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Research Article

Relationship Between Knowledge and Fasting Plasma Glucose Values of Patients with Type 2 Diabetes Mellitus at Sleman Public Health Center

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ABSTRACT

Diabetes Mellitus (DM) is a chronic disease caused by unstable blood sugar (glucose) levels, characterized by the body's inability to metabolize carbohydrates and fats. Unstable or uncontrolled blood sugar levels can be influenced by a lack of knowledge, which impacts the attitudes and behavior of people with DM. Controlling blood sugar levels in patients with DM is very important to avoid complications, both macrovascular and microvascular. The purpose of this study is to examine the connection between type 2 DM patients' fasting plasma glucose (FPG) values and their degree of knowledge. This study was conducted at Mlati 2, Ngaglik 2, and Ngemplak 2 Health Centers of Sleman Regency Yogyakarta. This cross-sectional study used an analytical observational strategy. Purposive sampling was used to choose the 227 patients who participated in this study as respondents. The Diabetes Knowledge Questionnaire (DKQ-24) was the tool utilized in this study to gauge respondents' knowledge levels and the outcomes of the FPG levels taken from medical records. The Spearman-rank test was used for data analysis with significance set as $p<0.05$. The majority of patients, 99 (43.61%) had a moderate degree of knowledge and 207 (91.19%) had uncontrollable FPG levels. Based on bivariate analysis, there was no significant relationship between knowledge level and FPG values ($p = 0.926$), while the strength of the relationship was classified as a very low category ($r = 0.006$).

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder characterized by elevated blood sugar (hyperglycemia), which happens because the pancreas does not produce insulin adequately. Based on data in 2021, the incidence of DM in Indonesia reached 537 million people with an age range of 20 to 79 years, and is expected to increase significantly to 643 million in 2030. Based on data from the Daerah Istimewa Yogyakarta Regional Health Office (DIY) (2019), there were 74,668 DM patients with only 55,190 patients who have received health services according to current health standards. Sleman Regency itself is recorded to have 24,690 DM patients, which is the highest number in DIY Province.

The high number of cases of type 2 diabetes mellitus (T2DM) can be caused by several factors, including a poor lifestyle with minimal activity, high sugar consumption, low knowledge about diabetes, and poor adherence to medication (Murtiningsih *et al.*, 2021). Unstable or uncontrolled blood sugar levels can be influenced by minimal knowledge, which can impact the attitudes and behavior of people with DM (Salama *et al.*, 2019). Patients with low levels of knowledge tend to have difficulty receiving and understanding information. As a result, patients with DM may then be indifferent to the

information provided, making it more difficult for them to understand the importance of maintaining controlled blood sugar levels (Riyambodo, 2017).

Controlling blood sugar levels in people with DM is necessary to avoid complications. Research by Kunaryanti *et al*. (2018) showed that most patients had low levels of knowledge about diabetes (68.8%), and the majority of patients had poor behavior in controlling blood sugar levels (65.6%). Another study conducted by Hunaifi (2018) also showed that the majority of diabetes patients had low knowledge (67.5%), with the majority of patients having high blood sugar levels (70%). Accordingly, knowledge related to the prevention and management of DM is needed. Knowledge about DM is needed as a basis for the community to demonstrate DM prevention behavior, so that the blood sugar levels of DM patients become controlled. However, based on research conducted by Ramadhani and Khotami (2023), it is not always the case that patients who possess a high degree of DM knowledge behave well. This dilemma means that someone who has good knowledge does not necessarily have good DM prevention skills. The reason is because the knowledge they have is not applied in their lives.

METHODS

This cross-sectional study used an analytical, observational methodology. Purposive sampling was the sample method employed. The sampling sites were at the Mlati 2, Ngaglik 2, and Ngemplak 2 Health Centers in Sleman Regency, Yogyakarta. Sampling using the Slovin formula and obtained a sample size of 227 respondents. The inclusion criteria of the research sample were patients with T2DM, aged >18 years, using oral antidiabetic drugs, and diagnosed with T2DM for >1 year. While the exclusion criteria of the research sample were patients who used insulin, patients who had complications of kidney disorders (nephropathy) and heart disease (cardiovascular), could not read, could not write, poor mobility (there were physical limitations that hindered), pregnant patients, did not fill out informed consent, did not fill out the questionnaire completely, and were not willing to participate in the study. The independent variable in this study was the level of knowledge while the dependent variable was the patients' fasting plasma glucose (FPG) value. The Diabetes Knowledge Questionnaire (DKQ)-24 is a tool used in this study to measure the level of knowledge of respondents and the results of FPG levels were taken from patients' medical records. The statistical test used was the Spearman-rank test to see the relationship between the variable level of knowledge with the FPG value of patients with T2DM. This study has been approved by the Medical and Health Research Ethics Committee, Faculty of Medicine, Public Health and Nursing Universitas Gadjah Mada No. KE/FK/0260/EC/2025.

RESULTS AND DISCUSSION

RESULTS

Based on the table of respondent characteristics presented (Table 1), it can be seen that 38.33% of respondents were 61-70 years old, mostly female with 74.45% and many of the respondents have a high school education as much as 36.12%. The majority of respondents work as housewives, 53.98% and nearly half have a monthly Rp. income of <1 million, namely 48.02%. Most of the respondents had family support, as many as 71.37%. The majority of respondents were diagnosed with T2DM for 1-5 years, namely 57.71% and most did not have a family history of DM, as many as 62.56%. Many of the respondents did not have comorbidities, namely 26.43%. The majority of respondents had a history of going to the health center and had a laboratory examination 1 month ago, namely 96.92% and 88.55%. Most of the respondents consumed monotherapy, 56.39%. Many of respondents had moderate knowledge, namely 43.61% and most had uncontrolled FPG values, namely 91.19%. There was no significant relationship found between the level of knowledge and the value of FPG in patients with T2DM at Mlati 2, Ngaglik 2, and Ngemplak 2 Health Centers (p=0.926). The strength of the relationship was classified as a very low category (r = 0.006) (Table 2).

Table 1. Characteristics of research respondents

Characteristics	Frequency (n = 227)
Sociodemographic Characteristics	
Age	
1. 21-30 years	2 (0.88%)
2. 31-40 years	4 (1.76%)
3. 41-50 years	22 (9.69%)
4. 51-60 years	84 (37.00%)
5. 61-70 years	87 (38.33%)
6. >71 years	28 (12.33%)
(Mean±SD) (years)	60.00±9.084
Gender	
1. Man	58 (25.55%)
2. Woman	169 (74.45%)
Last Education	
1. Elementary School	60 (26.43%)
2. Junior High School	42 (18.50%)
3. Senior High School	82 (36.12%)
4. Bachelor	34 (14.98%)
5. No School	9 (3.96%)
Work	
1. Housewife	122 (53.98%)
2. Retired	21 (9.29%)
3. Self-employed/trader	40 (17.70%)
4. Farmer	6 (2.65%)
5. PNS/TNI/POLRI	7 (3.10%)
6. No work	12 (5.31%)
7. Other	18 (7.96%)
Income (monthly Rp)	
1. <1 million	109 (48.02%)
2. 1–3 million	46 (20.26%)
3. >3 million	37 (16.30%)
4. No work	35 (15.42%)
Family Support	
1. There is family support	162 (71.37%)
2. No family support	65 (28.63%)
Medical History Characteristics	
Length of time diagnosed with type 2 DM	
1. 1-5 years	131 (57.71%)
2. 6-10 years	61 (26.87%)
3. >10 years	35 (15.42%)
History of DM in the family	
1. There is a history in the family	85 (37.44%)
2. There is no history in the family	142 (62.56%)
Comorbidities	
1. Hypertension	112 (49.34%)
2. hypercholesterolemia	15 (6.61%)
3. Gout	10 (4.41%)
4. Hypertension and hypercholesterolemia	15 (6.61%)
5. Hypertension and gout	8 (3.52%)
6. Gout and hypercholesterolemia	2 (0.88%)
7. Hypertension, gout, and hypercholesterolemia	5 (2.20%)
8. Do not have comorbidities	60 (26.43%)
History of Going to the Health Center	
1. 1 month ago	220 (96.92%)
2. 2 month ago	4 (1.76%)
3. 3 month ago	3 (1.32%)
Laboratory Examination History	
1. 1 month ago	201 (88.55%)
2. 3 month ago	15 (6.61%)
3. 6 month ago	7 (3.08%)
4. 1 year ago	4 (1.76%)

Medical History Characteristics	
DM Medication Consumed	
1. Monotherapy	128 (56.39%)
2. Combination	99 (43.61%)
Knowledge	
1. Low	39 (17.18%)
2. Medium	99 (43.61%)
3. High	89 (39.21%)
Fasting Plasma Glucose	
1. Controlled	20 (8.81%)
2. Not Controlled	207 (91.19%)

DM: diabetes mellitus; SD: standard deviation.

Table 2. The relationship between the level of knowledge and fasting plasma glucose value

		FPG Value				
		Controlled	**Not Controlled**	**Total**	***p*-value**	***r*-value**
Level of Knowledge	**Low**	4	35	39	0.926	0.006
	Medium	8	91	99		
	High	8	81	89		
Total		20	207	227		

DISCUSSION

The older a person gets, the more their knowledge increases, so that it affects one's behavior (Ramadhani *et al*., 2023). This pattern of behavior is supported by research conducted by Khairani *et al*. (2016), which found that knowledge and the practice of DM prevention are related. However, insulin sensitivity and the body's ability to metabolize glucose decline with age. As a result, blood sugar levels become uncontrolled because with the increasing ag comes the greater the risk of developing DM. In general, women know more about DM, including its risk factors, symptoms, control and management. Positive attitudes and a wealth of information are linked to women's health. However, because women have a higher body mass index than males and because their hormone estrogen fluctuates, which can raise blood sugar levels, women experience the majority of DM. Additionally, women's low density lipoprotein (LDL) levels tend to be higher than men's (Gazzaz, 2020). Generally, the higher the education a person has, the greater the concern for their health, where the level of education affects a person's mindset. This healthy informed attitude will help patients in carrying out self-care, so that with this ability the patient can better control their blood sugar levels (Agustina and Muflihatin, 2019). This is in accordance with the research of Nurayati and Adriani (2017), that found education is one of the success factors in treatment. Work is needed to earn income that is used to meet basic needs. Patients with high income will generally have a healthier lifestyle, where economic status will determine the availability of facilities needed for learning so that it affects a person's knowledge and affects the control of the patient's blood sugar levels (Unhanisyah *et al*., 2023). This finding is in accordance with research conducted by Oktorina (2019), which found the lack of income will affect the level of knowledge because patients with low income find it difficult to get information about health and other medical measures.

Income that is higher affects the patient's ability to access health facilities, health information and increased knowledge about DM. In addition, low income will limit a person from seeking information, care, use of health facilities, and treatment for themselves which affects the uncontrolled blood sugar where patients affected by DM are mostly at low-income levels (Unhanisyah *et al*., 2023). Family support can be in the form of actions, material, and verbal that help increase the knowledge and compliance of DM patients. Generally, family support is related to adherence to taking medication which results in whether or not the patient's blood sugar levels are controlled (Priscayanti *et al*., 2023). The main source of a person's knowledge is experience, and the experience gained by a person can expand knowledge. According to Fajriyah *et al.* (2017), with more experience comes higher knowledge. Basically, the longer a person has DM, the more knowledge about DM will increase. This is because patients will try to find as much information as possible to prevent it. However, the longer a person suffers from DM, the quality of life will decrease which results in the patient's blood sugar control becoming poor as well

(Hariani *et al*., 2020). Patients with a family history of DM have better knowledge about DM; this is because patients can get information from families who also have DM in the form of information and experience. With a family who also has DM, the patient will be helped to control blood sugar levels (Ndetei *et al*., 2024). By doing regular controls and examinations, it will help patients know about their disease. Consulting with health workers when going to the health center will also help patients to increase their knowledge about DM because they get additional information from health workers. This positively affects the control of the patient's blood sugar levels (Unok, 2024). The results showed that the majority of respondents had low and moderate levels of knowledge (60.79%). Respondents with low and moderate levels of knowledge tended to have difficulty accepting and understanding the information provided and were indifferent, making it more difficult for them to understand the importance of maintaining controlled blood sugar levels. Low and moderate knowledge of DM management in this study resulted in the FPG profile of most respondents being uncontrolled (91.19%). This result will increase the risk of diabetes complications in respondents in the future.

Based on the results of statistical tests using the Spearman rank test (Table 2), the p = 0.926 (>0.05) was obtained, meaning that there was no significant relationship between the level of knowledge and the value of FPG in type 2 DM patients, with a correlation coefficient of r = 0.006 included in the very weak category. This could be influenced by several characteristics related to the results obtained, namely: employment, the majority in this study worked as housewives, where a person's economic status determines the availability of facilities to obtain information and whether or not blood sugar levels are controlled (Unhanisyah *et al*., 2023). Regarding income, the majority in this study had a low income, where low income limits a person to obtain information, care, and treatment which has an impact on whether a person's blood sugar levels are controlled (Unhanisyah *et al*., 2023). Regarding the family history of patients with DM, the majority in this study did not have a family history of DM. Generally, the patients with a family history of DM have better access to information and experience. This will help patients to control their blood sugar levels with the help of their family (Ndetei *et al.,* 2024).
Increased knowledge is the target of achieving education, with increased knowledge, the patient's quality of life will also increase, namely lifestyle changes, compliance with treatment, and a higher quality of life (Romitha, 2019). According to Ramadhan (2020), someone with less knowledge tends to find it difficult to receive information, so they become indifferent to the information provided. Good knowledge will greatly help patients to have the ability to be independent in carrying out self-care, so that with this ability patients can control blood sugar levels. The high knowledge of respondents is expected to increase the desire of patients with T2DM to control blood sugar levels (Yuwindry *et al*., 2016). This finding is also in accordance with the research of Fauzia *et al.* (2018), where there was no significant relationship found between the level of knowledge and glycemic control, because to achieve glycemic control requires a population with high literacy. This finding was supported by the research conducted by Agustina and Muflihatin (2019). which found that patients with good knowledge levels have more controlled blood sugar levels while patients with low knowledge levels have uncontrolled blood sugar levels.

CONCLUSIONS

The study's findings indicate that there was no significant correlation between the value of FPG and degree of knowledge among patients with T2DM at Mlati 2, Ngaglik 2, and Ngemplak 2 Health Centers (p= 0.926), while the strength of the relationship was classified as a very low category (r = 0.006).

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CONFLICT OF INTEREST

No conflicts of interest were disclosed by the author.

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