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ORIGINAL ARTICLE

Factors Affecting Blood Glucose in Type 2 Diabetes Mellitus Patients: The Role of Diet, Physical Activity, and Medication Adherence in The Prolanis Program at Denkesyah Clinic, Madiun, East Java

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ABSTRACT

Background: Diabetes Mellitus (DM) is a chronic disease that requires continuous management. Blood glucose control is strongly influenced by lifestyle factors, including diet, physical activity, and medication adherence. This study aimed to analyze the effect of diet, physical activity, and medication adherence on blood glucose levels among diabetes mellitus patients participating in the Prolanis program at Denkesyah Clinic, Madiun, East Java. **Methods**: A quantitative cross-sectional study at Denkesyah Clinic Madiun, from June to July 2025. A total of 69 respondents were purposively selected from 224 Prolanis participants. Data were collected using structured questionnaires and fasting blood glucose measurements. Multiple linear regression analysis was applied to determine the associations between variables. **Results**: Diet was categorized as good (37.7%), physical activity as moderate (34.8%), medication adherence as high (43.5%), and blood glucose as abnormal (50.7%). Regression analysis revealed significant associations between diet (p=0.030), physical activity (p=0.001), and medication adherence (p=0.000) with blood glucose. Medication adherence was the most influential factor (highest Beta). **Conclusions**: Diet, physical activity, and medication adherence significantly affect blood glucose control, with adherence to medication being the strongest determinant. Strengthening education and adherence monitoring within the Prolanis program is essential for achieving optimal glycemic control.

Keywords: Blood glucose levels, Diabetes mellitus, Diet, Medication adherence, Physical activity, Prolanis

INTRODUCTION

Diabetes Mellitus (DM) is a major global health problem. The International Diabetes Federation (IDF) reported 537 million people living with diabetes in 2021, projected to rise to 783 million by 2045. Indonesia currently ranks fifth globally, with 19.5 million cases in 2021. Diabetes Mellitus cases in primary healthcare facilities (FKTP) across 38 districts/cities in East Java have reached 842,004 cases (97.5% of the estimated number of DM patients). According to official health data from Madiun City in 2023, there were 12,068 people suffering from diabetes (Madiun City Profile, 2023).

Preliminary survey data conducted by the researcher on June 10, 2024, at Denkesyah Clinic Madiun showed that the number of diabetes mellitus cases in 2023 was 96 cases, increasing to 337 cases in 2024, with 224 patients actively participating in the Prolanis program.

Modern lifestyle has become part of society's secondary needs. In terms of food choices, diet is one of the contributing factors to diabetes. In modern eating habits, practicality is prioritized while health aspects are neglected, such as foods high in fat, salt, and sugar. This has become one of the causes of the increasing prevalence of degenerative diseases, including diabetes (Kristiawan, P.A., Nugroho, R., Rr. Maria, D., &

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Tabita, Noviani, 2019). Several scientific journals state that diet is one of the causes of diabetes. The study by Juli Widiyanto and Sri Rahayu (2019) found an effect of diet on the incidence of diabetes, as indicated by a P-value <0.05, namely 0.031.

The success of treatment does not only depend on the accuracy of diagnosis, the selection, and administration of appropriate medication, but also on the fulfillment of the prescribed therapy. Adherence to treatment rules is very important, as it influences treatment outcomes. Non-adherence to therapy can lead to negative consequences. Medication non-adherence results in treatment failure and increased hospitalization (Jilao, 2017).

Physical activity is one of the strategies in managing diabetes mellitus, serving to increase insulin sensitivity and maintain physical fitness. When the body moves, the demand for fuel in the active muscles rises, triggering complex bodily reactions that involve metabolic system activity, hormone release and regulation, as well as the autonomic nervous system. At rest, muscle activity uses very little glucose as a fuel source, whereas during exercise, glucose and fat become the main energy sources. By utilizing glucose as the primary fuel, blood glucose levels are expected to decrease (Tjokroprawiro A, 2014). Based on these problems, the researcher intends to conduct a study on the Analysis of Factors Affecting Blood Glucose Levels in Terms of Diet, Physical Activity, and Medication Adherence among Diabetes Mellitus Patients in the Prolanis Program at Denkesyah Clinic, East Java. This study aims to analyze the effect of diet, physical activity, and medication adherence on blood glucose levels among diabetes mellitus patients participating in the Prolanis program at Denkesyah Clinic, Madiun, East Java.

METHODS

This type of research is quantitative, cross-sectional study was conducted at Denkesyah Clinic Madiun, June–July 2025. The population consisted of 224 Prolanis participants, with 69 respondents selected purposively. Data were collected using questionnaires (diet, physical activity, medication adherence) and fasting blood glucose measurement. The dependent variable was blood glucose; independent variables were diet, physical activity, and adherence. Physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure (WHO in Yulianti, 2022). Diabetes mellitus is a metabolic disorder characterized by elevated blood glucose levels (hyperglycemia) due to impaired insulin secretion and insulin action. Dietary patterns are defined as a person's daily food consumption habits. Compliance is a person's adherence to the treatment they are required to undergo.Data were analyzed using multiple linear regression (SPSS). Ethical clearance was obtained from the institutional review board.

RESULTS AND DISCUSSION

Table 1 shows that Prolanis patients with high medication adherence had predominantly normal blood glucose levels (43.5%), whereas those with low adherence were more likely to have abnormal blood glucose levels (17.4%). Dietary patterns also showed a significant effect on blood glucose control.

Table 1. Factors Affecting Blood Glucose Levels in Type 2 Diabetes Mellitus Patients in the Prolanis Program at Denkesyah Clinic, Madiun

Variable	Blood Glucose		Total
	Normal	Abnormal	
Medication Adherence			
High	43,50%		43,5%
Moderate	5,80%	33,30%	39,1%
Low		17,40%	17,4%
Diet			
Good	31,90%	5,80%	37,7%
Fair	13,00%	11,60%	24,6%
Poor	4,30%	33,30%	37,6%
Physical Activity			
Light	4,30%	27,50%	31,8%
Moderate	13,00%	21,70%	34,7%
Heavy	31,90%	1,40%	33,3%

Patients with poor dietary habits had the highest proportion of abnormal blood glucose (33.3%), while those with good dietary habits were

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more likely to have normal blood glucose levels (31.9%). Physical activity was likewise significantly associated with blood glucose levels. Patients engaging in heavy physical activity were more likely to maintain normal blood glucose (31.9%), whereas those with light activity showed a higher proportion of abnormal blood glucose (27.5%).

The regression model revealed a significant association (B = +0.095, Beta = -0.250, p = 0.030), suggesting that unhealthy dietary habits contribute to higher blood glucose levels. Regression analysis confirmed this association (B = -0.155, Beta = .170, p = 0.001), indicating that increased physical activity helps lower blood glucose levels.

The regression analysis demonstrated that medication adherence had the strongest effect on blood glucose levels, with a negative regression coefficient (B = -0.399), a standardized Beta of .586, and a highly significant p-value (p = 0.000). This indicates that higher adherence to medication significantly reduces the risk of abnormal blood glucose.

Overall, the regression model confirmed that all three variables—medication adherence, diet, and physical activity—had significant effects on blood glucose control (p < 0.05).

Table 2. Cross-tabulation of blood sugar levels against diet, physical activity and medication compliance

No	Independent Variable	Devendent Variable	Regression Coefficient (B)	Standardized Beta	p-value
1	Diet	Blood Glucose	+0.095	-.250	0.030
2	Physical Activity		-0.155	.170	0.001
3	Medication Adherence		-0.399	.586	0.000

The majority of Prolanis participants with diabetes mellitus were women, mostly aged >60 years, with high school education, and predominantly self-employed. Most had been suffering from diabetes for 5–10 years. Older women are more vulnerable due to hormonal changes (especially post-menopause) and declining metabolic function, including reduced insulin sensitivity. Statistical analysis showed that medication adherence was the most influential factor compared to diet and physical activity. A regression coefficient (B = -0.399) indicates that every one-unit increase in adherence reduces blood glucose by 0.399 units, assuming other variables remain constant. According to the WHO's Adherence to Long-Term Therapies framework, adherence in chronic diseases like diabetes is the main determinant of therapeutic success. Without adherence, other interventions such as diet and exercise are less effective.

The findings of this study align with a 2023 study by Doru and colleagues, which examined the relationship between diet and physical activity and the incidence of diabetes mellitus in the Birobuli Community Health Center (Puskesmas) work area in Palu City. The study found a significant association between diet and the incidence of diabetes mellitus, with a P-value of 0.005, with α <0.005. Furthermore, the results of this study support the findings of Latifah and her team in 2020, who explored the impact of lifestyle on the incidence of diabetes mellitus in pre-elderly individuals at Padangsidimpuan City Regional General Hospital. The study demonstrated a significant association between dietary habits and diabetes mellitus, with a P-value of 0.001, with α <0.005, involving a total of 90 respondents.

This study confirms that medication adherence plays a pivotal role in blood glucose control. While diet and physical activity remain important, medication directly and effectively regulates glucose. Therefore, strategies to improve adherence—through education, reminder systems, and family support—are crucial in Prolanis and diabetes management in general. Non-adherence increases the risk of complications, including stroke, coronary heart disease, blindness, kidney failure, and diabetic foot. Thus, adherence is essential for successful diabetes management and for maintaining stable blood glucose levels.

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CONCLUSIONS

Diet, physical activity, and medication adherence significantly influence blood glucose levels in type 2 DM patients. Medication adherence is the strongest determinant (p value < 0.00 < 0.05). Educational interventions, adherence monitoring, and patient support systems within the Prolanis program are essential for achieving optimal glycemic control.

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