



The Relationship Between Knowledge and Physical Activity with Blood Glucose Levels in Patients with Diabetes Mellitus

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Abstract

Background: Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia and remains a major global health problem. Effective management of DM requires proper self-management behaviors, including adequate knowledge and regular physical activity, which are essential for maintaining optimal blood glucose levels. This study aimed to examine the relationship between knowledge and physical activity with blood glucose levels among patients with diabetes mellitus. **Methods:** This study employed a quantitative approach with a descriptive correlational design using a cross-sectional method. The study was conducted at Tadjuddin Chalid Hospital, Makassar, Indonesia, in December 2025. A total of 40 respondents were selected using purposive sampling. Data were collected using structured questionnaires, while blood glucose data were obtained from medical records. Data were analyzed using descriptive statistics and Chi-square. **Result:** The results showed that the majority of respondents were aged 50–60 years (57.5%), female (67.5%), had low educational levels (87.5%), and had been living with diabetes for 4–6 years (52.5%). Most respondents had blood glucose levels of 100–200 mg/dL (62.5%). There was a statistically significant relationship between knowledge and blood glucose levels ($p = 0.000$), where respondents with good knowledge had better glycemic control. Additionally, a significant relationship was found between physical activity and blood glucose levels ($p = 0.000$), indicating that respondents with active physical activity had better glycemic control compared to those with low physical activity. **Conclusion:** Knowledge and physical activity are significant determinants of glycemic control among patients with diabetes mellitus. Therefore, integrating patient education and the promotion of regular physical activity into diabetes management programs is essential to improve clinical outcomes and reduce the risk of complications.

Keywords: diabetes mellitus, knowledge, physical activity, blood glucose, glycemic control.

1. Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both (Lestari et al., 2021). It represents a major global health concern, with the World Health Organization reporting that approximately 422 million people were living with diabetes worldwide, and the number increased to around 589 million adults in 2024 (WHO, 2023; WHO, 2024). The International Diabetes Federation also estimated that 537 million adults were affected globally, indicating a continuous rise in prevalence (IDF, 2021).

Effective management of diabetes mellitus requires continuous self-care, including medication adherence, dietary regulation, and physical activity. Maintaining optimal blood glucose levels is essential to prevent both acute and chronic complications associated with diabetes. Poor glycemic control can lead to serious health problems such as cardiovascular disease, nephropathy, neuropathy, and retinopathy, which significantly reduce patients' quality of life.

Physical activity is one of the key components in diabetes management, as it helps improve insulin sensitivity, enhances glucose uptake by muscles, and contributes to better blood glucose control (Simamora, 2022). However, insufficient physical activity remains a significant risk factor for poor glycemic control and the progression of complications in patients with diabetes mellitus (Mubarrok & Wiyanti, 2023).

In addition to physical activity, patients' knowledge about diabetes plays a crucial role in disease management. Adequate knowledge enables patients to understand the importance of lifestyle modification, adhere to treatment recommendations, and perform appropriate self-care behaviors. Conversely, limited knowledge may lead to poor disease management, resulting in uncontrolled blood glucose levels and increased risk of complications.

Several factors have been identified as contributors to diabetes outcomes, including age, gender, duration of illness, lifestyle behaviors, and level of knowledge. Among these, knowledge and physical activity are modifiable factors that can be improved through education and behavioral interventions, making them important targets in diabetes management programs.

In Indonesia, diabetes mellitus is the third leading cause of death, accounting for approximately 6.7% of total mortality, following stroke and coronary heart disease (Sample Registration Survey, 2014). Regional data from South Sulawesi also show an increasing prevalence of diabetes, highlighting the need for effective strategies to improve glycemic control among patients.

Despite the recognized importance of knowledge and physical activity, many patients with diabetes mellitus still experience difficulties in maintaining proper self-management behaviors. Therefore, understanding the relationship between these factors and blood glucose levels is essential to support the development of effective interventions. Based on this background, this study aims to examine the relationship between knowledge and physical activity with blood glucose levels among patients with diabetes mellitus.

2. Materials and Methods

This study employed a quantitative approach with a descriptive correlational design using a cross-sectional method. The cross-sectional design involves measuring both independent and dependent variables at a single point in time without follow-up, aiming to describe and analyze the relationship between variables (Sugiyono, 2022). The study was conducted at Tadjuddin Chalid Hospital, Makassar, Indonesia, and data collection took place in December 2025.

The population consisted of all patients diagnosed with diabetes mellitus who were hospitalized at Tadjuddin Chalid Hospital, Makassar. The sample included patients undergoing treatment between January and July 2025. The sample size was determined using the Slovin formula with a margin of error of 10%, resulting in a total of 40 respondents. A purposive sampling technique was applied based on predefined inclusion and exclusion criteria.

The inclusion criteria were patients diagnosed with diabetes mellitus, those willing to participate, those registered in the hospital medical records, and those hospitalized at Tadjuddin Chalid Hospital. Patients who refused to participate or were not present during the data collection period were excluded from the study.

In this study, the independent variables were knowledge and physical activity, while the dependent variable was blood glucose level among patients with diabetes mellitus. Data were collected using a structured questionnaire adapted from previous research (Adisaputra et al., 2021). The questionnaire consisted of several sections, including informed consent, respondent characteristics (age, gender, occupation, and education level), knowledge related to diabetes mellitus, and physical activity levels. The instrument was reviewed for content validity based on relevant literature, and reliability testing was conducted prior to data collection. Respondents were given approximately 30–50 minutes to complete the questionnaire, with assistance provided if clarification was needed.

The data collection procedure began with obtaining research permission from Universitas Graha Edukasi Makassar and approval from the Director of Tadjuddin Chalid Hospital. The researcher coordinated with healthcare staff to identify eligible respondents, explained the study objectives, and obtained informed consent. Questionnaires were distributed and collected upon completion, followed by checking for completeness and accuracy.

Data analysis was performed using SPSS Statistics version 24. Descriptive (univariate) analysis was used to present the distribution and frequency of each variable. Inferential (bivariate) analysis using the Chi-square test was conducted to examine the relationship between knowledge and blood glucose levels, as well as physical activity and blood glucose levels. A p -value of < 0.05 was considered statistically significant.

This study adhered to ethical principles, including informed consent, anonymity, confidentiality, beneficence, and justice (Notoatmodjo, 2018). Participants were informed about the purpose of the study and signed a consent form prior to participation. Their identities were kept confidential using coded data, and participants had the right to withdraw at any time without any consequences.

3. Results

Table 1 show, the characteristics of respondents in this study show that the majority of patients were aged 50–60 years, accounting for 57.5% ($n = 23$), while 42.5% ($n = 17$) were aged 61–70 years. Based on gender, most respondents were female (67.5%, $n = 27$), compared to male respondents (32.5%, $n = 13$).

In terms of occupation, the largest proportion of respondents were housewives or fishermen (57.5%, $n = 23$), followed by entrepreneurs/farmers/self-employed individuals (25.0%, $n = 10$), and those who were not working (17.5%, $n = 7$). Regarding educational level, most respondents had a low educational background, with 87.5% ($n = 35$) having completed elementary to junior high school, while only 12.5% ($n = 5$) had completed senior high school.

Based on the duration of diabetes mellitus, more than half of the respondents had been diagnosed for 4–6 years (52.5%, $n = 21$), while 47.5% ($n = 19$) had been diagnosed for 1–3 years. Furthermore, the majority of respondents had blood glucose levels in the range of 100–200 mg/dL (62.5%, $n = 25$), while 37.5% ($n = 14$) had levels between 201–263 mg/dL.

Table 1. Characteristics of Respondents (n = 40)

Characteristics	Category	n	%
Age (years)	50–60	23	57.5
	61–70	17	42.5
Gender	Male	13	32.5
	Female	27	67.5
Occupation	Not working	7	17.5
	Housewife/Fisherman	23	57.5
	Entrepreneur/Farmer/Self-employed	10	25.0
Education Level	Elementary–Junior High School	35	87.5
	Senior High School	5	12.5
Duration of DM	1–3 years	19	47.5
	4–6 years	21	52.5
Blood Glucose Level	100–200 mg/dL	25	62.5
	201–263 mg/dL	14	37.5

Overall, these findings indicate that most respondents were middle-aged to older adults, predominantly female, with relatively low educational levels, and had been living with diabetes for several years. This profile may influence their self-management behaviors, including physical activity, which is relevant to the focus of this study.

Table 2. Relationship Between Knowledge and Blood Glucose Levels

Knowledge Level	100–200 mg/dL	201–263 mg/dL	Total	p-value
Good	25 (62.5%)	0 (0.0%)	25	0.000
Poor	0 (0.0%)	15 (37.5%)	15	
Total	25	15	40	

Table 2 showed a significant relationship between knowledge and blood glucose levels among patients with diabetes mellitus. All respondents with good knowledge had blood glucose levels in the range of 100–200 mg/dL (62.5%), whereas all respondents with poor knowledge had higher blood glucose levels (201–263 mg/dL) (37.5%). The statistical analysis using the Chi-square test indicated a p-value of 0.000 ($p < 0.05$), which means that there is a statistically significant relationship between knowledge and blood glucose levels. This finding suggests that better knowledge is associated with better blood glucose control.

Table 3. Relationship Between Physical Activity and Blood Glucose Levels

Physical Activity	100–200 mg/dL	201–263 mg/dL	Total	p-value
Active	25 (62.5%)	0 (0.0%)	25	0.000
Low	0 (0.0%)	15 (37.5%)	15	
Total	25	15	40	

The results (Table 3) also demonstrated a significant relationship between physical activity and blood glucose levels. All respondents who had active physical activity were in the blood glucose range of 100–200 mg/dL (62.5%), while those with low physical activity were entirely in the higher blood glucose category (201–263 mg/dL) (37.5%). The Chi-square test showed a p-value of 0.000 ($p < 0.05$), indicating a statistically significant relationship between physical activity and blood glucose levels. This finding highlights that higher levels of physical activity are associated with better glycemic control among patients with diabetes mellitus.

4. Discussion

Based on the characteristics of respondents presented in Table 1, the majority of participants were aged 50–60 years, predominantly female, and had relatively low educational levels. This finding is consistent with previous studies indicating that the prevalence of diabetes mellitus increases with age and is often higher among women due to hormonal, behavioral, and lifestyle factors (International Diabetes Federation, 2021). In addition, low educational attainment has been associated with limited health literacy, which can negatively affect an individual’s ability to understand disease management and adhere to treatment recommendations (Nutbeam, 2008).

The findings in Table 1 also show that more than half of the respondents had been living with diabetes for 4–6 years, suggesting that most participants were in the chronic phase of the disease. According to the American Diabetes Association (ADA, 2020), a longer duration of diabetes is associated with a higher risk of complications and requires more intensive self-management strategies, including lifestyle modification and regular monitoring of blood glucose levels.

As shown in Table 2, there was a statistically significant relationship between knowledge and blood glucose levels ($p = 0.000$). Respondents with good knowledge tended to have better glycemic control compared to those with poor knowledge. This finding highlights that knowledge plays a crucial role in diabetes self-management. Patients with adequate knowledge are more likely to understand the importance of treatment adherence, dietary regulation, and lifestyle modification, which contribute to improved blood glucose control. This result is consistent with previous studies indicating that higher levels of knowledge are associated with better self-care behaviors and improved clinical outcomes (Walker et al., 2022; Powers et al., 2020).

Furthermore, Table 3 demonstrates a significant relationship between physical activity and blood glucose levels ($p = 0.000$). Respondents who were physically active had better glycemic control, while those with low physical activity exhibited higher blood glucose levels. This finding is in line with existing evidence that regular physical activity enhances insulin sensitivity, increases glucose uptake by skeletal muscles, and helps regulate blood glucose levels (Colberg et al., 2016). Therefore, physical activity remains a fundamental component in the management of diabetes mellitus.

The findings of this study indicate that both knowledge and physical activity are important determinants of glycemic control among patients with diabetes mellitus. These factors are modifiable and can be improved through targeted interventions such as health education programs and structured physical activity promotion. Improving patients' knowledge may enhance their ability to perform appropriate self-care behaviors, while increasing physical activity can directly contribute to better metabolic control.

However, this study has several limitations. The sample size was relatively small, and the cross-sectional design does not allow for causal inference. In addition, the use of self-reported questionnaires may introduce response bias. Therefore, future studies are recommended to use larger sample sizes and more advanced analytical methods to further explore the relationships between these variables.

Overall, the results of this study emphasize the importance of integrating patient education and physical activity promotion into diabetes management programs. Healthcare providers should focus on improving patients' knowledge and encouraging regular physical activity as key strategies to achieve better glycemic control and reduce the risk of complications.

5. Conclusions

This study found that most respondents were middle-aged to older adults, predominantly female, with low educational attainment and a relatively long duration of diabetes mellitus, indicating a population at risk for suboptimal disease management. There was a statistically significant relationship between knowledge and physical activity with blood glucose levels. Patients with higher levels of knowledge and those who engaged in regular physical activity demonstrated better glycemic control, while lower levels of knowledge and physical inactivity were associated with elevated blood glucose levels.

These findings confirm that knowledge and physical activity are key determinants of glycemic control in patients with diabetes mellitus. Therefore, integrating patient education and the promotion of regular physical activity into diabetes management programs is essential to improve clinical outcomes and reduce the risk of complications.

Conflict of Interest

The authors declare no conflicts of interest.

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