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The effects of nutrition counseling on dietary compliance and blood sugar levels of type 2 diabetes mellitus patients

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Abstract

One of the efforts to increase individuals' or families' knowledge and ability of nutrition is nutrition counseling. Patients are entitled to qualified nutrition counseling because it is an integral part to accelerate their healing process. Type II DM patients' compliance with diet therapy is a difficult problem to control. Some studies showed that 75% of patients did not comply with the recommended diet, and 53% had poor blood glucose control. This study employed an experimental study with a quasi-experimental design as well as a pretest and posttest without a control. The sample of this study was 30 people. This study was conducted in Meuraxa Regional General Hospital, Banda Aceh from June to July 2017. The primary and secondary data were analyzed using the statistical test of T-test dependent and chi-square test with a level of confidence (0:05). The result show before receiving the nutrition counseling, type II diabetes patients' compliance was 43.4%, after receiving the counseling, their compliance increased to 73.7%. Moreover, before the counseling, the average of their blood sugar levels was 318.13, but after the counseling, their blood sugar levels decreased by 273.20 mg/dl; thus, the margin of decline was 42.167 mg/dl. The chi-square test discovered that the nutrition counseling significantly influenced adherence and obtained a p-value of <0.05. Meanwhile, the dependent t-test showed that the blood sugar levels of the type II diabetes patients were p<0.05. It is expected that the nutrition officers provide continuous or sustainable nutrition counseling to increase the patients' knowledge and dietary compliance and help them achieve normal blood sugar levels.
Keywords: blood sugar levels, compliance diet, nutrition counseling, type 2 diabetes

Introduction

Basic Health Research (Riskesdas, 2013) reported that the highest prevalence of diabetes mellitus (DM) in Indonesia based on the doctor diagnosis was found in Yogyakarta (2.6%), DKI Jakarta (2.5%), North Sulawesi (2.4%), and East Kalimantan (2.3%). Meanwhile, the highest prevalence of diabetes mellitus based on doctor diagnosis or symptoms was found in Central Sulawesi (3.7%), North Sulawesi (3.6%), South Sulawesi (3.4%), and East Nusa Tenggara. (3.3%). The prevalence of diabetes mellitus in Aceh is 1.7% or the second-highest prevalence in Indonesia with a prevalence of 1.1%. The 2011 census of the Nangroe Aceh Darussalam reported that the population suffering from diabetes mellitus was 21%. Achieving normal blood sugar levels for people with diabetes mellitus requires energy, motivation, time, cost, and cooperation between patients and the health team, such as doctors, nurses, and nutritionists. DM disease management can be conducted through education, meal planning, physical exercises, and pharmacological intervention. Meal management for patients is a major component of diabetes management; thus, it is necessary

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to determine the appropriate composition of a diet to control blood sugar levels (Sukraniti et al., 2011).

Various studies deployed that dietary adherence to medical and nutritional treatments of chronic diseases is generally low. A study found that 75% of diabetes patients were mistakenly injected insulin, 58% took the wrong dose, and 80% did not follow the recommended diet (Soewondo P, 2007). Nutritional therapy is the main component to succeed in DM management of which the principle is giving diet based on three factors: types of food, numbers of calories, and meal schedules. These three factors are also recommended for DM patients who undergo outpatient treatment. One of the efforts to increase individuals' or families' knowledge and ability of diabetes mellitus and their diet is nutrition counseling provided by a nutritionist or dietitians (PERSAGI, 2010).

Methods

This study employed experimental research with the quasi-experimental design, a pretest, and a post-control design to determine the effects of nutrition counseling on dietary compliance and blood sugar levels of type 2 diabetes mellitus patients at the Meuraxa Regional General Hospital, Banda Aceh. The population of this study was all type 2 diabetes mellitus patients at the Meuraxa Regional General Hospital, Banda Aceh. The research subjects were divided into two groups: the treatment group and the non-treatment group. Each group consisted of 30 people. The treatment group received the counseling three times with an interval of one week between counseling. Meanwhile, the non-treatment group did not receive the counseling. Nutrition counseling was conducted for 45 minutes at the nutrition polyclinic. This study collected dietary compliance data of the meal arrangements, comprising of the need-based amount of energy consumed, types of food (foodstuffs or low glycemic foods), and regular meal schedules. Research subjects were considered adherent to the diet if these three factors were applied. Blood sugar levels were checked before and after the provision of nutrition counseling. The blood sugar was checked using the Acchu-Check and referred to fasting blood sugar. The data were statistically analyzed using the Chi-square test. Meanwhile, the dietary compliance with blood sugar levels was analyzed using the independent t-test with a significance level of 95% ($\alpha < 0.05$).

Results

This study discovered that the nutrition counseling affected the dietary compliance and blood sugar levels of type 2 diabetes patients. The chi-square test discovered that after receiving the nutrition counseling, the type 2 DM patients' compliance increased by 73.7% or was categorized as good. The score of $p<0.05$ showed that the counseling significantly affected the patients' dietary compliance. Moreover, this study revealed that there was a significant difference in the patients' blood sugar levels before and after receiving the nutrition counseling. The decrease was 42.167 mg/dl. The statistical test using the dependent t-test of $p<0.05$ found that the nutrition counseling significantly affected blood sugar levels of type 2 DM patients in the outpatient ward of Meuraxa Regional General Hospital, Banda Aceh.

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Table 1. Characteristics of Respondents

Characteristics of Subjects	With Nutrition Counseling		Without Nutrition Counseling	
	N	%	n	%
Genders				
Male	14	46.6	14	46.6
Female	16	53.4	16	35.4
Total	30	100	30	100
Ages				
Young adults	12	40.0	12	40.0
Middle adults	11	36.7	11	36.7
Old adults	7	23.3	7	23.3
Total	30	100	30	100
Education				
Basic education	6	20.0	8	26.7
Middle education	13	43.3	10	33.3
Higher education	11	36.7	12	40.0
Total	30	100	30	100
Professions				
Civil servants	13	43.,3	10	33.4
Farmers	6	20.0	7	23.3
Merchants	5	16.6	7	23.3
Housewives	8	26.7	6	20.0
Total	30	100	30	100

Table 1. Shows the characteristics of the research subjects. Genders in the two study groups had the same proportions, namely men by 46.6% and women by 53.3%. Meanwhile, the two research groups showed slightly diverse proportions of age, namely 40% of young adults, 43.3% of middle-aged adults, and 3.3% of old adults. The most dominant education level of the treatment group was secondary education. In contrast, the most dominant education level of the non-treatment group was the higher education (40%). Most of the research subjects in the two groups were civil servants.

Table 2 describes the eating arrangements of the research subjects. The group receiving the nutrition counseling consumed a sufficient amount of energy based on their bodies' needs (64.4%). Meanwhile, the group not receiving nutrition counseling consumed energy more than needed by their bodies (73.3%). The glycemic index of food signified that the group receiving the nutrition counseling mostly selected sufficient foods or low glycemic food (70%). Meanwhile, the group not receiving the nutrition counseling consumed more foods or high glycemic foods (56.7%). the data of eating schedule described that the group receiving the nutrition counseling regularly took meals according to the arranged schedule every day (76.6%). On the other hand, the group not receiving the nutrition counseling had irregular eating habits and did not follow the arranged eating schedule (73.4%).

Table 2 shows that the amount of energy intake of the patients before receiving the nutrition counseling was not good (63.3%), but their amount of energy intake was good (73.3%) after taking the nutrition counseling. This improvement occurred because after receiving the nutrition counseling, the respondents thought that they had to take a balanced amount of food based on their body needs because the nutrition value of DM patients is different from that of healthy people. Before receiving the nutrition counseling, they took a successive amount of energy. Therefore, a low level of knowledge can affect the wrong food intake that leads to obesity and ultimately increases blood sugar levels.

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Table 2. Meal Arrangements of Type 2 DM Patients

Meal Arrangement	With Nutrition Counseling		Without Nutrition Counseling	
	n	%	n	%
Amount of energy intake				
Enough	19	63.4	8	26.7
More	11	36.6	22	73.3
Total	30	100	30	100
Glycemic index				
Low	21	70.0	13	43.3
High	9	30.0	17	56.7
Total	30	100	30	100
Meal Schedules				
Regular	23	76.6	8	26.6
Irregular	7	23.4	22	73.4
Total	30	100	30	100

Few respondents (36.6%) consumed carbohydrates with a high glycemic index >10% because they consumed pure sugar (sucrose) twice per day when taking tea, coffee, or snacks. They preferred this consumption habit because they did not want to drink unless it tasted sweet. In addition, they believed that blood sugar could be only controlled by drugs without eating arrangements. Sucrose may be consumed by people with diabetes, but their total amount of intake does not exceed 5% of the total energy intake. Unfortunately, the sucrose intake of the research respondents exceeded the recommendation by 20% of the total energy per day. Consequently, the risk of hyperglycemia could increase.

Before receiving the nutrition counseling, the respondents' eating schedule was mostly irregular (76.6%), but after receiving the nutrition counseling, their eating schedule became significantly regular (73.3%). This change occurred because after participating in the nutrition counseling, the respondents implemented a regular eating schedule as recommended and assumed that consuming regular food based on the recommended schedule could prevent their stomachs from being empty and stabilize sugar intake in the body. Moreover, they argued that a delay or irregular eating caused hypoglycemia or decreased blood sugar levels. In contrast, before receiving the nutrition counseling, most of the respondents' eating habits were irregular because they would eat when feeling hungry and ignore the number and interval of meals.

Table 3. Dietary Compliance of Type 2 DM Patients

Diet Compliance	Without Nutrition Counseling		With Nutrition Counseling	
	n	%	n	%
Not Obey	17	56.6	8	26.6
obey	13	43.4	22	73.4
Total	30	100	30	100

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Table 3 describes compliance with implementing the DM diet most of the respondents in the treatment group were obedient to implement the diet recommended by the nutrition counselors (73.4%). In contrast, most of the respondents in the non-treatment group did not comply with the diet recommended by the nutrition counselors (43.4%).

Table 4. Blood Sugar Levels of Type 2 DM Patients

Blood Sugar Levels	Min	Max	Average
Without nutrition counseling (mg/dl)	245	430	318.13
With nutrition counseling (mg/dl)	190	360	273.20

Table 4 illustrates that blood sugar levels decreased after the provision of nutrition counseling. Before the provision of nutrition counseling, the average sugar level of sugar was 318.13 mg/dl. However, after the provision of nutrition counseling, the average blood sugar level was 273.20 mg/dl. Blood sugar levels of some samples decreased by (42.167 mg/dl) after the counseling because the patients started to follow the recommended diet and pay attention to their food intake patterns; thus, their blood sugar levels became stable and did not increase. This finding is almost the same as that of (Sukraniti, 2011) who discovered that the percentage of good, moderate, and bad blood sugar levels changed after nutrition counseling. Before the counseling, the blood sugar levels of 32 patients (91.43%) decreased, while the blood sugar levels of the other 3 patients (8.57%) did not decrease, change, or increase.

Table 5. Nutrition Knowledge of Type 2 Diabetes Mellitus Patients

Nutrition Knowledge	Without Nutrition Counseling		Nutrition Counseling	
	n	%	N	%
Not good	2	80	11	20
Good	9	40	19	60
Total	30	100	30	100

Table 5 shows that before the nutrition counseling, the nutritional knowledge of type 2 diabetes patients was generally not good with a score of 80.0%. However, after the nutrition counseling, most of them had good knowledge with a score of 60%. A study by Saifunurmazah, 2013 discovered that most type 2 DM patients who received the nutrition counseling had a good diet, while those without the nutrition counseling had a poor diet. Moreover, (Paruntu, 2014; Kurniasih I, 2010) revealed that there was a significant difference in dietary compliance between before and after the nutrition counseling. This significant difference was indicated by the comparison of dietary compliance values before and after the nutrition counseling and by the respondents' obedience after receiving the counseling.

Table 6. The Effects of Nutrition Counseling on Diet Compliance of Type 2 Diabetes Mellitus Patients

Nutrition Knowledge	**Dietary Compliance**				**Total**		**P**
	Obey		Not Obey				
	n	%	n	%	n	%	
Not good	7	11.67	25	41.67	32	100	0.02
Good	23	38.33	5	8.33	28	100	
Total	30	50	30	50	60	100	

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Table 6 explains that the type 2 DM patients who had poor nutrition knowledge showed a bad category of dietary compliance by 41.67.7%. In contrast, the patients who had good nutrition knowledge showed good compliance by 27.3%. The type 2 DM patients who had poor nutrition knowledge showed a significant percentage of disobedience by 41.67%. In contrast, the patients who had good nutrition knowledge showed significant non-adherence by 8.33%.

Table 7. Effects of Nutrition Counseling on Blood Sugar Levels of Type 2 Diabetes Mellitus Patients

Blood Sugar Levels	Mean	Deviation Standards	t	n	p
Before and after the nutrition counseling	42.1	9.234	4.5	60	0.000

Table 7 shows that the patients' blood sugar levels decreased after receiving the nutrition counseling by 42.167 mg/dl. The statistical tests using the dependent t-test found a significant difference in blood sugar levels before and after the provision of the nutrition counseling. This finding concluded that the nutritional counseling significantly affected blood sugar levels of type 2 DM patients at Meuraxa General Regional Hospital, Banda Aceh ($p<0.05$).

Discussion

Diet compliance of the respondents was caused by a change in mindset, increase in knowledge, and ability to motivate themselves to implement a diet for independent health. In addition, support increased the 'respondents' confidence in what he did and helped them continue to implement a healthy diet. Dietary adherence is an effort to regulate the types, schedules, and amount of nutrition intake with specific purposes, such as maintaining health, maintaining nutritional status, preventing health risks, and curing diseases. The main principles of the diet for people with diabetes are the types of food, meal schedules, and the amount of calorie intake.

Most of the respondents were obedient (56.6%) after receiving the nutrition counseling because they considered that implementing the recommended diet regularly brought several benefits, such as preventing them from feeling weakness due to high blood sugar levels, reducing other symptoms they usually felt, and avoiding further complications to reduce medical costs. Whereas before receiving the nutrition counseling, most of the respondents did not comply (80.0%) regular and healthy diet because 'they less desired to change to a better condition, had a lack of information and knowledge of the illness, and received inadequate support from their family. Consequently, they did not know the importance of adhering a good and regular diet. Their bad habit caused a high intake of carbohydrates, especially simple carbohydrates which can quickly increase blood sugar.

The data of knowledge levels presented that before receiving the nutrition counseling, the majority of the sample (24 patients) had had poor knowledge (80.0%), but after receiving the nutrition counseling, 19 people had good (63.3%). This improvement occurred because before receiving nutritional counseling the respondents had possessed a lack of knowledge and information about recommended diet for diabetes mellitus sufferers. However, their

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knowledge improved after receiving the nutrition counseling. Notoadmodjo (2011) states that changing one's health behavior requires increasing knowledge through health education. Education is an important element of health management for patients with diabetes mellitus (Rusimah, 2010). Health education usually conducts various activities; one of which is the nutrition counseling.

The low level of nutrition knowledge can result in an indifferent attitude towards the consumption of certain foodstuffs even though they are quite available and contain high nutrients. Each individual usually obtains nutritional knowledge from every experience and various sources, such as mass media, print media, electronic media, and manuals from close relatives. This knowledge can increase by forming individual confidence so that he can behave in accordance with everyday life (Chabchoub et al., 2000; Norris et al., 2002).

This study revealed that levels of education and occupation also influenced the patients' dietary compliance. Most of the patients holding a low to high levels of education and working as employees were the most obedient to the healthy diet. However, some respondents with low education adhered to the recommended diet and received the information provided because they wanted to improve their dietary compliance and recover soon. Moreover, their adherence could not be separated from the support of their caring family. Many cases show that patients with sufficient levels of education frequently did not know healthy diet because they have never received information of health or are accustomed to unhealthy eating behaviors and patterns. Notoatmodjo (2007) argues that levels of education affect behavior and produce many changes, especially knowledge of health. The higher the level of formal education, the more easily patients comprehend the information, including health information. In other words, levels of education escalate individuals' awareness to behave in a healthy life.

Sugar intake into the body comes from the food consumed. The glycemic index can show the speed of food that increases blood sugar levels; the higher the glycemic index, the faster the blood sugar levels of diabetes sufferers increase. A complex carbohydrate is a recommended type of food because it is good to consume and takes longer to be broken down into glucose; thus, the complex carbohydrate does not increase blood sugar levels (Sustrani et al., 2005).

In addition to diet settings, DM sufferers must do physical activities and exercises, especially aerobic. Aerobic exercise can reduce blood sugar levels because it is a systematic process using motion stimulation that improves or maintains the body's functional quality, including the quality of lung endurance, heart, muscle strength and endurance, flexibility, and body composition. Aerobic exercise requires all major muscles with continuous, rhythmic, and progressive movements. The use of music in the aerobic is useful to increase exercise motivation, training time management, and training speed (Irianto D, 2000; Abe T. and Sakarai, 2000). Finally, family support is very influential in controlling the blood sugar levels of diabetic patients. Therefore, they can avoid symptoms of microvascular complications.

Conclusion

Type 2 DM patients in the outpatient ward of Meuraxa Regional General, Banda Aceh had a poor level of knowledge of nutrition before receiving the nutritional counseling. However, after receiving the nutrition counseling, their knowledge mostly improved. Most of the research subjects carried out the diet obediently and followed the dietary recommendations. The provision of nutritional counseling has a significant relationship with

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adherence and blood sugar levels of type 2 DM patients in the outpatient ward of the Meuraxa Regional General Hospital, Banda Aceh. The Meuraxa Banda Aceh Hospital is expected to provide a special room for diabetes mellitus patients who are undergoing outpatient treatment. Therefore, they can easily get nutritional counseling, and their knowledge can increase to accelerate the healing. Moreover, nutrition officers are expected to continuously provide nutrition counseling or increase knowledge and diet compliance as well as assist the patients to achieve normal blood sugar levels.

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