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The Effect of Cardiovascular Self-Management Support Program on Preventing Cardiovascular Complications Behaviors and Clinical Outcomes in Elderly with Poorly Controlled Type 2 Diabetes Mellitus in Indonesia.

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Abstract

Elderly with poorly controlled type 2 DM are more common to develop Cardiovascular Disease (CVD) as major complication. Prevention could be managed by action of preventing cardiovascular complications behaviors (PCCB) which majorly consisted of DM diet and heart healthy diet, physical exercise, taking medications regularly, and smoking cessation. Cardiovascular self-management support program (CSSP) could facilitate successful and improvement the PCCB and clinical outcomes in elderly with poorly controlled type 2 DM. A quasi-experimental study was conducted to find out the effectiveness of CSSP on PCCB and clinical outcomes in elderly with poorly controlled type 2 DM. Fifty-nine elders with poorly controlled type 2 DM were randomly recruited which divided into the experimental group and the control group. Of these, 30 participants in the experimental group received the CSSP and the usual care whereas the control group only received the usual care. PCCB was measured by the preventing cardiovascular complications behaviors questionnaire (PCCBQ), while clinical outcomes were measured by clinical devices provided by Public Health Center. An Independent *t*-test was conducted to determine the between group effect of the program and Paired *t*-test was used to report the within group effect of the program. The result showed that the mean score of the PCCB in the experimental group was significantly higher than those in the control group after received the program ($p < .05$) and improved the mean scores of the clinical outcomes except for the diastolic blood pressure ($p > .05$). The CSSP in this study clearly indicated positive effects on improving the PCCB and some clinical outcomes in elderly with poorly controlled type 2 DM.

Keywords: cardiovascular self-management support program, preventing cardiovascular complications behaviors, poorly controlled type 2 DM, elderly

Introduction

Type 2 Diabetes Mellitus (DM) in elderly was a global health problem as much as some developing countries and Indonesia is among these [1]. The high prevalence of type 2 DM in elderly was associated

with poor glycemic control [2]. The characteristic of elderly with poorly controlled type 2 DM was HbA1c level > 7 % or fasting blood glucose (FBG) ≥ 154 mg/dl [2,3]. Endothelial dysfunction, oxidative stress, and inflammation in those population play a central role in developing cardiovascular disease (CVD) complications [4,5]. Controlling risk factors of CVD complications is necessary to be done to reduce its prevalence [6].

The goal treatment for preventing CVD complications in elderly with DM must be individualized and should be attention on the potential for greater harm [7] due to they have more physical limited, cognitive functioning decline, and physiological changes that would affect self-management ability to prevent CVD complications [8]. Preventing CVD complications in elderly with DM can be carried out by performing the preventing cardiovascular complications behaviors (PCCB) which consist of DM diet and heart healthy diet, physical exercise, taking medications regularly, and smoking cessation [3]. Furthermore, reducing clinical status such as fasting blood glucose (FBG), lipid profiles, and blood pressure (BP) as CVD risk factors should be done due to these clinical status could contribute to make artery wall enlarged and ruptured as well as developed myocardial infarction quickly [9].

Elderly with DM have special need in improving behaviors and clinical status to prevent CVD complications. They were associated with various troubles regarding their abilities to perform self-management because of functional changes caused by aging, physiological and social problem [10]. These changes would impact on managing DM complications through the doctor's instruction or drug alone [11]. Also, they need social support such as support from family member to achieve the behavioral change goals [12]. Therefore, elderly with poorly controlled type 2 DM need diabetes self-management support to improve the self-management behaviors and be physically active [13].

The effectiveness of self-management has been proven as a basic foundation for empowering health behaviors, and had benefit to improve clinical outcomes in patients with DM. Performing 5 A's self-management support could facilitate the self-management behaviors and change behaviors in patients with chronic illness including diabetes [14]. The 5 A's self-management support is a counseling approach that entails a series of sequential steps to facilitate self-management and behavioral change. The process of 5 A's self-management support consisted of assess, advise, agree, assist, and arrange [15].

Previous studies have been conducted regarding the self-management support. The 5 A's self-management support has been proven improving the health behaviors, FBG, lipid profiles, and BP in patient with metabolic syndrome in Thailand [16]. Self-management support could improve the health behaviors in patient with poorly controlled type 2 DM [13]. In Indonesia, self-management support also could improve the behaviors to prevent diabetic foot ulcer [17], improve dietary and exercise behaviors, and clinical outcomes in general DM population [18].

Until present time, there have been no published that use a 5 A's self-management support program could improve the PCCB and clinical outcomes which were FBG, total-cholesterol, HDL-cholesterol, LDL-cholesterol, and BP in elderly with poorly controlled type 2 DM especially in Indonesia to prevent CVD complications. It was necessary due to Indonesia is one of the country which has a high prevalence of DM in elderly who aged more than 60 years [1] and the prevalence of CVD complications in those population was also high [19]. Therefore, the cardiovascular self-management support program was important to be done by applying a 5 A's self-management support to improve the PCCB and clinical outcomes in elderly with poorly controlled type 2 DM in Indonesia.

Materials and Methods

The quasi-experimental study, two groups, pre-test and post-test design was conducted between January 2016 to April 2016 at the Elderly Health Care Unit, Public Health Center, Cilegon City, Indonesia. The sample size was calculated based on the power analysis technique with a significance level of .05, power of .80, and the effect size (d) was 1.83 that was obtained from a previous study [18]. There were 59 participants who completed the study which were 30 participants in the experimental group (EG) and 29 participants in the control group (CG).

Samples were recruited based on the inclusion criteria, then randomly assigned to either the EG or CG which used matching technique based on the age and gender. The EG received the cardiovascular self-management support program and usual care while the CG only received the usual care based on the guideline from Elderly Health Care Unit, Public Health Center, Cilegon City, Indonesia.

The inclusion criteria was aged ≥ 60 years old, FBG ≥ 154 mg/dl in the past 3 months or HbA1c level > 7 %, duration of diabetes at least 1 year, able to communicate in Indonesian language, both verbal

and written, can be contacted by a telephone and home visit, have no hearing impairment, have family member who stay together with elderly, and have no mental health problems. Participants signed informed consents before they participated in this study and participation would be terminated if participants developed a severe condition during the program or could not join all sessions of the interventions.

The researchers provided a booklet regarding preventing cardiovascular complications behaviors which contained information regarding the DM diet and heart healthy diet, exercise for elderly with poorly controlled type 2 DM, medications to prevent CVD complications, and smoking cessation. This booklet was made by the researchers. Every participant followed this booklet as a guideline to perform the preventing cardiovascular complications behaviors.

Data Collection

The instruments used were the Demographic Data Questionnaire and Health Related Information (DDQHRI), Preventing Cardiovascular Complications Behaviors Questionnaire (PCCBQ), and clinical outcomes measurements.

The DDQHRI, developed by the researchers, consisted of age, gender, education level, family member who taking care the elderly, the last FBG, total-cholesterol, HDL-cholesterol, LDL-cholesterol, systolic blood pressure (SBP), and diastolic blood pressure (DBP).

The PCCBQ, an instrument used to measure the PCCB, was modified by the researchers based on the previous study [20] with Cronbach's alpha coefficient of .88. This instrument divided into four subscales which were DM diet and heart healthy diet, physical exercise, taking medications regularly, and smoking cessation with total 25 questions. Each item has been measured by using a five-point Likert scales. The higher score of PCCBQ indicated that elderly were more frequent to perform PCCB.

Clinical outcomes measurements which were FBG that was measured by using GlucoDr®, total-cholesterol, HDL-cholesterol, LDL-cholesterol were measured by using LipidPro™, and BP was measured by using OMRON IA2 automatic blood pressure equipment.

Procedure of the cardiovascular self-management support program

The cardiovascular self-management support program (CSSP) was developed based on the 5 A's self-management support model proposed by Glasgow et al. [14]. The program aimed to improve the PCCB and the clinical outcomes to prevent CVD complications. Participants who were in the EG received

individually instruction of the CSSP and usual care for eight week and were involved family member. Individually session was held in six education and discussion sessions by face to face, and two sessions by telephone (60 minutes/session).

The process of CSSP was (1) assessing current confident, belief, and behaviors of the participants; (2) providing specific information by educational and counseling session regarding PCCB. In this process, family member of the participants was involved. The activities included explain about benefit of DM diet and heart healthy diet by reducing carbohydrate intake, sugar intake, and following the DASH diet to prevent CVD complications, walking is the best physical exercise for elderly with poorly controlled type 2 DM, the benefit of taking medications regularly associated to prevent CVD complications, and explain about the negative effect of smoking that could develop CVD complications quickly. Furthermore, these behaviors could improve the clinical outcomes such as FBG, lipid profiles, and BP as risk factors of CVD complications in elderly with diabetes. Moreover, in this process, the researchers also provided and distributed the preventing cardiovascular complications behaviors booklet and medications log book for the participants and their family member as a guideline to perform the PCCB. A booklet contained the information regarding the PCCB and the role of the family member to improve the PCCB of the participants, whereas medications log book was used to record the activity of the participants in term of taking medications regularly; then (3) collaborating between the researchers, the participants, and their family member to set the specific goals regarding the PCCB, participants could modify, change, and manage their PCCB based on the specific goals to achieve the goals.

The next process was (4) assisting the participants and their family member to develop the personal action plans to meet the goals. The activities were listed the specific goals for the PCCB, identified the possible barriers related to the PCCB, discussed of the barriers techniques used to address the barriers during performing the PCCB, and the last process was (5) encouraging the participants to maintain their behaviors to achieve the goals and arranging the time for follow-up planning both telephone and face to face at the Elderly Health Care Unit and home visit. The activities in each session were continued in every week during eight weeks.

For the participants who were in the CG only received the usual care based on the guideline from Public Health Center, including regular check-up once a month for free such as blood glucose, blood

pressure, lipid profiles, also they received the general health education about taking medications and DM diet held by the nurse as well as received the aerobic class for elderly once a week based on the clients' interest. However, there was no specific education to prevent CVD complications by PCCB. Data and blood samples of both groups were collected by the research assistants at the baseline and at eight week after program implemented.

Data Analysis

Descriptive statistics were used to analyze the DDQHRI. Chi-square, Fisher's Exact test, and Independent *t*-test were used to examine the difference of characteristics between EG and CG at the baseline. The assumption of normality and homogeneity of variance of the variables have been conducted before determine the appropriate statistical analysis. The researchers used the Independent *t*-test for testing the differences of mean score of the PCCB and clinical outcomes between the EG and CG, while Paired *t*-test was used to test the differences of mean score of the PCCB clinical outcomes in both the EG and the CG before and after received the CSSP.

Result and Discussion

Demographic data and health related information

There was no significance difference between the EG and the CG at the baseline of the DDQHRI in elderly with poorly controlled type 2 DM.

Table 1 Demographic data and health related information.

Characteristics	Experimental group (EG)		Control group (CG)		Statistic values	*p*
	n_1	%	n_2	%		
Age						
(*Min* – *Max* = 60 – 77 years)	*M* = 62.90	*SD* = 3.75	*M* = 63.17	*SD* = 3.57	.28[c]	77
Gender					.14[a]	.70
Male	7	23.3	8	27.6		
Female	23	76.7	21	72.4		

Table 1 Demographic data and health related information (*continue*)

Characteristics	Experimental group (EG)		Control group (CG)		Statistic values	*p*
	n_1	%	n_2	%		
Family taking care of elderly					6.57[a]	.11
Children	24	80	15	51.7		
Wife	1	3.3	3	10.43		
Husband	5	16.7	7	24.1		
Children and wife	0	0	2	6.9		
Children and husband	0	0	2	6.9		
The last FBG (mg/dl)					.06[c]	.24
(*Min* – *Max* = 154 – 406)	*M* = 227.97	*SD* = 78.71	*M* = 206.38	*SD* = 62.85		
The last total-cholesterol (mg/dl)					.20[c]	.62
(*Min* – *Max* = 120 – 233)	*M* = 183.70	*SD* = 25.12	*M* = 191.31	*SD* = 20.10		
The last HDL-cholesterol (mg/dl)					.81[c]	.92
(*Min* – *Max* = 31 – 67)	*M* = 48.77	*SD* = 9.67	*M* = 49	*SD* = 8.79		
The last LDL-cholesterol (mg/dl)					.57[c]	.68
(*Min* – *Max* = 45 - 120)	*M* = 78.27	*SD* = 19.02	*M* = 80.21	*SD* = 17.40		
The last SBP (mmHg)					.45[c]	.62
(*Min* – *Max* = 120 – 176)	*M* = 149.43	*SD* = 12.52	*M* = 150.93	*SD* = 10.71		
The last DBP (mmHg)					.40[c]	.19
(*Min* – *Max* = 80 – 105)	*M* = 87.17	*SD* = 5.82	*M* = 85.17	*SD* = 5.74		

[a]Chi-square, [b]Fisher's exact test, [c]Independent *t*-test

Effect of cardiovascular self-management support program (CSSP) on preventing cardiovascular complications behaviors (PCCB) in elderly with poorly controlled type 2 DM

Table 2 shows the mean score of the PCCB between the EG and the CG before receiving the program showed no significance difference (t = -1.72, p < .05). However, after receiving the program, the mean score of the PCCB showed significance difference between the EG and the CG (t = 24.01, p = < .05).

Table 2 Pre-test and post-test mean scores of the PCCB

Variable	Experimental group (EG) $n_1 = 30$		Control group (CG) $n_2 = 29$		95% CI			
	M	SD	M	SD	Lower	Upper	*t*	*p*
PCCB								
Pre-test	50.87	15.52	56.69	9.54	-12.56	.92	-1.72	.07
Post-test	91.20	3.30	59.07	6.43	29.43	34.83	24.01	.00

M = mean score, *SD* = standard deviation

Table 3 shows the comparison of the PCCB mean score within the EG and CG. Participants in the EG showed there was a statistically significant difference between the pre-test and post-test mean scores on PCCB (t = -14.83, p < .05). In contrast, participants in the control group reported that there was no significant difference between pre-test and post-test mean score on PCCB (t = -1.54, p > .05).

Table 3 Comparison of the pre-test and post-test mean score of the PCCB

Variable	Pre-test		Post-test		95% CI			
	M	SD	M	SD	Lower	Upper	*t*	*p*
Experimental group								
PCCB	50.87	15.52	91.20	3.30	-45.89	-34.77	-14.83	.00
Control group								
PCCB	56.69	9.54	59.07	6.43	-5.53	.77	-1.54	.13

M = mean score, *SD* = standard deviation

Effect of cardiovascular self-management support program on clinical outcomes in elderly with poorly controlled type 2 DM

Table 4 shows the mean scores of the clinical outcomes before receiving the program demonstrated no significance difference between the EG and the CG (p > .05) except for DBP (p < .05). However, after receiving the program, the clinical outcomes showed significance difference between the EG and the CG (p < .05) except for the DBP (p > .05).

Table 4 Pre-test and post-test mean scores of the clinical outcomes

Variable	Experimental group (EG) $n_1 = 30$		Control group (CG) $n_2 = 29$		95% CI			
	M	SD	M	SD	Lower	Upper	*t*	*p*
Clinical outcomes (pre-test)								
FBG	220.17	70.54	195.10	69.47	-11.45	61.57	1.37	.17
Total-cholesterol	195.30	35.98	198.96	28.94	-20.46	13.55	-.40	.68
HDL-cholesterol	46.73	8.90	45.52	7.37	-3.04	5.47	.57	.56
LDL-cholesterol	83.53	30.01	85.24	16.08	-14.32	10.91	-.27	.78
SBP	145.33	20.12	149.66	18.02	-14.29	5.65	-.86	.38
DBP	84.67	5.71	88.62	6.39	-7.12	-.78	-2.50	.01
Clinical outcomes (post-test)								
FBG	142.20	36.43	182.31	53.20	-64.04	-16.18	-3.36	.00
Total-cholesterol	156.97	40.06	190.38	44.55	-55.53	-11.28	-3.02	.00
HDL-cholesterol	54.10	8.36	42.38	7.13	7.67	15.77	5.79	.00
LDL-cholesterol	64.67	16.20	96.59	31.03	-45.08	-18.75	-4.89	.00
SBP	134.33	13.30	144.83	16.30	-18.26	-2.72	-2.70	.00
DBP	82.33	4.30	83.79	6.21	-4.26	1.34	-1.04	.30

M = mean score, *SD* = standard deviation

Table 5 shows the comparison of the clinical outcomes mean scores within the EG and CG. Participants in the EG showed had significant differences of the FBG, total-cholesterol, HDL-cholesterol, LDL-cholesterol, and SBP before and after receiving the program ($p < .05$) except for DB ($p > .05$). In contrast to the participants in the CG showed that there were no significance difference of the clinical outcomes before and after receiving the program ($p > .05$) except for the DBP ($p < .05$).

Table 5 Comparison of the pre-test and post-test mean score of the clinical outcomes within the EG and CG

Variables	Pre-test		Post-test		95% CI			
	M	SD	M	SD	Lower	Upper	*T*	*p*
Clinical outcomes in EG								
FBG	220.17	70.54	142.20	36.43	57.50	98.43	7.79	.00
Total-cholesterol	195.30	35.98	156.97	40.06	24.27	52.39	5.57	.00
HDL-cholesterol	46.73	8.90	54.10	8.36	-11.83	-2.89	-3.37	.00
LDL-cholesterol	83.53	30.01	64.67	16.20	8.46	29.27	3.70	.00

Table 5 Comparison of the pre-test and post-test mean score of the clinical outcomes within the EG and CG (*continue*)

Variables	Pre-test		Post-test		95% CI		*t*	*p*
	M	SD	M	SD	Lower	Upper		
SBP	154.33	20.12	134.33	13.30	4.84	17.15	3.65	.00
DBP	84.67	5.71	82.33	4.30	-.20	4.86	1.88	.07
Clinical Outcomes in CG								
FBG	195.10	69.47	182.31	53.20	-6.94	32.52	1.32	.19
Total-cholesterol	198.76	28.94	190.38	44.55	-12.42	29.18	.82	.41
HDL-cholesterol	45.52	7.37	42.38	7.13	-1.25	7.53	1.46	.15
LDL-cholesterol	85.24	16.08	96.59	31.03	-23.25	.56	-1.95	.06
SBP	149.66	18.02	144.83	16.30	-2.54	12.20	1.34	.19
DBP	88.62	6.39	83.79	6.21	1.21	8.43	2.73	.01

M = mean score, *SD* = standard deviation

Discussion

This study found that the average age of the participants was 62 years in the EG and 63 years in the CG. Prevalence of type 2 DM in elderly was more than twice that of middle aged adults and peaks at 60 – 74 years old [21]. Elderly with poorly controlled type 2 DM in this study lived with their children. They accompanied and assisted the elderly to perform the preventing cardiovascular complications behaviors. Similar to the previous studies revealed that family member had positive impact on improving the diabetes self-management behaviors and health outcomes including FBG and HbA1c [12,22]. Furthermore, elderly with poorly controlled type 2 DM both in the EG and CG had the normal level of CVD risk factors which were the last total-cholesterol, HDL-cholesterol, LDL-cholesterol, SBP, and BP except for the last FBG was high in two groups.

The improvement of PCCB in this study was due to the application of the 5 A's self-management support model. This model consisted of assess, advice, agree, assist, and arrange [14,15]. The researchers assessed the knowledge, skill, and belief of elderly with poorly controlled type 2 DM in the beginning. The result of this process was to gain deep understanding about self-management issue and belief of the participants. Advice process in this study was the researchers provided the specific information individually regarding PCCB which were DM diet and heart healthy diet, physical exercise, taking medications regularly, and smoking cessation to the participants by involving their family member. It was consistent

with a previous study revealed that giving education individually enabled the patient to feel free to either gain more knowledge or share their experience based on achieving goals and problem solving when they were facing the barriers [23]. However, in contrast with a previous study reported that provided information in a group was better in achieving goals target in elderly with diabetes because they could ask other elderly to any unclear information [24].

Improving PCCB in elderly with poorly controlled type 2 DM was also due to they received the preventing cardiovascular complications behaviors booklet. This booklet was useful for the participants and their family member in regards to their daily lives as well as improved their knowledge. It has been found that written guidelines was effectively improved knowledge and behaviors in patient with diabetes. [25]. Furthermore, during conducted the study, the researchers continued to the agree process by collaborating with the participants and their family member to set the specific goals of the PCCB and the clinical outcomes levels achievement every week so that they could perform PCCB well in their daily lives to reach the goals. It was consistent with previous studies reported that incorporating collaborative goals setting into routine primary care practice was useful strategy to promote behavior change [23]. Also, purpose of goals setting was to get effect of behavior changes and improve clinical outcomes [26].

Developing the personal action plans were also contributed in improving PCCB in elderly with poorly controlled type 2 DM by identifying the possible barriers, discussion, using the problem solving to address the barriers, and sharing the action plans to the researchers. During conducted the study, some elderly with poorly controlled type 2 DM found the barriers related to the culture of the DM diet and heart healthy diet in Indonesia. For instance celebration of the Prophet Muhammad's birthday called *Maulid*, praying for dead people during the first to seventh day called *Tahlilan*. During these celebrations, each family prepares a lot of food in which they do not consider about the amount of carbohydrate, sugar, and fat. Also, during these celebrations, the families invite their neighbors to celebrate, pray, and eat together. Consequently, some elderly with poorly controlled type 2 DM had difficulty to manage the challenges to perform PCCB especially for DM diet and heart healthy diet during celebrations. The strategy to solve these barriers was come from the family member of elderly. He/she was important to remind the elderly to avoid certain food during celebration.

In this study, family support had influenced to improve PCCB in elderly with poorly controlled type 2 DM. Family support is a part of assist process of the 5 A's self-management support model. Similar to another study reported that elderly with DM need family support to achieve the goals of behavioral change [26,14]. The role of family member who supported the elderly with poorly controlled type 2 DM was reminding them to eat food based on the DM diet and heart healthy diet to prevent CVD complications, preparing foods for elderly, performing and accompanying elderly to do physical exercise as recommended by the researcher, reminding them to take their medications as scheduled, and record the activity of elderly in term of taking medications into medications log-book every day. Similar to a previous study revealed that to achieve the behavioral change goals should involve the family member, health care professionals, or other care givers [27].

The last reason in term of improving PCCB in elderly with poorly controlled type 2 DM was due to they received weekly follow-up both telephone and face to face. Each week they received a follow-up regarding the PCCB. This method could improve the confidence of elderly and expectations to change and maintain positive behaviors. This finding was consistent with a previous study reported that intervention using phone calls and face to face follow-up were effective in improving self-management behaviors such as dietary and physical exercise [28,29]. Furthermore, self-management program should include longer-term follow-up process to ensure that positive behavioral changes occurred.

Moreover, according to Table 5, some clinical outcomes in EG were improved which were FBG, total-cholesterol, HDL-cholesterol, LDL—cholesterol, and SBP after receiving a cardiovascular self-management support program. These improvements were due to participants in the EG performed well in term of PCCB. First, they performed the DM diet and heart healthy diet by Dietary Approach to Stop Hypertension (DASH) diet which consisted of protein, reduce total fat intake, whole grains, low fat dairy product, rich in fruits and vegetables, and limit sodium intake to no more than one tea spoon per day. Similar to a previous study revealed the DASH diet has significantly reduced the FBG level, HbA1c, lipid profiles, and body weight [30]. The mechanisms of the DASH diet in improving FBG and lipid profile were explained that fiber from whole grains, legumes, and nuts could reduce glucose absorption as well as improved insulin demand and β-cell function, whereas polyunsaturated fats from vegetable oils and nuts could reduce

postprandial glucose, triglycerides, and increase skeletal muscle cell membrane fluidity and glucose uptake [31,32].

Beside the DM diet and heart healthy diet, the second reason in improving some clinical outcomes in elderly with poorly controlled type 2 DM was due to they performed physical exercise regularly. In this study, family member of elderly accompanied elderly to perform walking for at least 30 minutes per day during 3 – 5 days a week. Walking is a kind of exercise which improves oxygen consumption and increases the functioning of the cardiovascular and respiratory systems as well as improves the physiological parameters such as fasting blood glucose and lipid profiles. Moreover, walking could restore the endothelial function and reduce the arterial stiffness which is the positive denominator for developing cardiovascular complications in patients with type 2 DM [33].

The last reason in improving some clinical outcomes in elderly with poorly controlled type 2 DM in EG were due to they performed taking medications regularly. In this study, most of them received medications from the doctor such as metformin, amlodipine, and simvastatin. Also, the researchers provided medication log book for elderly with poorly controlled type 2 DM in the EG. Thus, they could record their taking medications activity every day. Metformin has a benefit to reduce FBG by 50 – 70 mg/dl and it is linked with lower cardiovascular risk in elderly with diabetes [34]. Amlodipine was effectively reduced blood pressure and CVD risk [35]. While simvastatin is to prevent CVD complications by reducing risk factors of CVD complications such as hypercholesterolemia, LDL – cholesterol, and HDL – cholesterol [36].

However, according to DBP pre-test (Table. 4) there was significantly difference between EG and CG. Also, DBP post-test (Table. 4) showed that there was no significantly difference between EG and CG after received the program. These results occurred due to DBP in the EG and CG presented in the normal level both before received the program and after received the program.

Conclusion

In this study, the cardiovascular self-management support program consisted of assess, advise, agree, assist, and arrange. This program was specifically individualized and directed to improve the preventing cardiovascular complications behaviors and clinical outcomes in elderly with poorly controlled

type 2 DM to prevent CVD complications. The findings of this study showed that the cardiovascular self-management support program was effectively improved the PCCB and some clinical outcomes which were FBG, total-cholesterol, HDL- cholesterol, LDL- cholesterol, and SBP after eight weeks in the experimental group than in the control group except DBP. The result indicated that this program has benefit, feasible, effective, and appropriate to be implemented in elderly with poorly controlled type 2 DM.

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