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Research Article

The Correlation between Self-Care Management and Blood Sugar Levels among Patients with Type 2 Diabetes Mellitus in the Working Area of the Kedaton Health Center

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ABSTRACT

Diabetes Mellitus is a group of metabolic diseases characterized by hyperglycemia that occurs due to abnormalities in insulin secretion, insulin action, or both. Uncontrolled DM progresses to complications. A way to prevent complications is self-care management. To analyze the correlation between self-care management and the blood sugar levels in type 2 diabetes mellitus patients in the working area of Kedaton Health Center. An analytical observational study with a cross-sectional design. Data were collected by completing a questionnaire and measuring blood sugar levels. The sample consisted of 158 respondents, selected using a purposive sampling technique. The analysis test used the Spearman correlation test. There are 98 respondents (62.0%) with poor self-care management and 60 respondents (38.0%) with good self-care management. The majority of respondents have uncontrolled blood sugar levels, namely 132 respondents (83.5%). The results of the Spearman correlation test showed a significant correlation between self-care management and blood sugar levels in type 2 diabetes mellitus patients in the working area of Kedaton Health Center (p-value = 0.002), with a weak positive correlation (r = 0.242). There is a significant correlation between self-care management and blood sugar levels in type 2 diabetes mellitus patients in the working area of Kedaton Health Center. The worse self-care management of the respondents, the more uncontrolled the blood sugar levels will be (180 mg/dL).

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INTRODUCTION

Diabetes Mellitus is a group of metabolic diseases with a characteristic of hyperglycemia that occurs due to abnormalities in insulin secretion, insulin function or both (Alwi 2014). DM is a chronic disease that is a health problem in almost all levels of society in the world, chatacterized by blood glucose levels exceeding normal values (≥200 mg/dL) (Muharani Syaftriani et al. 2023). Indonesia ranks 5th with the most DM sufferers in the world out of 10 countries suffering from DM, namely around 19.5 million people aged 20-79 years and is estimated to increase in 2045 to 28.6 million people in Indonesia will suffer from DM ((International Diabetes Federation (IDF) 2021). The prevalence of DM in Indonesia that has been diagnosed by doctors was 1.4% in 2013 and increased to 1.5% in 2018. Based on the results of the Regional Health Survey (Riset Kesehatan Daerah) in 2018, the prevalence of DM in West Java was 1.74%, below the national prevalence of 2%. The total number of DM sufferers, based on 2023 Riskesdas data, was 21.231 cases in Cirebon City and 14.055 cases in Cirebon Regency (Dinkes Jawa Barat 2023).

If left uncontrolled, DM can lead to potentially fatal complications, such as macrovascular (usually affecting the heart, brain, and blood vessels) and microvascular (usually affecting the eyes and kidneys), as well as central nervous system (neuropathy) disorders, including motor, sensory, and autonomic neuropathy (Muharani Syaftriani et al., 2023). DM complications are essentially preventable if patients make lifestyle changes for the better, but the number of DM sufferers continues to increase every year (Nurjanah et al., 2018). This occurs due to the inability of DM sufferers to manage their disease independently (American Diabetes Association 2020).

One preventive measure for DM complications is self-care management. Self-care consists of two words: self, meaning self, and care, meaning caring or caring for (Chaidir, Wahyuni, and Furkhani 2017). Diabetes self-care management is an individual's action to control DM, which includes treatment and prevention of complications. Some aspects included in diabetes self-care management are regulating eating patterns (diet), physical activity or exercise, monitoring blood sugar, compliance with taking medication, and self-care or foot care. Diabetes self-care management aims to achieve blood sugar levels within the normal range to prevent complications, reduce morbidity and mortality rates due to DM and help improve the achievement of goals in implementing DM (Asyrofi, Arisdiani, and Puji 2018), (Ramadhani et al. 2019). Self-care according to Orem is an implementation of activities initiated and carried out by the individual himself to meet the needs to maintain life, health and well-being according to conditions both healthy and sick. Self-care management in patients with chronic diseases is a complex matter and is very necessary for the successful management and control of the chronic disease (Angeli et al., 2019). Muflihatin et al. (2024) reported that self-care behavior was significantly associated with blood glucose regulation among individuals with type 2 diabetes mellitus. Patients who consistently engaged in effective self-care practices tended to maintain better glycemic control, while inadequate self-care was linked to higher and poorly controlled blood glucose levels. (Khoiroh Muflihatin et al. 2024)

This study holds significant importance as the prevalence of type 2 diabetes mellitus in Indonesia continues to increase, with many patients still failing to achieve optimal glycemic control. In West Java Province, the prevalence of diabetes mellitus has been reported at 1.74%. In 2023, there were 21,231 recorded cases in

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Cirebon City and 14,055 cases in Cirebon Regency, placing Cirebon among the regions with the highest number of diabetes cases in West Java. (Dinkes Jawa Barat 2023) At the primary healthcare level, such as the Kedaton Health Center, most patients with type 2 diabetes mellitus in this area are enrolled in the Chronic Disease Management Program (Prolanis). However, local reports indicate that glycemic control among these patients remains suboptimal. Many patients face difficulties in maintaining consistent self-care behaviors, including medication adherence, regular blood glucose monitoring, dietary regulation, and physical activity. In addition, patients' understanding of diabetes management and their motivation to adopt healthy behaviors are still limited, as frequently observed during health education sessions conducted at the Kedaton Health Center. Therefore, this study aims to analyze the correlation between self-care management and blood glucose levels among patients with type 2 diabetes mellitus in the working area of the Kedaton Health Center. The findings are expected to serve as a reference for improving self-care management strategies in healthcare facilities, provide local scientific evidence to support the development of more effective educational and behavioral intervention programs at the primary care level, and enhance public awareness to maintain good self-care management practices, thereby improving glycemic control, reducing complications, and enhancing patients' quality of life.

METHODS

This study is an analytical observational study with a cross-sectional study. Primary data were collected using a questionnaire and secondary data were collected using the results of blood glucose levels examinations through services at community health centers and the Integrated Health Post for Non-Communicable Disease (Posbindu PTM) activities. Sampling was conducted using a purposive sampling technique with a sample size of 158 respondents. This study was conducted at the Kedaton Health Center, Cirebon Regency, West Java, and was carried out in June-July 2024. The inclusion criteria for this study included patients receiving treatment at the health center or participating in Non-Communicable Disease Integrated Health Post (Posbindu PTM) activities, as well as those who provided informed consent to participate as respondents. The independent variable in this study was self-care management and the dependent variable in this study was blood sugar levels. The level of self-care management was obtained through the Diabetes Self-Care Management Questionnaire (DSMQ). The DSMQ questionnaire consists of 16 questions consisting of 4 categories: glucose management, dietary control, physical activity, and health care. The DSMQ assessment is divided into favorable, namely "applies to me very much = 3, applies to me to a consider-able degree = 2, applies to me to some degree = 1, does not apply to me = 0", while for unfavorable assessments the opposite applies. Self-care management was categorized as good (≥6) and poor (<6). Blood sugar levels were obtained from respondents who were fasting on average, throught data recorded by the community health center, which were categorized as controlled (<180 mg/dL) and uncontrolled (≥180 mg/dL). Blood glucose measurement in this study was conducted using random blood glucose testing, which was performed on patients during their visits to the health center or during Non-Communicable Disease Integrated Health Post (Posbindu PTM) activities. The samples were collected randomly, and the majority of patients were in a fasting state at the time of blood sampling.

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This study was approved by the Ethics Committee of the Faculty of Medicine, Swadaya Gunung Jati University, Cirebon (No. 56/EC/FKUGJ/V/2024).

RESULTS

Respondent Characteristics

In this study, respondent characteristics can be distinguished based on age, gender, education level, occupation, family income, and smoking habits.

Based on table 1, most of the respondents are aged 46-55 years, namely 56 respondents (35.4%) and most respondents are female, namely 130 respondents (82.3%). Based on education level, it is dominated by elementary school education, namely 77 respondents (48.7%). Based on occupation, it is dominated by housewives, namely 71 respondents (44.9%) and most respondents have an income of <1,500,000, namely 117 respondents (74.1%). Based on smoking habits, it is dominated by non-smoking habits, namely 151 respondents (95.6%).

Table 1. Respondent of Characteristics

Characteristics	Frequency (N)	Percentage (%)
Age		
26-35 years	6	3,8
36-45 years	32	20,3
46-55 years	56	35,4
56-65 years	50	31,6
>65 years	14	8,9
Gender		
Male	28	17,7
Female	130	82,3
Educational Level		
Incomplete Elementary School	60	38
Elementary School	77	48,7
Junior High School	7	4,4
Senior High School	10	6,3
Bachelor/Diploma	4	2,5
Occupation		
Trader	25	15,8
Enterpreneur	2	1,3
Farmer/Laborer	39	24,7
Housewife	71	44,9
Unemployed	13	8,2
Others	8	5,1
Family Income		
<1.500.000	117	74,1
1.500.000-2.500.000	21	13,3
2.500.000-3.500.000	15	9,5
>3.500.000	5	3,2
Smoking Habit		
Yes	7	4,4
No	151	95,6
Total	158	100

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Univariate Analysis

Self-Care Management

Table 2. Frequency Distribution of Self Care Management

Self-Care Management	Frequency (N)	Percentage (%)
Good	60	38,0
Poor	98	62,0
Total	158	100,0

Table 3. Frequency Distribution of Self-Care Management by Category

Self-Care Management	Frequency (N)	Presentase (%)
Glucose Management		
Good	76	48,1
Poor	82	51,9
Dietary Contol		
Good	78	49,4
Poor	80	50,6
Physical Activity		
Good	108	68,4
Poor	50	31,6
Health Care		
Good	76	48,1
Poor	82	51,9
Total	158	100,0

Table 2 shows that the distribution of self-care management is as follows: 60 respondents (38.0%) had good self-care management, while 98 respondents (62.0%) had poor self-care management. This suggests that during the current study period, respondents with poor self-care management were more dominant than those with good self-care management.

Based on Table 3, it is known that the distribution of self-care management by category, namely, most respondents have poor glucose management as many as 82 respondents (51.9%). Based on the diet category, it is dominated by a poor diet, namely 80 respondents (50.6%). Based on the physical activity category, it is dominated by good physical activity, namely 108 respondents (68.4%). Based on health care, it is dominated by poor health care, namely 82 respondents (51.9%).

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Blood Sugar Levels

Table 4. Frequency Distribution of Blood Sugar Levels

Blood Sugar Levels	Frequency (N)	Percentage (%)
Controlled	26	16,5
Uncontrolled	132	83,5
Total	158	100,0

Bivariate Analysis

Table 5. Results of the Analysis of the Relationship between Self-Care Management and Blood Sugar Levels

Self-Care Management	Blood Sugar Levels		Total	*P value*	r
	Controlled	Uncontrolled			
	n (%)	n (%)	n (%)		
Good	23 (23.5)	75 (76.5)	60 (100.0)		
Poor	3 (5.0)	57 (95.0)	98 (100.0)	0.002	0.242
Total	26 (16.5)	132 (83.5%)	158 (100.0)		

Table 4 shows the distribution of blood sugar levels: 26 respondents (16.5%) had controlled blood sugar levels, while 132 respondents (83.5%) had uncontrolled blood sugar levels. This suggests that during the study period, respondents with controlled blood sugar levels were more dominant than those with uncontrolled blood sugar levels.

Table 5 shows the data distribution of 158 respondents. Three respondents (5.0%) had poor self-care management with controlled blood sugar levels, and 57 respondents (95.0%) had poor self-care management with uncontrolled blood sugar levels. Meanwhile, those with good self-care management had 23 respondents (23.5%) with controlled blood sugar levels and 75 respondents (76.5%) with uncontrolled blood sugar levels.

This study obtained the results of the Spearman correlation test with a p value <0.002 (p <0.05), indicating a significant relationship between self-care management and blood sugar levels in type 2 diabetes patients in the Kedaton Health Center work area. The r value showed 0.242, indicating a weak relationship between self-care management and blood sugar levels in a positive direction. It can be concluded that the worse the self-care management of the respondents, the more uncontrolled their blood sugar levels will be (≥180 mg/dL).

DISCUSSION

The results of this study showed a significant correlation between self-care management and blood sugar levels in patients with type 2 diabetes mellitus in the working area of Kedaton Health Center. Most respondents (62.0%) had poor self-care management, and the majority (83.5%) had uncontrolled blood sugar levels. These findings indicate that self-care management plays a crucial role in achieving good glycemic control.

These results are consistent with previous studies that suggest poor self-care management

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is associated with uncontrolled blood glucose levels (Nurjanah et al. 2018); (Khoiroh Muflihatin et al. 2024). Patients who do not routinely monitor their blood glucose, regulate their diet, engage in physical activity, or adhere to their medication are more likely to experience uncontrolled blood sugar levels. The results of this study explain that the poorer the self-care, the more uncontrolled the blood sugar levels. This means that the better a patient implements self-care management, the more likely their blood sugar levels will remain within the controlled range.

Age was also found to be an important factor. Most respondents were 46–55 years old, an age group that is more prone to decreased physical activity, muscle mass loss, and metabolic changes leading to impaired insulin production (Grayssa Sendy Ayuningtyas 2021). People aged over 45 years' experience glucose intolerance due to decreased body function. Glucose intolerance can cause shrinkage of the pancreatic β cells, resulting in reduced hormone production and increased blood sugar levels (Khoiroh Muflihatin et al., 2024). Likewise, most respondents were women, who are at greater risk of developing type 2 DM due to hormonal factors and higher prevalence of obesity (Salsabillah Ansafa Iffada 2022).

Based on the research results, most respondents had elementary school education. Education level influenced respondents' understanding of self-care management (Grayssa Sendy Ayuningtyas, 2021). With the majority having only elementary school education, low literacy may hinder comprehension of diabetes management strategies, thereby contributing to poor self-care practices. A high level of education will make it easier for someone to receive and understand information so that they have a good understanding of self-care management behavior and have self-management skills to use information related to diabetes obtained from various media compared to someone with a low level of education (Abbasi et al. 2018). Similarly, occupation and income also influenced outcomes. Most respondents were housewives with low income, which may limit access to healthy food, medical care, and self-monitoring tools. Work is closely related to a person's physical activity both outside and inside the home. The activities carried out by housewives are mostly done inside the home and they also get more rest time, so that food intake cannot be converted into energy and carbohydrate accumulation occurs which has an impact on obesity and makes it easier to get diabetes (Salome Naba et al. 2021; (Ramadhani et al. 2019). Physical activity carried out by a person has a close relationship with the occurrence of type 2 DM, this is related to glucose levels in the body which will be converted into energy if a person often does activities. Where this will result in insulin increasing so that blood sugar levels can decrease (Nurjanah et al. 2018). Work is also related to economic status, where low economic status can cause the risk of poor glycemic control, this is due to the inability to buy healthy food, the ability to cause stress that triggers weight gain, the desire to smoke and alcohol consumption can cause diabetes complications (Ramadhani et al. 2019). Physical activity is one factor included in self-care management. People who are active have a lower risk of developing diabetes compared to those who are less active. This is because good physical activity will stabilize blood sugar levels, as one factor that increases blood sugar levels is a lack of physical activity, which can lead to diabetes (Nurjanah et al. 2018).

According to research by Putri & Isfandiari (2013), there is a relationship between knowledge, eating patterns, physical activity and compliance with taking medication with average blood sugar levels, because most

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respondents with good knowledge can carry out management or self-care management of DM themselves so that the patient's blood sugar levels can be controlled well (Nurjanah et al. 2018). Controlling DM such as regulating eating patterns or diet, controlling blood sugar, physical activity, and using health services can affect the stability of the patient's bloodugar levels (Cut Najwa Adila Zuqni 2019).

DM management is a management that requires quite expensive medical costs, so that most DM sufferers who have low incomes cannot afford to carry out continuous health checks, while DM patients must visit health services at least 1 to 2 times a week to check the conditions related to their disease. Socioeconomics also greatly influences the self-care management of DM patients (Nurjanah et al. 2018).

Glucose management and health care carried out by respondents who do not routinely undergo checks can be caused by the lack of tools to check blood sugar levels independently, which can result in uncontrolled blood sugar levels. Patients who frequently meet with health workers for consultations will gain more knowledge about how to maintain blood sugar levels to keep them under control, including regular medication, blood sugar checks, regular physical activity, and consumption of low-sugar foods. Where this can have a positive impact on controlling blood sugar levels in DM sufferers. If all aspects of self-care management are implemented routinely, it can reduce the occurrence of complications in DM patients (Khoiroh Muflihatin et al. 2024).

Compliance with medication is important for DM patients to achieve treatment goals and prevent complications effectively. Compliance with medication has been proven to lower blood sugar levels and improve the quality of life of DM patients (Safruddin and Yuliati 2022). Boredom and non-compliance of respondents in medication causes uncontrolled blood sugar levels. The cause of low compliance with medication is due to the patient's habit of forgetting and not complying with medication according to doctor's instructions (Riset et al. n.d.). Increasing compliance with medication in diabetes patients is one of the very important factors in controlling blood sugar levels in type 2 DM patients (Agustina et al. 2022). In addition, the length of time suffering from DM affects blood sugar control. A length of time suffering from diabetes that exceeds 6.5 years is a high-risk factor for complications, this is because the longer a person suffers from DM, the more uncontrolled blood glucose levels become, resulting in prolonged hyperglycemia (Putri et al. 2020).

The findings regarding medication adherence further strengthen the evidence that compliance plays a key role in blood glucose control. Respondents who forgot or did not adhere to medication instructions were more likely to have uncontrolled blood sugar, consistent with the study by Safruddin and Yuliati (2022). Regular physical activity was also confirmed as a protective factor against poor glycemic control, as exercise enhances insulin sensitivity and glucose utilization (Nurjanah et al. 2018).

In this study, the Spearman correlation test showed a weak but significant positive correlation ($r = 0.242$; $p = 0.002$). Although the correlation was weak, it was positive, indicating that the worse self-care practices were, the more uncontrolled blood sugar levels became. This means that as patients improved their self-care management, their blood sugar levels tended to remain within the controlled range (<180 mg/dL). These results emphasize the importance of improving education, supervision, and motivation for diabetes mellitus patients to implement comprehensive self-care behaviors.

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The limitation of this study is that it used a cross-sectional design, which cannot establish causality. In addition, self-care management was measured based on self-reported questionnaires, which may introduce recall bias or social desirability bias. Future studies are recommended to use longitudinal designs and objective measures of adherence and glycemic control to strengthen the evidence.

Overall, this study highlights that effective self-care management covering diet, glucose monitoring, physical activity, and adherence to medication is essential to achieving optimal blood sugar control and preventing complications in type 2 diabetes mellitus patients.

CONCLUSION

Based on the research results, we concluded that there is a relationship between self-care management and blood sugar levels in patients with type 2 diabetes mellitus in the Kedaton Community Health Center (Puskesmas) area. The weak but positive correlation found in this study aligns with previous research indicating that self-care behaviors play an important role in glycemic regulation, although their impact may vary depending on patient adherence and disease severity. Studies such as those by Muflihatin et al. (2024) have also reported a significant association between self-care practices and blood glucose control in patients with type 2 diabetes. The relatively small correlation coefficient in the present study may be influenced by differences in patients' understanding of diabetes management, variations in medication adherence, and inconsistent implementation of dietary and physical activity recommendations. Nonetheless, the significant association observed highlights the need for more structured educational programs and regular monitoring in primary healthcare settings. It is hoped that health services can provide education on the importance of self-care management behaviors for patients with diabetes mellitus, including glucose management, diet, physical activity, and health care, so that patients' blood sugar levels can be properly controlled.

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