Analysis Of Factors Associated With Blood Glucose Levels Among Type 2 Diabetes Mellitus Patients At Jatinegara Public Health Center In 2025

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Abstract.

Type 2 diabetes mellitus (T2DM) is one of the most prevalent non-communicable diseases in Indonesia. Blood glucose control is essential to prevent complications; therefore, identifying associated factors is crucial. ***Objective:*** *To determine the factors associated with random blood glucose (RBG) levels among T2DM patients enrolled in the Prolanis program at Jatinegara Health Center in 2025.* ***Methods:*** *This study employed an analytical cross-sectional design involving 92 T2DM Prolanis patients. Data were collected through interviews, questionnaires, anthropometric measurements, and medical records. Data analysis included univariate, bivariate (chi-square), and multivariate (logistic regression).* ***Results:*** *Most respondents had normal RBG levels (80.4%), were female (76.1%), aged >60 years (56.5%), and had a family history of diabetes (57.6%). Non-modifiable factors (sex, age, family history) and modifiable factors (BMI, knowledge, stress, fiber intake, and physical activity) were not significantly associated with RBG levels (p>0.05). However, carbohydrate consumption patterns emerged as the dominant factor increasing the risk of hyperglycemia (OR=4.08; 95% CI=0.869–19.171).* ***Conclusion:*** *Carbohydrate consumption pattern was identified as the dominant factor associated with random blood glucose levels among T2DM Prolanis patients at Jatinegara Health Center. Nutritional interventions and education on low-glycemic index diets should be strengthened to improve glycemic control.*

Keywords: *Type 2 Diabetes Mellitus; Random Blood Glucose; Risk Factors and Prolanis.*

I. INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from impaired insulin secretion, insulin action, or both [1]. It is considered one of the most significant global health problems due to its high prevalence, chronic nature, and potential for serious complications. According to the World Health Organization (WHO) [2], DM was directly responsible for approximately 1.5 million deaths in 2019, with almost half of these deaths occurring before the age of 70. The global burden of diabetes has increased dramatically, with more than 415 million people affected in 2015, and projections indicate that the number will rise to 642 million by 2040. In Indonesia, DM has become a pressing public health concern, with the country ranking seventh worldwide in terms of the number of diabetes cases, and a reported national prevalence of 2.2% [3].Type 2 diabetes mellitus (T2DM) is the most common form of DM, accounting for the majority of cases globally. Unlike type 1 diabetes, which is primarily autoimmune in nature, T2DM is strongly influenced by lifestyle and environmental factors in addition to genetic predisposition. Modifiable risk factors include unhealthy dietary patterns, obesity, physical inactivity, psychological stress, and hypertension, while non-modifiable risk factors include age, sex, and family history of diabetes. These factors contribute not only to the onset of T2DM but also to poor glycemic control among those already diagnosed.Evidence from previous studies highlights the role of physical activity, obesity, dietary habits, and stress in influencing blood glucose levels among patients with T2DM [4,5].

Urban populations, particularly in low- and middle-income countries, are disproportionately affected due to lifestyle transitions associated with rapid urbanization, increased consumption of processed and fast food, sedentary behavior, and higher levels of psychosocial stress. These conditions create an environment conducive to poor glycemic control and increased risk of complications such as cardiovascular disease, kidney disease, neuropathy, and retinopathy.In Jakarta, the capital city of Indonesia, the prevalence of diabetes has been increasing steadily in line with urbanization and demographic transitions. At Jatinegara

Health Center, East Jakarta, the prevalence of DM was reported to be 2.3% in 2024, which is higher than the average prevalence observed in other primary health centers in East Jakarta. The Jatinegara area is characterized by high population density, urban lifestyle patterns, and a large proportion of elderly residents, all of which are suspected to contribute to the increased burden of T2DM in this community.Given the importance of maintaining adequate glycemic control to prevent complications, understanding the factors associated with **Random Blood Glucose (RBG)** levels in patients with T2DM is essential. Identifying both modifiable and non-modifiable risk factors provides valuable insights for designing targeted interventions, particularly within primary health care programs such as Prolanis, which is aimed at improving the quality of life and clinical outcomes of patients with chronic diseases. Therefore, this study was conducted to analyze the factors associated with RBG levels among T2DM patients enrolled in the Prolanis program at Jatinegara Health Center, East Jakarta.

II. METHODS

Study Design

This study employed a quantitative analytic approach with a cross-sectional design. Independent variables (age, education, sex, dietary patterns, occupation, family history of diabetes, obesity, physical activity, hypertension, and stress) and the dependent variable (Random Blood Glucose [RBG] level among patients with type 2 diabetes mellitus) were measured simultaneously.

Study Setting and Period

The research was conducted at Jatinegara Health Center, East Jakarta, from April to June 2025. This primary health care center provides chronic disease management programs, including Prolanis, which serves as the main source of patient data in this study.

Population and Sample

The study population consisted of all T2DM patients enrolled in the Prolanis program at Jatinegara Health Center, totaling 120 individuals. The sample size was determined using the Slovin formula with a 5% margin of error, yielding 92 respondents. Sampling was performed using purposive sampling techniques with the following criteria:

a. Inclusion criteria: patients diagnosed with T2DM by a physician, able to communicate effectively, and willing to provide informed consent.
b. Exclusion criteria: patients with type 1 DM or individuals unwilling to participate.
c. Variables
d. Independent variables: age, sex, education, occupation, family history of diabetes, dietary patterns, physical activity, obesity, hypertension, and stress.
e. Dependent variable: Random Blood Glucose (RBG) levels in patients with T2DM.

Research Ethics

This study adhered to ethical research principles, including respect for persons, beneficence, non-maleficence, and justice. All respondents provided written informed consent prior to participation. Confidentiality of patient identity and data was strictly maintained.

Data Collection Procedures and Instruments

Data collection was conducted after obtaining official research permission. Primary data were obtained through structured interviews and questionnaires assessing dietary patterns, physical activity, stress, and knowledge. Anthropometric measurements (Body Mass Index/BMI), blood pressure assessment, and RBG testing were conducted using standardized procedures with a glucometer. Secondary data were obtained from medical records at Jatinegara Health Center.

Data Processing and Analysis

The data analysis process involved several stages: editing, coding, scoring, data entry, and data cleaning.

a. Univariate analysis was used to describe the frequency distribution of respondent characteristics.
b. Bivariate analysis was performed using the chi-square test to examine the association between independent variables and RBG levels.

c. Multivariate analysis was conducted using multiple logistic regression to identify the most dominant factors associated with RBG levels. Independent variables with a p-value ≤0.25 in the bivariate analysis were included in the regression model.

III. RESULT AND DISCUSSION

The study was conducted at the Jatinegara District Health Center, East Jakarta, which serves approximately 326,000 residents across eight sub-districts. The health center provides a comprehensive range of non-communicable disease (NCD) services, including diabetes management, Prolanis activities, laboratory examinations, nutritional counseling, physical activity sessions, and routine health education. The high number of visits from diabetes patients makes this location a representative setting for the study.

Univariate Analysis

The majority of respondents were female (76.1%) and aged over 60 years (56.5%). More than half reported a family history of diabetes (57.6%). Hypertension was present in 67.4% of participants, while 44.6% were classified as obese. Nearly half of the respondents had low levels of diabetes-related knowledge (48.9%), and the majority experienced high levels of stress (93.5%). Most respondents reported frequent carbohydrate consumption (70.7%), adequate fiber intake (87.0%), and moderate levels of physical activity (75.0%).Regarding **Random Blood Glucose (RBG)** levels, the majority of respondents had normal values (80.4%), while 19.6% were classified as hyperglycemic.

Bivariate Analysis

Table 1. presents the association between non-modifiable factors (age, sex, family history) and RBG levels.

Variable	GDS (Random Blood Glucose)				Total		OR (95% CI)	Nilai P
	Normal		High					
	n	%	n	%	n	%		
Sex (n=92)								
Male	16	21,6	6	33,3	22	23,9	0,552	
Female	58	78,4	12	66,7	70	76,1	(0,179 – 1,700)	0,461
Total	74	100	18	100	92	100		
Age (n=92)								
40-60 years	31	41,9	9	50,0	40	43,5	0,721	
>60 years	43	58,1	9	50,0	52	56,5	(0,257 – 2,025)	0,721
Total	74	100	18	100	92	100		
Family Histpry of DM (n=92)								
Yes	43	58.1	10	55.6	53	57.6	1,110	
No	31	41.9	8	44.4	39	42.4	(0,393-3,133)	1,000
Total	74	100	18	100	92	100		

Table 2. Association between Modifiable Factors and Random Blood Glucose (RBG) Levels among T2DM Patients

Variable	GDS (Random Blood Glucose)				Total		OR (95% CI)	Nilai P
	Normal		High					
	n	%	n	%	n	%		
Hypertension (n=92)								
Normal	21	22,8	9	9,7	30	32,6		
High	50	54,3	12	13	62	67,4	-	0,3813
Total	71	77,1	21	22,8	92	100		
BMI (n=92)								
Normal	27	36.5	5	27.8	32	34.8	-	0.579
Overweight	16	21.6	3	16.7	19	20.7		
Obese	31	41.9	10	55.6	41	44.6		
Total	74	100	18	100	92	100		
Knowledge Level (n=92)								
Good	7	9.5	4	22.2	11	12.0		
Fair	28	37.8	8	44.4	36	39.1	-	0.197
Poor	39	52.7	6	33.3	45	48.9		
Total	74	100	18	100	92	100		

Stress Level (n=92)								
High	69	93.2	17	94.4	86	93.5	-	0.884
Moderate	4	5.4	1	5.6	5	5.4		
Low	1	1.4	0	0	1	1.1		
Jumlah	74	100	18	100	92	100		
Carbohydrate Consumption Pattern (n=92)								
Rare	25	33.8	2	11.1	27	29.3	4.082 (0.869-19.171)	0.830
Frequent	49	66.2	16	88.9	65	70.7		
Total	74	100	18	100	92	100		
Fiber Consumption Pattern (n=92)								
Rare	8	10.8	4	22.2	12	13.0	0.424 (0.112-1.607)	0.241
Frequent	66	89.2	14	77.8	80	87.0		
Total	74	100	18	100	92	100		
Physical Activity (n=92)								
Light	16	21.6	7	38.9	23	25.0	0.433 (0.145-1.299)	0.225
Moderate	58	78.4	11	61.1	69	75.0		
Total	74	100	18	100	92	100		

Multivariate Analysis

No statistically significant associations were found between non-modifiable factors (sex, age, family history) and modifiable factors (hypertension, BMI, knowledge, stress, carbohydrate intake, fiber intake, and physical activity) with RBG levels ($p>0.05$).Candidate variables ($p\leq0.25$) from the bivariate selection included knowledge level, carbohydrate intake, fiber intake, and physical activity. The final multivariate logistic regression model revealed that **carbohydrate intake** was the dominant factor associated with RBG levels (OR=4.08; 95% CI: 0.869–19.171). This finding indicates that T2DM patients with frequent carbohydrate consumption were four times more likely to experience hyperglycemia compared to those with lower carbohydrate intake.

Discussion

This study showed that the majority of T2DM patients enrolled in the Prolanis program at Jatinegara Health Center had normal RBG levels (80.4%), although 19.6% remained hyperglycemic. This finding is clinically important since uncontrolled hyperglycemia increases the risk of chronic complications such as nephropathy, retinopathy, and cardiovascular disease [6].Most respondents were female (76.1%) and aged over 60 years (56.5%). The predominance of female participants aligns with evidence suggesting that women are more proactive in accessing health services, including chronic disease management programs [7]. The large proportion of older adults is consistent with the established role of aging in the development of insulin resistance and pancreatic β-cell dysfunction [8].More than half of respondents (57.6%) had a family history of diabetes, highlighting the role of genetic predisposition as emphasized by Gaulton et al. [9]. However, no significant association was found between genetic factors and RBG levels in this study. This may be explained by the role of Prolanis interventions, which could mitigate the influence of hereditary risk on short-term glycemic levels.

All respondents were reported to have hypertension, and 65.3% were classified as overweight or obese. Both conditions are known to be important risk factors for insulin resistance and cardiovascular complications [10,11]. Nevertheless, in this study, neither hypertension nor BMI showed a significant relationship with RBG levels. This contrasts with the findings of Wahyuni et al. [12], who reported a positive correlation between obesity and hyperglycemia. The discrepancy may be attributable to the stabilizing effect of pharmacological treatment and health education provided within the Prolanis program.Nearly half of the respondents demonstrated low levels of knowledge (48.9%), and almost all (93.5%) reported high stress levels. Theoretically, both factors may influence treatment adherence and glycemic control [13,14]. However, no significant associations were found in this study. The provision of continuous health education and counseling through Prolanis may have reduced the direct impact of these factors on RBG levels.Dietary carbohydrate intake emerged as the most influential factor in glycemic control. Patients with frequent carbohydrate consumption were 4.08 times more likely to have hyperglycemia compared to those with lower intake.

This result is consistent with the findings of Brand-Miller et al. [15] and Yulianti et al. [16], which demonstrated that excessive intake of high-glycemic index foods significantly elevates blood glucose levels. In contrast, adequate fiber intake (87.0%) did not show a significant association with RBG, differing from Weickert & Pfeiffer [17]. This discrepancy may be due to variations in fiber type consumed and the limitations of dietary assessment methods.Most respondents reported moderate levels of physical activity (75.0%), in line with recommendations by Colberg et al. [18] for glycemic management. Nevertheless, no significant association with RBG was observed. This finding is consistent with Qurratueni [19], but contrasts with Susanti et al. [20], who highlighted the role of moderate-to-vigorous activity in reducing glucose levels. The differences may be due to the cross-sectional design of this study and the potential confounding effect of routine pharmacological therapy in Prolanis participants.Overall, the lack of statistically significant associations for most factors with RBG levels may be explained by the limited sample size, biological variability, and the influence of Prolanis as an effective chronic disease management program. Despite this, dietary carbohydrate intake consistently emerged as the dominant factor associated with RBG, underscoring the importance of dietary interventions and low-glycemic index food education as key strategies in the management of T2DM.

IV. CONCLUSION

This study demonstrated that the majority of type 2 diabetes mellitus (T2DM) patients enrolled in the Prolanis program at Jatinegara Primary Health Center presented with random blood glucose (RBG) levels within the normal range. Despite the high prevalence of comorbid conditions such as hypertension and obesity, most participants were able to maintain acceptable glycemic levels at the time of examination. The analysis indicated that non-modifiable factors, including sex, age, and family history of diabetes, as well as modifiable factors such as body mass index, nutritional status, level of knowledge, psychological stress, fiber intake, and physical activity, were not significantly associated with RBG levels. However, dietary patterns, particularly frequent carbohydrate consumption, were found to be the dominant factor associated with an increased risk of hyperglycemia among T2DM patients.These findings reinforce the crucial role of dietary management in diabetes care. While many lifestyle factors play a role in overall health, carbohydrate intake appears to exert the greatest influence on short-term glycemic fluctuations in this study population.

Therefore, the incorporation of structured nutritional counseling, individualized diet planning, and consistent monitoring of carbohydrate intake should be prioritized in primary health care settings. Strengthening patient adherence to dietary recommendations is essential to ensure sustained glycemic control and to minimize the risk of long-term complications such as cardiovascular disease, nephropathy, and retinopathy.Furthermore, the results highlight the importance of integrating dietary interventions with existing Prolanis services, which already provide regular check-ups, physical activity programs, and health education. A more comprehensive approach, with greater emphasis on nutrition-focused interventions, may enhance the overall effectiveness of chronic disease management in primary care.In conclusion, this study underscores that glycemic management among T2DM patients cannot rely solely on pharmacological treatment but must be supported by consistent lifestyle modification, especially in relation to carbohydrate intake. Policy makers and primary health care providers should consider strengthening health promotion programs that target dietary behavior, while also developing community-based strategies to increase awareness and empower patients in managing their condition.

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