B-ICON Proceeding

SUPPORTIVE EDUCATIVE DEVELOPEMENT FOR FAMILY ACCOMPANYERS OF DIABETES MELLITUS PATIENT

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Abstract

Diabetes mellitus is a chronic non-communicable disease that continues to increase globally and poses serious health challenges. Effective management requires not only medical treatment but also strong family support to ensure adherence to self-care behaviors. This study aimed to analyze the effect of developing supportive-educative family groups on adaptive behavior and self-care independence of patients with diabetes mellitus through the implementation of five pillars of diabetes management: education, medical nutrition therapy, physical activity, pharmacological therapy, and self-monitoring of blood glucose. This quasi-experimental study was conducted in the working area of Simbarwaringin Primary Health Care, Lampung Tengah, involving 157 respondents. The sample consisted of 72 family members in the intervention group and 85 in the control group, selected through purposive sampling. Data were collected using the modified Diabetes Social Support Questionnaire-Family and analyzed with paired-sample t-test and independent two-sample t-test. The results showed a significant improvement in family supportive-educative behavior after the intervention in the intervention group compared to the control group ($p < 0.001$). Family support improved significantly in nutrition management, physical activity, pharmacological therapy adherence, stress management, and self-monitoring of blood glucose. Moreover, the proportion of patients with random blood glucose >200 mg/dl decreased from 59.7% to 29.2% in the intervention group, while it remained high in the control group. In conclusion, supportive-educative family group intervention was proven effective in enhancing family support, patient adaptive behavior, and self-care independence, thereby contributing to better glycemic control among patients with diabetes mellitus.

Keywords: Diabetes Militus (DM), Family Caregivers, Educational Intervention, Support

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INTRODUCTION

Diabetes Mellitus (DM) is a non-communicable disease (NCD) whose prevalence continues to increase year by year worldwide. Data shows that in 2019, approximately 463 million people (9.3%) aged 20–79 years suffered from DM. This figure is higher in the 65–79 age group, at 19.9%. The number of DM sufferers is estimated to continue to increase, reaching 20.4% in 2030 and 20.5% in 2045 (IDF, 2021).

In Indonesia, the prevalence of diabetes mellitus (DM) based on doctor's diagnosis among residents aged 15 years and older reached 10%. Nearly all provinces experienced an increase in prevalence in 2020, with the highest rates recorded in DKI Jakarta (3.4%), East Kalimantan (3.1%), the Special Region of Yogyakarta (3.1%), and North Sulawesi (3%). By gender, the prevalence of DM in 2018 was recorded at 1.2% in men and 1.8% in women. Meanwhile, in Lampung Province, the number of DM cases was

recorded at 22,345 cases (1.37%), with 0.82% of these cases in rural areas (Ministry of Health of the Republic of Indonesia, 2022) This condition shows that DM is still a public health challenge that requires collaborative efforts from health workers, the community, and families to reduce the incidence rate (SKI, 2023).

Families play a vital role in maintaining the health of their members, ensuring their productivity and efficiency. Family support can take the form of informational, instrumental, emotional, and even esteem support. states that the role of nurses in family nursing care includes modifying the family environment, facilitating the achievement of family developmental tasks, maintaining family structure and function, and helping families adapt to stressors so they can overcome health problems independently. This is in line with Dorothea E. Orem's (1971) theory in(Friedman, 2020)Every individual actually has the ability to meet their basic needs independently. Family support is a fundamental factor influencing a person's self-care agency in making decisions and carrying out self-care (Nwinee, 2011; Schnall). Family roles in health include recognizing health problems, determining appropriate action, caring for sick family members, modifying the household environment, and utilizing available health care facilities (Manungkalit & Sari, 2022).

For people with diabetes, family involvement is essential to achieving adaptive behavior and independence in self-care. One approach that can be developed is supportive-educative family care. This family support focuses on the five pillars of diabetes care: diet management, physical exercise, nursing therapy, medical therapy, and the use of complementary therapies. Supportive education within the family is implemented through three techniques: support, guidance, and teaching (Gandes et al., 2022).

Interviews with the NCD program manager at the Simbarwaringin Community Health Center in Central Lampung Regency in 2023 showed that there were 365 people with diabetes. This number was spread across several areas, namely Simbarwaringin (59 people), Trimurjo (46 people), Adipuro (53 people), Liman Benawi (36 people), Depokrejo (33 people), Tempuran (55 people), Purwodadi (59 people), and Purwoadi (24 people). However, most diabetes patients in these areas have not received supportive and educational family support. Many families do not understand how to care for their family members with diabetes, so patients tend to be less independent in managing their health.

Based on these problems, this study aims to develop a supportive-educative family care model and assess the effectiveness of family support in increasing the independence of DM patients, especially in controlling blood sugar levels through the five pillars of DM care in the working area of the Simbarwaringin Community Health Center, Central Lampung.

MATERIALS AND METHODS

This study used a quasi-experimental design. Researchers compared the effect of family support and educational groups for patients with diabetes mellitus on adaptive behavior and independence through interventions based on the five pillars of DM patient management. Respondents received family support and educational interventions related to the five pillars of DM patient management.

The population in this study were families whose family members suffered from DM who were in the area under the guidance of the Simbarwaringin Community Health Center, Central Lampung, totaling 365 people. Sampling used a non-probability sampling technique with a purposive sampling approach, namely determining the sample based on research criteria: Willing to be respondents in the study and agree to informed consent, able to communicate verbally and understand Indonesian, there are family members who suffer from Diabetes mellitus. Respondents in this study were 150 respondents divided into an intervention group of 75 and a control group of 75.

The data collection tool used the Diabetes Social Support Questionnaire-Family questionnaire modified by the researchers. Statistical tests used the Paired-Sample t-Test to test the effect in the intervention group and the Independent Two-Sample t-Test to test the difference between the control and intervention groups.

The research activity flow begins with outreach to respondents about the five pillars that can control blood glucose levels in cases of Diabetes Mellitus (Parkeni, 2021). The 5 pillars include: 1) education, 2) medical nutrition therapy, 3) physical exercise, 4) pharmacological therapy and 5) self-monitoring of blood glucose. Followed by the formation of supertive family groups of DM sufferers. After the group is formed, it is continued with training for family members or care givers of diabetes mellitus sufferers. After the training, mentoring is carried out in the educational support group in order to increase the knowledge and skills of family members in implementing the five pillars of controlling blood glucose levels. Then continued with monitoring the educational supportive behavior of care givers towards family members who suffer from diabetes mellitus. Then finally, the independent behavior of diabetes mellitus sufferers is checked including: compliance with 1) healthy eating patterns 2) Increasing physical activity 3) Using Diabetes medication in special circumstances safely and regularly 4) Conducting Independent Blood Glucose Monitoring (PGDM).

RESULTS AND DISCUSSION

Results

The study's respondents numbered 157, divided into an intervention group of 75 respondents, but only 72 had data that could be analyzed, and a control group of 85 responses. The results of the data analysis are

as follows:

Respondent characteristics

Table 1. Distribution of Respondent Characteristics Based on Respondent's Age, DM Patient's Age, Gender and Length of DM Suffering

Respondent characteristics	**Intervention group**		**Control Group**	
	Amount	**%**	**Amount**	**%**
Respondent's age				
Not yet productive	0	0	0	0
Productive	66	91.67	80	94.12
non-productive	6	8.33	5	5.88
	72	100%	85	100%
Age of DM Patients				
Not yet productive	0	0.00	0	0.00
Productive	56	77.78	60	70.59
non-productive	16	22.22	25	29.41
	72	100%	85	100%
Gender				
Man	13	18.06	21	24.71
Woman	59	81.94	64	75.29
	72	100%	85	100%
Long Time Suffering from DM				
≥ 1 year	29	40.3	16	18.82
1.1 - 3 years	6	8.3	19	22.35
≤ 3 years	37	51.4	50	58.82
	72	100%	85	100%

From table 1 it can be seen that almost all respondents or companions of DM patients were of productive age in the intervention group (91.67%) and the control group (94.12%), the age of DM patients was mostly of productive age in the intervention group 77.78% and the control group 70.59%, most of the DM patients were female in the intervention group 81.94% and the control group 75.29%, and based on the length of time suffering from DM more than half had been more than 3 years in the intervention group 51.4% and in the control group 58.82%.

Random Blood Sugar in DM Patients

Table 2. Distribution Random Blood Sugar before and after intervention in the intervention group and control group

Blood Sugar Value	**Intervention group**	**Control group**

		Amount	%	Amount	%
Before Intervention	<200	29	40.3	31	36.47
	>200	43	59.7	54	63.53
After the Intervention	<200	51	70.83	27	31.76
	>200	21	29.17	58	68.24

Based on table 2, the results obtained before the intervention were more than half of the DM patients with blood sugar >200 mg/dl in the intervention group 59.7% and the control group 63.53% and after the intervention, blood sugar >200 mg/dl in the intervention group 29.17% and in the control group 68.24%.

Respondent Knowledge

Table 3. Distribution Knowledge before and after intervention in the intervention group and control group

Knowledge about DM	**Intervention group**			
	Amount	**%**	**Amount**	**%**
	Before		**after**	
Good	29	40.3	22	30.56
Enough	10	13.9	31	43.06
Not enough	33	45.8	19	26.39
Knowledge about DM	**Control group**			
	Amount	**%**	**Amount**	**%**
	Before		**After**	
Good	1	1.18	1	1.18
Enough	30	35.29	32	37.65
Not enough	54	63.53	52	61.18

Table 3 shows that respondents' knowledge of DM before the intervention was given was mostly lacking knowledge in the intervention group (45.80%), and in the control group (63.53%). After the intervention, the majority of respondents' knowledge was sufficient (43.06%), and in the control group (61.18%).

Supportive Educational Family Intervention Group

Table 4. Distribution of mean values, standard deviations and standard errors of family educational support for family members of DM patients before and after intervention in the intervention group (N=72)

No	Educational Supportive Sub-Variable		Mean	Std. Dev	Std. Error
1	Nutritional Regulation	Before	18.57	11.57	1.36
		After	24.50	8.75	1.03
2	Physical Exercise	Before	10.22	7.88	.93
		After	15.10	7.86	.926
3	Pharmacological therapy	Before	10.88	10:52	1.24
		After	17.47	6.67	.79
4	Stress Management	Before	10.19	5.75	.68
		After	13.90	5.95	.70
5	Self-Blood Sugar Test	Before	11.94	8.62	1.01
		After	19.88	8.23	.97
6	Educational support	Before	61.81	34.53	4.07
		After	90.85	22.81	2.69

From table 4 it can be seen that overall the educational support provided by families to sick family members before the intervention averaged 61.81 with a standard deviation of 34.53 and a standard error of 4.07 and the average after the intervention was 90.85 with a standard deviation of 22.81 and a standard error of 2.28.

Table 5. Dependent t-test analysis of family educational support for family members of DM patients before and after intervention in the intervention group (N=72)

Family Educational Supportive Behavior	Mean	Std. Dev	SE Mean	p-value
Nutritional Regulation	-5.93	12.74	1.50	.000
Physical Exercise	-4.88	10.60	1.25	.000
Pharmacological Therapy	-6.60	10.79	1.27	.000
Stress Management	-3.71	8.72	1.03	.001
Self-Blood Sugar Test	-7.93	11.01	1.30	.000
Educational Supportive	-29.04	38.07	4,487	.000

From table 5, it can be seen that the average difference in educational support carried out by families on sick family members is -29.042 with a standard deviation of 38.07. The results of the statistical test obtained a p-value of 0.000, so it can be concluded that there is a significant difference in educational support carried out by families on sick family members after the intervention compared to before the

intervention.

Supportive Educational Family Control Group

Table 6. Distribution of mean values, standard deviations and standard errors of family educational support for family members of DM patients before and after intervention in the control group (N=85)

No	Educational Supportive Sub-Variable		Mean	Std. Dev	SE
1	Nutritional Regulation	Before	12.66	9.14	.99
		After	15.85	9.71	1.05
2	Physical Exercise	Before	8.14	6.82	.74
		After	10.89	6.94	.75
3	Pharmacological therapy	Before	10:55	7.65	.83
		After	10.94	7.67	.83
4	Stress Management	Before	9.41	5.21	.57
		After	10.54	4.98	.54
5	Self-Blood Sugar Test	Before	14.28	8.11	.88
		After	16.22	8.00	.87
6	Educational support	Before	55.05	32.28	3.50
		After	64.45	29.04	3.15

From table 6 it can be seen that overall the educational support given by families to sick family members before the intervention averaged 55.05 with a standard deviation of 32.28 and a standard error of 3.50 and the average after the intervention was 64.45 with a standard deviation of 29.04 and a standard error of 3.15.

Table 7. Dependent t-test analysis of family educational support for family members of DM patients before and after intervention in the control group (N=85)

Family Educational Supportive Behavior	Mean	Std. Dev	SE Mean	p-value
Nutritional Regulation	-3.19	13.51	1.47	.032
Physical Exercise	-2.75	9.37	1.02	.008
Pharmacological Therapy	-.389	10.84	1.18	.742
Stress Management	-1.13	7.21	.78	.152

PGDM	-1.94	11.94	1.29	.138
Educational Supportive	-9.40	44.32	4.81	.054

From table 7, it can be seen that the average difference in educational support provided by families to sick family members is -9,400 with a standard deviation of 44.32. The results of the statistical test obtained a p-value of 0.054, so it can be concluded that there is a significant difference in educational support provided by families to sick family members after the intervention compared to before the intervention.

Independent analysis of educational support before intervention of Intervention and Control groups

Table 8 Distribution of Mean, Standard Deviation and Standard Error of Family Educational Supportive Services for Family Members of DM Patients before the intervention in the intervention and control groups

No	Educational Supportive Sub-Variable		Mean	Std. Dev	Std. Error
1	Nutritional Regulation	Intervention	18.57	11.57	1.36
		control	12.66	9.14	.99
2	Physical Exercise	Intervention	10.22	7.88	.93
		control	8.14	6.82	.74
3	Pharmacological therapy	Intervention	10.88	10:52	1.24
		control	10:55	7.65	.83
4	Stress Management	Intervention	10.19	5.75	.68
		control	9.41	5.21	.57
5	Self-Blood Sugar Test	Intervention	11.94	8.62	1.02
		control	14.28	8.11	.88
6	Educational support	Intervention	61.81	34.53	4.07
		control	55.05	32.28	3.50

From table 8 it can be seen that overall the educational support provided by families to sick family members before the intervention averaged 61.81 with a standard deviation of 34.54 and a standard error of 4.07. In the control group the average was 55.05 with a standard deviation of 32.28 and a standard error of 3.50.

Table 9. Independent t-test analysis of family educational support for family members of DM patients before intervention in the intervention and control groups

Family Educational Support	Mean Diff	Standard Error Difference	p-value
Nutritional Regulation	5.91	1.65	.000
Physical Exercise	2.08	1.17	.078
Pharmacological Therapy	.32	1.45	.825
Stress Management	.78	.88	.373
Self-Blood Sugar Test	-2.34	1.34	.082
Educational Supportive	6.76	5.34	.207

From table 9, it can be seen that the average difference in educational support carried out by families on sick family members is 6.76 with a standard error of 5.34. The results of the statistical test obtained a p-value of 0.207, so it can be concluded that there is no significant difference in educational support carried out by families on sick family members before the intervention in the intervention group compared to the control group.

Independent analysis of family educational support after intervention in the Intervention and Control groups

Table 10. Distribution of Mean, Standard Deviation and Standard Error of Family Educational Supportive Services for Family Members of DM Patients After Intervention in the Intervention and Control Groups

No	Educational Supportive Sub-Variable		Mean	Elementary School	SE
1	Nutritional Regulation	Intervention	24.50	8.75	1.03
		control	15.85	9.71	1.05
2	Physical Exercise	Intervention	15.10	7.86	.93
		control	10.89	6.94	.75
3	Pharmacological therapy	Intervention	17.47	6.67	.79
		control	10.94	7.67	.83
4	Stress Management	Intervention	13.90	5.95	.70
		control	10.54	4.98	.54
5	Self-Blood Sugar Test	Intervention	19.88	8.23	.97
		control	16.22	7.99	.87
6	Educational support	Intervention	90.85	22.81	2.69
		control	64.45	29.04	3.15

From Table 10, it can be seen that overall, the educational support provided by families to sick family members after the intervention averaged 90.85 with a standard deviation of 22.81 and a standard error of 2.69. In the control group, the average was 64.45 with a standard deviation of 29.04 and a standard error of 3.15.

Table 11. Independent t-test analysis of family educational support for family members of DM patients after intervention in the intervention and control groups

Family Educational Supportive Behavior	**Mean Diff**	**SE Diff**	**p-value**
Nutritional Regulation	8.65	1.49	.000
Physical Exercise	4.20	1.18	.000
Pharmacological Therapy	6.53	1.16	.000
Stress Management	3.36	.87	.000
Self-Blood Sugar Test	3.65	1.30	.000
Educational Supportive	26.40	4.22	.000

From table 11, it can be seen that the average difference in educational support carried out by families on sick family members between the intervention group and the control group is 26.40 with a standard error of 4.223. The results of the statistical test obtained a p-value of 0.000, so it can be concluded that there is a significant difference in educational support carried out by families on sick family members after the intervention between the intervention group and the control group.

From Table 1, the research results show data on the ages of respondents and patients**.** DM Almost all respondents (91.67% intervention and 94.12% control) were of productive age. This indicates that the companion group has a high potential to provide effective support, because they are in an active and productive phase of life. And DM patients are also mostly of productive age, with 77.78% in the intervention group and 70.59% in the control group. This is in line with the theory that diabetes mellitus is more common in individuals over 45 years of age, but high rates in productive age indicate a significant health challenge for the community. Viewed from gender Gender: There is a predominance of female gender in both groups (81.94% intervention and 75.29% control). Previous research has shown that women are more vulnerable to diabetes complications, which may be caused by hormonal and social factors. This supports the importance of a gender-sensitive intervention approach in health programs. Duration of DM: More than half of patients in both groups have suffered from DM for more than 3 years (51.4% intervention and 58.82% control). In fact, longer duration of DM is associated with an increased risk of complications. Other research shows that patients with longer disease duration are more likely to experience serious health problems, making it crucial to provide ongoing education and interventions for disease management.

According to demographic theory, the productive age group is the period during which individuals can contribute economically and socially. With a high proportion of respondents and patients in this age group, health interventions can be directed at empowering this group to better manage their diabetes, thereby contributing to broader public health. Research by (Unger, T., Borghi, C., Charchar, F., 2020). Studies show that social support and diabetes education are crucial for patients, especially those in the productive age group. The support provided by respondents can improve adherence to treatment and lifestyle changes. Research by (Rahayu, 2023) Studies have shown differences in diabetes management between men and women, with women often experiencing greater difficulty managing the disease. Data showing a female predominance in both groups emphasizes the need for a more inclusive approach and consideration of gender differences in intervention programs.

The results of this study indicate significant characteristics of respondents and DM patients that may influence the effectiveness of interventions. By understanding demographics and factors contributing to DM management, intervention programs can be tailored to better meet the specific needs of age and gender groups.

Table 2 shows the data before the intervention, the percentage of diabetes mellitus (DM) patients with blood sugar levels >200 mg/dl was: Intervention Group: 59.7% and Control Group: 63.53%. After the intervention, the percentages became: Intervention Group: 29.17% Control Group: 68.24%. Comparison before and after the intervention in the intervention group showed a significant decrease from 59.7% to 29.17%. This shows that the intervention given was effective in lowering blood sugar levels in DM patients. In the control group, although blood sugar levels before the intervention were higher, after the intervention, the percentage increased to 68.24%. This shows that without intervention, the patient's condition can worsen. The educational intervention applied to the intervention group proved effective in lowering blood sugar levels. In contrast, the control group showed an increase in blood sugar levels, indicating the need for educational support to prevent worse conditions.

Educational support emphasizes the importance of education and support to improve patient understanding of diabetes management. Effective education can help patients change behaviors and improve adherence to treatment. In this context, interventions conducted for the intervention group might include: nutrition education: Teaching patients about the importance of a healthy diet. Increased physical activity and foot care: Motivating patients to be more physically active, both through daily activities and planned activities such as swimming, diabetes exercises, and diabetes foot exercises. Stress management: Teaching relaxation techniques that can help control blood sugar levels. And the importance of self-monitoring blood sugar (Mia, Chrisnawati, 2020).

Study (Gandes et al., 2022), it was found that the educational supportive model had a positive and significant effect on self-regulation (0.651) and self-efficacy (0.548), self-regulation on self-care agency

(0.592), self-efficacy on self-care agency (0.094), and self-care agency on HbA1c (0.130). The results of the study (Anggraini et al., 2019) showed that diet management education was able to improve self-efficacy and caregiver practices in dietary care of family members with type 2 diabetes (p-value = 0.000 and α = 0.05). Diet management education had an effect on self-efficacy and caregiver practices. The results showed that there was an average difference in foot care independence in the intervention group and the control group with a p-value of 0.000. Foot care education and practices should be provided early as a preventive measure for complications.

In Table 5, the average difference in educational support provided by families to sick family members is -29.042. A negative average difference indicates that the average level of educational support from families increased after the intervention. This suggests that families were more proactive in providing educational support to sick family members after receiving specific information or training.

The results of the statistical test p-value 0.000 indicate that the resulting mean difference is statistically significant. This indicates that the intervention successfully increased family educational support. This means that the intervention successfully influenced the way families interact and provide education to sick family members. Interventions in this study include education on nutritional management, physical exercise, pharmacological therapy, stress management, and self-blood sugar checks have been shown to change the dynamics of educational support within the family. This change is caused by increased family knowledge so that families are better at supporting sick family members through education, higher awareness Interventions can increase family awareness of the importance of educational support, so they are more active in providing support, Changes in Attitudes and Behavior occur, Families may feel more capable and motivated to help sick family members, which is reflected in the way they provide support. So it can be concluded that family involvement in the process of Treatment and care is more actively involved in the process of care and treatment of sick family members so that the support provided is more effective (Silalahi, 2019)

Qualitative research (Dewi et al., 2022) With respondents from families of patients diagnosed with type 2 diabetes mellitus, it was found that families play a significant role in caring for diabetes mellitus patients, including supporting family members with diabetes, reminding them to exercise and control their blood sugar, maintaining a diet, accompanying them in taking medication, controlling blood sugar levels, taking them to health facilities for check-ups, and caring for diabetic wounds. Furthermore, families play a role as motivators, coordinators, and contributors.

Table 11 shows a difference in the average educational support of 26.40 between the intervention and control groups. This indicates that the intervention implemented had a significant positive impact in increasing educational support from families. The statistical test results showed a p-value of 0.000, meaning that the results obtained were statistically significant ($p < 0.05$). The Impact on Families shows

the importance of educational support from families in the process of caring for sick family members. Families involved in the intervention tend to provide more support, which can contribute to improving the health and well-being of patients. Increased awareness among families with family members suffering from diabetes about the importance of the family's role in supporting sick members. Educational and training programs for families can be implemented to improve their support skills (Manungkalit & Sari, 2022).

CONCLUSION

The results of this study indicate that the intervention of forming a supportive-educational group for families of Diabetes Mellitus sufferers through the application of the five pillars of DM management (education, medical nutrition therapy, physical exercise, pharmacological therapy, and independent blood glucose monitoring) has a significant influence on increasing adaptive behavior and patient independence.

Before the intervention, most patients still had random blood sugar levels above 200 mg/dl and relatively low family knowledge about diabetes care. However, after group formation and educational assistance, there was a significant increase in family knowledge, skills, and supportive-educational behavior in the intervention group compared to the control group. This was demonstrated by a decrease in the proportion of patients with blood sugar >200 mg/dl from 59.7% to 29.17% in the intervention group, as well as significant differences in aspects of nutritional management, physical exercise, pharmacological therapy, stress management, and self-monitoring of blood sugar.

Thus, it can be concluded that family support through a supportive-educational model has proven effective in increasing family support, patient independence, and control of blood glucose levels in DM patients in the work area of the Simbarwaringin Community Health Center, Central Lampung.

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Declaration of Interest Statement

In research, research results are not influenced or there is no conflict of interest either with the funding provider, research location or with respondents and research data enumerators.

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