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ORIGINAL ARTICLE

The Effectiveness of Diabetes Self-Management Education on Improving the Self-Efficacy of Diabetes Mellitus Patients in the Puskesmas Kota Langsa

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Abstract: Diabetes Mellitus (DM) is one of the chronic diseases whose number of sufferers is increasing every year in various parts of the world. The low knowledge of diabetics regarding their disease causes them to be unable to properly carry out self-care, so their blood sugar levels are not controlled. Diabetes is also one of the comorbidities that causes death in COVID-19 patients. The purpose of this study was to test the effectiveness of *Diabetes Self-Management Education* (DSME) in improving the self-efficacy of type 2 diabetes mellitus patients in the work area of the Puskesmas Kota Langsa. The quasi-experimental method was used, and the design was pre-test and post-test with control group design, with 25 respondents in each group. The study was conducted from June 7–August 7, 2021, in the working area of the Puskesmas Kota Langsa. Data collection was carried out using questionnaires, the implementation of comprehensive education, the measurement of random blood sugar levels, and taking into account research ethics. The results of the study were obtained by the majority of female respondents in the early adult age category, the majority of whom had diabetes over 10 years old. The *paired t-test* found significant differences in the intervention group after receiving DSME education compared to the control group. Education was conducted intensively in the intervention group, which discussed knowledge of DM, diet, physical exercise, and stress management. It is hoped that Puskesmas can adopt DSME as a reference in educating the public, especially people with type 2 diabetes mellitus.

Keywords: Diabetes Self-Management Education, Self-Efficacy, DSME

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INTRODUCTION

Every year, the number of people affected grows in various parts of the world. This disease is a metabolic disorder in which the body's ability to utilize glucose, fat, and protein is impaired due to insulin deficiency or insulin resistance. [1] Diabetes is also a chronic metabolic disease characterized by an increase in blood glucose (or blood sugar) levels, which causes serious damage to the heart, blood vessels, eyes, kidneys, and nerves. The most common is type 2 diabetes mellitus, usually in adults, which occurs when the body becomes resistant to insulin or does not produce enough insulin.[2]

About 422 million people worldwide suffer from diabetes mellitus, mainly in low- and middle-income countries, and 1.6 million deaths are directly attributed to diabetes mellitus each year. Both the number of cases, and the prevalence of diabetes mellitus have been steadily increasing over the past few decades. [2] Data from the International Diabetes Federation in 2017 reported by liputan6.com stated that Indonesia was ranked as the 6th country with the highest number of diabetes mellitus sufferers, namely around 10.3 million people. Indonesia ranks 6th (six) after China, India, the United States, Brazil, and Mexico.[3]

In the case of the current Corona Virus Diseases 2019 (COVID-19) pandemic, diabetes mellitus trails hypertension to become a comorbid or the highest cause of death in COVID-19 sufferers. Comorbidity is the condition of two or more chronic diseases suffered by a patient. In COVID-19 patients who have comorbidities, they already have a congenital disease. According to data from Italy, 99 percent of COVID-19 patients who die have other diseases. More than 75% have hypertension, 35% have diabetes mellitus, and 33% have heart disease.[4]

Self-care is an individual's planned action to control his illness to maintain, and improve his health, and well-being status. [7] The concept model in Dorothea Orem's theory known as *the self-care* model provides a clear understanding that the form of nursing services is viewed as the implementation of activities that can be carried out by individuals with the aim of maintaining life, health, and well-being according to the state of health and illness, which emphasizes the client's needs for self-care. [8]

One of the important pillars in diabetes mellitus management is health education, which in its implementation requires the participation of patients, their families, and communities. Health workers become educators to assist patients, and their families in changing patient behavior. Integrated education, and motivation are useful for achieving successful behavior change. [9] *DSME* is an essential element of care for all people with diabetes mellitus, and is necessary to improve patient

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knowledge. The standards are designed to define quality diabetes mellitus self-management education, and to assist diabetes mellitus educators in a variety of ways to provide *evidence-based education.* [10]

DSME is an ongoing process to facilitate the knowledge, skills, and abilities necessary for the self-care of diabetes mellitus patients. This process combines the needs, goals, and life experiences of diabetics, and is guided by evidence-based standards. The overall goal of DSME is to support informed decision-making, self-care behaviors, problem-solving, and active collaboration with healthcare teams, and to improve the clinical outcomes, health status, and quality of life of people with diabetes mellitus. [10]

Self-efficacy or self-efficacy of diabetes mellitus focuses on the patient's confidence to be able to carry out behaviors that can support the cure of their disease, and improve *self-care* such as diet adherence, physical exercise, medications, glucose level control, and diabetes mellitus treatment in general. 13. Self-efficacy is defined as an individual's belief in his ability to organize, and perform certain tasks needed to obtain the expected results. Self-efficacy helps a person make choices and efforts to move forward, as well as persistence and perseverance in maintaining tasks that cover their lives. [14]

METHOD

This study used *the quasi-experiment* method with a design that included a *pre-test, and post-test research design with a control group design*. Respondents were patients' with diabetes mellitus type 2 divided into 2 (two) groups, namely the intervention group and the control group. Both groups began with a *pre-test*, after which the intervention group was given practice while the control group was not. After that, the intervention group was given a *post-test.* [22]

Table 1. Research Design

	Pre-Test	Intervention	Post-Test
Control Group	O1		O2
Intervention Group	O1	X	O2

This research was conducted at the Puskesmas Kota Langsa, from June 7 to August 7, 2021. The total sample was 25 people for each group, bringing the total respondents to 50. [25]

Data collection used questionnaires to measure self-efficacy, namely: the *Diabetes Management Self-Efficacy Scale* (Van der Bijl & Shortbridge-Bagget, 1999), which consisted of 20 questions. This questionnaire has been tested for validity, and reliability with 23 to 15 questions, because 5 questions are considered to be of the same intent. The Diabetes *Self-Management Education*

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material is adopted from The Liver, and consists of [12] module forms consisting of 5 (five) pillars of material, namely knowledge of diabetes mellitus, diet, physical activity, foot exercises, and foot care, as well as stress management in diabetes mellitus.

RESULT

General Description of the Subject

The subjects of this study were patients with type 2 DM who went to the Puskesmas Kota Langsa and were selected according to the criteria, and divided into intervention groups, and control groups of 25 respondents each.

Table 2. Characteristic Distribution of Respondents

Characteristics of Respondents	Intervention Group	Control Group
Gender		
Male	4 (16%)	11 (44%)
Woman	21 (84%)	14 (56%)
Age		
Late Adult	4 (16%)	3 (12%)
Early elderly	12 (48%)	12 (48%)
Late Seniors	6 (24%)	8 (32%)
Seniors	3 (12%)	2 (8%)
Education		
SD	5 (20%)	7 (28%)
Junior High School	4 (16%)	5 (20%)
High School	11 (44%)	8 (32%)
D3/D4/S1	5 (20%)	5 (20%)
Work		
Doesn't work	4 (16%)	3 (12%)
Civil Servants/TNI/Polri	3 (12%)	2 (8%)
Private employees	1 (4%)	3 (12%)
Self-employed	2 (8%)	5 (20%)
Farmer	2 (8%)	3 (12%)
Fisherman	2 (8%)	0
Housewife	11 (44%)	9 (36%)
Marital Status		
Marry	21 (84%)	22 (88%)
Widow/widower	4 (16%)	3 (12%)
Long-suffering from DM		
< 5 years	4 (16%)	5 (20%)
5-10 years	9 (36%)	7 (28%)
> 10 years	12 (48%)	13 (52%)

Based on table 2, the distribution of respondents in the intervention group was mostly women (84%), and the majority of the aged in the early elderly category, 45–55 years (48%). The majority had the last education of high school (44%), the majority of respondents did not work outside the home or had the status of a housewife (44%), the majority of respondents with married status or living with a partner (84%), and the majority had diabetes mellitus type 2 more than 10 years old (48%). Furthermore, the distribution of respondents in the control group was dominated by women (56%), the majority of the elderly (48%), the majority had a high school education (32%), the majority of respondents did not work outside the house or had the status of a housewife (36%), the majority of respondents with married status or living with a partner (88%), and the majority had suffered from diabetes mellitus type 2 more than 10 years old (52%).

Examination of Blood Sugar

Before respondents fill out the pre-intervention questionnaire, they are first

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examined for random blood sugar levels, and after filling out the post-intervention questionnaire, their blood sugar levels are also checked.

Table 3. Overview of Random Blood Sugar Levels Test Result

Group		Mean	SD	ONE
Intervention	Pre	358,40	90,029	18,006
	Post	321,04	93,120	18,624
Control	Pre	370,60	76,334	15,269
	Post	369,28	73,881	14,776

Based on table 2, there is a difference in the average results of random blood sugar levels of respondents of the intervention group before education (mean = 358.50) and after education (mean = 321.04). The control group also had differences in the average blood sugar levels of respondents before education (mean = 370.60), and after education (mean = 369.28).

Description of Self-Efficacy of Respondents of the Intervention Group

The picture of self-efficacy of respondents of the intervention group before, and after treatment can be described as in table 4. Before the intervention, the majority of respondents had moderate self-efficacy (64%), and after the intervention, the majority of respondents with high category self-efficacy (84%)

Table 4. An Overview of the Self-Efficacy of Respondents of the Intervention Group Before and After Intervention

Self-Efficacy	Pre Intervention	Post Interventions
Low	4 (16%)	0
Keep	16 (64%)	4 (16%)
Tall	5(20%)	21 (84%)
Sum	**25(100%)**	**25 (100%)**

Self-Efficacy of the Control Group

The picture of self-efficacy of respondents of the control group before, and after treatment can be described in table 5. Before the intervention, the majority of respondents had moderate self-efficacy (56%), and after the intervention, the majority of respondents were still moderate self-efficacious (60%).

Table 5. Description of the Self-Efficacy of the Control Group Respondents Before, and After the Intervention

Self-Efficacy	Pre Intervention	Post Interventions
Low	4 (16%)	3 (12%)
Keep	14(56%)	15 (60%)
Tall	7(28%)	7 (28%)
Sum	**25 (100%)**	**25 (100%)**

The Average Levels of Self-Efficacy of the Intervention Group and the Control Group Before and After the Intervention Were Similar.

The average picture of the self-efficacy of respondents of the intervention group and control group before and after treatment can be described as in table 6. Before the intervention, the majority of respondents had moderate self-efficacy

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(mean = 30.12) and after the intervention, the majority of respondents had high self-efficacy (mean = 39.4). In the control group, before *the intervention, the mean* was 29.80 and after the intervention, *the mean* was 30.12.

Table 6. An Average Picture of the Self-Efficacy of Respondents of the Intervention Group and the Control Group Before and After the Intervention

Group		Mean	SD	ONE
Intervesi Group	Pre	30,12	5,239	1,048
	Post	39,04	3,657	,731
Control Group	Pre	29,80	5,148	1,030
	Post	30,12	4,944	,989

Differences in the Self-Efficacy of Respondents Before and After the DSME Intervention in the Intervention Group

A bivariate analysis to test the differences in the self-efficacy of respondents before, and after the intervention using the *paired t-test*, whose data are presented in table 7, with results in the intervention group having significant differences before the intervention (mean = 30.12) compared to after the intervention (mean = 39.04), t = -9,387, and P-value 0.000. This shows that DSME education can be useful in improving the self-efficacy of people with type 2 diabetes mellitus.

Table 7. Differences In Self-Efficacy in the Group Pre-Intervention, and Post Intervention

Self-efficacy	Mean	SD	ONE	*P*-value
Pre-Intervention	30,12	5,239	1,048	0,000
Post Interventions	39,04	3,657	0,731	

Differences in Respondents' Self-Efficacy Before, and After Intervention in the Control Group

The differences in the self-efficacy of respondents before, and after intervention in the control group were tested using a *paired t-test*. The results are presented in Table 8. The test results were obtained on average before the intervention at 29.80, and after the intervention period, they obtained *a mean* of 30.12. There is a difference, but only a little bit, with *a P*-value *of* 0.018, and a value of t-2.551.

Table 8. Differences in Self-Efficacy in the Pre-Intervention and Post-Intervention in the Control Groups.

Self-efficacy	Mean	SD	ONE	P-Value
Pre-Intervention	29,80	5,148	1,038	0,018
Post Interventions	30,12	4,994	0,989	

Differences in Self-Efficacy of Respondents in the Intervention Group and the Control Group After the Intervention

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The results of the statistical test using *the independent sample t-test*, to see the difference in self-efficacy of respondents of the intervention group, and the control group after the intervention, showed that there was a difference in self-efficacy between the intervention group, and the control group after the intervention, with a value (*t* = 7.253; *P <0.0001*) as in table 9.

Table 9. Differences in Self-Efficacy of Respondents of the Intervention Group, and the Control Group After the Intervention

Self-efficacy	Mean	SD	ONE	*P*-value
Intervention Group	39,04	3,657	0,731	0,000
Control Group	30,12	4,944	0,989	

Discussion of Self-Efficacy of Respondents Before the Implementation Of DSME

Based on the results of the study obtained, the majority of respondents with moderate self-efficacy, in both the intervention group (64%), and the control group (56%), 16% of respondents were from both groups with low self-efficacy.

At the time of providing the first education, the average respondent did not understand self-management in the management of diabetes mellitus. Respondents did not yet know that *self-efficacy* is a determinant of how people feel, think, and motivate themselves, and has a major influence on behavior. [14] Self-efficacy is one of the most influential aspects of *self-knowledge* in everyday human life. This is because the self-efficacy possessed also influences the individual in determining the actions to be taken to achieve a goal, including the estimation of various events that will be faced. Self-efficacy is the belief that a person can master a situation and get positive results. [14]

Damayanti's research [16] of 2018 DSME was able to increase respondents' knowledge to reduce the risk of non-ulcer diabetes mellitus foot. The Liver[12] study also obtained results where before the intervention, the majority of respondents had moderate or low self-efficacy.

Harrington[30] recommends that health care providers adjust diabetes mellitus education programs for individuals living with type 2 diabetes mellitus. Through patient-care provider collaborative relationships, individuals may eventually experience improved self-efficacy, leading to improved self-management of people with type 2 diabetes mellitus. Based on his research, it was found that there were significant differences in respondents' self-efficacy before the implementation of DSME in respondents with DM type 2 in African women compared to after the implementation. Harrington administered the DSME for 4 hours, and used a *Stanford Self-Efficacy for Diabetes (SED)* questionnaire to measure respondents' self-efficacy.

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Self-Efficacy of Respondents After the Implementation of DSME

Based on the results of the study, the majority of respondents in the intervention group after obtaining DSME had high self-efficacy (84%). The high efficacy control group remained unchanged (28%), but respondents whose self-efficacy was increasing to 28%. The intervention group received DSME education while the control group was not educated, so there was no significant increase in self-efficacy.

The same study conducted by Sugarman[31], which created an *online* class to teach DSME to people with type 2 diabetes, gained an increase in respondents' self-efficacy, but the increase was not significant. The study was conducted in Ocala, Florida, US, with 50 respondents. Simbolon[32] research also found that DSME can improve the knowledge, attitude, and *self-efficacy* of people with type 2 diabetes mellitus. DSME educational materials are complete, and easy to understand by patients with diabetes mellitus, so that the items that become a reference in managing diabetes mellitus can be carried out properly. The success of diabetes mellitus management depends on information about type 2 diabetes mellitus, the patient's motivation, and self-efficacy to perform self-care designed to control psychological symptoms, and complications.

Self-efficacy is also a person's belief in one's own ability to face or solve a problem, achieve goals, and overcome obstacles to achieving an expectation in a particular situation. People with diabetes mellitus can continue to live a friendly life with their disease, and currently, in the COVID-19 pandemic season, they can manage the disease, and maintain themselves by staying vigilant to avoid COVID-19 disease. People with diabetes mellitus are more vulnerable to COVID-19 exposure or infection than people without comorbid diseases.

Differences in Self-Efficacy of Respondents Before, and After the Intervention of DSME

Using bivariate analysis to test the difference in respondents' self-efficacy before, and after the intervention using *the paired t-test*, results were obtained in that the intervention group had a significant difference before the intervention (Mean = 30.12) compared to after the intervention (Mean = 39.04), t = -9.387, and *P*-value 0.000. In the control group, the test results were obtained on average before the intervention, at 29.80, and after the intervention period, they were obtained at an average of 30.12. There is a difference, but only a little bit, with a *P*-value of 0.018, and a value of t -2.551. These results showed that by providing DSME education, the increase in respondents' self-efficacy was seen significantly.

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This study is in line with the Hati[12] study, in which it was found that the intervention group experienced a significant increase in self-efficacy after obtaining DSME materials compared to the control group that was not given any education during the research process. *Self-efficacy* is a determinant of how people feel, think, motivate themselves, and behave. Damayanti16's research also found that the provision of DSME education was able to reduce the incidence of non-ulcer diabetes mellitus in feet.

The Steinhardt[34] pilot study, which used the *Diabetes Coaching Program* (DCP) to examine the self-efficacy of people with type 2 diabetes, found that there was an increase in the efficacy, and self-management of diabetes mellitus. *The pilot* documented the feasibility, and potential effectiveness of DCP to improve diabetes mellitus empowerment, diabetes mellitus self-management, and reduction in the progression of obesity, type 2 diabetes mellitus, and cardiovascular disease in African American communities. The results of the study are in line with this study, where the provision of education or training related to diabetes mellitus was able to increase the self-efficacy of respondents with diabetes mellitus.

In line with this study, Walker[35] found that there was a significant association between the self-efficacy of diabetes mellitus, as measured by perceived diabetes mellitus self-management, and glycemic control, the mental health component of quality of life, medication adherence, and most self-care behaviors (diet, exercise, and blood sugar tests). Another similar study, also conducted by Hailu[36] at Jimma University Medical Center among adult patients with type 2 diabetes mellitus, found a significant improvement in the diabetes knowledge scores of intervention participants, and their adherence to dietary, and foot care recommendations. This suggests that DSME interventions are clinically important in developing countries such as Ethiopia.

Differences in Self-Efficacy of the Respondents Before, and After the Intervention of DSME

The results of the statistical test using *the independent samples t-test*, to see the difference in self-efficacy of the respondents of the intervention group, and the control group after the intervention, found that there was a difference in self-efficacy between the intervention group, and the control group after the intervention, with a value of t = 7.253; P <0.0001.

Indrayana[27] research found that DSME education affected the self-efficacy of type 2 diabetes mellitus patients, where there were significant differences between the treatment groups, while in the control group there was no significant increase in self-efficacy. The Liver[12] study also found

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that the intervention group experienced a significant increase in self-efficacy after obtaining DSME material compared to the control group after the intervention period. Widyanata[28's] research found that DSME was able to improve the self-efficacy of diabetes mellitus patients.

Sugarman[31] in his study found an increase in self-efficacy scores in participants with type 2 diabetes mellitus after *online* classes. However, these results were not significant. More than 92% of participants reported perceived benefits in the classroom, and were 100% interested in participating in other similar classes. Evidence suggests that face-to-face, lecture-style education for diabetes self-management has a significant positive effect on *self-efficacy* in patients with diabetes. However, web-based interactive self-paced programs such as modules or interactive websites do not have strong positive results on self-efficacy in patients with chronic diseases.[31]

One of the efforts that can be applied to diabetes mellitus patients is the DSME education program. DSME is a process of providing knowledge to patients about the application of care strategies independently to optimize metabolic control, prevent complications, and improve the quality of life of diabetes mellitus patients. DSME is an effort that can be done by nurses to provide ongoing education for clients, so as to save clients from complications. The emergence of complications that lead to death in diabetes mellitus patients is due to the low *self-efficacy,* and self-care behavior of diabetes mellitus patients themselves. *Low self-efficacy* has an impact on the low success of self-care of diabetes mellitus patients, causing an uncontrolled glycemic profile (HbA1c). Structured lifestyle education is needed to improve the glycemic profile (HbA1c), one of which is DSME.[28]

CONCLUSION

Based on the results of the study, researchers concluded that the self-efficacy of the intervention group respondents increased significantly after the DSME intervention, with as many as 84% of respondents having high categories. The average intervention group experienced an increase in self-efficacy from an average of 30.12 to 39.04 after the intervention. There were differences in respondents' self-efficacy before, and after the intervention using a *paired-samples t-test*, with the results in the intervention group having a significant difference before the intervention (Mean = 30.12) compared to after the intervention (Mean = 39.04), t = -9.387, and *P*- value 0.000. Differences in the self-efficacy of respondents before, and after intervention in the control group were tested using a *paired t-test*. The test results were obtained on average before the intervention at 29.80, and after the intervention period, at 30.12. Differences in self-efficacy of

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respondents of the intervention group, and the control group after the intervention found that there was a difference in self-efficacy between the intervention group, and the control group after the intervention with a value of t = 7.253; P< 0.0001.

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