram carbohydrate)

Fat: $2000 \times 30\% = 600$ kcal (9 kcal/gram = 66.67 gram fat)

Indonesian eating behaviors

Ethnic and cultural backgrounds contribute to what people eat in eating behavior (Davis & Sherer, 1994). For instance, ethnic groups in Indonesia have particular eating behavior. The Javanese people are keen to eat food and drink predominantly sweet. Similarly, the ethnic group of Minang in West Sumatera has specific foods predominantly high in fat, and with a spicy and salty taste. The people eat fewer vegetables, but a lot of meat, moreover, they commonly use coconut milk in cooking. The famous ethnic group in Jakarta, Betawinese, has particular eating habit that those people eat meats in various cooking such as soup, meat barbeque, and meat steak. On the other hand, the Sundanese, ethnic group in West Java, has eating behavior that may enhance healthy nutritional behavior. The people often eat plenty of raw vegetables which contain rich fibers (Culture Grams World Edition, 2005). Eating rich fiber foods like Sundanese did is mainly recommended for diabetics, particularly type 2 diabetics.

Influencing factors of nutritional health promoting behaviors (NHPB) among type 2 diabetes patients

Modifying the lifestyle through promoting eating behavior is an essential part of management for type 2 diabetics. However, changing behavior is complicated to be achieved because there might be many factors influencing type 2 diabetes patients in adopting NHPB. Many literatures have explored factors influencing NHPB among type 2 diabetics that can be described as follows:

a. Age is considered as one factor influencing eating behavior because of ageing process. Since a progressive loss of taste buds of the tongue results in a decreased sensitivity to sweet and salty tastes, but more sensitivity to bitter and sour (Pender, 1996). It also influences a person in performing eating healthy behavior because of physical ability changes. The difference in age is also associated with competency of self care where older age was associated with dependency on others (Opassanun, 1999; as cited in Chitwarin, 2001), in addition, age was a significant predictor

of diet self care where older adults showed a higher level of diet self-care compared to younger adults (Wen et al. 2004).

b. Gender is a determinant factor on the management of disease. Many studies showed mixed results related to gender and dietary control behavior. Men tend to be more confident in their ability to control diabetes that they felt more support from their wives, have fewer medical complications, and were less likely to report depression and anxiety (Rubin & Peyrot, 1998). On the other hand, Vallis et al. (2003) reported that women had a better quality of life and healthier eating habits than men. Moreover, they were more likely than men to participate in health-promoting behaviors such as diet and exercise (Nothwehr & Stump, 2000), and had higher nutritional and health-responsibility activities (Johnson, 2005).

c. Ethnic has been studied by several worldwide studies as one factor that can increase or decrease the risk of developing diabetes. Ethnic and cultural backgrounds contribute as significant influences in eating behavior through affecting food choices (Davis & Sherer, 1994). Similarly, Pender explained that the cultural values in certain ethnic group may build a specific eating behavior that will increase or even decrease in performing health promoting behaviors (Pender et al., 2002).

d. The education level may contribute to the individual performing NHPB, because education is one indicator of the ability to think, that will affect a person's capacity in learning about the modification of eating behavior. Previous studies found that low education affected the ability to grasp knowledge and an incorrect understanding of messages which may impinge on the practice of knowledge acquired related to dietary control (Hunt et al. 1998; Albarran et al. 2005; Caliskan, Ozdemir, Ocaktan, and Idil, 2005).

e. Socioeconomic status (SES) means the family income that may impact on the individual's lifestyle, particularly performing healthy behavior. People who have a high income may have better opportunities to find something that is useful in caring for themselves (Pender, 1987 as cited in Patlak, 2002). On the other hand, decreased income level will enhance the evidence of malnutrition (Davis & Sherer, 1994; Smith, Baghurst, & Owen, 1995; Inglis et al., 2005), low compliance, and inadequate diabetic control (Wonodirekso, 2002). In addition, one previous study also found that income had a positive relationship with health promoting behaviors among elderly and diabetic people (Hunkittikul, 1996; Borisut, 1997 as cited in Patlak, 2002).

f. Perceived benefits are positive outcome expectations that a person believes will increase from engaging in certain behaviors (Brunner, 1969 as cited in Walker et al, 2006). Perceived benefits had been proved in the study of Walker et al (2006) as a determinant for healthy eating in consuming fruits, vegetables, and whole grains and limiting meat group and fats foods intake. The study assessed perceived benefits by using the Healthy Eating Benefits and Barriers Scales (HEBBS) which contains 9 items of benefits, having Cronbach's coefficient alpha was .80. Likewise, other previous studies revealed that perceived benefits had significant relationship with healthy behaviors (Harris, et al. 1982 & 1987 as cited in Garay-Sevilla et al. 1995; Tongpila, 1999, Janchanakit, 1998 as cited in Patlak, 2002). Patlak's study investigated factors influencing health promoting behaviors among HIV infected patients. Perceived benefits as one factor was measured by a questionnaire which developed by the researcher based on the HPM of Pender with positive dimensions concerning the benefits of performing health promoting behaviors. The reliability of the questionnaire was .84.

Several previous studies identified the perceived benefits of eating healthy diet as preventing diseases, staying healthy (Holgado et al, 2000), controlling weight, promoting quality of life, and being fit (Zunft et al. 1997).

The investigator in the present study developed a questionnaire of perceived benefits of NHPB. The questionnaire focuses on assessing subjects' perception or opinion about benefits of NHPB related to their illness. The questionnaire comprises 12 items as follows: the role of healthy diet, the benefits of keeping meal plan, eating appropriate amount of calorie, limiting high calorie foods, eating foods in moderate.

g. Perceived barriers are impediment or negative outcome expectations that inhibit involvement of a person in a behavior. Perceived barriers of NHPB consists of perceptions concerning the unavailability, inconvenience, difficulty, or time consuming nature of nutritional health promoting behaviors (Pender, Murdaugh, Parsons, 2002). Perceived barriers of eating behavior among diabetics are considered as critical influences determining adherence to diet among people with type 2 diabetes (Shultz, Sprague, Branen, & Lambeth, 2001). The previous study investigated the differences of patients' and educators' perspective of patient barriers to following a meal or exercise plan. The study revealed that certain barriers were major for both relative to diet such as difficulty maintaining a diet away from home; fond of foods not in the meal plan. Whilst, study of Walker et al (2006) revealed that perceived barriers was negatively

related to healthy eating behaviors in women older adults. This study measured perceived barriers by using Healthy Eating benefits and Barriers Scale which developed by Walker et al (2006).

Other existing studies had also identified the barriers as time pressures, competing priorities, social events, negative emotions, difficulty resisting temptation, inappropriate food taste (Estey, Tan, & May, 1990; Schlundt, Rea, Kline, & Pichert, 1994; Travis, 1997, p. 228 as cited in Whittemore, 2000; Fertig, Simmons, & Martin, n.d.), lack of time to prepare food, gathering eating (Wen et al., 2004), lack of knowledge of a specific diet plan, (Nagelkerk, Reick & Meengs 2006), lack of knowledge regarding the disease and treatment, inadequate and inaccuracy dietary counseling, and poor compliance with dietary advice given (Nthangeni et al., 2002).

Based on the literatures, the researcher developed the instrument to measure the perceived barriers of NHPB which focused on some items of barriers to perform NHPB, such as: busy with many activities, inappropriate taste of food, having social gathering or eating out, influence of someone or other people, limited financial, bad mood, lack of knowledge, spend great energy, no prepare food separately, lack of support, unsure about appropriate food, high cost to have healthy food.

h. Social support means physical and emotional comfort given to person(s) by family, friends, co-workers and others (Wikipedia, The Free Encyclopedia, 2006). Social support can be distinguished into four types of supportive behaviors (House, 1981 as cited in Kelsey et al., 1996). Firstly, emotional support is expression of caring, encouragement, empathy, feelings of love and belongingness from others. Secondly, informational support involves practical advice or suggestions provided by health care professionals along with family and friends; another example such as giving reading materials about dietary control or arranging good meal. Thirdly, appraisal support gives reinforcement of behaviors that is helpful for self-evaluation purposes; for instance, giving reward or appreciation for diabetic's good behavior. Fourthly, instrumental support gives tangible support and services that may directly help someone in need, such as personal care, shopping, and financial assistance for person with diabetes. Pender (2002) identified social support sources come from family, friends, and health care providers.

Social support in the management of diabetes has a significant role in predicting dietary adherence, particularly for type 2 diabetes patients (Garay-Sevilla et al., 1995). Lack of social support, mainly from family and friends, is considered a barrier to adherence and self care of

diabetes (Glasgow et al., 2001). Eating behavior among diabetics could be influenced by others; they deviate from recommended diet due to social and personal pressures, food choices and eating behaviors of significant others (Glasgow et al., 1987; Goodal & Halford, 1997 as cited in Marzilli (n.d.); Garay-Sevilla, et al., 1995; Gallant, 2003). In addition, Suwonnaroop & Zauszniewski (2002) also revealed that social support became the major predictor of health promoting behaviors.

Social support from family member, friends or health providers could facilitate type 2 diabetes patients to carry out NHPB optimally in many ways, such as give motivation to maintain good behaviors in selecting healthy diet, remind the diabetic to control the diet, or encourage the diabetes persons to keep their healthy eating behaviors (Kelsey et al, 1996).

The present study will assess the social support by modifying the instrument of the Diabetes Social Support Questionnaire-Friends and Family Version, which was developed by La Greca & Bearman (2000). The instrument assesses friend and family support for adolescence with diabetes. The DSSQ-Friends and DSSQ-Family versions had internal consistency score ($\alpha = .94, .95$, respectively); consists of 29 total items which grouped into 5 parts insulin injections, blood glucose, meals, exercise, and emotional support. The present study takes item of meals from DSSQ-Family and Friends version, and adds 4 items related to support receives from health care professionals.

Summary

Type 2 diabetes has become a major concern with its rapid increase globally. Moreover, the disease is susceptible to added complications due to chronic hyperglycaemia. Thus, the standard management of diabetes aims to control blood glucose levels and prevent complication such as blindness, amputation, or renal failure. The management involves medication, exercise, and diet control. For type 2 diabetes, nutritional modification is the cornerstone of treatment as in many cases this type can be dealt with dietary control only.

Undoubtedly true, type 2 diabetics must develop nutritional modification, particularly exhibiting nutritional health promoting behaviors. The behaviors help to preserve their healthy status and well being level on a lifetime. However, it is not easy to change eating behavior among type 2 diabetics. The behaviors need skills in selecting appropriate food, arranging meal plan, and recognizing the amount of food calories. Moreover, they should perform NHPB consistently in

order to control their blood glucose level. Many studies have explored the failure of dietary adherence among these people as there are many factors influencing the healthy behavior in type 2 diabetes patients. Therefore, this study will investigate the level of NHPB among type 2 diabetes patients in Jakarta and explore factors influencing NHPB, including perceived benefits of NHPB, perceived barriers of NHPB, social support, age, gender, ethnic, education, and income that may predict the NHPB among adult patients with type 2 diabetes.