Exploring the relationship between self-management and blood glucose level in patient with type 2 diabetes mellitus

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ABSTRACT

Background: Diabetes mellitus (DM) is a condition characterized by high blood sugar levels resulting from unstable blood sugar levels in diabetics. DM can not only be treated with pharmacological therapy but also requires non-pharmacological therapy, one of which is self-management.
Objective: to determine the relationship between the level of self-management and blood glucose in type 2 diabetes mellitus.
Methods: This research employed a cross-sectional design with 35 respondents selected through an accidental sampling technique. Data collection involved using the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire and a Glucometer. The data were then analyzed using the Spearman Rank Test.
Results: The data analysis revealed that 62.9% of patients with Type 2 DM experienced self-management in the medium category, and 88.6% had blood sugar levels in the high category. Based on the analysis results, a p-value of 0.180 was obtained, indicating that there is no relationship between self-management and blood glucose levels in patients with type 2 diabetes mellitus. The correlation coefficient of -0.232 indicated a low correlation strength, and as the correlation coefficient is negative, the relationship between the two variables is not in the same direction.
Conclusions: It is evident that need more investigation of self-management practices to achieve stable or normal blood sugar levels. Improving self-management is crucial as it can help prevent complications associated with diabetes mellitus.

Keywords: self-management; blood sugar levels; type 2 diabetes mellitus

INTRODUCTION

Diabetes mellitus (DM) is one of the non-communicable diseases that continue to be a problem in Indonesia. DM is a condition characterized by high blood sugar levels resulting from unstable blood sugar levels in people with diabetes (International Diabetes Federation, 2017). Being a chronic disease, DM can have negative impacts on various aspects of life, and individuals with the condition must be able to independently manage all

Nursing and Healthcare Practices

- *Nursing and healthcare practices for patients with T2DM should prioritize improving self-management techniques to achieve stable or normal blood sugar levels.*
- *Healthcare providers should focus on educating patients about effective self-management strategies, as the data analysis shows that a significant percentage of patients had blood sugar levels in the high category.*
- *Given the low correlation strength between self-management and blood glucose levels, healthcare professionals must explore other factors and interventions that could contribute to better diabetes mellitus management and prevent complications.*

of these components throughout their lives (Ansari et al., 2022). The treatment of DM not only involves pharmacological therapy but also requires non-pharmacological therapy, such as self-management (M. Hidayah, 2019). Self-management is an integral part of DM control and involves individual behaviors carried out consciously, universally, and limited to oneself (Handriana & Hijriani, 2020). Effective self-management can help stabilize blood glucose levels.

According to the International Diabetes Federation (IDF) in 2017, the worldwide prevalence of DM among people aged 20-79 years was 425 million, and it is estimated to increase to 629 million by 2045. In Indonesia, the prevalence of people with diabetes mellitus increased by 1.6% from 6.9% in 2013 to 8.5% in 2018. Specifically in East Java, the prevalence of diabetes mellitus rose from 2.1% in 2013 to 2.6% in 2018 (Rikesdas, 2018). In Banyuwangi, there were 41,965 people with diabetes mellitus in 2019, with the Klatak Health Center having the highest number of diabetes mellitus patients, reaching 1,737 individuals. As of 2021, the Klatak Health Center had 346 DM patients receiving regular treatment, with blood sugar levels exceeding 200 mg/dL.

Type 2 diabetes mellitus (T2DM) can occur due to several risk factors, including lifestyle, medical conditions, genetics, psychosocial factors, and demographic factors. These factors include hyperuricemia, sleep quality/quantity, smoking, depression, cardiovascular disease, dyslipidemia, aging, ethnicity, family history of diabetes mellitus, hypertension, physical activity, and obesity (Ismail et al., 2021). Diabetes mellitus causes short-term and long-term health complications. Blood sugar control is essential to reduce the morbidity and mortality of DM sufferers by preventing and/or delaying the emergence of complications. Optimal glucose level control can only be achieved when the patient adheres to self-management practices, such as maintaining a healthy diet, engaging in physical activity, monitoring blood sugar levels, taking medication regularly, and reducing risk factors (Mikhael et al., 2019). Proper self-management can effectively stabilize the blood sugar levels of people with diabetes.

Self-management refers to an individual's ability to manage daily life, control, and reduce the impact of the illness he or she suffers from. In the context of diabetes, self-management serves as the foundation of diabetes treatment and plays a critical role in preventing complications. Self-management strategies for diabetes patients include focusing on glucose control through diet, physical exercise, and medication/insulin management (Galuh & Prabawati, 2021). Efforts to control risk factors for type 2 diabetes mellitus are known as "CERDIK" actions, which involve: 1) Regular health checks to control weight, check blood pressure, blood sugar, and cholesterol regularly, 2) Avoiding cigarette smoke and refraining from smoking, 3) Engaging in regular physical activity for at least 30 minutes a day, 4) Maintaining a balanced diet with healthy food and balanced nutrition, 5) Ensuring adequate rest, and 6) Properly managing stress (Kemenkes RI, 2017).

In the literature review of self-management of Diabetes Mellitus, particularly focusing on Type 2 DM patients at the Tarogong Health Center, self-management is defined as the actions taken by DM patients to manage and control their condition, which include activities like diet, exercise, blood sugar monitoring, medication management, and foot care. The goal of self-management is to optimize the control of metabolism in the body, prevent acute and chronic complications, improve the patient's quality of life, and reduce the

cost of treating DM. In the study, nearly all respondents with T2DM (97.1%) demonstrated moderate self-management. These results differ from previous research where the self-management behavior of T2DM patients was categorized as good. The aim of this study is to evaluate the correlation between the level of self-management and blood glucose in type 2 diabetes mellitus.

METHODS

Design

A cross-sectional design was used in this study.

Sample and Setting

The study was based on the total population of 346 people with DM at the Klatak Health Center. The sample size was calculated using 10% of the population, resulting in 35 DM patients. The inclusion criteria for the sample were as follows: T2DM patients recorded at the Klatak Health Center, T2DM patients seeking treatment at the Klatak Health Center, T2DM patients willing to participate as respondents, and patients capable of performing activities independently. On the other hand, the exclusion criteria included: T2DM patients with complications that may interfere with the study (e.g., chronic kidney failure, heart failure, visual impairment), elderly individuals with T2DM who have hearing and memory impairments, and T2DM with physical, mental, or cognitive limitations that may interfere with research (e.g., visual impairment, hearing impairment, and mental impairment).

Data Collection

The independent variable in this study is self-management, while the dependent variable is the blood sugar levels in T2DM patients. The instruments used in this study to assess self-management were the Summary of Diabetes Self-Care Activity Questionnaire (SDSCA) and a glucometer to measure blood sugar levels in T2DM patients. The research was conducted at the Klatak Health Center in Banyuwangi, East Java, Indonesia, from May 11th to May 23rd, 2022. Data collection involved providing direct questionnaires to respondents who met the inclusion criteria. Researchers also checked the blood sugar levels of the respondents and administered the SDSCA questionnaire. Subsequently, the researchers summarized and processed the research results.

Data Analysis

The results of the data analysis in this study utilized the Spearman Rank statistical test using SPSS 25 for Windows. If the value obtained in the statistical test shows a p-value < 0.05, then there is a significant relationship between the level of self-management and blood sugar levels in T2DM patients. In other words, Ho is rejected. Conversely, if p ≥ 0.05, it means Ho is accepted, indicating that there is no significant relationship between the level of self-management and blood sugar levels in patients with T2DM.

Ethical Consideration

The researcher followed an ethical process by submitting an ethical test to the Klatak Health Center. Research ethics in this study involved health workers as research subjects, necessitating adherence to research ethical standards. The researcher obtained informed consent from the respondents after providing a detailed explanation of the research process. Respondents signed the informed consent, and the researcher ensured the confidentiality of the data. The study received ethical approval from the Health Research Ethics Committee Institute of Health Science Banyuwangi, with the ethical approval number: 100/01/KEPK-STIKESBWI/IV/2022.

RESULTS

Table 1 presents the demographic characteristics of the respondents. It indicates that the majority of respondents were aged between 46 and 55 years old, with 18 respondents (51.4%). Among the participants, 26 respondents (74.3%) were female, and 20 respondents (57.1%) had an elementary school education level. Additionally, 22 respondents (62.9%) identified as housewives. The study also found that most of the participants had been suffering from diabetes mellitus for more than 5 years, with 24 people (68.6%).

The data analysis results revealed that 63% of patients with T2DM experienced self-management in the medium category, while 88% had blood sugar levels in the high category. The data was then subjected to the Spearman rank test using SPSS version 25 with a significance level of 0.05. The obtained p-value was 0.180, which indicates that the p-value is greater than 0.05 (p > 0.05). Since the p-value is greater than 0.05, the alternative hypothesis is rejected, and the null hypothesis is accepted. This means

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Table 1. Respondents Characteristics (n=35).

Characteristics	Category	n	%
Age	46-55 years	18	51.4
	56-65 years	13	37.1
	>65 years	4	11.4
Gender	Male	9	25.7
	Female	26	74.3
Level of Education	Elementary school	20	57.1
	Junior high school	3	8.6
	Senior high school	11	31.4
Occupation	Bachelor	1	2.9
	Entrepreneur	6	17.1
	Housewife	22	62.9
	Civil servant	1	2.9
	Trader	6	17.1
Length of Disease	>5 year	24	68.6
	5-10 year	5	14.3
	>10 year	6	17.1

Table 2. The Correlation between Self-Management level and Blood glucose.

Self-management	Blood Glucose		Total	p	r
	80-144	>144			
Low	0 (0%)	12 (34%)	12 (34%)	0.180	-0.232
Medium	4 (12%)	18 (51%)	22 (63%)		
High	0 (0%)	1 (3%)	1 (3%)		

that there is no significant relationship between self-management and blood glucose levels in patients with T2DM. Additionally, the correlation coefficient was calculated to be -0.232, indicating a low correlation strength between the two variables. The negative correlation coefficient suggests that the relationship between self-management and blood glucose levels is not in the same direction; in other words, as self-management increases, blood glucose levels do not necessarily decrease or vice versa (Table 2).

DISCUSSION

Diabetes self-management is defined as the independent self-care carried out by individuals with DM, involving knowledge, attitudes, and behaviors to maintain personal health and prevent long-term complications (Nguyen et al., 2022). There are 5 pillars of self-management for type 2 diabetes mellitus, namely education, nutritional therapy (diet), physical activity (exercise), blood sugar monitoring, pharmacological interventions, and wound care (PERKENI, 2015). Good or bad self-management is influenced by several factors that can affect patients in managing their diabetes, namely age, gender, level of education, and duration of suffering from DM (Ningrum et al., 2019).

One of the factors that can affect self-management is age. Based on the study results, 22 respondents (62.9%) had self-management in the medium category, and almost half of them were 14 respondents (40.0%) aged between 46 and 55 years. The self-management questionnaires were filled out by respondents who have experienced an aging process, resulting in changes to their physique and anatomy. As a result, respondents with increasing age are better able to understand and monitor their self-management. This is in line with the research by Azissah (2017),

which states that the aging process occurring after the age of 30 years results in anatomical, physiological, and biochemical changes.

Another factor that can affect self-management is gender. According to the study results, 22 respondents (62.9%) had self-management in the medium category, and the majority of them (19 respondents, 54.3%) were female. The researcher mentioned that there were more female respondents than male because female respondents were better at managing their self-management health and paying more attention to it compared to men. This is in line with the previous study which suggests that females tend to exhibit better self-management compared to male clients (Fatimah, 2016).

The level of education is another factor that can affect self-management. Based on the study results, 22 respondents (62.9%) had self-management in the medium category, and almost half of them were 14 respondents (40.0%) with an elementary school education level. The researcher stated that respondents with elementary school education had less knowledge related to health sciences. On the other hand, higher education allows individuals to gain more knowledge, specifically about self-management information, leading to more positive behavior. This is in line with the theory proposed by Notoatmodjo (2014), which suggests that good education results in more open and objective behavior when receiving information.

Self-management can be influenced by the duration of suffering from DM. Based on the study results, it was found that 22 respondents (62.9%) had self-management in the medium category, and most of the long-time DM sufferers were 24 respondents (68.6%) with a duration of less than 5 years. From the self-management interviews, the researchers stated that respondents who had experienced DM for less than 5 years were more likely to neglect their self-management due to frustration from continuous treatment, leading to potential complications. These complications can worsen physical and psychological conditions, and coupled with a lack of knowledge about self-management, patients may face difficulties in improving their self-management and achieving therapeutic targets. This finding is in line with the research of (Windani & Rosidin (2019), which suggests that patients diagnosed with DM for less than 5 years exhibit better medical behavior compared to those with longer treatment duration who may feel frustrated.

Blood sugar levels fluctuate, increasing after eating and decreasing in the morning after waking up. Hyperglycemia occurs when blood sugar levels rise above normal, while hypoglycemia refers to blood sugar values falling below normal (PERKENI, 2015). Patients with T2DM may not be aware that their blood glucose levels are already high due to several factors. Factors that can be changed include the level of education, which can influence the patient's knowledge (Nababan et al., 2019), while factors that cannot be changed include age and gender (Akhsyari, 2016).

Age is a factor that can affect blood sugar levels. Based on the study results, 31 respondents (88.6%) had blood sugar levels in the high category (above 144 mg/dL), and almost half of them were 17 respondents (48.6%) aged 46-55 years. The aging process leads to reduced function of pancreatic cells in producing insulin. Additionally, there may be a decrease in mitochondrial activity in muscle cells, up to 35%, which results in increased fat levels in muscles, about 30%, leading to insulin resistance. Therefore, the risk of diabetes increases with age, particularly after the age of 45-60 years, as intolerance to blood sugar levels starts to rise.

Gender is another factor that can influence blood sugar levels. Based on the study results, 31 respondents (88.6%) had blood sugar levels in the high category (above 144 mg/dL), and the majority of them, 22 respondents (62.9%), were female. The number of women with high blood sugar levels is higher compared to men. This difference is attributed to increased sensitivity to insulin action in the liver and muscles among women, influenced by the hormone estrogen. Changes in estrogen levels can affect blood sugar levels, and an increase in estrogen can lead to insulin resistance.

Education level is another factor that can also affect blood sugar levels. According to the study results, 31 respondents (88.6%) had blood sugar levels in the high category (more than 144 mg/dL), and almost half of them were 16 respondents (45.7%) with an elementary school education level. Education plays a crucial role in increasing knowledge. Individuals with lower education may find it difficult to receive information due to limited knowledge, leading to inappropriate food choices and uncontrolled eating patterns, which in turn increases blood sugar levels.

Another factor influencing blood sugar levels

is the duration of suffering from DM. Based on the study results, 31 respondents (88.6%) had blood sugar levels in the high category (more than 144 mg/dL), and the majority of long-time DM sufferers were 24 respondents (68.6%) with a duration of less than 5 years. Prolonged periods of DM can cause continuous blood sugar level accumulation, leading to potential complications. Proper blood sugar control can be achieved if the patient follows appropriate therapy. This aligns with the research of Herrera-Rangel et al. (2014), which indicates that the longer a person experiences diabetes mellitus, the higher the incidence of complications they may encounter.

Based on the results of the Spearman rank test analysis using SPSS version 25 with a significance level of 0.05 (5%), a p-value of 0.180 was obtained, indicating that the p-value is greater than 0.05 ($p > 0.05$). Therefore, the alternative hypothesis was rejected, and H0 was accepted, implying that there is no relationship between self-management and blood glucose levels in patients with type 2 diabetes mellitus. The correlation coefficient of 0.232 suggests a low correlation strength. Furthermore, the negative correlation coefficient indicates that the relationship between the two variables is not in the same direction; a higher level of self-management does not necessarily lead to lower blood sugar levels.

In conclusion, the results of the research show that most of the self-management in individuals with T2DM (from 35 respondents) is at a moderate level, and their blood glucose levels are high, with more than 144 mg/dL, as observed in 18 respondents (51.4%). Self-management is an integral part of diabetes control. For instance, patients are often advised to maintain a healthy diet and exercise regularly to keep their glucose levels under control. Self-management involves conscious and individual actions for controlling diabetes, including treatment and prevention of complications. Various aspects are encompassed in diabetes self-management, such as dietary regulation (diet), physical activity/exercise, blood sugar monitoring, drug compliance, and self/foot care (Handriana & Hijriani, 2020).

Blood sugar levels increase after eating and decrease in the morning after waking up. Hyperglycemia occurs when blood sugar levels rise above normal, while hypoglycemia is when there is a decrease in blood sugar values below normal (PERKENI, 2015). Typically, the highest level one hour after eating should not exceed 180 mg per 100 cc of blood (180 mg/dL). If it goes beyond this level, the kidneys cannot retain the excess sugar, and it will be excreted in the urine. This can be toxic and may lead to weakness, complications, and other metabolic disorders. When the body doesn't receive enough energy from sugar, it processes other substances, such as fat and protein (Desita, 2019).

Self-management comprises five aspects: dietary management, physical activity, blood sugar level monitoring, regular medication intake, and foot care. The self-management questionnaire consisted of 14 questions. From the results of the self-management questionnaire, most of the 20 respondents (57%) were classified as having poor dietary management, 24 respondents (69%) had poor physical activity, and almost all, 33 respondents (94%), had poor foot care.

Based on the researchers' assumptions and study results, most respondents had poor dietary management, with 20 respondents (57%) falling into this category. This is likely because the respondents did not meet several aspects of proper dietary arrangements, such as avoiding sweet foods and high-carbohydrate foods, which is particularly important for people with T2DM. Therefore, diabetic patients need to be disciplined in their diet settings. The dietary regulation aims to control metabolism and maintain blood sugar levels within the normal range.

Furthermore, most respondents had poor physical activity, with 24 respondents (69%) falling into this category. This is attributed to a lack of physical activity, particularly among female patients, most of whom are housewives. The lack of regular physical activity can have a negative impact on insulin sensitivity, which is crucial for stabilizing blood sugar levels. This finding is consistent with research by Ariyani & Badaruddin (2022), which indicates that low-intensity physical activity affects glucose utilization, leading to persistently high blood glucose levels in the circulation.

From the research results, it was found that almost all respondents (94%) were categorized as having poor foot care practices. This was attributed to the respondents' lack of knowledge and information about proper foot care for individuals with DM. Foot care is essential to prevent the occurrence of diabetic foot or foot ulcers. It is a crucial activity for people with DM as it aims to reduce the risk of foot ulcers. Key aspects to consider when performing foot

care include daily foot examination, thorough washing of the feet, proper drying with a soft cloth, choosing comfortable footwear, and checking the condition of the shoes used. This aligns with research by Sonsona (2014), which emphasizes the significance of foot care for people with DM, as foot disorders are the most common problem leading to the need for treatment, amputations, or lifelong disabilities.

In summary, the research indicates that self-management is still in the moderate category, leading to continuous increases in blood sugar levels among individuals with diabetes mellitus, despite some efforts in certain self-management aspects. Therefore, patients can improve their self-management, especially in the aspects of diet food management, exercise, and foot care, by receiving education and following the recommendations provided to them. Proper education and adherence to the recommended self-management practices can contribute to better diabetes control and overall health outcomes for patients.

CONCLUSION

This study established a relationship between self-management and blood sugar levels in patients with T2DM at Klatak Community Health Center. The findings indicate that need more investigation about self-management in controlling blood sugar levels among patients with T2DM. It is hoped that the results of this study will encourage respondents to actively engage in every activity conducted by the health center related to diabetes mellitus self-control. By practicing good self-management, patients can effectively prevent complications and maintain stable blood sugar levels. This, in turn, can lead to improved overall health outcomes for individuals with diabetes mellitus.

Declaration of Interest

None

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Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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