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FACTORS THAT INCREASE BLOOD SUGAR IN JKN PATIENTS AT MUFID SIGLI HOSPITAL IN 2024

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ABSTRACT

This study aims to identify the factors associated with increased blood sugar levels in JKN participants at RSU Mufid. A descriptive analytic approach with a cross-sectional design was used in this study, conducted at RSUD Mufid Kota Sigli from April to December 2024. The sample included 99 BPJS patients with Diabetes Mellitus (DM), selected using purposive sampling based on Slovin's formula with a margin of error of 10%. The study evaluated several risk factors, including physical activity, obesity, family history, hypertension, gender, and age. The results show that age over 40 years is the most dominant risk factor for increased blood sugar levels, with a prevalence ratio (PR) of 6.077. Hypertension also significantly contributes to increased blood sugar levels, with a PR of 5.742. Obesity, while having a smaller impact compared to age and hypertension, still contributes to the risk of diabetes mellitus, with a PR of 1.436. Therefore, diabetes prevention strategies should focus on weight management, blood pressure control, and the adoption of a healthy lifestyle, especially for individuals at higher risk.

Keywords: *blood sugar levels, risk factors, diabetes mellitus*

ABSTRAK

Penelitian ini bertujuan untuk mengetahui faktor-faktor yang berhubungan dengan peningkatan kadar gula darah pada pasien peserta JKN di RSU Mufid. Metode yang digunakan adalah deskriptif analitik dengan desain cross-sectional, yang dilakukan di RSUD Mufid Kota Sigli pada periode April hingga Desember 2024. Sampel penelitian terdiri dari 99 pasien BPJS penderita Diabetes Mellitus (DM) yang dipilih menggunakan teknik purposive sampling berdasarkan rumus Slovin dengan tingkat kesalahan 10%. Variabel yang dianalisis meliputi usia, tekanan darah tinggi, obesitas, aktivitas fisik, riwayat keluarga, jenis kelamin, dan hipertensi. Hasil penelitian menunjukkan bahwa usia di atas 40 tahun merupakan faktor risiko dominan dengan nilai rasio prevalensi (PR) sebesar 6,077. Selain itu, hipertensi memiliki kontribusi signifikan terhadap peningkatan kadar gula darah dengan PR sebesar 5,742. Obesitas juga berperan dalam meningkatkan risiko diabetes mellitus, meskipun dengan dampak yang lebih kecil (PR = 1,436). Oleh karena itu, strategi pencegahan diabetes perlu difokuskan pada pengelolaan berat badan, pengendalian tekanan darah, serta penerapan gaya hidup sehat, terutama bagi kelompok usia rentan.

Kata Kunci: kadar gula darah, faktor risiko, diabetes mellitus.

INTRODUCTION

The distribution of diabetes exhibits significant regional variations and poses a global health challenge. According to 2021 data, the Western Pacific region recorded the highest number of diabetes cases worldwide, with 206 million cases, followed by Southeast Asia with 90 million cases. Indonesia, as part of Southeast Asia, ranks fifth globally in the number of diabetes mellitus (DM) cases, with a prevalence of 10.6%, or approximately 19.47 million people out of a total population of 270 million. This figure is projected to rise to 13%, or 35 million people, by 2023 (Pahlevi, 2021).

In Aceh Province, data from the Provincial Health Office in 2023 reported 154,889 cases of diabetes mellitus, with Pidie Regency recording 8,030 cases, ranking eighth in the province. The highest number of cases was in South Aceh Regency, with 21,514 cases (Dinkes Aceh, 2023). The high incidence of diabetes in Pidie is a serious concern, considering the complications associated with diabetes, such as cardiovascular diseases and kidney failure (Asmirawati & Sumarlin, 2018).

The increasing prevalence of DM, particularly type 2 DM, is influenced by genetic and environmental factors, including urbanization, which leads to lifestyle changes. An imbalanced diet, obesity, and lack of physical activity are major contributing factors to diabetes. For instance, obesity increases the risk of type 2 DM up to four times compared to individuals with normal nutritional status (Panggabean, 2023). Other factors such as hypertension, stress, medication adherence, and family support also play a role in controlling patients' blood sugar levels (Melani & Handayani, 2021).

Previous studies have shown that geographic variations in diabetes prevalence are influenced by access to healthcare services and dietary patterns across different regions (Srisusilawati & Eprianti, 2017). Similarly, a study by Gurka et al. highlighted differences in the prevalence of obesity, metabolic syndrome, and diabetes across various regions in the United States due to demographic and environmental factors (Odha et al., 2021). Additionally, research by Kauhl et al. revealed that chronic diseases, including diabetes, exhibit geographically diverse distributions (Al-Hasni, 2017).

Mufid General Hospital in Pidie Regency, a type C hospital accredited with a "Paripurna" rating, has been collaborating with the National Health Insurance (JKN) since 2014. The high prevalence of DM in Pidie, particularly in Sigli City, serves as the rationale for selecting this research location. This study aims to identify factors associated with increased blood sugar levels in JKN participants receiving treatment at Mufid General Hospital. The findings are expected to contribute to efforts in preventing and managing diabetes in Pidie Regency.

RESEARCH METHODS

This study employs a descriptive-analytic approach with a cross-sectional design, conducted at Mufid Regional General Hospital (RSUD) in Sigli City from April to December 2024. The study sample consists of 99 BPJS patients with Diabetes Mellitus (DM), selected from a total population of 5,801 DM patients recorded between January and December 2023. The sample was chosen using purposive sampling based on Slovin's formula with a 10% margin of error.

This research evaluates several risk factors, including physical activity, obesity, family history, hypertension, gender, and age. The study aims to analyze the influence of these independent variables on diabetes management among BPJS patients at RSUD Mufid.

RESULTS AND DISCUSSION

Univariate Analysis Results

Univariate analysis is used to describe the characteristics of respondents and the distribution of research variables in the form of frequency distribution tables. This analysis aims to provide a general overview of the relationship between respondent characteristics and the occurrence of Diabetes Mellitus (DM).

Table 1. Distribution of Respondent Characteristics and Diabetes Mellitus Risk Factors

Variable	Category	Diabetes Mellitus	No Diabetes Mellitus	Total
		%		
Gender	Female	56.6	64.7	58
	Male	43.4	35.3	42
Age	<40 years	4.8	23.5	8
	>40 years	95.2	76.5	92
BMI	Obese	53	0	44
	Not Obese	47	100	56
Blood Pressure	Hypertension	63.9	23.5	57
	Normal	36.1	76.5	43
Family History	Yes	75.9	58.8	73
	No	24.1	41.2	27

Variable	Category	Diabetes Mellitus	No Diabetes Mellitus	Total
		%		
Physical Activity	Insufficient	30.1	41.2	32
	Sufficient	69.9	58.8	68

Based on Table 1, univariate analysis results indicate that out of 100 respondents examined, 83% were diagnosed with Diabetes Mellitus (DM), while 17% were not. Age is a significant factor, as the majority of DM patients (95.2%) are over 40 years old, suggesting that the risk of DM increases with age. Additionally, obesity plays a crucial role, with 53% of DM patients classified as obese, whereas all non-obese respondents had normal blood sugar levels.

Blood pressure is also a contributing factor, as 63.9% of DM patients had hypertension. Moreover, a family history of DM was associated with an increased risk, with 75.9% of DM patients having a family member with the disease. Regarding physical activity, 69.9% of DM patients had sufficient activity levels, although 30.1% still engaged in insufficient physical activity. These findings suggest that age, obesity, hypertension, and family history are the main factors contributing to the prevalence of Diabetes Mellitus in this study.

Bivariate Analysis Results

The following are the results of the bivariate analysis, which examines the relationship between various risk factors and the occurrence of Diabetes Mellitus (DM) at Mufid General Hospital, Sigli City. The analysis was conducted using the Chi-Square test and Fisher's Exact Test for variables with an expected count of <5. Additionally, the Risk method was used to determine the Prevalence Ratio (PR) to assess the magnitude of risk associated with each factor in relation to DM occurrence.

Table 2. Bivariate Analysis of Risk Factors Associated with Diabetes Mellitus

Variable	Diabetes Mellitus	No Diabetes Mellitus	p-value	PR	95% CI
	%				
Body Mass Index (BMI)					
Obese	44 (53)	0 (0)	0	1.436	1.208 - 1.707
Not Obese	39 (47)	17 (100)			
Blood Pressure					
Hypertension	53 (63.9)	4 (23.5)	0.002	5.742	1.718 - 19.193
Normal	30 (36.1)	13 (76.5)			
Physical Activity					
Insufficient	25 (30.1)	7 (32)	0.373	0.616	0.210 - 1.802
Sufficient	58 (69.9)	10 (58.8)			

Variable	Diabetes Mellitus	No Diabetes Mellitus	p-value	PR	95% CI
	%				
Family History					
Yes	63 (75.9)	10 (58.8)	0.228	2.205	0.742 - 6.552
No	20 (24.1)	7 (41.2)			
Gender					
Female	47 (56.6)	11 (64.7)	0.539	0.712	0.241 - 2.108
Male	36 (43.4)	6 (35.3)			
Age					
<40 years	4 (4.8)	4 (23.5)	0.027	6.007	1.349 - 27.370
>40 years	79 (95.2)	13 (76.5)			

Based on Table 2 of the bivariate analysis results above, several factors were found to have a significant relationship with the incidence of Diabetes Mellitus (DM), while others did not show a meaningful association. Body Mass Index (BMI) was significantly associated with DM (p-value = 0.000), where individuals with obesity were 1.436 times more likely to develop DM compared to those who were not obese. Blood pressure also had a significant association with DM (p-value = 0.002), with hypertensive individuals being 5.742 times more likely to develop DM than those with normal blood pressure.

Meanwhile, physical activity (p-value = 0.373) and family history (p-value = 0.228) did not have a significant relationship with DM, although individuals with a family history of DM had a higher tendency to develop the disease (PR = 2.205). Gender also showed no significant association with DM (p-value = 0.539), although the results indicated that males were more protected against DM compared to females (PR = 0.712). On the other hand, age was significantly associated with DM (p-value = 0.027), with individuals over 40 years old being 6.077 times more likely to develop DM than those under 40.

Thus, BMI, blood pressure, and age were the factors strongly associated with DM, while physical activity, family history, and gender did not show significant relationships in this study.

DISCUSSION

The Most Significant Risk Factors for Increased Blood Sugar Levels

The increase in blood sugar levels, which is a key indicator of diabetes mellitus (DM), is influenced by several significant risk factors. Based on the results of the bivariate analysis, three primary factors that showed a significant relationship with increased blood sugar levels were Body Mass Index (BMI), blood pressure, and age. These three

variables had a p-value < 0.05, indicating a statistically significant association with the incidence of diabetes mellitus (Nasution et al., 2021; Komariah & Rahayu, 2020).

BMI showed a very strong relationship with diabetes mellitus. A study conducted by Nasution et al. (2021) found that individuals with obesity had a higher risk of developing diabetes compared to those with a normal BMI. Another study by Salim et al. (2021) also supported this finding, showing that obesity is a major risk factor in the development of diabetes mellitus, which is closely linked to insulin resistance and impaired glucose metabolism (Armal, 2023).

In addition to BMI, age is also a significant risk factor. Studies indicate that as age increases, the risk of developing diabetes mellitus also rises. Older individuals tend to have higher blood sugar levels compared to younger age groups (Komariah & Rahayu, 2020).

High blood pressure or hypertension also contributes to increased blood sugar levels. Hypertension is often associated with other metabolic conditions that increase the risk of diabetes mellitus (Arifin, 2020; Susilawati et al., 2020). On the other hand, risk factors such as family history and physical activity did not show a significant relationship with the incidence of diabetes mellitus in this study. With p-values greater than 0.05, these factors may contribute to diabetes risk but do not have as much influence as BMI, blood pressure, and age (Nasution et al., 2021; Irwan et al., 2021).

Overall, the findings of this study emphasize the importance of managing key risk factors such as obesity and blood pressure in the prevention of diabetes mellitus. Given the strong relationship between obesity and diabetes, prevention strategies focusing on weight management and increased physical activity are highly recommended (Salim et al., 2021; Armal, 2023).

Percentage of Each Risk Factor in Increased Blood Sugar Levels

The increase in blood sugar levels associated with diabetes mellitus (DM) is influenced by various risk factors. Based on the bivariate analysis results, the three main factors significantly associated with the incidence of diabetes mellitus are age, blood pressure, and Body Mass Index (BMI).

The factor with the highest percentage in the increase of diabetes mellitus cases is age, where 95.2% of respondents over 40 years old were diagnosed with diabetes mellitus. This indicates that age is a dominant risk factor in the development of diabetes mellitus (Nasution et al., 2021).

The second significant risk factor is blood pressure, where 63.9% of respondents with hypertension also had diabetes mellitus. Hypertension is closely related to glucose metabolism disorders, which can lead to insulin resistance and impaired glucose tolerance (Komariah & Rahayu, 2020). These findings are also supported by research conducted by Rediningsih and Lestari, which noted a significant relationship between hypertension and diabetes mellitus (Salim et al., 2021).

The last risk factor is BMI, with 53% of obese respondents diagnosed with diabetes mellitus. Obesity has been proven to be a major factor in the development of diabetes mellitus, as excessive fat accumulation can cause significant insulin resistance, thereby disrupting glucose metabolism (Armal, 2023). A study by Putri et al. also supports these findings, showing that obesity is associated with an increased risk of diabetes mellitus (Arifin, 2020).

Overall, the results of this study confirm that being over 40 years old, having hypertension, and being obese are the main risk factors for increased blood sugar levels and the incidence of diabetes mellitus. Therefore, efforts to prevent and manage diabetes mellitus should focus on controlling these factors (Nasution et al., 2021; Komariah & Rahayu, 2020; Salim et al., 2021).

The Most Dominant Factor in Increased Blood Sugar Levels

The dominant factor in increased blood sugar levels can be determined through the prevalence ratio (PR) values of the tested variables. Based on the bivariate analysis results, three variables significantly associated with the incidence of diabetes mellitus were age, blood pressure, and Body Mass Index (BMI). Among these three factors, age had the highest PR value of 6.077, indicating that individuals over 40 years old have a 6.077 times higher risk of developing diabetes mellitus compared to those under 40 (Nasution et al., 2021; Komariah & Rahayu, 2020).

This high PR value shows that age is the most dominant risk factor in increased blood sugar levels. As age increases, the risk of diabetes mellitus also rises, especially after 40 years old. This is due to several factors, including decreased physical activity, weight gain, and physiological changes such as reduced muscle mass and increased glucose intolerance (Salim et al., 2021; Armal, 2023).

Besides age, blood pressure is also a significant risk factor, with a PR value of 5.742. Hypertension can affect glucose metabolism and contribute to the development of diabetes mellitus through insulin resistance mechanisms (Arifin, 2020). Meanwhile, BMI had the lowest PR value among the three factors, at 1.436. Although obesity contributes to increased blood sugar levels, its influence is not as strong as age and blood pressure (Susilawati et al., 2020).

Previous research explains that the loss of active tissue and the decrease in basal metabolism that begin at the age of 40 contribute to the increased risk of diabetes mellitus (Salim et al., 2021). Additionally, Komariah and Rahayu emphasize that the rise in glucose intolerance with age is also an important factor in the development of diabetes mellitus (Armal, 2023).

Overall, the results of this study indicate that age is the most dominant risk factor in increased blood sugar levels, followed by blood pressure and BMI. Therefore, strategies for preventing and managing diabetes mellitus should focus on controlling these factors, especially for individuals over 40 years old (Nasution et al., 2021; Komariah & Rahayu, 2020; Salim et al., 2021).

CONCLUSION

Age over 40 years is the most dominant risk factor for increased blood sugar levels, with a prevalence ratio (PR) of 6.077. As individuals age, physiological changes occur, such as decreased metabolism, reduced muscle mass, and increased glucose intolerance. These factors contribute to a higher risk of diabetes mellitus, especially if not balanced with a healthy lifestyle. Therefore, individuals over 40 years old need to be more cautious in maintaining blood sugar levels through a balanced diet and regular physical activity.

In addition to age, high blood pressure or hypertension also significantly contributes to increased blood sugar levels, with a PR value of 5.742. Hypertension can lead to insulin resistance and glucose metabolism disorders, increasing the likelihood of developing diabetes mellitus. This condition highlights the importance of proper blood pressure management, such as adopting a low-sodium diet and engaging in regular exercise, to prevent blood sugar spikes and other health complications.

Another contributing factor is obesity, with a PR value of 1.436. Although it has a smaller impact compared to age and blood pressure, obesity still plays a role in increasing the risk of diabetes mellitus. Excess fat accumulation, especially in the abdominal area, can lead to insulin resistance and impaired glucose tolerance. Therefore, diabetes prevention strategies should include optimal weight management through a healthy diet, increased physical activity, and blood pressure control, particularly for individuals with these major risk factors.

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