

Family Functional-based Coaching Program on Healthy Behavior for Glycemic Control among Indonesian Communities: A Quasi-experimental Study

Rian Adi Pamungkas^{1*} and Kanittha Chamroonsawadi^{2*}

¹Department of Nursing, Faculty of Health Science, Esa Unggul University, Jakarta, Indonesia

²Department of Family Health, Faculty of Public Health, Mahidol University, Bangkok, Thailand

ARTICLE INFO

Article history:

Received: 2 January 2020

Accepted: 7 March 2020

Online:

DOI 10.5001/omj.2020.115

Keywords:

Diabetes Mellitus, Type 2; Self-Management; Surveys and Questionnaires; Indonesia.

ABSTRACT

Objectives: This study sought to examine the impact of a family functional-based coaching program on improving the perceived family functioning practice and clinical outcomes among patients with glycemic uncontrolled type 2 diabetes mellitus (T2DM) in the Indonesian community. **Methods:** We applied a quasi-experimental study, pretest, and posttest design with a non-equivalent control group. Sixty pairs of T2DM patient-caretaker dyads were recruited and assigned to either an intervention or control group. The Family Function Questionnaire (FFQ) was used to assess the perception of family functioning practices by T2DM patients of their caretakers to support their diabetes self-management. The clinical outcomes were measured using clinical outcome devices and laboratory tests. These measurements were conducted and compared at a baseline and 12 weeks after completing the program. **Results:** Patients who received the family functional-based coaching program saw significant improvement in perception of family function practice, compared to the control group who received usual care. The findings also showed a positive decline glycated hemoglobin and total cholesterol levels after receiving the 12-week program. However, no significant difference was found in body mass index. **Conclusions:** It can be concluded that a family functional-based coaching program is feasible to implement among uncontrolled T2DM in a large scale study.

The worldwide prevalence of diabetes mellitus (DM) in the last four decades has increased. In 2014, the World Health Organization (WHO) estimated 422 million of the world population were living with DM, and accounted for approximately 1.6 million deaths. Almost half of all deaths were attributed to high blood sugar levels before the age of 70 years old.¹ In Indonesia, a national survey in 2011 found 133 million people were reported to be living with diabetes, and 194 million people would be newly diagnosed with DM.² From the total estimation, 87.5% of people were noted to be glycemic uncontrolled type 2, while only 14.3% of patients met with the target goal of glycemic control.

Type 2 DM (T2DM) patients who could follow an appropriate use of medication and proper medication over the entry period of treatment were associated with optimal blood glucose control.³ In contrast, poor medication adherence and lack of blood glucose control harm an increase of treatment

failure that leads to poor health outcomes as well as long-term complications.⁴

Diabetic complications such as retinopathy, nephropathy, and neuropathy lead to long-term disability, low quality of life, premature death, as well as a financial loss for both patients and their families.⁵ Therefore, controlling blood glucose becomes crucial to reduce the impacts of diabetes complications.

Uncontrolled glycemia is defined as persistently elevated blood glucose and glycosylated hemoglobin levels (> 6.5%) for several months or years before severe complications occurred.^{6,7} Diabetes mellitus self-management (DMSM) is essential for T2DM patients to achieve a healthy lifestyle. DMSM requires patients to make use of the available resources, value and prefer a healthy diet, be physically active, avoid cigarette smoking and alcohol drinking, and adhere to medication, blood glucose monitoring, and prevention of complications.⁸

Several studies suggested family as a fundamental source of support in the practice of DMSM because

*Corresponding author: ✉kanittha.cha@mahidol.ac.th; rian.adi@esaunggul.ac.id

effective DMSM practices will not guarantee good glycemic control without good cooperation and clear roles between the patients and their families.^{9,10} A quality relationship between them could influence a mutual understanding of their roles in facilitating each other with DMSM practice.^{11,12} Family function can be defined as how family members can play a role in supporting and assisting a patient with T2DM with DMSM practices.

Previous findings found that family members can support DMSM by preparing healthy meals and reminding patients to take their medication and test their blood sugar level. Good relationships and positive communication between patients and family members will facilitate a pleasant family atmosphere to encourage patients on lifestyle modification.^{13,14} Some key factors determine the appropriate roles and functions of the family, such as sufficient knowledge on healthy lifestyle behaviors and awareness of diabetic management.^{15,16} Therefore, programs to enhance the knowledge, awareness, roles, and function of the family members to support DMSM need to be addressed.

The family function is directly associated with the patients' perception of how they need their family members to be involved and support daily diabetic care and is linked with cognitive-affective evaluation and physical interactions.^{17,18} The well-functioning of the family has positive effects on DMSM practice, healthy behaviors, and glycated hemoglobin (HbA_{1c}) level reduction.¹⁹ Our previous qualitative study found the lack of family function in DMSM support includes poor communication on DMSM due to inadequate knowledge, and lack of skills to support patients on self-management. Moreover, some family conflicts on daily meal preparation, such as the family members being strict on food intake or providing separated meals from the rest of the family, may induce stress and depression among the patients. In some circumstance, T2DM patients were neglected by their families when they faced severe conditions.²⁰

A family functional-based program was an effective strategy to enhance family members' functions to support patients in DMSM practice.^{15,21} This study aimed at identifying the effectiveness of a family functional-based coaching program on clinical outcomes among patients with uncontrolled T2DM. An intervention program was

developed based on capacity building and coaching strategy among family members to enhance their family functions to deal with the patients' problems and support their DMSM practices. Family functioning theory²² was applied to construct a family functional-based coaching program to enhance the knowledge, awareness, and skills of the family members in supporting the patients on self-management. Several strategies, including reflection and sharing, goal setting, role-play, individual coaching, follow-up, and a home visit were applied in the intervention activities. Findings from this study can be applied with routine services to strengthen the roles and function of the family members in supporting DMSM practices among patients with uncontrolled T2DM in Indonesia communities in the future.

METHODS

A quasi-experimental study, pretest, and posttest design with a non-equivalent control group were applied in this study. Data were collected both at the initial period and the end of the 12-week follow-up as a posttest.

Polewali Mandar district of west Sulawesi Province was the study site. Two sub-districts were randomly selected for the intervention and control groups.

Patients included in the study were those with uncontrolled T2DM and one of their family members who were the main caretaker. Patients attended one of two community health centers located in each selected part of the target district. The inclusion criteria among the uncontrolled T2DM were: (1) HbA_{1c} level was $\geq 6.5\%$, (2) aged 35–59 years, and (3) be able to communicate (verbal and written) in the Indonesian language. Patients with severe diabetic complications that needed to be hospitalized were excluded from this study. Moreover, other reasons that caused them to not comply with the intervention were also excluded. The inclusion criteria for a family caretaker were: (1) living together with T2DM patients for at least one year, and (2) willing to participate in this study.

The sample size calculation was based on a comparison of two sample means.²³ Two mean scores of DMSM practices between the intervention and the control groups based on a previous study was used to estimate the sample size.²¹

$$n = \frac{2SD^2}{\frac{[z(\alpha/2) + z\beta]^2}{\mu_1 + \mu_0}}$$

Thus, $n = 22$ patient-family member dyads

Thirty percent of samples were added up for incomplete data or withdrawn from the study. A total of 30 patient-family member dyads per each group were the required sample size. A total of 60 dyads were randomly allocated using a simple random sampling technique to both the intervention and control group.

Simple random sampling was done to select a sub-district in the northern area as an intervention community while another sub-district in a southern area was a control community. Among these communities, the socio-cultural contexts were similar. The researchers, with support from healthcare providers, recruited the study samples of patient-caretaker dyads in each intervention and control communities.

A family functional-based health coaching program was developed based on a family functioning model.²² The program is aimed at improving the family function of the family member in supporting DMSM practices and clinical outcomes of T2DM patients. The patient-caretaker dyads took part in a 12-week learning program (using the local language), which consisted of eight sessions taking 1.5–3 hours each. A focal point of this intervention program was the family members who responded as the primary caretaker.

The intervention program is comprised of five topics. The first topic concerned problem-solving and skill-based coaching to explore the family-patients' problems, the diabetic goal setting, and to develop the problem-solving skills of the caretaker to support the patient's self-management practice. This took place once a week for three hours. The second topic emphasized narrative-based coaching to improve family members' knowledge and to raise awareness on the importance of DMSM practice to prevent severe complications. This topic consumed two hours of a once-weekly session. The third topic focused on mindfulness-based coaching to create a sense of responsibility to support and provide positive encouragement to the patients to maintain their self-management. This topic was consumed for two weeks, with 1.5 hours of each weekly session. The

fourth topic aimed to develop collaborative learning and to build skills in preparing a simple menu for diabetes control and selecting an appropriate physical activity. We also performed individual coaching to enhance personal skills in controlling blood glucose and managing hypoglycemic and hyperglycemic symptoms. This topic consumed three weeks with two hours of each once-weekly session. The fifth topic emphasized the importance of patients' self-report on DMSM behaviors for glycemic control. This topic consumed 1.5 hours of a once-weekly session. Before implementing the program, one session on diabetic knowledge and raising awareness on glycemic control was the pilot test to verify the appropriateness of teaching strategies and time management. All of the intervention activities in eight sessions were conducted at the health center. Moreover, telephone follow-up and home visits for home-based coaching to strengthen family function in supporting diabetic patients in all aspects were conducted at the patient's home every week in the ninth to the twelfth week after the end of the eighth week.

During implementation, the researchers also provided a diabetes self-management booklet and a medication logbook for self-report of the patients on their activities in terms of regular medication, regular exercise, and regular blood glucose monitoring. Details of the family functional-based health coaching program are summarized in Table 1.

The researcher trained the research assistants (fourth-year student nurses) for data collection by interviewing both patients and family members. Laboratory reports of blood samples at each community health center in both the intervention and control groups at baseline and in the twelfth week of the intervention. The information was retrieved from the patient's profile at each health center. The researchers and research assistants implemented the eight-week program. During the home visit, both local healthcare providers and village health volunteers were accompanied to each patient's home.

An interview questionnaire was employed to collect data from both the intervention and control groups. The questionnaire was developed by the researchers and validated by three experts. Data was obtained through a face-to-face interview taking 30 to 45 minutes for each respondent and considered as the baseline data for all respondents. Thirty samples were involved in a pilot test to examine the reliability

Table 1: Family functional-based health coaching program based on the family function model.

The focal point of family-based coaching	Strategies	Main activities	Goals
Problem-solving based coaching	<ul style="list-style-type: none"> Reflection and experience sharing on problem-solving 	<ul style="list-style-type: none"> Reflection and sharing current problems with DMSM within the family Sharing experience on an effective strategy to solve the problems Brainstorm on a scenario 	<ul style="list-style-type: none"> Explore family-patients problem and develop problem-solving skills
Narrative-based coaching	<ul style="list-style-type: none"> Small group discussion Case study Watching video 	<ul style="list-style-type: none"> Demonstrate healthy menu for diabetic patients Case study on diabetes complications and how to solve the problems 	<ul style="list-style-type: none"> Improve family members' knowledge/raising awareness
Mindfulness-based coaching	<ul style="list-style-type: none"> Goal setting Positive responsiveness 	<ul style="list-style-type: none"> Goal setting on supporting patients for DMSM practice Role-play to provide emotional support 	<ul style="list-style-type: none"> Create a sense of responsibility among family members
Skill-based coaching	<ul style="list-style-type: none"> Individual coaching Role-play 	<ul style="list-style-type: none"> Practice on a simple menu preparation Recognize the portion size and calculate calorie intake Determine proper physical activity fit with patients' needs Practice on positive communication to encourage patients' practice Recognize symptoms of hypoglycemia and hyperglycemia Remind the importance of medication adherence and blood glucose monitoring 	<ul style="list-style-type: none"> Develop a collaborative learning and build-up skill
Self-report and follow-up coaching	<ul style="list-style-type: none"> Self-report Telephone follow-up Home visit 	<ul style="list-style-type: none"> Weekly self-report of patients on DMSM practice Regular telephone follow-up to strengthen family members' roles Home visit to empower both patients and their family members 	<ul style="list-style-type: none"> Strengthen supportive behaviors of family members to monitor DMSM practice of the patients

DMSM: diabetes mellitus self-management.

The control group received routine care based on a standard guideline of the country by the community health center. The guidelines comprised free regular check-ups once a month with routine health education every time they visit.

of the questionnaire. The questionnaire was divided into three parts, as follows:

The sociodemographic and health-related information were assessed using an interview questionnaire for both patients and family members. The patient's questionnaire consisted of seven items on general information, three items on clinical factors, 10 items on physiological factors, and seven items on behavioral risk factors. The family member's questionnaire consisted of seven items on sociodemographic data.

The Family Function Questionnaire (FFQ) on DMSM constructed based on family functioning theory²² was used to assess the perceived family function in DMSM practice among patients. The FFQ was a four-point rating scale from strongly agree, agree, disagree, and strongly disagree. This instrument consisted of six domains of family function: three items on problem-solving, three items on communication, five items on family roles, three items on affective responsiveness, three

items on affective involvement, and two items on behavioral control. The first version of the FFQ was constructed in English and then translated into the Indonesian language, and was back-translation by a native expert. The internal consistency found that the Cronbach's alpha for the Indonesian version of FFQ was 0.80, which is considered a reliable questionnaire. The FFQ scores ranged 0–3 (0 = not at all, 1 = sometimes, 2 = often, and 3 = regularly). Higher scores indicate greater perceived family function in DMSM practice.

Clinical outcomes measurements included HbA_{1c} level, body mass index (BMI), and total cholesterol level. The clinical outcomes were measured before and after receiving the program. The HbA_{1c} and overall cholesterol levels were obtained after three months of the intervention based on the laboratory results obtained from the same community health center. The research assistants did the anthropometric measures among the intervention and the control groups with the same calibrated weight machine

in the morning of each baseline and three month follow-up period at each community health center. BMI was calculated using standard methods of body weight divided by the square meter of body height (kg/m^2).

This study was approved by the Ethical Review Board Faculty of Public Health, Mahidol University, number: MUPH 2018-173. Informed consent was obtained from each patient and the caretaker who was willing to participate in this study.

Data were entered, checked, and analyzed by the researchers with statistical software. Descriptive statistics were used to describe the sociodemographic characteristics of patients and family members in both the intervention and control groups. The Kolmogorov-Smirnov test was used to test the assumption of normality for perceived family functioning in DMSM practice and clinical outcomes. Since the data showed normality distribution, the paired *t*-test was applied to determine whether any significant differences were found at baseline and 12 weeks after receiving the family-based health coaching program within each group. Moreover, an independent *t*-test was used to examine the differences of mean scores before and after implementation of the program and the mean scores of changed on perceived family function and clinical outcomes between the intervention and control groups. Statistical significance was set at $p < 0.050$.

RESULTS

At the end of the posttest, in both groups, 60 patient-caretaker dyads remained in our study without any drop-out. The most significant percentage of the subjects in the intervention and control groups were females (80.0% and 63.3%, respectively). The average age was 56.2 ± 7.6 years in the intervention group and 54.5 ± 9.2 years in the control group. More than half of the patients' occupations in both groups were housewives (60.0% and 40.0%), and one-third had completed high school (33.3% and 26.7%), respectively. In the intervention group, 46.7% of patients had a history of diabetes compared to 56.7% in the control group.

The duration of illness in both groups was more than four years. Comorbidities (hypertension and hypercholesterolemia) were present in 43.3% of the intervention group and 33.3% in the control group.

The mean BMI of both groups was close to overweight levels; 23.7 ± 3.5 among the intervention group and 24.6 ± 3.5 among the control group. The mean HbA_{1c} in both the intervention and control groups were $> 8.0\%$. The mean score of the cholesterol level among the intervention group was 204.0 ± 32.6 mg/dL and 199.0 ± 41.3 mg/dL in the control group. The mean blood pressure of both the intervention group (128/83 mmHg) and control group (128/82 mmHg) was in the normal range. All variables were not significantly different between the intervention and control groups ($p > 0.050$) [Table 2].

The majority of participants in the intervention group (50.0%) and control group (60.0%) were females. The patient cohort had an average age of 43.0 ± 14.0 years in the intervention group and 41.5 ± 13.2 years in the control group. The majority of patients in both the intervention and control groups were married (76.7% and 86.7%, respectively). Nearly half of the main caretakers in the intervention group worked as farmers (43.3%), while this percentage was lower in the control group (30.0%). Almost half (43.3%) of participants in the intervention group had completed high school compared to 36.7% seen in the control group. For the intervention group, nearly half of the family members were husbands (46.7%), while this number was 23.3% in the control group. For all variables, we found no significant difference between the intervention and the control groups ($p > 0.050$) [Table 3].

Table 4 compares the mean scores of perceived family function in DMSM practice before and after receiving the program within the intervention and control groups. Perceived family function by the patients within the intervention group after receiving the coaching program was higher than before implementation. Each significant domain of the family function-based coaching program found among the intervention group comprised of ability to problem-solve ($p < 0.001$), communication ($p < 0.001$), role in DMSM practice ($p < 0.001$), affective responsiveness ($p < 0.001$), affective involvement ($p < 0.001$), and behavior control ($p < 0.001$). In contrast, findings within the control group showed no significant difference in perceived family function before and after implementation of the family functional-based health coaching program except problem-solving ($p = 0.010$) and family role ($p = 0.004$).

Before implementation of the program, all six domains of perceived family function in both

Table 2: Demographic and health information of the type 2 diabetes mellitus patients between the intervention and the control groups (N = 60).

Characteristics	Intervention group (n = 30)		Control group (n = 30)		p- value	
	n	%	n	%		
General information						
Age, mean ± SD	56.2 ± 7.6		54.5 ± 9.2		0.439	
Gender						
Male	6	20.0	11	36.7	0.152	
Female	24	80.0	19	63.3		
Marital status						
Married	30	100	50	100	0.214	
Other	0	0.0	0	0.0		
Occupation						
Not working	2	6.7	2	6.7	0.709	
Housewife	18	60	12	40.0		
Farmer	5	16.7	6	20.0		
Seller	1	3.3	1	3.3		
Retirement	2	6.7	4	13.3		
Entrepreneur	1	3.3	1	3.3		
Civil servant	1	3.3	4	13.3		
Education						
Not study	6	20.0	1	3.3		0.438
Primary school	6	20.0	7	23.3		
Secondary school	5	16.7	7	23.3		
High School	10	33.3	8	26.7		
Diploma	0	0.0	0	0.0		
Bachelor/master	3	10.0	7	23.3		
Family history of diabetes						
Diabetes	14	46.7	17	56.7	0.438	
No diabetes	16	53.3	13	43.3		
Clinical factors						
Duration of illness, mean ± SD	4.4 ± 1.5		4.2 ± 1.6		0.720	
Comorbidity						
No comorbidity	10	33.3	8	26.7	0.205	
Hypertension	3	10.0	7	23.3		
Cholesterol	13	43.3	10	33.3		
Hypertension + cholesterol	2	6.7	2	6.7		
Rheumatoid	2	6.7	0	0.0		
Allergy	0	0.0	3	10.0		
Physiology factors						
Body mass index (kg/m ²), mean ± SD	23.7 ± 3.5		24.6 ± 3.5		0.065	
Fasting blood glucose (mg/dL), mean ± SD	229.5 ± 62.1		254.4 ± 100.0		0.049	
HbA _{1c} (%), mean ± SD	8.0 ± 1.9		8.5 ± 2.9		0.112	
Total cholesterol (mg/dL), mean ± SD	204.0 ± 32.6		199.0 ± 41.3		0.178	

SD: standard deviation; HbA_{1c}: glycated hemoglobin.

groups were not significantly different [Table 5]. Whereas after implementation, all six domains were significantly higher in the intervention group than the control group, including problem-solving ($p < 0.001$), family role ($p < 0.001$), affective responsiveness

($p < 0.001$), affective involvement ($p < 0.001$), and behavior control ($p < 0.001$). Only communication was not significantly different ($p = 0.434$).

The mean scores of change between the two groups were significantly changed in all six domains

Table 3: Demographic data of the family members between the intervention and control groups (N = 60).

Characteristics	Intervention group (n=30)		Control group (n=30)		p- value
	n	%	n	%	
Age (min-max = 17-69)	M = 43	SD = 14.90	M = 41.57	SD = 13.27	0.375
Gender					0.380
Male	15	50.0	18	60.0	
Female	15	50.0	12	40.0	
Marital status					0.305
Married	23	76.7	26	86.7	
Not married	7	23.3	4	13.3	
Occupation					0.210
Not working	3	10.0	5	16.7	
Housewife	7	23.3	10	33.3	
Farmer	13	43.3	9	30.0	
Retirement	1	3.3	0	0.0	
Entrepreneur	1	3.3	4	13.3	
Civil servant	2	6.7	1	3.3	
Student	3	10.0	1	3.3	
Education					0.312
Not study	0	0.0	0	0.0	
Primary school	3	10.0	4	13.3	
Secondary school	9	30.0	4	13.3	
High School	13	43.3	11	36.7	
Diploma	2	6.7	6	20.0	
Bachelor/master	3	10.0	5	16.7	
Relationship with patients					0.235
Husband	14	46.7	7	23.3	
Wife	4	13.3	9	30.0	
Daughter	6	20.0	8	26.7	
Son	1	3.3	4	13.3	
Cousin	5	16.7	2	6.7	

M: mean; SD: standard deviation.

Table 4: Comparison of mean score on perceived family function, before and after receiving the intervention program within the intervention and the control groups.

Characteristics	Pretest		Posttest		t	df	p- value
	Mean	SD	Mean	SD			
Perceived family function practice among families in the intervention group							
Problem-solving	2.3	1.4	4.6	0.6	-7.779	29	< 0.001
Communication	1.7	1.5	5.0	0.8	-10.410	29	< 0.001
Family role	3.0	1.9	7.3	0.9	-11.190	29	< 0.001
Affective responsiveness	3.0	1.2	5.4	0.6	-8.389	29	< 0.001
Affective involvement	1.0	1.2	5.1	0.6	-14.130	29	< 0.001
Behavior control	1.3	1.7	4.9	0.8	-10.140	29	< 0.001
Perceived family function practice among families in the control group							
Problem-solving	2.8	1.4	2.7	1.0	0.510	29	0.010
Communication	2.6	1.9	2.4	1.0	0.340	29	0.506
Family role	3.3	2.7	2.9	1.1	1.679	29	0.004
Affective responsiveness	2.9	1.1	2.1	1.0	3.026	29	0.131
Affective involvement	2.4	1.6	1.8	0.8	1.768	29	0.267
Behavior control	2.4	1.7	2.1	0.6	0.952	29	0.363

SD: standard deviation.

Table 5: Comparison of means scores on perceived family function between the intervention and the control groups.

Characteristics	Intervention group		Control group		<i>t</i>	df	<i>p</i> -value
	Mean	SD	Mean	SD			
Pretest of perceived family function practice							
Problem-solving	2.3	1.4	2.8	1.4	-1.331	58	0.189
Communication	1.7	1.5	2.6	1.9	-2.027	58	0.047
Family role	3.0	1.9	3.7	2.7	-1.132	58	0.262
Affective responsiveness	3.0	1.2	2.9	1.1	0.215	58	0.831
Affective involvement	1.7	1.2	2.4	1.6	-1.843	58	0.070
Behavior control	1.3	1.7	2.4	1.7	-2.330	58	0.023
Posttest of perceived family function practice							
Problem-solving	4.6	0.6	2.7	1.0	8.131	58	< 0.001
Communication	2.6	0.9	2.4	1.0	0.787	58	0.434
Family role	5.3	0.6	2.1	1.1	14.208	58	< 0.001
Affective responsiveness	5.1	0.6	1.8	1.0	16.784	58	< 0.001
Affective involvement	5.1	0.6	1.8	0.8	16.784	58	< 0.001
Behavior control	4.9	0.8	2.1	0.6	14.290	58	< 0.001
Mean score of change (Posttest-pretest) on family function between the two groups							
Problem-solving	2.2	1.5	-0.1	1.4	6.130	58	< 0.001
Communication	0.9	1.9	-0.1	2.1	2.070	58	0.042
Family role	0.6	2.5	-0.7	2.5	2.150	58	0.035
Affective responsiveness	2.3	1.6	-0.8	1.4	7.880	58	< 0.001
Affective involvement	3.4	1.3	-0.5	1.7	9.940	58	< 0.001
Behavior control	3.5	1.9	-0.3	1.9	7.830	58	< 0.001

SD: standard deviation.

among the intervention group compared to the control group ($p < 0.050$).

Two outcomes among the intervention group were significantly different after receiving the program compared to before; HbA_{1c} ($p < 0.001$) and total cholesterol level ($p < 0.001$) [Table 6]. Only BMI had

no significant difference ($p > 0.050$). While among the control group, the mean scores of clinical outcomes were not significantly different after implementation compared to the baseline data ($p > 0.050$).

The results revealed that before the implementation of the program, clinical outcomes between the

Table 6: Comparisons of mean scores on clinical outcomes, before and after receiving a family functional-based health coaching program within the intervention and the control groups.

Variables	Pretest		Posttest		<i>t</i>	df	<i>p</i> -value
	Mean	SD	Mean	SD			
Clinical outcomes of the intervention group							
HbA _{1c}	8.0	1.9	6.4	1.1	5.998	29	< 0.001
Body mass index	23.7	3.5	23.5	2.8	0.207	29	0.838
Total cholesterol	204.3	32.6	176.1	22.3	4.308	29	0.001
Clinical outcomes of the control group							
HbA _{1c}	8.5	2.9	8.2	2.6	1.739	29	0.093
Body mass index	24.3	3.5	24.2	2.6	0.132	29	0.896
Total cholesterol	199.7	41.3	198.3	38.4	0.475	29	0.639

SD: standard deviation; HbA_{1c}: glycated hemoglobin.

Table 7: Comparison of mean scores and mean scores of change on patients' clinical outcomes between the intervention and control groups.

Variables	Intervention group		Control group		<i>t</i>	df	<i>p</i> -value
	Mean	SD	Mean	SD			
Pretest of clinical outcomes							
HbA _{1c}	8.0	1.9	8.5	2.9	-0.788	58	0.434
Body mass index	23.7	3.5	24.3	3.5	-0.680	58	0.499
Total cholesterol	204.3	32.6	199.7	41.3	0.478	58	0.643
Posttest of clinical outcomes							
HbA _{1c}	6.4	1.1	8.2	2.6	-3.464	58	0.001
Body mass index	23.5	2.8	24.2	2.6	-0.984	58	0.329
Total cholesterol	176.1	22.3	198.3	38.4	-2.315	58	0.024
Mean score of change (posttest-pretest)							
HbA _{1c}	-1.6	1.4	-0.3	0.9	-4.001	58	< 0.001
Body mass index	-0.1	3.1	-0.0	1.5	-0.128	58	0.901
Total cholesterol	-28.2	35.8	-1.4	16.5	-3.713	58	0.001

SD: standard deviation; HbA_{1c}: glycated hemoglobin.

two groups were not significantly different ($p > 0.050$) [Table 7]. After the implementation, HbA_{1c} ($p = 0.001$) and total cholesterol ($p < 0.050$) levels in the intervention group were significantly lower than the control group. Only BMI had no significant difference ($p > 0.050$). Moreover, the mean scores of change in the experimental group for both HbA_{1c} ($p < 0.001$) and total cholesterol level ($p = 0.001$) were significantly changed in a positive direction when compared with the control group. Only BMI did not change ($p > 0.050$).

DISCUSSION

After implementing a family functional-based health coaching program, the DMSM practice and clinical outcomes among glycemic uncontrolled T2DM patients and the family function in all six domains in the intervention group were significantly better than before implementation and compared to the control group. This is due to the effects of our family functional-based health coaching program. The family functional-based health coaching program plays a vital role in enhancing DMSM practice. Family members act as a change agent to improve patients' behaviors.²⁴ Among Indonesian communities, like other Muslim societies, family members are key to influencing patients' daily life and self-management practices due to traditional and cultural beliefs. Patients and family members

closely join family activities together, especially daily meal preparation.²⁵ Family functional-based coaching programs conducted among both patients and caretakers act to ensure mutual understanding and consensus agreement to reach the ultimate goal of glycemic control. The goal setting strategy has proved as practical guidance for both patients and their family members to engage their commitment into practice.^{26–28} This will persuade patients to continue improving their DMSM practice under the untiring support of their family members.¹⁰

The improvement of perceived family function in DMSM practice in the intervention group was associated with the application of the family functioning concept.²² Affective responsiveness and positive communication between the patients and their family members induced a pleasant family atmosphere to facilitate behavioral changes in the patients and to maintain family involvement in behavioral control among the patients.

Participatory learning (PL) by different strategies such as brainstorming, group discussion, demonstration, role-play, and practice with intensity coaching is appropriate for an adult learning experience. PL helps family members recognize their roles in supporting patients for proper DMSM practice. Moreover, PL will provide more chances for participants to share their experiences through group discussion. This can be supported by a study that found that a group-discussion-based education

program can improve DMSM among patients when compared with a usual care.²⁹ Previous findings on the family functional-based program demonstrated positive effects on enhancing DMSM practice that can support findings from our present study.^{19,21,29,30} Moreover, the PL strategy is suitable for adults to obtain more knowledge and skill in creating a simple menu preparation, recognizing the portion size, and calculating of calorie intake. Consistent with a previous study, PL was confirmed to increase good collaboration between patients and their family members on healthy behavioral change.³¹

In this study, we sequentially applied the family functional-based health coaching program every week for 12 weeks. Moreover, follow-up and home visits were conducted to identify obstacles and to solve problems while the program was implemented. This finding was similar to a previous study that revealed that telephone follow-up and home visits have a positive effect on the improvement of diabetes self-management practice.^{32,33}

The strength of the present study demonstrated the direct effects of family functional-based health coaching on behavioral change and health outcomes of patients since similar characteristics were found between the intervention and control groups. There were no effects from any baseline information that can influence the different changes between the two groups.

Although the family functional-based health coaching program has positive effects on health outcomes, some limitations were encountered in this study, such as the shortened period of the program implementation since we could only conduct three months follow-up. This was due to the time constraint of both patients and family members to participate and allow us to schedule home visit and follow-up appointments. Moreover, the researchers could not visit their homes without being accompanied by healthcare providers who had tight work schedules. Therefore, the three months follow-up period might not result in a significant BMI change. Other studies with longer durations of follow-up on behavior changed training programs revealed a considerable improvement in BMI.^{28,34} Whereas, excessive BMI has been demonstrated to be a key biological risk factor related to many health outcomes, including T2DM, cardiovascular disease, and non-communicable disease-related mortality.³⁴

CONCLUSION

Conducting a family functional-based coaching program was practical to improve the family function among family members to support DMSM practice of uncontrolled T2DM patients. Therefore, the 12-week family functional-based health coaching program was feasible to implement among Indonesian communities. Future studies may need to expand the duration of follow-up (one to two years) to achieve better results, especially for BMI reduction. Suggestions for further study should be considered to expand in other communities by using patients with good glycemic control and their families. It benefited from sharing a lesson learned and how to establish as a peer educator network to support other neighborhood communities to learn how to support T2DM patients in proper self-management.

Disclosure

The authors declared no conflicts of interest. No funding was received for this study.

Acknowledgements

The authors would like to thank the Indonesia Endowment Fund for Education for the granting of this study. We also thank all staff of public health centers, Polewali Mandar district. Special thanks to participants and research assistants who support us during data collection.

REFERENCES

1. World Health Organization (WHO). (2020). Diabetes: Key facts. [cited 2020 June 8]. Available from: <https://www.who.int/news-room/fact-sheets/detail/diabetes>.
2. Perkumpulan Endokronologis Indonesia. Revisi konsensus: pengendalian dan pencegahan diabetes mellitus tipe 2 di Indonesia. 2011 [cited 2019 September]. Available from: <https://dokumen.tips/documents/revisi-final-konsensus-dm-tipe-2-indonesia-2011.html>.
3. Raum E, Krämer HU, Rüter G, Rothenbacher D, Rosemann T, Szecsenyi J, et al. Medication non-adherence and poor glycaemic control in patients with type 2 diabetes mellitus. *Diabetes Res Clin Pract* 2012 Sep;97(3):377-384.
4. Wroth TH, Pathman DE. Primary medication adherence in a rural population: the role of the patient-physician relationship and satisfaction with care. *J Am Board Fam Med* 2006;19(5):478-486.
5. World Health Organization (WHO). Global report on diabetes Switzerland: WHO Press; 2016.
6. Otiniano ME, Al Snih S, Goodwin JS, Ray L, AlGhatrif M, Markides KS. Factors associated with poor glycemic control in older Mexican American diabetics aged 75 years and older. *J Diabetes Complications* 2012 May-Jun;26(3):181-186.
7. Polikandrioti M, Dokoutsidou H. The role of exercise and nutrition in type II diabetes mellitus management. *Health Sci J* 2009;3(4):216-221.
8. Pamungkas RA, Chinnawong T, Kritpracha P. The effect of dietary and exercise self-management support program on dietary behavior, exercise behavior, and clinical

- outcome in Muslim patients with poorly controlled type 2 diabetes mellitus in a community setting in Indonesia. *Nurse Media Journal of Nursing* 2015 June;5(1):1-14.
9. Bennich BB, Roder ME, Overgaard D, Egerod I, Munch L, Knop FK, et al. Supportive and non-supportive interactions in families with a type 2 diabetes patient: an integrative review. *Diabetol Metab Syndr* 2017 Jul;9(57):57.
 10. Pamungkas RA, Chamroonsawasdi K, Vatanasomboon P. A systematic review: family support integrated with diabetes self-management among uncontrolled type II diabetes mellitus patients. *Behav Sci* 2017 Sep;7(3):62.
 11. Fisher L, Chesla CA, Bartz RJ, Gilliss C, Skaff MA, Sabogal F, et al. The family and type 2 diabetes: a framework for intervention. *Diabetes Educ* 1998 Sep-Oct;24(5):599-607.
 12. Wagner EH, Austin BT, Davis C, Hindmarsh M, Schaefer J, Bonomi A. Improving chronic illness care: translating evidence into action. *Health Aff* 2001 Nov-Dec;20(6):64-78.
 13. Pamungkas R, Chamroonsawasdi K, Vatanasomboon P. Family functioning integrated with diabetes self-management: a concept analysis. *Frontiers of Nursing* 2018;5(3):199-206.
 14. Zhang Y. Family functioning in the context of an adult family member with illness: a concept analysis. *J Clin Nurs* 2018 Aug;27(15-16):3205-3224.
 15. Baig AA, Benitez A, Quinn MT, Burnet DL. Family interventions to improve diabetes outcomes for adults. *Ann N Y Acad Sci* 2015 Sep;1353:89-112.
 16. Rad GS, Bakht LA, Feizi A, Mohebi S. Importance of social support in diabetes care. *J Educ Health Promot* 2013 Oct;2:62.
 17. Cárdenas L, Vallbona C, Baker S, Yusim S. Adult onset diabetes mellitus: glycemic control and family function. *Am J Med Sci* 1987 Jan;293(1):28-33.
 18. Mayberry LS, Osborn CY. Family involvement is helpful and harmful to patients' self-care and glycemic control. *Patient Educ Couns* 2014 Dec;97(3):418-425.
 19. García-Huidobro D, Bittner M, Brahm P, Puschel K. Family intervention to control type 2 diabetes: a controlled clinical trial. *Fam Pract* 2011 Feb;28(1):4-11.
 20. Pamungkas RA, Chamroonsawasdi K, Vatanasomboon P, Charupoonphol P. Barriers to effective diabetes mellitus self-management (DMSM) practice for glycemic uncontrolled type 2 diabetes mellitus (T2DM): a socio cultural context of Indonesian communities in West Sulawesi. *Eur J Investig Health Psychol Educ* 2019;10(1):250-261.
 21. Cai C, Hu J. Effectiveness of a Family-based Diabetes Self-management Educational Intervention for Chinese Adults With Type 2 Diabetes in Wuhan, China. *Diabetes Educ* 2016 Dec;42(6):697-711.
 22. Miller IW, Ryan CE, Keitner GI, Bishop DS, Epstein NB. The McMaster approach to families: theory, assessment, treatment and research. *J Fam Ther* 2000;22(2):168-189.
 23. Lemeshow S, Hosmer DW, Klar J, Lwanga SK. World Health Organization. Adequacy of sample size in health studies. Chichester: Wiley;1990.
 24. Conn S, Curtain S. Health coaching as a lifestyle medicine process in primary care. *Aust J Gen Pract* 2019 Oct;48(10):677-680.
 25. Pamungkas RA, Chamroonsawasdi K. HbA1c reduction and weight-loss outcomes: a systematic review and meta-analysis of community-based intervention trials among patients with type 2 diabetes mellitus. *Int J Diabetes Dev Ctries* 2019;1:1-4.
 26. Miller CK, Headings A, Peyrot M, Nagaraja H. Goal difficulty and goal commitment affect adoption of a lower glycemic index diet in adults with type 2 diabetes. *Patient Educ Couns* 2012 Jan;86(1):84-90.
 27. Nelis SM, Thom JM, Jones IR, Hindle JV, Clare L. Goal-setting to promote a healthier lifestyle in later life: qualitative evaluation of the age well trial. *Clin Gerontol* 2018 Jul-Sep;41(4):335-345.
 28. Pamungkas RA, Chamroonsawasdi K. Self-management based coaching program to improve diabetes mellitus self-management practice and metabolic markers among uncontrolled type 2 diabetes mellitus in Indonesia: A quasi-experimental study. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. 2020 Jan 1;14(1):53-61.
 29. Habibzadeh H, Sofiani A, Alilu L, Gillespie M. The effect of group discussion-based education on self-management of adults with type 2 diabetes mellitus compared with usual care: a randomized control trial. *Oman Med J* 2017 Nov;32(6):499-506.
 30. Wichit N, Mnatzaganian G, Courtney M, Schulz P, Johnson M. Randomized controlled trial of a family-oriented self-management program to improve self-efficacy, glycemic control and quality of life among Thai individuals with type 2 diabetes. *Diabetes Res Clin Pract* 2017 Jan;123:37-48.
 31. Palis AG, Quiros PA. Adult learning principles and presentation pearls. *Middle East Afr J Ophthalmol* 2014 Apr-Jun;21(2):114-122.
 32. Kaur R, Kajal KS, Kaur A, Singh P. Telephonic consultation and follow-up in diabetics: impact on metabolic profile, quality of life, and patient compliance. *N Am J Med Sci* 2015 May;7(5):199-207.
 33. Samimi Z, Talakoub S, Ghazavi Z. Effect of telephone follow-up by nurses on self-care in children with diabetes. *Iran J Nurs Midwifery Res* 2018 Jan-Feb;23(1):26-30.
 34. Hu Y, Bhupathiraju SN, de Koning L, Hu FB. Duration of obesity and overweight and risk of type 2 diabetes among US women. *Obesity* 2014 Oct;22(10):2267-2273.