Nurse Media Journal of Nursing, 5 (1), 2015, 1 - 14
Available Online at http://ejournal.undip.ac.id/index.php/medianers

The Effect of Dietary and Exercise Self-Management Support Program on Dietary Behavior Exercise Behavior and Clinical Outcomes in Muslim Patients with Poorly Controlled Type 2 DM in a Community Setting in Indonesia

Rian Adi Pamungkas[1], Tippamas Chinnawong[2], Charuwan Kritpracha[3]

ABSTRACT

Purpose: The objective of this study was to examine the effect of dietary and exercise self-management support program on the dietary behavior, exercise behavior, and clinical outcomes of Muslim patients with poorly controlled type 2 DM in Indonesia.
Methods: This study was a quasi-experimental, two group, pre-test and post-test design. The experimental group received the dietary and exercise self-management support program and usual care, whereas the control group only received the usual nursing care.
Result: 35 subjects in the experimental group and 35 subjects in the control group completed the program, respectively. The findings indicated that there are significantly differences in dietary behavior (p=.00), exercise behavior (p=.00) and clinical outcomes: fasting blood glucose (FBG) (p=.00), cholesterol total level (p=.01) and systolic blood pressure (p=.00) between the experimental group and control group. However, for the BMI status (p=.84) and diastolic blood pressure (BP) (p=.32) were no significant differences between two groups.
Conclusion: The dietary and exercise self-management support program was effective for improving the dietary behavior, exercise behavior, FBG, and total cholesterol level for individuals with poorly controlled type 2 diabetes mellitus. Further studies should be replicated using larger groups over a longer time frame.

Keywords: self-management, dietary behaviors, exercise behaviors, poorly controlled type 2 diabetes mellitus.

[1] Master of Nursing Science Student, Faculty of Nursing, Prince of Songkla University, Thailand, E-Mail: adirian491@yahoo.com
[2,3] Lecturer of Medical Nursing Department, Faculty of Nursing, Prince of Songkla University, Thailand

BACKGROUND

Globally, the high prevalence of DM is a common problem. In Indonesia, diagnosis of DM was reported to be 133 million adults. In addition, it was estimated that 194 million adults would be diagnosed with DM by 2030, with14.7 % in urban and 7.2 % in rural areas (Indonesian Endocrinologist Society [PERKENI], 2011). The high proportion of patients remains due to poor glycemic control (Karter et al., 2005)

Poorly controlled DM refers to patients with DM who recently had hemoglobin A1c (HbA1c) levels greater than 9 mg% or equal to ≥ 200 mg/dl fasting blood glucose (FBG) while the optimal level of fasting blood glucose (FBG) should be less than 130 mg/dl (ADA, 2013).

Serious multiple long-term complications are associated with poorly controlled DM, including constriction of blood vessels, nephropathy and retinopathy, neuropathy, peripheral angiopathy, and problems of the cardiovascular system (Polikandrioti & Dokoutsidou, 2009). In addition, type 2 DM is also associated with recent blindness among adults and increased medical costs (Center for Chronic Diseases [CDC], 2011).

Prevention of DM complications is important to improvethe quality of life of the population (Hjelm, Mufunda, Nambozi, & Kemp, 2003). Dietary and exercise management have become the cornerstone of management in patients with poorly controlled diabetes. Diabetes management has been stated as a potential foundation for empowering patients to increase physical, psychological, and changed behaviors (Sun, Tsoh, Saw, Chan, & Cheng, 2012). Although effective self-management of diet and exercise behaviors have benefits for the patients, the majority of patients have difficulty managing their behaviors (Lin, Anderson, Chang, Hagerty, & Loveland-Cherry, 2008). Patients and health care providers have difficulty recognizing dietary and exercise behaviors as an aspect of type 2 DM management, although patients realize the need to recognize these behaviors (Delamater, 2006; Grodner, Long, & Walkingshaw, 2007). Thereby, the active role of the patients in performing self-management is necessary.

A self-management support program is a method of care in which the patients participate and engage actively in their daily treatment (Kanfer & Gaelick-Buys, 1991). This method has become important since patients have to be responsible his/her day to day care (Embrey, 2006; Kanfer & Gaelick-Buys, 1991) and are required to actively manage their blood sugar level (Harkins, 2008).

Some previous studies had been conducted in Indonesia related to self-management. However, most measured dietary behaviors in the general population with type 2 DM, not in Muslim patients with poorly controlled type 2 DM. In addition, previous researchers also did not measure exercise behaviors, whereas exercise behaviors are necessary to maintain blood sugar by increasing the uptake of blood sugar in the muscles which has a positive impact to decrease complications and clinical outcomes including blood pressure level, level of HDL & LDL and body mass index (BMI) (Colberg et al., 2010). Therefore, this study will focus on the effectiveness of self-management support programs on dietary behavior and exercise behavior and clinical

outcomes, especially blood sugar, blood pressure, body mass index (BMI), and total cholesterol in Muslim patients with poorly controlled type 2 DM in a community setting in West Sulawesi Province, Indonesia

OBJECTIVE

The objective of this study was to compare the effect of dietary and exercise self-management support programs on the dietary behavior, exercise behavior, and clinical outcomes of patients who receive a dietary and exercise self-management support program and those receiving the usual nursing care for Muslim patients with poorly controlled type 2 DM in Indonesia.

METHODS

The design of this study used a quasi-experimental design with two groups, pre-test and post-test. The participants were randomly assigned to the experimental and control groups. The experimental group received the usual care and the dietary and exercise self-management support program, whereas the control group received the usual nursing care based on standard care in a public health center.

Samples

This study was conducted at community setting in Polewali Mandar Sub-district, West Sulawesi Province, Indonesia. Patients who met the inclusion criteria were recruited for this study. The inclusion criteria included: (1) Muslim patients with fasting blood sugar level ≥ 154 mg/dl, (2) stayed in community setting, West Sulawesi Province, Indonesia, (3) 20-70 years old, (4) be able to communicate by Indonesian language, both verbal and written, (5) can be assessed by telephone, (6) have no vision impairment and hearing impairment, and (7) have no movement impairment and depression. Whereas, patients who had severe complications that caused the patients to be unable to continue participating in this study or unable to perform the dietary and exercise self-management program, or have to be hospitalized for any reason during the intervention process were excluded. The samples size was calculated based on a significance level of alpha=0.05, power= 0.80 and d= 0.80. Seventy patients were required for both the experimental and control groups.

Instruments

The instruments of this study were devided into two part including:

Dietary and Exercise Self-Management Support Program

The dietary and exercise self-management support program was developed by using self-management concept from Kanfer and Gaelick-Buys (1991). The program was constructed within 8 weeks. In this program, patients were assisted in self-mobitoring by reflecting and monitoring the behaviors for approximately 30 to 60 minutes. After that the reseacher provide individual education and counseling session approximately 60 minutes by using lecture and discussion method. The personal obstacles and problem were also explored in this session. With regard to the content of the education and counseling session, the reseacher coached the patients to estimate the total calorie based on body mass index and a standard calculation which are 10% protein, 60% carbohydrate, and 30 fat. For the exercise program, the researcher demontrated warm-up exercise (5 minutes deep breathing exercise and smooth muscle

movement) before exercise and and warming down (5 minutes relaxing exercise) after 30 minutes of walking exercise. Before walking, the patients should wear a pair of comfortable shoes and do not cause blisters on the foot and asked patients to wear loose-fitting clothing that allows moving freely. For preventing the hypoglycemia, patients bring some water and healthy snacks during walking. Start by walking slowly and try to build walking regime gradually. After a few minutes, try walking a little faster. Towards the end of your walk, gradually slow down your pace to cool down. Finish off with a few gentle stretches, which will help improve the flexibility.

Then the researcher distrib uted the dietary and exercise self-management booklet. Patiets were assisted to perform self-evaluation by comparing the current behavior with the desired behaviors. After that, goals setting and creating the action plan strategies, self- reinforcement and follow-up strategies, including weekly telephone follow-up, brief counseling, and face to face follow-ups for the last session

Data Collection Instruments

The Demographic Data Questionnaire and Health Information (DDQHI). After providing informed consent, the patients were required to fill out the The Demographic Data Questionnaire and Health Information (DDQHI). The Demographic Data consisted of 6 items including patient's name, age, gender, occupation, education, and family income. The Health Information consisted of 16 items including weight, height, BMI status, waist circumference, the recent fasting blood glucose level, blood pressure level, HbA1c level (if present), total cholesterol level, treatments/medications, exercise history, comorbidity, responsibility to cook, medication adherence history, current smoking status, and DM complication.

The Dietary Behaviors Questionnaire (DBQ). This measurement was modified based on existing toolsby Primanda (2011). It was used to measure dietary self-management and consists of 4 components, including selecting a healthy diet (13 items), arranging a meal plan (7 items), recognizing the amount of calorie needs (5 items), and managing dietary behaviors challenges (5 items). Each item was measured by using a five point (0-4) likert scale in which0 = never, 1 = seldom, 2 = occasionally, 3= often, and 4= repeatedly. The total score is from 0-120. The scoring system is divided into three categories: poor (score 0-40), medium (score 41-80), and high (score 81-120) with the highest score indicating more the frequent dietary behaviors.

The Exercise Behaviors Questionnaire (EBQ). The exercise behavior questionnaire (EBQ) was used to measure the exercise behaviors of the patients with poorly controlled type 2 DM. It was modified based on existing tools by Marcus, Rossi, Selby, Niaura, and Abrams (1992). This instrument consistsed of 24 items, each item was measured by using a five point (0-4) likert scale in which 0 = never, 1 = seldom, 2 = occasionally, 3= often, and 4= repeatedly. The total score is from 0-96 with the scoring system being poor (score 0-32), medium (score 33-64), and high (score 65-96)with the highest score indicating more the frequent dietary behaviors.

*Clinical Outcomes Measurement.*The clinical outcomes data includes, fasting blood glucose level (FBG), total cholesterol level, body mass index (BMI) status, and blood pressure level (BP). FBGlevel was measured by using a glucose meter (one touch basic monitor) after 8 hours of fasting, total cholesterol level was measured by using an automatic lipid pro-meterand body mass index (BMI) was calculated by using the

standard methods such as body weight divided by the square of body height (kg/m^2). Whereas, the level of blood pressure (BP) was tested by using a mercury sphygmomanometer.

Ethical Considerations

This study had been approved by the IRB of the Faculty of Nursing, Prince of Songkla University, Thailand and permission letters were obtained from the Head of the Health Department and the Head of Public Health Center, West Sulawesi Province, Indonesia. The informed consent was obtained from all patients. Important information related to the purpose of the study, procedures, risk, and benefits of the study were explained to the patients. The confidentiality of the patients was maintained throughout the study.

Statistical Analysis

The statistical software package applied in this study was SPSS 16.0 for Windows with the significance level set at an alpha of .05. Descriptive statistics were used to analyze demographic characteristics and clinical characteristics. Whereas An independent-t test wasused to compare pre-test and post-test mean score of the dietary behaviors,exercise behaviors and clinical outcomes of the patients between the experimental and control group.

RESULT

Patients Characteristics

A total of seventy patients were enrolled in the study, 35 patients were allocated to the experimental group and 35 patients to the control group. The baseline characteristics of both groups were similar. The largest percentage of the subjects in the experimental group were female (74.3 %) with had an average age of 53.91 years (SD = .50). More than half of subjects (60.0 %) had elementary school level education and reported that their monthly income was >1,000,000 IDR or (> 84 USD). The duration of having diabetes was more than one year and the majority of the patients were categorized as poorly glycemic controlled (≥200 mg/dl) (80.0 %) with the mean BMI level being 24.06 (SD = 3.86) and cholesterol level 205 mg/dl (SD = 57.45). For the comorbidities, 60.0 % had hypertension. Compared to the control group at baseline, the experimental group had no significantly different patient characteristics (Table 1).

Table 1. Demographic characteristics and clinical characteristic of subjects in the type 2 diabetes self-management study, (n = 70)

Characteristics	Experimental Group n = 35 n (%)		Control Group n = 35 n (%)		x^2	*P*
Age (Min-Max = 26-70)	53.91	(.50)	54.34	(0.63)		
Young Adult(20-33 years)	3	(8.6)	5	(14.3)	1.90[a]	.75
Middle Age (34-59 years)	22	(62.8)	17	(48.6)		
Elderly (60-80 years)	10	(28.6)	13	(37.1)		

Gender						
Male	9	(25.7)	7	(20.0)	.037[a]	.84
Female	26	(74.3)	28	(80.0)		
Occupation						
Healthcare related worker	2	(5.7)	1	(2.9)	.062[a]	.80
Non-healthcare related worker	33	(94.3)	34	(97.1)		
Educational level						
Elementary school	21	(60.0)	27	(77.1)	8.95[a]	.44
Junior high school	6	(17.1)	3	(8.6)		
Senior high school	5	(14.3)	3	(8.6)		
Diploma	3	(8.6)	2	(5.7)		
Monthly income						
<1,000,000 IDR (< 84 USD)	5	(14.3)	9	(25.7)	2.01[a]	.15
>1,000,000 IDR (> 84 USD)	30	(85.7)	26	(74.3)		
Cooking responsibility						
Cooking by oneself	27	(77.2)	28	(80.0)	1.88[a]	.75
Family cooking	6	(17.1)	6	(17.1)		
Combination of cooking one self & family cooking	2	(5.7)	1	(2.9)		
Experience of previous dietary and exercise educational program						
No	30	(85.7)	29	(82.9)	.034[a]	.85
Yes	5	(14.3)	6	(17.1)		
Current smoking status						
Does not smoke	30	(85.7)	31	(88.6)	.753[a]	.38
Smokes	5	(14.3)	4	(11.4)		
Duration of illness						
< one year	6	(17.1)	3	(8.6)	.67[a]	.41
≥ one year	29	(82.9)	32	(91.4)		
FBG controlled						
Fairly controlled (131- 199 mg/dl)	7	(20.0)	8	(22.9)	2.59[a]	.10
Poorly controlled (≥200 mg/dl)	28	(80.0)	27	(77.1)		

BMI (Min-Max = 16.41- 35.00)	24.06	(3.86)	23.21	(3.64)	.95[t]	.34
Cholesterol Level (Min-Max = 140-415)	205	(57.45)	210	(44.48)	-.40[t]	.68
Cormobid diseases						
No comorbid diseases	9	(25.7)	12	(34.3)	6.40[a]	.37
Hypertension	21	(60.0)	19	(54.2)		
Hypercholesterolemia			1	(2.9)		
Combination of Hypertension and Hypercholesterolemia	5	(14.3)	3	(8.6)		

Note: [a] = Chi-square test, [b] = Fisher exact test

Dietary Behaviors

After 8 weeks participating in the dietary and exercise self-management support program, the dietary behaviors of the patients were significantly higher in the experimental group (M = 67.54, SD = 12.88) than those in the control group who received the usual care (M = 37.6, SD = 10.12) (t = 10.81, p < .01) (Table 2). The improvement of dietary behaviors included: selecting healthy diet (t = 9.11,*df* =64.38, *p*< .01), arranging meal plan (t = 8.89,*df* =61.21, *p*< .05), recognizing the amount food calories(t = 13.7,*df* =67.94, *p*< .05), and managing dietary behaviors (t = 11.47,*df* =64.37, *p*< .05) (Table 3).

Table 2. Differences in dietary behaviors between the experimental and control group (N = 70)

	Control Group (n = 35)		Experimental Group (n = 35)			
Variable	M	SD	M	SD	*t*	*P*
Total Dietary Behaviors Score	37.6	10.12	67.54	12.88	10.81	.00*

Note. *df* = 68, **p*< .01)

Table 3. Differences in dietary behaviors based on dietary behaviors dimensions between the experimental and control group (N = 70)

	Control Group (n = 35)		Experimental Group (n = 35)			
Variable	M	SD	M	SD	*t*	*p*
1. Selecting Healthy Diet	22.63	8.91	40.09	7.00	9.11[a]	.00*
2. Arranging Meal Plan	13.2	4.57	21.63	3.23	8.89[b]	.00*

3. Recognizing the Amount Food Calories	3.31	2.16	10.51	2.22	13.7[c]	.00*
4. Managing Dietary Behaviors Challenges	7.11	3.09	14.74	2.43	11.47[d]	.00*

Note. [a] = *df* = 64.38, [b] = *df* = 61.21, [c] = *df* = 67.94, [d] = *df* = 64.37, *p < .0.1

Exercise Behaviors

The findings of exercise behaviors in the experimental group in this study were statistically different after receiving the dietary and exercise self-management support program than those in the control group who received the usual care (M = 67.54, SD = 10.121) (M = 37.60, SD = 12.882), (*t* = 10.81, *p*< .01) (Table 4).

Table 4. Differences in exercise behaviors, between the experimental and control group (N = 70)

	Control Group (n = 35)		Experimental Group (n = 35)			
Variable	M	SD	M	SD	*t*	*P*
Total Exercise Behaviors Post-Test Score	37.60	12.882	67.54	10.121	10.81	.00*

Note. *df* =65.57, **p*< .05)

Clinical outcomes

With regard to mean differences of post-test clinical outcomes score between the experimental and control group. The fasting blood glucose (FBG) and cholesterol total level of subjects in the experimental group were significantly higher than those of the control group (t = -4.75,*df* =61.87, *p*< .01)(t = 2.64,*df* =67.32, *p*< .01). This indicated that the fasting blood glucose (FBG) and cholesterol total level of the experimental group was lower after receiving the dietary and exercise self-management support program than those of the control group. However, the BMI Status, systolic BP, and diastolic BP of the experimental group and control group were not significantly different (p > .01) (Table 5).

Table 5. Differences in clinical outcomes (fasting blood glucose, cholesterol total level, BMI status and blood pressure), between the experimental and control group (N = 70)

Clinical Outcomes	Experimental Group n = 35		Control Group n = 35			
	M	SD	M	SD	*t*	*P*

Fasting Blood Glucose (FBG)	149.20	50.23	218.23	69.56	-4.75[a]	.00*
Cholesterol Total	179.11	33.16	199.09	29.99	2.64[b]	.01*
BMI Status	25.56	3.29	23.40	3.59	.19[c]	.84
Systolic BP	137.71	19.41	141,71	19.17	-.86[d]	.38
Diastolic BP	83.46	8.38	85.42	8.52	-.99[e]	.32

Note. [a] = *df* = 61.87, [b] = *df* = 67.32, [c] = *df* = 67.48, [d] = *df* = 67.98, [e] = *df* = 67.98, *$p <$ .05

DISCUSSION

Analysis of the dietary and exercise self-management support program.

The purpose of this study was to evaluate the effectiveness of the dietary and exercise self-management support program to promote patients in performing dietary behaviors and exercise behaviors. The findings of this study indicated that is possible to promote the dietary and exercise self-management support program for Muslim patients with poorly controlled type 2 DM in Indonesia. Despite the concern that the low education level of the subjects would cause them difficulty in understanding the content of dietary and exercise self-management support program, the patients in the experimental group improved their ability to perform dietary behavior and exercise behavior more successfully than those patients in the control group within eight weeks interventions. The self-management support program has becomes the critical element of the care model for promoting patients to participate and engage actively in their daily treatment care (Kanfer & Gaelick-Buys, 1991). This is important in order to change patient behaviors and prevent diabetes complication.

The findings show the beneficial effects of the dietary and exercise self-management support program by improving behavior and several clinical outcomes. The program incorporated improving the patient's knowledge and skills, including how patients reflect on their current dietary and exercise behaviors, education and counseling session, individual goal setting and action plan, individual coaching of dietary and exercise behaviors, self evaluation and self-reinforcement. Moreover, the researcher helped the patients to evaluate achievement, assess difficulty and set realistic goals based on patient's obstacles and make adjustments in order to attain goals. These become major factors for dietary and exercise behavior change. In other words, the formulation of an action plan was taught patients in order to make a lifestyle change, monitor signs and symptoms, record and interpret their fasting blood glucose levels, cholesterol total levels, body mass index, and blood pressure. Furthermore, the patients also had opportunity to share their experiences with other patients, assess problem solving, anticipate obstacles, and maintain new behaviors during this program. These factors promoted problem-solving, anticipation of obstacles, and maintenance of new behaviors. These methods made patients more confident in their abilities in order to deal with their conditions.

Analysis of dietary behavior of the patients with poorly controlled type 2 DM

Dietary behaviors have become the most common problem in patients with poorly controlled type 2 DM. Dietary management is more difficult to manage than medication taking and insulin therapy (Primanda, 2011). However, this study found that dietary

behaviors significantly improve after participating in the program. The improvement in the dietary behaviors score could be due to several factors:

The first reason is related to patient's learning. The patients learn from their own experience or other fellow patients. Most patients with DM who had experienced or had observed severe illness or signs and symptoms of hypoglycemia, hyperglycemia, in order to be concent in managing their dietary behaviors.

The second factor is related to knowledge. In the self-management program, patients in the experimental group received individual educational and counseling regarding diabetes, complications of diabetes and the importance of dietary and exercise self-management in maintaining clinical outcomes. Adequate information related to dietary self-management improves patients' dietary behavior. This finding is consistent with a previous study that stated that the increasing of the knowledge significantly improves self-management of dietary behaviors (Primanda, 2011).

The third factor is culture of the patients related to dietary behaviors. Culture has an important role in the patient performing dietary behavior. With regard to customs in West Sulawesi Province, there are many customs including folk festivals, harvest party, and parties for fishermen that incorporate food and ceremonies. They prepare various types of food that contain fat and sweet foods in large portions, so that it becomes a challenge to manage dietary behavior. It was indicated that culture contributed to self-management behaviors. However, the finding in this study showed significantly improved dietary behaviors. The ability to manage dietary behaviors challenges was related to the Muslim culture of West Sulawesi Province. The majority of patients in this study fasted during Ramadan or fasted on Monday and Thursday. During the days of fasting, patients are encouraged to manage their dietary behaviors by consuming healthy halal food, recognizing the food portions, and setting meal times. Thus, the Muslim patients were able to manage their dietary behaviors for example changes in eating habits, consumption trends and behaviors based on Muslim culture

The fourth factor is related to belief and perception regarding dietary management. The patient's belief about the effectiveness of meal arrangements and patient's experience can encourage patients to make behavioral changes in accordance with dietary recommendations. Thereby, dietary self-management can be achieved. A previous study found that good perception related to the diseases was associated with adherence to dietary self-management (Broadbent, Donkin, & Stroh, 2011). This was consistent with another study which stated that dietary management was related to specific beliefs about diet can improve patient's dietary adherence respectively (Harvey & Lawson, 2009).

Analysis of exercise behavior of the patients with poorly controlled type 2 DM

Exercise behaviors also contributed to poorly controlled type 2 DM. The findings of this study showed significantly increased exercise behaviors after participating in the self-management program. This finding is similar to a previous study which reported that self-management intervention significantly increased exercise behaviors (Clark, Hampson, Avery, &Simpson, 2004). Several factors that contributed to patients actively performing exercise behavior included:

Knowledge about the importance of exercise behavior, knowledge is one of the factors that might contribute to the patient performing walking exercise at a high level in this study. Understanding the patients are important elements in patients' activating better exercise self-management (Kisokanth et al., 2013). This finding was consistent with the previous study conducted in Sri Lanka which found that knowledge can influence exercise self-management of the patients and is an integral component of high quality diabetic care.

Strength of Muslim people's beliefs is related to exercise behaviors. Belief is the most important role in Muslim patients' performing the exercise behaviors. Islamic teaching always places physical activity as the focus of highest concern in maintaining health for Muslim people. The importance of walking as a physical exercise was taught by the Prophet Muhammad SAW by walking around Medina on foot. Moreover, the third obligation of the five pillars in Islam requires that Muslims must perform physical activity. Therefore, the daily performance of five prayers was indicated as a form of exercise because its movements involve all the muscles and joints of the body, and concentration relieves mental stress. It was indicated that exercise was not only of faith but also as physical strength of a Muslim. Good Muslim people have to follow Islamic teaching. Similar to this study, the majority of patients performed exercise behaviors because they believed that exercise can maintain their spiritual health, mental health, and physical health based on Islamic teaching by Prophet Muhammad SAW. This finding was consistent with a previous study which found that praying in stressful conditions may strengthen faith and sense of confidence and improve physical well being by decreasing the blood glucose level and aiding the decomposition of patients with type 2 DM (Rahman, 2004; Masters & Spielmans, 2007).

Perceived self-efficacy. Theoretically, percieved self-efficacy is interpreted as a condition of personal self-confidence that can understand the way of one's thinking and motivation for active behavioral change when faced with obstacles or barriers (Bandura, 1994). In order words, self-efficacy can influence personal confidence to routinely take active exercise. Linked with this study, the subjects in the experimental group have high motivation to perform a high level of exercise behavior. This finding was supported by a previous study which stated that people with a high level of self-efficacy tend to be active in regular exercise behaviors (Hutchins, Drolet, & Ogletree, 2010).

Social support related to exercise adherence. Social support has become an influencing factor in patients' participation in exercise behavior in the present study. Good social support has a vital role in the patients performing good exercise adherence. Families or friends must be aware, supportive and should try to avoid scheduling events which may interfere with exercise time. This can help to avoid any potential conflicts or distractions which will affect of exercise adherence. This statement was consistent with a previous study which confirmed that active behaviors exercise was associated with social support. This was a critical self-reported factor of motivation and adherence, especially for women. In addition, patient's preferences also had a positive impact toinfluence exercise adherence and maximize outcomes of care (Hemmingsson, Page, Fox & Rossner, 2001; Grave, Calugi, Centis, Ghoch, & Marchesini, 2010). In order to promote

exercise adherence and maximize outcomes of care, the researcher tried to integrate patients' preferences in treatment, address patients' expectations of care, and attitudes and beliefs toward interventions. This method was carried out through clinical discussions focusing on the benefits of exercise, how to address potential barriers to exercise and modify the program to promote adherence.

Clinical outcomes of the patients with poorly controlled type 2 DM

The results of this study indicated that increasing dietary and exercise self-management skills may contribute to better levels of fasting blood glucose and total cholesterol levels. This finding was consistent with a previous study which found that self-management programs significantly improve exercise behavior, blood glucose level and cholesterol level (Suwankruhasn et al., 2013).

Although the effectiveness of this model improved the fasting blood glucose and cholesterol level, the result did not support the improvement of the BMI status and blood pressure. This might be due to some patients having difficulties in complying with their diet and in reducing weight, especially new diabetes sufferers. However, it should be noted that the majority of patients had an average body mass index in the normal line. This finding was related to one of the symptoms of type 2 diabetes in which patients 'lose weight. Similarly a previous study found that patients who had difficulty complying with their diet experienced a changed BMI status (Moattari et al., 2012; Streur et al., 2013).

CONCLUSION

In conclusion, the dietary and exercise self-management support programwas effective for improving the dietary behavior, exercise behavior, FBG, and total cholesterol level for individuals with poorly controlled type 2 diabetes mellitus. However, BMI status and blood pressure did not improve even after eight weeks of participation in the program. In the future we propose establishing a program specifically related to Islamic culture in another area, replicating this study, but using larger groups over a longer time frame because patients in a community setting are greatly influenced by local culture and beliefs.

REFERENCES

American Diabetes Association (ADA). (2013). Diabetes care. Introduction. [Introductory]. *Diabetes care, 36 Suppl 1*, S1-2. doi: 10.2337/dc13-S001.

Bandura, A. (1994). *Self-efficacy*. In V. S. Ramachaudran (Ed.), Encyclopedia of human behavior (pp. 71-81). New York: Academic Press.

Broadbent, E., Donkin, L., & Stroh, J. (2011). Illness and treatment perceptions are associated with adherence to medications, diet, and exercise in diabetic patients. *Diabetes Care*, 34, 338–340. doi: 10.2337/dc10-1779.

Clark, M., Hampson, S. E., Avery, L., &Simpson, R. (2004). Effects of a tailored lifestyle self-management intervention in patients with Type 2 diabetes. *British Journal of Health Psychology*, 9, 365–379.

Colberg, S. R., Sigal, R. J., Fernhall, B., Regensteiner, J. G., Blissmer, B. J., Rubin, R. R., . . . American Diabetes, A. (2010). Exercise and type 2 diabetes: the American College of Sports Medicine and the American Diabetes Association: joint position statement. [Practice Guideline]. *Diabetes care, 33*(12), e147-167. doi: 10.2337/dc10-9990.

Delamater, A. M. (2006). Improving patient adherence. *Clinical Diabetes*, 24, 71-77.

Embrey, N. (2006). A concept analysis of self-management in long term conditions. *British Journal of Neuro science Nursing*, 2, 507-513.

Grave, R. D., Calugi, S., Centis, E., Ghoch,M. E., & Marchesini, G. (2010). Review Article: Cognitive-Behavioral Strategies to Increase the Adherence to Exercise in the Management of Obesity. *Journal of Obesity*, 1- 11. doi.org/10.1155/2011/348293

Grodner, M., Long, S., & Walkingshaw, B. C. (2007). *Foundations and clinical application of nutrition:A nursing approach* (4th ed). Missouri:Mosby-Elseivier

Harkins, V. (2008). *A practical guide to integrated type II diabetes care*. Departement of Health and Children, 1-33.

Harvey, J. N., & Lawson, V. L. (2009). The importance of health belief models in determining self-care behaviour in diabetes. [Research Support, Non-U.S. Gov't Review]. *Diabetes Medicine*, 26(1), 5-13. doi: 10.1111/j.1464-5491.2008.02628.x

Hemmingsson, E., Page, A., Fox, K., & Rossner, S. (2001). Influencing adherence to physical activity behaviour change in obese adults. *Scandinavian Journal of Nutrition/Naringsforskning*, 45, 114-119.

Hjelm, K., Mufunda, E., Nambozi, G., & Kemp, J. (2003). Preparing nurses to face the pandemic of diabetes mellitus: A literature review. *Journal of Advanced Nursing*, 41(5), 424-434. doi: 10.1046/j.1365-2648.2003.02548.x

Hutchins, M; Drolet, J. C., Ogletree, R. J. (2010). Physical Activity Patterns and Self-Efficacy of Selected College Students. *The Health Educator*, 42 (2), 84-88.

Kanfer, F. H., & Gaelick-Buys, L. (1991).*Self-management methods*. In F. H. Kanfer & A. P Goldstein (eds.), Helping people change: A textbook of methods (4th ed.) (pp. 305-360). New York: Pergamon Press.

Kisokanth, G. Prathapan, S. Indrakumar, J. Joseph, J. (2013). Factors influencing self-management of Diabetes Mellitus; areview article. *Journal of Diabetology*, 3(1), 1-7.

Lin, C., Anderson, R. M., Chang, C., Hagerty, B. M., & Loveland-Cherry, C. J. (2008). Development and testing of the diabetes self-management instrument: a confirmatory analysis. *Research in Nursing & Health*, 31(4), 370-380.

Marcus, B. H., Rossi., Joseph, S., Selby, V. C., Niaura, R. S., & Abrams, D. B. (1992). The stages and processes of exercise adoption and maintenance in a worksite sample. *Health Psychology*, 11(6), 386-395. doi: 10.1037/0278-6133.11.6.386

Masters, K. S., & Spielmans, G. I. (2007). Prayer and health: review, meta-analysis, and research agenda. [Meta-Analysis Review]. *Journal Behavior Medicine*, 30(4), 329-338. doi: 10.1007/s10865-007-9106-7.

Moattari, M., Ghobadi, A., Beigi, P., &Pishdad. G. (2012). Impact of self management on metabolic control indicators of diabetes patients. *Journal of Diabetes and Metabolic Disorder*. 11:6 doi:10.1186/2251-6581-11-6.

PERKENI. (2011). *Revisi konsensus pengendalian dan pencegahan diabetes mellitus tipe 2 di Indonesia 2011* [Consensus revision control and prevention of type 2 diabetes mellitus in Indonesia 2011]. Retrieved from: http://www.perkeni.org/

Primanda, Y. (2011). *Effect of dietary self management support program on dietary behaviors in patients with type 2 diabetes mellitus in Yogyakarta, Indonesia*. Unpublished master's thesis of Faculty of Nursing, Prince of Songkla University, Thailand.

Rahman, A. (2004). *Salat: An Islamic Yoga and Meditation* (2004 edition.). New Delhi Adam Publishers & Distributers.

Sun, A. C., Tsoh, J. Y., Saw, A., Chan, J. L., & Cheng, J. W. (2012). Effectiveness of a culturally tailored diabetes self-management program for Chinese Americans. [Evaluation StudiesResearch Support, N.I.H., Extramural Research Support, Non-U.S. Gov't]. *Diabetes Educational*, 38(5), 685-694. doi: 10.1177/0145721712450922.

Streur, W. J., Hurlburt, W. B., Fisher, K., & Fenaughty, A. (2013). Clinical Outcomes Associated with Self-Management Classes among Patients of an Urban Community Health Center. *Chronic Disease Prevention Health Promotion*.5(2), 2-6.

Suwankruhasn, N., Pothiban, L., Panuthai, S., & Boonchuang. P. (2013). Effects of a Self-management Support Program for Thai People Diagnosed with Metabolic Syndrome. *Pacific Rim International Journal Nursing Research*, 17(4), 371-383.