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Relationship Between Eating Behaviors and Physical Activity with Blood Glucose Levels in Type 2 Diabetes Mellitus Patients in Gayaman Public Health Center Mojokerto

Erva Heni Rosiana, Ika Ainur Rofi'ah, Moch. Achwandi, Enny Virda Yuniarti
Faculty of Health Science, Bina Sehat PPNI University, Mojokerto City, East Java, Indonesia
Corresponding E-mail: ikaainur.ns@gmail.com

ABSTRACT

Introduction: Diabetes mellitus can be caused by an unhealthy lifestyle including poor eating behavior and mild physical activity which can affect glucose metabolism so that blood glucose levels are high. This study aims to determine the relationship between eating behavior and physical activity with blood glucose levels in type 2 diabetes mellitus patients.
Method: The study design used correlation analysis with a cross-sectional approach. The population in this study was all type 2 diabetes mellitus patients at the Gayaman Public Health Center Mojokerto. The sampling technique of this study was consecutive sampling. The research instrument used an eating behavior questionnaire adopted from the Aethelstone and physical activity level (PAL) questionnaire and was analyzed using the Spearman Rho test.
Results: The results showed that 44.6% of respondents had poor eating behaviors, 48.2% had mild physical activity, and 80.4% had high blood glucose levels. The results of the Spearman Rho test showed that there was a significant relationship between eating behavior with blood glucose levels *(p value*=0,001;α<0,05) and physical activity with blood glucose levels (p *value*=0,002;α<0,05) in patients with type 2 diabetes mellitus at the Gayaman Public Health Center Mojokerto.
Conclusion: Poor eating behaviors tend to cause high blood glucose levels because of excessive intake of food and drinks that contain carbohydrates which are metabolized to be glucose, if the patient is not doing physical activity then the glucose levels become high. The importance of controlling blood glucose levels in Type 2 Diabetes Mellitus patients by improving eating behavior includes an eating schedule, reducing food and drinks that contain a lot of glucose, and increasing physical activity.

Keywords: Eating Behaviors, Physical Activity, Blood Glucose Levels, Diabetes Mellitus

INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease characterized by high blood glucose levels that exceed normal, when blood sugar levels are equal to or more than 200 mg/dl, and fasting blood glucose levels are above or equal to 126 mg/dl (Hestiana, 2017). DM can be caused by an unhealthy lifestyle including poor eating behavior and lack of physical activity which affects glucose metabolism so that blood glucose levels are high (Aiysah, 2019). According to the International Diabetes Federation, there are 425 million people

with DM in the world with a prevalence of type 2 DM cases (85-90%). Based on Basic Health Research data (2019), in Indonesia, there are 10 million cases of DM. Meanwhile, East Java Province is included in the top 10 prevalence of DM sufferers throughout Indonesia or ranks ninth with a prevalence of 6.8%. In East Java, the number of DM in 2019 was 841,971 (Annisa et al., 2021).

Several factors can exacerbate DM disease, including high blood pressure, obesity, age, family history/genetics, eating behavior, and physical activity. Poor eating behavior, including inappropriate meal times and irregular amounts of food consumption, will affect blood glucose levels. Poor eating behavior can cause blood glucose levels to increase and cause complications (Widiyoga & Saichudin, 2020). Research conducted by Alidya (2022), explained that the results of the probability of eating behavior with blood glucose levels are $p < 0.001$, which means that there is a significant relationship between eating behavior and blood glucose levels in type 2 DM patients. Lack of physical activity is a factor that can cause DM because it occurs insulin resistance so that blood glucose can not enter the body's cells which eventually glucose accumulates in the blood and causes an increase in blood glucose levels (Pertiwi, 2019). By doing sufficient physical activity, blood glucose levels will be converted into energy and insulin will increase, thereby reducing blood glucose levels (Melati & Herlina, 2022).

Research conducted by Eristamiani (2019), showed that there was an effect of physical activity on blood glucose levels with a p-value <0.001, there was a decrease in blood glucose from 95.33 mg/dl before physical activity to 86.64 mg/dL after physical activity, which means there was a significant decrease of blood glucose levels. The prevention to control blood glucose levels in type 2 DM patients can be to modifiable risk factors, there are eating behavior and physical activity (Febrianti et al., 2020). Type 2 DM patients are encouraged to adopt a healthy diet. Physical activity must also be increased by exercising regularly, at least 3-4 times a week (Kemenkes RI, 2018). According to the background, the researcher is interested in examining the relationship between eating behavior and physical activity with blood glucose levels in type 2 DM patients at the Gayaman Health Center in Mojokerto.

METHOD

The study design used correlation analysis with a cross-sectional approach. The population in this study was all type 2 diabetes mellitus patients at the Gayaman Public Health Center Mojokerto. The sampling technique of this study was consecutive sampling. The research instrument used an eating behavior questionnaire adopted from the Aethelstone and physical activity level (PAL) questionnaire and was analyzed using the Spearman Rho test.

RESULTS

Respondent Characteristics

The results based on table 1 showed that the average of age was 56.55 years with a standard deviation of 10.07 years. The median length of suffering from DM was 4.91 years, with the latest being 1 year and the longest being 18 years. Most of the respondents were female as many as 39 respondents (69.6%). The proportion of marital status was mostly married as many as 46 respondents (82.1%). The proportion of education level for the majority of elementary schools was 23 respondents (41.1%). The proportion of the respondent's employment was mostly unemployed as many as 34 respondents (60.7%).

Table 1 Respondent's Characteristics

Variable	Mean	Median	SD	Min-Max	95% CI *Lower-Upper*
Age*	56,55	56.50	10.07	36-85	53.86-59.25
Suffering DM	4.91	3.50	4.13	1-18	3.81-6.02
Variable				**N**	**%**
Gender	Man			17	30.4
	Women			39	69.6
Marital Status	Single			0	0
	Married			46	82.1
	Widower/Widow			10	17,9
Education Level	Illiterate			2	3.6
	Elementary School			23	41.1
	Junior High School			12	21.4
	Senior High School			5	8.9
Employment	Unemployed			34	60.7
	Private Employee			19	33.9
	Civil Engineer			3	5.4

*Data was normally distributed

Table 2 Eating Behaviors, Physical Activity, and Blood Glucose Levels

Variable		n	%
Eating Behaviors	Poor	25	44.6
	Average	17	30.4
	Good	14	25.0
Physical Activity	Low	27	48.2
	Moderate	12	21.4
	High	17	30.4
Blood Glucose Levels	Low	1	1.8
	Normal	10	17.9
	High	45	80.4

Eating Behaviors, Physical Activity, and Blood Glucose Levels

The results based on table 2 showed that most of the respondents' eating behaviors were poor eating behaviors as many as 25 respondents (44.6%). The proportion of physical

activity was low physical activity, there were 27 respondents (48.2%). The proportion of blood glucose levels was high, there were 45 respondents (80.4%).

Table 3 Bivariate Analysis

Variable		Blood Glucose Levels						*P value*
		Low		Normal		High		
		n	%	n	%	n	%	
Eating Behaviors	Poor	0	0	2	3.6	23	41.1	0.001*
	Average	0	0	1	1.8	16	28.6	
	Good	1	1.8	7	12.5	6	10.7	
Total		1	1.8	10	17.9	45	80.4	
Physical Activity	Low	1	1.8	0	0	26	46.4	0.002*
	Moderate	0	0	3	5.4	9	16.1	
	High	0	0	7	12.5	10	17.9	
Total		1	1.8	10	17.9	45	80.4	

* Significant at p-*value* <0.05

Bivariate Analysis

Eating Behaviors and Blood Glucose Levels

The results of the analysis based on table 3 showed that there was a significant relationship between eating behavior and blood glucose levels in Type 2 Diabetes Mellitus patients at the Gayaman Health Center in Mojokerto (p value=0.001; α <0.05). The results of the further analysis showed that the value of the correlation coefficient was -0.429. The level of strength of the correlation between eating behaviors and blood glucose levels was weak and had a negative correlation. It means, the better eating behaviors, the lower blood glucose levels.

Physical Activity and Blood Glucose Levels

The results of the analysis based on table 3 showed that there was a significant relationship between physical activity and blood glucose levels in Type 2 Diabetes Mellitus patients at the Gayaman Health Center in Mojokerto (p value=0.002; α <0.05). The results of the further analysis showed that the value of the correlation coefficient was -0.396. The level of strength of the correlation between physical activity and blood glucose levels was weak and had a negative correlation. It means the higher the physical activity, the lower the blood glucose levels.

DISCUSSION

Eating Behaviors

Most of the respondents' eating behaviors are poor eating behaviors of 44.6%. This is in line with previous studies which state that economic factors or sources of income will influence a person's choice of food quality. Poor eating behaviors will worsen the condition

of patients suffering from Type 2 DM, with the results of the study showing that out of 46 respondents (100%) have poor eating behaviors. Of the 46 respondents, 28 of them are housewives, and 11 respondents with self-employed jobs (Media, 2017). Based on the results obtain in this study and the data obtain in previous studies, it can be seen that economic factors (type of work) can affect a person's eating behaviors. Someone whose low income, will cause someone to consume whatever they have, because to choose the quality and type of food, there are economic limitations so they will tend to only consume what they have.

Physical Activity

The proportion of physical activity is mostly light at 48.2%. According to Sabila's research (2022), physical activity can be influenced by several factors, one of which is employment status. This is in line with previous research which states that the type of employment also influences a person's physical activity. Lack of daily activities can lead to obesity which triggers an increase in the production of cytokine hormones resulting in insulin resistance, with the result that 51.2% have low physical activity and 33 of the respondents are unemployed (Dhifa & Masikki, 2018). Based on the results obtained in this study and data obtained in previous studies, it can be seen that the type of employment can affect a person's physical activity. Someone who works will tend to do physical activity compared to the unemployed. Someone who is unemployed has a higher chance of not being physically active compared to someone who employee.

Blood Glucose Levels

The proportion of blood sugar levels is mostly high at 80.4%. This research is in line with research conducted by Gresty & Mulyadi (2018) which shows that most respondents have high blood glucose levels of 93.3%. Other research shows that most respondents have high glucose levels, there is 66% (Fahmiyah & Latra, 2018). According to Shoufika's research (2018), blood glucose levels are the total glucose present in the blood plasma. An increase in blood glucose levels will lead to a decline in the health condition of Type 2 DM patients. Therefore, Type 2 DM patients require good and regular management to keep blood glucose levels under control (Hestiana, 2017). Based on the results obtained in this study as well as data obtained from previous studies, it can be seen that high blood glucose levels are a factor that influences the occurrence of Type 2 DM. Several factors also influence high or low blood glucose levels, including eating behaviors and physical activity which is conducted.

Eating Behaviors and Blood Glucose Levels

There is a significant relationship between eating behaviors and blood glucose levels in Type 2 DM patients at Gayaman Health Center, Mojokerto (p-value=0.001; α <0.05). This research is in line with the results of Alidya's research (2022), there is poor eating behaviors result in uncontrolled blood glucose with the results of a probability eating behaviors with blood glucose levels (p-value <0.001; α <0.05), which means that there is a

significant relationship between eating behaviors and blood glucose levels in Type 2 DM patients. This study is also by other studies which state that uncontrolled eating behaviors can result in increased blood glucose levels with a p-value of 0.03, meaning that there is a significant relationship between eating behavior and blood glucose levels in Type 2 DM patients (Astutisari et al., 2022). Based on the results of the study it can be concluded that poor eating behaviors can affect blood glucose levels. The better eating behaviors in Type 2 DM patients, the lower blood glucose levels.

Physical Activity and Blood Glucose Levels

There is a significant relationship between physical activity and blood glucose levels in Type 2 DM patients at Gayaman Health Center, Mojokerto (p value=0.002; α <0.05). This study is in line with Astutisari's research (2022), which states that there is a significant relationship between high physical activity and blood glucose levels in Type 2 DM patients (p value=0.009; α <0.05). This study is also by Eristamiani's research (2019), which shows that there is an effect of physical activity on blood glucose levels (p-value <0.001; α <0.05), meaning that there is a decrease in blood glucose levels from 95.33 mg/dl before physical activity to 86.64 mg/dl after doing physical activity, there is a significant decrease. Based on the results of the study it can be concluded that high physical activity can affect blood glucose levels. The less a person does physical activity, the higher their blood glucose levels.

CONCLUSION

Poor eating behaviors tend to cause high blood glucose levels because of excessive intake of food and drinks that contain carbohydrates which are metabolized to be glucose, if the patient is not doing physical activity then the glucose levels become high. The importance of controlling blood glucose levels in Type 2 Diabetes Mellitus patients by improving eating behavior includes an eating schedule, reducing food and drinks that contain a lot of glucose, and increasing physical activity.

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CONFLICT OF INTEREST

The author reported no conflict in this research.

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