

CHAPTER 4

RESULTS AND DISCUSSION

Results

This descriptive study aims to investigate whether perceived benefits of NHPB, perceived barriers of NHPB, and social support, can predict nutritional health promoting behaviors of type 2 diabetes patients in the multiple regression model, while possible confounding factors are controlled. The results are illustrated as follows:

1. Subjects' characteristics.
2. Distribution of nutritional health promoting behaviors (NHPB), perceived benefits of NHPB, perceived barriers of NHPB, and social support.
3. Description of daily calorie consumption.
4. Association of the selected factors with nutritional health promoting behaviors.
5. Factors associated with NHPB in the enter regression model

Subjects' characteristics.

One-hundred thirty adult patients with type 2 diabetes were recruited from two hospitals in Jakarta. Subjects' characteristics were described in two parts: subjects' demographic characteristics and subjects' health characteristics.

1. Subjects' Demographic Characteristics

Table 1 shows that the majority of the subjects were female (56.2%), married, Muslims and Javanese; finished high school and college; having monthly income between 1.000.000,00 to 2.000.000,00 IDR (equivalent 107 – 215 USD). They aged between 33 to 60 years old; most of them were over 50. The predominant occupation among subjects was as government employee, followed by housewives.

Table 1

Frequency and percentage of subjects categorized by their demographic characteristics (N=130).

Characteristics	Frequency	Percentage
Age (years)		
30-39	4	3.1
40-50	43	33.1
51-60	83	63.8
(\bar{X} = 51.97, SD = 5.58, Min= 33, Max= 60)		
Gender		
Male	57	43.8
Female	73	56.2
Ethnic		
Javanese	80	61.5
Betawinese	50	38.5
Religion		
Islam	114	87.7
Catholic	5	3.8
Protestant	10	7.7
Hindu	1	0.8
Marital status		
Single	1	0.8
Married	117	90
Widow	12	9.2
Level of education		
Elementary school	24	18.5
Junior high school	18	13.8
Senior high school	45	34.6
College or above	43	33.1

Table 1 (continued)

Characteristics	Frequency	Percentage
Occupation		
Housewife	42	32.3
Farmer	1	0.8
Private employee	16	12.3
Government employee	47	36.2
Business person	14	10.8
Retirement	10	7.7
Income/month		
Less than Rp. 500.000,00	23	17.6
Rp 500.000,00 – Rp. 1.000.000,00	29	22.3
More than Rp1.000.000,00 – Rp. 2.000.000,00	49	37.6
More than Rp. 2.000.000,00	28	21.5
Number of people live together		
1-5	104	80
More than 5	26	20
(\bar{X} = 4.25, SD = 1.87, Min = 1, Max =13)		

2. Subjects' Health Characteristics

Table 2 shows that most of the subjects (40.7%) were diagnosed as diabetes for less than 5 years with a mean of 7.46 years (SD = 5.96); 81.5% received dietary counseling. The majority had no major symptoms of diabetes (polyuria, polydipsia, polyphagia), only small proportion had the symptoms. All subjects received diabetes medication to control blood glucose, 70.8% of which were taking oral hypoglycemic agent (OHA). More than a half (50.8%) of subjects were obese, with their body mass index were over 25. More than three-fourth of the subjects (76.2%) had fasting blood glucose (FBG) over 120 mg/dL, with a maximum of 402 mg/dL. Total cholesterol of 55% subjects was high level, which was over 200 mg/dL, whereas 50.7% subjects had normal triglyceride serum level. Additionally, nearly half of the subjects (42.9%) had low HDL serum level, which was less than 45 mg/dL. Meanwhile, LDL serum level of 54.3% of the subjects was high; the level was over 130 mg/dL.

Table 2.

Frequency and percentage of patients' health characteristics (N=130).

Characteristics	Frequency	Percentage
Years since diagnose		
Under 5 years	53	40.7
5-10	43	33
above 10 years	34	26.3
(\bar{X} = 7.46, SD = 5.96, Min = 1, Max = 24)		
Received dietary counseling		
Yes	106	81.5
No	24	18.5
Excessive urination symptom		
Yes	44	33.8
No	86	66.2
Large fluid intake		
Yes	57	43.8
No	73	56.2
Excessive hunger		
Yes	38	29.2
No	92	70.8
Medication		
Insulin	11	8.4
Oral hypoglycemic agent (OHA)	92	70.8
Insulin and OHA	27	20.8
Body Mass Index (BMI)		
Less than 25	64	49.2
25 and over	66	50.8
(\bar{X} = 25.27, SD = 4.365, Min = 16.89, Max = 42.52)		

Table 2 (continued).

Characteristics	Frequency	Percentage
Last fasting BGL		
Less than 120 mg/dL	31	23.8
120 mg/dL and over	99	76.2
$(\bar{X} = 161.25, SD = 62.346, \text{Min} = 74, \text{Max} = 402)$		
Last lipid profile		
Total cholesterol (N= 71)		
Less than to 200	32	45.0
above 200	39	55.0
$(\bar{X} = 205.15, SD = 48.866, \text{min} = 65, \text{Max} = 315)$		
Triglyceride (N= 71)		
Less than to 150	36	50.7
Above 150	35	49.3
$(\bar{X} = 165.97, SD = 73.965, \text{Min} = 42, \text{Max} = 389)$		
HDL (N= 70)		
Less than 45	30	42.9
Above 45	40	57.1
$(\bar{X} = 47.83, SD = 14.128, \text{Min} = 19, \text{Max} = 89)$		
LDL (N= 70)		
Less than to 130	32	45.7
Above 130	38	54.3
$(\bar{X} = 136.62, SD = 40.298, \text{Min} = 58, \text{Max} = 253)$		

Distribution of nutritional health promoting behaviors (NHPB), perceived benefits of NHPB, perceived barriers of NHPB, and social support.

Table 3 presents that the subjects' level of global NHPB including its dimensions: selecting healthy diet, arranging meal plan, and recognizing the amount of food calorie were moderate.

The study also analyzed subjects' NHPB in all items (Appendix A - Table A1). The findings showed that several particular behaviors were not performed by the majority of subjects. Only a small proportion of subjects (24.6%) consumed high calorie fruits in moderate amounts; less than half of the subjects understood and were able to use serving methods; less than half of the subjects understood how to calculate food calories; and few of the subjects knew how many calories they should take at each meal.

Table 3.

Range of possible score, range of actual score, mean, standard deviation, coefficients of variance (CV), skewness, average of mean, and level of NHPB and its dimensions (N= 130).

	Range		Mean	SD	CV	Skews	Average	Level
	Possible score	Actual score						
NHPB	21-84	41 – 71	55.06	5.60	10	.06	2.62	Moderate
Selecting healthy diet	10-40	18 – 36	26.88	3.23	12	.39	2.68	Moderate
Arranging meal plan	7-28	13 – 25	18.47	2.20	12	-.44	2.63	Moderate
Recognizing the amount of food calorie	4-16	4 – 16	9.71	2.06	21	-.47	2.42	Moderate

Table 4 illustrates that the mean of social support was 85.90 ($SD = 2.31$), with the actual score ranged 8 – 32; the mean of perceived benefits and perceived barriers of NHPB was 24.97 ($SD = 3.48$), and 26.74 ($SD = 3.37$), respectively.

In relation to subjects' data in table 3 and 4, the skewness of all subjects' data showed below 1.00, which indicated that the data was normally distributed (Munro, 2001), however all variables' dispersion was very narrow with the coefficients of variation less than 25%.

Table 4.

Range of possible and actual score, mean, standard deviation, coefficients of variance (CV), and skewness of perceived benefits, perceived barriers, and social support (N= 130).

	Range		Mean	SD	CV (%)	Skews
	Possible score	Actual score				
Perceived benefits of NHPB	8-32	8 – 32	24.97	3.48	14	-.30
Perceived barriers of NHPB	12-48	19 – 40	26.74	3.37	12	.90
Social support	29-145	38 – 142	85.90	2.31	23	-.06

Description of daily calorie consumption.

Table 5 shows the distribution of the subjects' daily calorie intake. Carbohydrate intake was the largest source of calorie (53%), followed by fat (32%) and protein (15%). The mean of total energy of subjects' intake was lower than the average total energy as requirement ($\bar{X}= 1282.82$, $SD = 295.26$). Regarding the distribution of total calorie of subjects, the findings showed that subjects consumed the proportion of protein, fat, and carbohydrate as recommendation.

Table 5.

Distribution of daily calorie intake of subjects estimated by 24-hour dietary recall (N=130).

	%	Mean	SD	Min –Max
Energy (kcal)	100	1132.71	334.03	257 -2247
Protein (cal)	15	173.28	64.11	12 – 352
Fat (cal)	32	366.16	169.10	27 - 927
CHO (cal)	53	600.33	210.46	112– 1636

Further analysis to explore the consumption of individual's daily calorie intake was done. It identified whether or not the amount of calorie consumption of the subjects met the requirement of daily calorie intake. Table 6 presents the frequency and percentage of subjects consumed total calorie, including: total energy, protein, fat, and carbohydrate within 24 hours. The findings showed that most subjects consumed total energy, carbohydrate, and fat less than requirement, but protein intake was higher than requirement (more than 20% of total calorie). Surprisingly, no one appropriately consumed amount of total energy. In addition, only small proportion of subjects consumed appropriate calorie from fat, protein, and carbohydrate.

Table 6.

The frequency and percentage of subjects consumed total calorie classified by total energy, intake of protein, fat, carbohydrate within 24 hours (N= 130).

	More than requirement		Appropriate		Less than requirement	
	n	%	n	%	n	%
Energy (kcal)	47	36.2	-	-	83	63.8
Protein (cal)	95	73.1	1	.8	34	26.2
Fat (cal)	54	41.5	2	1.5	74	56.9
CHO (cal)	36	27.7	2	1.5	92	70.8

Associations of the selected factors with nutritional health promoting behaviors.

The Pearson's product moment correlation method was employed to test the relationship of perceived benefits, perceived barriers, social support, and age with nutritional health promoting behaviors. Meanwhile, gender, ethnic, education, and income were analyzed by independent *t*-test to assess the effect of these variables on NHPB.

1. Associations of gender, ethnic, education, and income with NHPB.

The study found that there was no significantly difference on NHPB between the subjects with regard to sex and ethnic, but there was significantly difference on NHPB between subjects with regard to education level and income; which means that the subjects with higher education as well as higher income had better score of NHPB, as presented in table 7.

Table 7.

The differences of NHPB between the subjects with regard to gender, ethnic, level of education, and level of income ($N = 130$).

Variables	Total mean score of NHPB			
	Mean	SD	t value	p Value
Gender				
Female	55.15	5.74	-.22	.41
Male	54.93	5.48		
Ethnic				
Javanese	55.60	5.43	1.41	.80
Betawenese	54.18	5.82		
Education				
Elementary – junior school	53.76	5.54	1.83	.04
Senior or above	55.67	5.56		
Income				
Less than Rp. 1.000.000,00	53.92	5.74	1.92	.03
More than Rp. 1.000.000,00	55.83	5.41		

2. Associations of perceived benefits, perceived barriers, social support, and age with NHPB.

Table 8 demonstrates matrix of Pearson's product moment correlation coefficients among perceived benefits, perceived barriers, social support, and age with NHPB of the subjects. There were significant positive relationship of perceived benefits, social support with nutritional health promoting behaviors at low level ($r = .20, .19, p < .05$, respectively). It meant that higher scores of perceived benefits and social support were likely to have higher NHPB. In addition, perceived benefits was significantly correlated with social support at low level ($r = .31, p < .01$), which meant higher perceived benefits were likely to have higher social support. Meanwhile, there were significant negative relationship between age and perceived benefits, which meant that older subjects would perceive lower benefits of NHPB. Likewise, social support had negative relationship with perceived barriers which meant that lower social support would be enhance perceived barriers of NHPB.

Table 8.

Pearson's product moment correlation coefficients among influencing factors and nutritional health promoting behaviors of type 2 diabetes patients (N = 130).

Variables	1	2	3	4	5
1. NHPB	1				
2. Age	.01	1			
3. Perceived benefits	.20*	-.19*	1		
4. Perceived barriers	-.12	-.13	-.10	1	
5. Social support	.19*	-.05	.31**	-.19*	1

** $p < 0.01$

* $p < 0.05$

Factors associated with NHPB in the enter regression model

From the table 7 and 8, it can be seen that only perceived benefits, social support, education, and income were significantly related to NHPB. Perceived benefits and social support were entered as selected factors into the regression model with NHPB a dependent variable by using enter method, including education and income as confounding factors were also entered into a regression model.

As shown in table 9, perceived benefits and social support could explain 4% of the variance of NHPB when each of them was only independent variable in the model. However, when those two variables were regressed together in the same model, they became non significant predictors of NHPB, where the beta values of two variables were no longer significant. Moreover, when two confounding factors were added to the prediction model, an additional 1% of the variance was explained ($F(4,125) = 2.74; p < .05$), but the beta values of all predictors became no significant, which means that four variables were not effective predictors of NHPB.

Table 9.

Summary of regression analysis for variables predicting nutritional health promoting behaviors (N = 130).

Variables	<i>B</i>	β	<i>t</i>	<i>R</i> ²	adjusted <i>R</i> ²	<i>F</i>
1 Perceived benefits	.32	.20	2.31*	.04	.03	5.34*
2 Social support	.05	.19	2.14*	.04	.03	4.58*
3 Perceived benefits	.25	.16	1.74	.06	.04	3.83*
Social support	.04	.14	1.51			
4 Perceived benefits	.24	.15	1.64	.08	.05	2.74*
Social support	.03	.11	1.24			
Education	-.86	-.07	-.73			
Income	-1.25	-.11	-1.13			

**p* < .05

Discussions

This descriptive study set out to explore nutritional health promoting behaviors (NHPB) in adult patients with type 2 diabetes, and to investigate whether perceived benefits of NHPB, perceived barriers of NHPB, and social support were predictors of NHPB in the multiple regression model when controlling for possible confounding factors (age, gender, ethnic, education, and income). One-hundred thirty patients with type 2 diabetes participated in this study.

Subjects' Characteristics.

The majority of subjects in this study were female. It is in lined with the study by Hillier and Pedulla (2001) who reported most subjects in aged group 18 – 45 years were female (57%). Likewise, Son et al (2005) studied 144 subjects with type 2 diabetes, of whom 81% were female. In addition, Aguilar-Salinas et al. (2003) also studied 2155 type 2 diabetes Mexicans of whom

60% were female. This, therefore, indicates a higher prevalence of type 2 diabetes in females than in males.

The subjects were mostly middle aged confirming that type 2 diabetes occurs more often in adults over the age of 40, especially in populations between the ages of 35 and 64 in developing countries (WHO, 2006). In addition, one study reported that increased prevalence and high incidence of type 2 diabetes in deprived areas in Middlesbrough and East Cleveland affecting those in the population who were between the ages of 40-69 years (Connolly, Unwin, Sherriff, Bilous, & Kelly, 2000). The illness arose in this age because of insulin resistance and impaired insulin secretion (Smeltzer & Bare, 2004) and, additionally, was associated with impaired glucose tolerance (IGT) (Chang et al., 2000). Insulin resistance is the condition of decreased tissue sensitivity to insulin in which insulin cannot transfer glucose to target cells, thus resulting in an increase in blood glucose level (American Diabetes Association, 2001; Smeltzer & Bare, 2004). Impaired insulin secretion occurs when there is a reduction in islet cell volume that beta cells fail to produce sufficient insulin resulting in a rise in blood glucose levels (McDowell and Gordon, 1996).

Furthermore, obesity was identified among most subjects. Type 2 diabetes was also strongly related with this condition because it can aggravate insulin resistance as well (WHO, 1999; Smeltzer & Bare, 2004).

Over half of the subjects were well-educated having finished secondary education or above (senior high school 34.6%, college 33.1%). The level of education may contribute to the subjects exhibiting nutritional health promoting behaviors as this factor may facilitate a person learning about eating behavior modification. A previous study demonstrated that a higher education level was an important predictor of disease awareness enhancing compliance with healthy eating behavior (Caliskan et al., 2005).

Fifty-nine percent of the subjects had a monthly income of over 1.000.000 rupiahs (USD 107) which was considered at the time of this study an above average income in Indonesia, where the average income of Indonesians in 2006 was approximately 590.000 rupiahs (equivalent 65 USD) (pikiran_rakyat.com, 2006). This indicated that most subjects who were admitted to the OPD had adequate incomes and, therefore, were potentially able to improve their health status by carrying out nutritional health promoting behaviors, for instance, by being able to afford buying and preparing healthy foods.

Description of nutritional health promoting behaviors (NHPB) among patients with type 2 diabetes

Findings of the study revealed that the level of a global nutritional health promoting behaviors among the subjects was at a moderate level, similar to the levels of its dimensions: selecting a healthy diet, arranging a meal plan, and recognizing food calorie intake – all which indicated a moderate level. The fact that the level of subjects' NHPB was not in the high range might be due to a narrow distribution of the NHPB data which be a result of the subjects tending to give answers in the mid choices of Likert scale band in all items. The findings were in line with the study of Chansawang & Petchratchart (2002) which revealed that the health practices of food control among diabetic patients in Namom District – Songkhla Province, Thailand were at a moderate level. In contrast, Jefferson, Melkus, & Spollett (2000) revealed that young Black adult women who were at risk for type 2 diabetes did not practice nutritional health promoting behaviors routinely.

The moderate level of subjects' NHPB was congruent with the description of their daily food consumption, whereby a majority of them could not meet an appropriate daily amount of calorie intake. Their consumption of total energy, fat, and carbohydrate was less than required, but they consumed more protein than needed. The findings indicated that subjects might have tried to substitute protein as calorie sources for fat and carbohydrate, so they ate more protein resulting in their consuming less total energy than required. The recommendation of protein consumption for type 2 diabetics is 10-20% of their total daily calories (McDowell & Gordon, 1996, American Diabetes Association, 1998) or 0.8 gr/kg/day (Heins & Beebe, 1996). However, many literatures explained that high protein diet (30% of protein) may help to reduce blood glucose level in type 2 diabetics since a slow conversion of protein to glucose being integrated into hepatic glycogen stores but not raise the rate of hepatic glucose release (Franz, 1997; Gannon et al., 2003). In addition, glucose from protein may not increase plasma glucose concentration but increase serum insulin response (American Diabetes Association, 2007). Therefore, most of the subjects were supposedly to have a controlled blood glucose level as they consumed a high protein diet. However, the findings showed that over 50% of the subjects had fasting blood glucose (FBG) more than 140 mg/dL, which indicated that their blood glucose were (still) poorly controlled (Endocrin Web's Diabetes Center, 2007). This phenomenon could be accounted for by various factors.

First, as mentioned above, most subjects had not met the appropriate amount of calorie intake as recommended; thus, an inappropriate calorie intake would cause the level of blood glucose to be unstable or abnormal. Essentially, calorie intake for type 2 diabetics should be balanced according to their personal need. Secondly, most of the subjects had been identified as incapable in understanding and calculating the amount of calories of their meals. The amount of calorie intake for such people has a great affect in altering the blood glucose levels. They were supposedly able to understand and calculate how much calories they should consume in each meal. Thus, although they tried to eliminate carbohydrate intake and substitute it for protein, this could not help to keep subjects' FBG well controlled.

The findings also revealed that several particular behaviors were not performed by the majority of subjects which were: consuming high calorie fruits in moderate amounts; understood and were able to use serving methods; understood how to calculate food calories; and knew how many calories they should take at each meal. This indicated that although the majority of the subjects have received dietary counseling, they could not perform NHPB adequately due to lack of information, misunderstood, or ineffective counseling program.

Relationships of possible influencing factors with nutritional health promoting behaviors.

The present study revealed low positive associations of perceived benefits and social support with NHPB. It means that higher levels of perceived benefits of NHPB and social support would lead to better nutritional health promoting behaviors among the subjects. These associations can be explained by the Pender model (Pender, 1996) which suggests that perceived benefits and social support directly influences a person to engage in NHPB through direct physical outcome or social pressures, leading the subjects to engage in NHPB regularly. This finding is also congruent with a study by Harris et al. (1987, as cited in Garay-Sevilla et al., 1995) which found that compliance to a prescribed diet among type 2 diabetics correlated with perceived benefits; additionally, other previous studies revealed that among type 2 diabetes patients social support had a relationship with healthy eating behaviors (Gleeson-Kreig et al., 2002; Glasgow et al., 2001; Wen et al., 2004). It is clear that motivation to carry out healthy eating behaviors develops when type 2 diabetics begin to experience the benefits of healthy eating diets and having adequate social support.

The present study also revealed that social support was positively related to perceived benefits of NHPB, which means that greater social support would lead to an increase in the perceived benefits of NHPB of the subjects. It can be explained that strong social support from family, friends, or health professionals is important for subjects to perceive more benefits of performing NHPB whereas social support was inversely related to perceived barriers of NHPB. A lack of social support would lead subjects to perceive greater barriers of NHPB and in sustaining nutritional health promoting behaviors. Thus, a lack of social support could be an important obstacle in subjects performing NHPB.

Unexpectedly, this study found no association between perceived barriers and nutritional health promoting behaviors. This finding is incongruent with a previous study which revealed that perceived barriers ($\bar{X}= 3.59$, $SD= 1.16$) was correlated and significant as a predictor of eating behaviors ($r= -.25$, $p<.001$) (Aljasem, Peyrot, Wissow, & Rubin, 2001). In addition, in relation to Pender's model (Pender, 1996), apparently when type 2 diabetes patients perceived barriers in conducting NHPB, such as time pressures, they tend to resist eating healthy diets. This could be explained in that the distribution of variation of perceived barriers' data was low with the coefficient of variation (CV) of only 12%, thus leading to the result that no association was indicated between perceived barriers and NHPB. The Perceived Benefits of NHPB questionnaire of this study might not be sensitive enough to detect variability of perceived benefits of NHPB among the subjects.

The present study found no association of demographic factors, such as age, gender, and ethnic with NHPB. The findings did not support Pender's model which proposed that race, sex, and age directly and indirectly influence health promoting behaviors. Additionally, the findings also were not congruent with previous studies which reported that subjects of different age in adults exhibited different performance in diet self care (Opassanun, 1999 as cited in Chitwarin, 2001; Wen et al., 2004).

That this study did not demonstrate an association of age with NHPB could have resulted from the fact that there was little variation of the subjects' ages which were mostly in the middle age group; therefore, being able to establish a difference in performance of NHPB due to age among these subjects who were in the same age group would not be possible. Also contrary to expectations, gender and ethnic were also not seen in this study as significantly related to NHPB. This could be due to the subjects' high level of education. The subjects, therefore, were more

likely to access to information and knowledge about diabetes control regardless gender and ethnicity. In addition, living in urban may have resulted in the subjects being more acculturated with urban values and an urban lifestyle, including eating behaviors. Therefore, the eating behaviors among the subjects' sex and ethnic background were not different as well. If the study conducted in rural areas where the subjects' cultural beliefs regarding eating behaviors are still maintained, different ethnicities would affect on NHPB.

Factors influencing nutritional health promoting behaviors in the multiple regression model.

The present study revealed that both perceived benefits of NHPB and social support were effective predictor for NHPB as each variable could significantly explain the variance of NHPB. However, when they were included in the same model with possible confounding factors such as education and income, none of the variables became significant predictor. This was not surprising because these variables were intercorrelated with each others, and the correlations among independent variables were stronger than the correlation between each independent variable with the dependent variable (NHPB) and this lead to such results. To be selected as a predictor in a multiple regression model, the correlation of independent variable with a dependent variable must be stronger than the correlations among independent variables. (Burns & Grove, 1997).

In addition, the minimum variation of the main variables: NHPB, perceived benefits, and social support in this study could account to a great extent for the low association between the independent variables and dependent variable. The narrow variation of the NHPB score reflected that almost all the subjects gave similar responses to each particular questions. This might be influenced by the culture of Indonesians who tend to answer the same answer when giving response to questionnaires by selecting mid ranges choices. Moreover, there might be other factors such as perceived self efficacy, perceived health or illness status that could affect stronger to NHPB of the subjects.

Overall, these findings supported Pender's model to some extent, whereby only perceived benefits and social support made statistically significant small contributions to the subjects' NHPB. These findings supported previous studies which revealed that perceived benefits and social support became influencing factors on eating behaviors among type 2

diabetics (Harris et al., 1982 as cited in Garay-Sevilla et al., 1995; Marzilli, n.d.; Wen et al., 2004; Albarran et al., 2005).