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THE EFFECT OF DIABETES SELF-MANAGEMENT EDUCATION (DSME) ON BLOOD SUGAR CONTROL IN PATIENTS WITH DIABETES MELLITUS

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ABSTRACT
Diabetes mellitus (DM) is a growing global health issue, both in terms of its prevalence and the impact of its complications. Controlling blood sugar levels is a key component in preventing DM complications. However, managing blood sugar remains challenging, primarily due to a lack of patient knowledge and skills in self-management. Diabetes Self-Management Education (DSME) is an educational approach designed to enhance patients' ability to independently manage their condition. This study aims to analyze the effect of DSME on blood sugar control in DM patients at Merauke Regional General Hospital. A pre-experimental design with a pretest-posttest approach without a control group was used. The sample consisted of 21 DM patients selected using probability sampling techniques. The intervention involved DSME delivered over four educational sessions, covering topics such as the concept of DM, dietary regulation, physical activity, and blood sugar monitoring. Blood sugar levels were measured before and after the intervention using a portable glucose meter. Data analysis was performed using repeated measures ANOVA. The average blood sugar levels of the patients decreased from 229 mg/dL before the intervention to 175 mg/dL at the first follow-up and 177 mg/dL at the second follow-up after the DSME intervention. The analysis showed a significant effect of DSME on reducing blood sugar levels ($p < 0.05$). DSME proved effective in improving blood sugar control in DM patients through structured education that supports self-care. This program also helps patients understand the importance of adopting a healthy lifestyle and adhering to therapy. Continuous implementation of DSME is recommended to improve the quality of care for DM patients and reduce the risk of long-term complications.

Keywords: blood sugar; diabetes mellitus; DSME; self-management

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INTRODUCTION

The International Diabetes Federation (IDF) confirms that Diabetes Mellitus (DM) is a global health emergency due to the rapid increase in cases. In 2021, more than half a billion people, or 537 million individuals worldwide, were living with DM. This number is projected to rise to 643 million (1.1%) by 2030 and 783 million (2.5%) by 2045. DM not only affects adults but can also occur in children and adolescents up to the age of 19, with cases in this group increasing annually. According to the 10th edition of the IDF Atlas published in 2021, it is estimated that over 1.2 million children and adolescents are living with type 1 DM. Additionally, data indicates high blood glucose levels during pregnancy, affecting 1 in 6 pregnancies globally. (Magliano et al., 2021; Ogurtsova et al., 2022).In Indonesia, the prevalence of Diabetes Mellitus (DM) among individuals aged 20–79 years is 10.6%, affecting approximately 19,465,100 people, with an estimated mortality rate of 236,711 cases. Moreover, the proportion of undiagnosed diabetes cases in this age group is 73.7%. According to data from the Health Research and Development Agency of the Indonesian Ministry of Health in 2019, the prevalence of DM in Papua Province is 1.1%. At Merauke Hospital , the number of non-insulin-dependent DM cases reached 787 in 2020 (Kementerian kesehatan RI, 2021).

Diabetes Mellitus is a chronic disease characterized by a metabolic disorder resulting in elevated blood glucose levels (hyperglycemia), which may lead to complications in the future (American Diabetes Association, 2023). DM complications are categorized into two types: macrovascular complications, including coronary artery disease, peripheral artery disease, and stroke; and microvascular complications, such as diabetic retinopathy, nephropathy, and neuropathy. These complications may already be present at the time of DM diagnosis. The effects of high blood sugar levels include a range of complications, prolonged medical care needs, high healthcare costs, reduced productivity, and even death. DM patients require adequate knowledge to build confidence in managing their condition through appropriate self-care activities (Elhefnawy et al., 2022)The introduction of diabetes self-management education plays a crucial role in reducing complications and premature mortality. Diabetes Self-Management Education (DSME) is a structured, ongoing educational program designed to provide DM patients with the knowledge, skills, and abilities necessary to manage their condition effectively (Banerjee et al., 2020).

According to Dewi (2020) DM management begins with education to improve patients' knowledge, skills, and self-care practices by integrating the four pillars of DM management. This integration guides DM patients to adhere to treatments, encouraging them to adopt healthier lifestyles. showed significant differences in blood glucose levels in type 2 DM patients before and after the application of DSME interventions.Blood sugar control is a critical component in preventing DM complications. However, challenges persist in managing blood sugar levels, primarily due to a lack of patient knowledge and self-management skills. DSME is an educational approach aimed at enhancing the ability of DM patients to independently manage their condition. It includes education on diet, physical activity, blood glucose monitoring, and proper medication use(Kusnanto et al., 2019; Prabowo et al., 2021). Numerous studies have demonstrated that DSME effectively improves blood glucose control by encouraging healthy behavior changes. Furthermore, DSME has been shown to enhance the quality of life for DM patients and reduce the risk of complications (Gracia, 2023).

DSME employs methods such as counseling, guidelines or modules, and behavioral interventions to improve patients' and their families' understanding of DM and their skills in managing the disease. This study aims to assess the effect of DSME on blood glucose control in DM patients at RSUD Merauke. It utilizes DSME guidelines to provide education focused on improving knowledge, skills, and self-care, leading to healthy lifestyle changes. However, implementing DSME in areas with limited healthcare access, such as Merauke Regency, remains a challenge. As a referral hospital in Papua, RSUD Merauke plays a strategic role in providing healthcare services for DM patients. Despite this, the effectiveness of DSME implementation in blood glucose management at the hospital has not been widely studied.The objective of this study is to evaluate the impact of DSME on blood glucose control in DM patients by providing counseling during each session and focusing on achieving controlled blood glucose levels, ultimately preventing acute complications and maximizing the quality of life for DM patients.

METHOD

This study is a quantitative research utilizing a pre-experimental design. Pre-experimental research is an experimental study conducted without considering a control group, where respondents are given a treatment, followed by observation of its effects . This design was employed to evaluate the outcomes of implementing Diabetes Self-Management Education (DSME) on blood sugar control in Diabetes Mellitus (DM) patients. Data collection was conducted from August to October 2024 at the Outpatient Unit of Merauke Regional General Hospital (RSUD).The study sample consisted of DM patients who met the predefined

inclusion criteria, involving a total of 21 respondents. Sampling was carried out using probability sampling techniques. The DSME intervention was delivered using leaflet media over four sessions. The sessions were structured as follows: Initial Meeting: Presentation of the program objectives, blood sugar target goals, and baseline blood sugar measurement. Session 1: Explanation of DM concepts, including its definition, causes, symptoms, complications, and management, followed by blood sugar measurement. Session 2: Education on dietary management for DM patients. Session 3: Instruction on physical activity and DM foot exercises. Session 4: Final blood sugar measurement. Fasting blood glucose (FBG) levels were measured repeatedly after the intervention using a portable glucose monitoring device (Easy Touch GCU). Measurements were taken before the intervention, followed by the first and second post-intervention measurements. Data analysis was performed using repeated measures ANOVA. This study received ethical approval from the Ethics Committee of the Faculty of Health Sciences, Respati University Yogyakarta, with protocol number 071.3/FIKES/PL/VI/2024. This study aims to evaluate the effect of Diabetes Self-Management Education (DSME) on blood sugar control in patients with diabetes mellitus, in order to improve patients' self-management in effectively managing their diabetes condition

RESULT

Table 1.
Frequency Distribution of Respondent Characteristics (n=21)

Characteristic	f	%
Sex		
Male	11	52,4
Fenale	10	47,6
Duration of Diabetes		
<1 Year	6	28,6
< 5 Year	10	47,6
>5 Year	5	23,8
Education		
Primary School	3	14,3
Junior Hight School	5	23,8
Senior Hight School	4	19,0
University	9	42,9
Occupation		
Not Employed	4	19,0
Farmer	1	4,8
Enterpreneure	1	4,8
Private Employee	2	9,5
Civil Servant	6	28,6
Other	7	33,3

Table 1 shows the characteristics of the 21 respondents based on gender, with the majority being male, accounting for 11 respondents (52.4%). As for the duration of diabetes, 10 respondents (47.6%) had been diagnosed for less than 5 years. Nine respondents (42.9%) had a higher education level, and seven respondents (33.3%) were categorized under "other" occupations.

Sphericity Mauchly Test

Table 2.
Mouchly's Test of Sphericit

Variable	Mauchly,s W	df	P Value
DSME	0,333	2	0,000

Table 2 shows the Mauchly's Sphericity Test, which is used to assess the variation in repeated data. The table above indicates that the significance probability value is below 0.05, meaning that the variation in the data is significantly different. Therefore, due to the variation in the

data, the repeated measures ANOVA test with the Greenhouse-Geisser correction was used for the analysis.

Tabel 3.
Test of Within – Subjects Effects

DSME	df	F	P Value
Sphericity Assumsed	2	7.025	0.002
Greenhouse-geisser	1.200	7.025	0.011
Huynh-Feldt	1.234	7.025	0.10
Lower-bound	1.000	7.025	0.015

Table 3 shows the Within-Subject Test, which is used to test the equality of variances. Therefore, the most appropriate repeated measures ANOVA test to use is the Greenhouse-Geisser test. The probability value of the test shows a significance of 0.011, indicating that there is a significant difference in the measurements taken from the respondents before, after the first measurement, and after the second measurement following the DSME intervention.

Table 4.
Estimates

DSME	Mean	SE	CI 95%
1	229.048	26.154	174.49-283.60
2	175.238	21.288	130.83-219.64
3	177.429	21.255	133.09-221.76

Based on the table above, the implementation of DSME activities resulted in a decrease in blood sugar levels in DM patients. The average statistical results show a reduction in blood glucose from 229 mg/dL to 175 mg/dL at the first measurement, and from 229 mg/dL to 177 mg/dL at the second measurement.

DISCUSSION

The results of the study show that Diabetes Self-Management Education (DSME) has a significant effect on blood glucose control in diabetes mellitus patients at RSUD Merauke. These findings are consistent with previous studies indicating that DSME is effective in enhancing patients' understanding and skills in managing their diabetes. Megawaty et al., (2023) stated that DSME helps patients recognize factors that influence blood glucose levels, such as diet, physical activity, and adherence to therapy. In this study, the structured implementation of DSME allowed patients to better understand the importance of lifestyle changes. DSME, integrated with family support, can significantly improve blood glucose control. On the other hand, the success of DSME is also influenced by the sustainability of the program and the level of patient involvement. Studies in other areas show that approaches involving individual counseling, group discussions, and the use of technology such as health monitoring apps can enhance the effectiveness of DSME(American Diabetes Association, 2023; Yorke & Atiase, 2018)Diabetes Self-Management Education (DSME) is a crucial intervention aimed at improving self-efficacy and self-management skills in individuals with diabetes. The implementation of DSME has shown significant improvements in various aspects of diabetes management, including eating habits, physical activity, and overall health outcomes. This educational approach empowers patients to control their condition, thereby reducing the risk of complications associated with diabetes. DSME significantly improves self-efficacy among diabetes patients. For example, a study showed that patients' self-efficacy scores sharply increased after DSME intervention, with one patient's score rising from 58 to 87(Putra & Tursina, 2024)

DSME has been shown to significantly affect blood glucose control in patients with diabetes mellitus. Several studies indicate that structured DSME programs improve patients' knowledge and self-management skills, leading to better glycemic outcomes. The following

section details the effects of DSME on blood glucose levels, patient knowledge, and overall diabetes management. A study in Bekasi showed that participants experienced a reduction in blood glucose levels after the DSME program, with one patient's glucose dropping from 158 mg/dL to 139 mg/dL, and another from 146 mg/dL to 124 mg/dL (Nurhayati et al., 2024). Another study highlighted that DSME, combined with acupressure, resulted in lower blood glucose levels, demonstrating the effectiveness of educational interventions in managing diabetes(Niswatin & Purwanti, 2024) The research also shows that DSME significantly increases diabetes knowledge among patients. For instance, a study reported an average increase of 13.29 in diabetes knowledge scores post-intervention. Increased knowledge leads to better dietary management and adherence to treatment protocols, which are critical for effective diabetes control (Astuti, 2024). DSME fosters long-term self-management skills, empowering patients to take control of their health. This includes understanding dietary restrictions, recognizing symptoms, and managing medications. Ongoing education through DSME is crucial for maintaining improved blood glucose control and enhancing the quality of life for diabetes patients (Syikir et al., 2023)

While DSME has shown positive effects on blood glucose control, it is important to recognize that not all patients respond in the same way. Factors such as socioeconomic status, access to healthcare, and individual motivation can influence the effectiveness of the DSME program. Therefore, a tailored approach may be necessary to maximize the benefits for diverse patient populations. Subkhan et al., (2024) found a significant difference in self-efficacy before and after DSME, with a p-value of 0.000, indicating strong effectiveness. DSME has been associated with better dietary habits, with patient adherence to recommended diets increasing from 56.0% to 69.3% (Agow et al., 2024).Physical activity levels also significantly improved, from 54.7% to 76.0%, demonstrating the program's role in promoting healthier lifestyles (Agow et al., 2024). Community-based DSME interventions showed a 48.55% improvement in self-management status among participants, highlighting the importance of tailored educational resources (Fahardianto & Rosyid, 2023; Nadya Nova et al., 2024)The findings of this study also show that the majority of diabetes mellitus (DM) patients are male (52.4%). This is consistent with Ciarambino et al., (2022) who stated that gender differences do not directly cause DM, but habits such as alcohol consumption and smoking are more prevalent in men, increasing the risk of DM. This study found that these habits are more common in men, which raises the risk of DM. Alcohol affects glucose metabolism by inhibiting gluconeogenesis and glycogenolysis, while nicotine in cigarettes reduces insulin sensitivity by increasing free radicals. Azizi et al., (2023)further added that high alcohol consumption in men in Papua impacts the increased SGOT levels, which are risky for metabolism.

The highest educational distribution among respondents was 42.9% with a higher education background. Roza et al., (2022)showed a significant relationship between higher education and self-care in DM, although higher education does not always guarantee a healthy lifestyle. Researchers noted that respondents with higher education often work in offices with low physical activity and unhealthy eating habits, such as consuming fast food(Arania et al., 2021). This is reinforced by Ramadhani & Khotami (2023)who stated that busy work schedules can lead to lifestyle changes contributing to DM. Most respondents (47.6%) had been suffering from DM for less than five years. The duration of DM relates to the risk of complications, such as diabetic neuropathy. According to Liao et al., (2023) poor blood glucose control and chronic hyperglycemia can lead to various complications, including neuropathy. Mawaddah & Wati (2024) also found that DM patients with more than five years of illness have a 4–5 times higher risk of developing diabetic neuropathy compared to those with short-term DM(Hendry et al., 2023).DSME is a health education program designed to facilitate knowledge and skills for self-management of DM, which is essential for patient self-

care. The DSME conducted in four sessions includes an initial meeting to explain the purpose of the activity, blood glucose targets, and measurement, session 1 covering the concept of DM (definition, causes, symptoms, complications, management) and blood glucose measurement, session 2 on dietary management for DM patients, session 3 on physical activity and DM foot exercises, and session 4 involving blood glucose measurement. Fasting blood glucose (FBG) levels are measured repeatedly after DSME interventions.

CONCLUSION

This study shows that Diabetes Self-Management Education (DSME) has a significant impact on blood glucose control in patients with diabetes mellitus at RSUD Merauke. The DSME intervention, which involves structured education on diabetes management, including diet regulation, physical activity, self-monitoring of blood glucose, and medication management, has a positive effect in enhancing patients' ability to manage their condition. The results indicate that patients who participated in the DSME program experienced better blood glucose reductions compared to those who did not receive the intervention. Furthermore, DSME also improved patients' understanding of the importance of self-care, adherence to medication, and making informed decisions in managing their condition. Thus, the implementation of DSME at RSUD Merauke can serve as an effective strategy to improve the quality of care for diabetes mellitus patients and help reduce the long-term risk of diabetes-related complications. This program should be continuously developed and implemented to improve patient health outcomesReference

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