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Factors Associated with the Incidence of Type 2 Diabetes Mellitus in Women at Kayen Regional Public Hospital

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Abstract. The International Diabetes Federation Atlas reports that the number of people with diabetes worldwide has reached 463 million and is projected to increase by 51% to around 700 million by 2045. In 2019, the global prevalence of diabetes in individuals aged 20–79 years was 9.3%. The Health Office of Pati Regency in 2018 reported that type 2 diabetes mellitus constituted 19.33% of all reported non-communicable disease cases, totaling 9,676 cases. This study aims to identify factors associated with the incidence of type 2 diabetes mellitus in women at Kayen Regional Public Hospital, Pati Regency. This quantitative research used a cross-sectional design with a sample of 89 women, selected through random sampling. The research instrument was a questionnaire administered directly at Kayen Regional Public Hospital. Data analysis included univariate and bivariate analyses using the Chi-Square test. The findings indicate significant associations between age and the incidence of type 2 diabetes mellitus (p-value = 0.0001), genetic factors (p-value = 0.0001), body mass index (p-value = 0.0001), physical activity (p-value = 0.0001), history of hypertension (p-value = 0.0001), and educational level (p-value = 0.002). In conclusion, the factors significantly associated with the incidence of type 2 diabetes mellitus in women at Kayen Regional Public Hospital include age, genetic predisposition, body mass index, physical activity, hypertension history, and educational level.

Key words: Diabetes mellitus factors, type 2 diabetes mellitus

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both (Indonesian Society of Endocrinology, 2021). Type 2 diabetes mellitus is a chronic condition marked by elevated blood glucose levels caused by insulin resistance or inadequate insulin production (Ministry of Health of the Republic of Indonesia, 2023). This condition affects how the body uses glucose as an energy source. Common symptoms include frequent thirst, hunger, and urination, rapid weight loss, blurred vision, numbness or tingling of the skin, and in women specifically, itching in the genital area, miscarriage, or fetal death with a birth weight >4 kg.

Diabetes mellitus is the third leading cause of death in Indonesia, accounting for 6.7% of total deaths, following stroke (21.1%) and heart disease (12.9%). According to the 2018 Basic Health Research (Riskesdas), the prevalence of diabetes has shown a significant increase over the past five years. The World Health Organization (WHO) predicts a sharp rise in the number of type 2 diabetes cases globally. In Indonesia, the number of type 2 diabetes patients is projected to increase from 8.4 million in 2000 to approximately 21.3 million in 2030. Similarly, the International Diabetes Federation (IDF) estimates a rise in the number of diabetes cases in Indonesia from 10.7 million in 2019 to 13.7 million by 2030. The 2023 Riskesdas data shows that the prevalence of diabetes in Indonesia is 11.7%, up from 10.9% in 2018.

The incidence of type 2 diabetes mellitus is higher in women compared to men. According to the 2023 Riskesdas, 2.0% of women in Indonesia are affected by diabetes, compared to 1.3% of

men—an increase from the 2018 figures. Physically, women have a greater tendency to develop a higher body mass index (BMI) than men. Women also tend to have higher cholesterol levels and different daily physical activities and lifestyle patterns, which significantly affect the risk of developing type 2 diabetes mellitus (Imelda, 2019).

In Central Java Province, the number of diabetes cases in 2023 reached 118,184, ranking third after East Java and West Java, with 47.4% categorized as type 2 diabetes. According to the 2023 Health Profile of Pati Regency, 33,621 cases were recorded, and all patients (100%) received healthcare services. Diabetes mellitus is one of the most common non-communicable diseases (NCDs) and is associated with significant risk factors. NCDs pose serious public health challenges due to their chronic nature, potentially impairing individual productivity. Diabetes patients often face physical limitations in performing daily activities due to the complications associated with the disease. The highest number of reported diabetes cases in Pati Regency was in Juwana Subdistrict (2,361 cases), followed by Kayen Subdistrict (1,982 cases).

In the Kayen Public Health Center service area, 1,982 cases of diabetes were identified, with the highest concentration in Kayen Village (314 cases or 15.84%). All patients received standard healthcare services, which included education, dietary planning, light physical exercise, pharmacological intervention, and blood glucose monitoring. These services were delivered monthly in group settings at each local non-communicable disease post (Posbindu PTM). Due to the high number of type 2 diabetes mellitus cases among women in the Kayen Subdistrict, this study was conducted to explore the factors associated with the incidence of type 2 diabetes mellitus in women at Kayen Regional Public Hospital.

METHODS

This study is a quantitative study, which involves the use of numerical data starting from the data collection stage. It employed an analytical survey design with a cross-sectional approach. In this design, all variables were measured and observed at a single point in time, allowing the researchers to conduct the study more efficiently. The research design used was a survey method with a questionnaire as the main instrument. The study was conducted at Kayen Regional Public Hospital, Pati Regency, in June 2024.

This study aimed to identify which factors among age, genetic history, body mass index, history of hypertension, physical activity, and education level are associated with the incidence of type 2 diabetes mellitus in women at Kayen Regional Public Hospital, Pati Regency. The study population consisted of all female outpatients attending the internal medicine clinic at the hospital. Based on the average number of patients from January to April 2024, there were 795 women. From this population, a total of 89 samples were obtained using Slovin’s formula.

The collected data were analyzed using SPSS software. Univariate analysis was used to describe the frequency distribution of the variables, and bivariate analysis using the Chi-Square test was conducted to determine the relationship between the independent variables and the incidence of type 2 diabetes mellitus.

RESULTS AND DISCUSSION

1. Univariat Analysis Results

The following presents the frequency distribution of characteristics among respondents with type 2 diabetes mellitus at Kayen Regional Public Hospital, Pati Regency.

Table 1. Frequency Distribution of Respondents Based on Age and Education

Variabel	N	%
Age		
22-44	11	12,4%
45-67	78	87,6%
Cumulative Age		
<45	11	12,4%
>45	78	87,6%
Genetic		
There isn't any	60	67,4%
There is	29	32,6%
Genetic		
Biological father	6	6,7%
Biological mother	22	24,7%
Brother	1	1,1%
Sister	2	2,2%
Body Mass Index		
Normal	58	65,2%
Underweight	7	7,9%
Overweight	17	17%
Obesitas	7	7
Physical Activity		
Light	59	66,3%
Currently	25	28,1%
Heavy	5	5,6%
History of Hypertension		
No	55	61,8%
Yes	34	38,2%
Level of education		
Low	45	50,6%
High	44	49,4%
Type 2 Diabetes Mellitus		
No DM	58	65,2%
Type 2 Diabetes Mellitus	31	34,8%

Sumber: Data Primer, 2022

Based on Table 1, there are two age categories among the 89 respondents. Respondents aged 22–44 years (<45) numbered 11 people (12.4%), while those aged 45–67 years (>45) totaled 78 people (87.6%). This indicates that the majority of respondents at Kayen Regional Public Hospital were aged over 45 years, ranging from 45 to 67 years.

Regarding genetic history, 60 respondents (67.4%) reported no family history of diabetes mellitus, while 29 respondents (32.6%) had a family history of the disease. This shows that most respondents did not have a genetic predisposition. Furthermore, among those with a family history, 22 respondents (24.7%) inherited it from their mother, 6 (6.7%) from their father, 2 (2.2%) from a sister, and 1 (1.1%) from a brother. This indicates that most respondents with a genetic history of diabetes mellitus inherited it from their mother.

Based on Body Mass Index (BMI), 58 respondents (65.2%) were in the normal category, 7 respondents (7.9%) were underweight, 17 respondents (17%) were overweight, and 7 respondents (7%) were obese. These findings indicate that most respondents had a normal BMI.

In terms of physical activity, 59 respondents (66.3%) engaged in light physical activity, 25 respondents (28.1%) in moderate activity, and 5 respondents (5.6%) in vigorous activity. This indicates that most respondents engaged in light physical activity. Regarding educational

attainment, there were two categories. Forty-five respondents (50.6%) had a low level of education (elementary and junior high school), while 44 respondents (49.4%) had a high level of education (senior high school and university). This indicates that most respondents had only completed elementary or junior high school. Lastly, based on diabetes status, 31 respondents (34.8%) had type 2 diabetes mellitus, while 58 respondents (65.2%) did not.

2. Bivariat Analysis Results

The following section presents the results of bivariate analysis, which was conducted to examine the relationship between age, genetic history, body mass index (BMI), physical activity, history of hypertension, and education level with the incidence of type 2 diabetes mellitus in women at Kayen Regional Public Hospital, Pati Regency.

Table 2. Association between Age and the Incidence of Type 2 Diabetes Mellitus in Women

	Incidence of Type 2 Diabetes Mellitus				**Total**		***P value***
Age	**DM Type 2**		**No DM**				
	N	**%**	**N**	**%**	**N**	**%**	
<45	11	100,0	0	0,0	11	100	0,0001
>45	20	25,6	58	74,4	78	100	
Total	**31**	**34,8**	**58**	**65,2**	**89**	**100**	

Based on Table 2, all respondents aged <45 years (11 people or 100.0%) were diagnosed with type 2 diabetes mellitus, while among those aged >45 years, only 20 (25.6%) had type 2 diabetes, and 58 (74.4%) did not. The chi-square test result shows a p-value of 0.0001 (<0.05), indicating a significant relationship between age and the incidence of type 2 diabetes mellitus in women. This finding aligns with a study by Cut Cahaya & Nunung (2021) at Meuraxa General Hospital, Banda Aceh, which also reported a significant association between age and type 2 diabetes (p = 0.000). It shows that while type 2 DM can occur at any age, the risk increases significantly for individuals over 45 years due to decreased glucose tolerance and insulin response with aging (Dewantari & Sukraniti, 2020).

Table 3. Association between Genetic History and the Incidence of Type 2 Diabetes Mellitus

	Incidence of Type 2 Diabetes Mellitus				**Total**		***P value***
Genetik	**DM Type 2**		**No DM**				
	N	**%**	**N**	**%**	**N**	**%**	
There isn't any	2	3,3	58	96,7	60	100	0,0001
There is	29	100,0	0	0,0	29	100	
Total	**31**	**34,8**	**58**	**65,2**	**89**	**100**	

As shown in Table 3, 100% of respondents with a genetic history of diabetes (29 individuals) were diagnosed with type 2 DM. Meanwhile, only 2 respondents without a genetic history (3.3%) had type 2 DM. The chi-square test yielded a p-value of 0.0001, confirming a significant association between genetic history and the incidence of type 2 diabetes mellitus in women. This is consistent with the findings of Sulaiman (2021) in Banyumelek Health Center, West Lombok, which reported a similar relationship. According to Mulyani & Kasih (2018), individuals with a family history of diabetes are four times more likely to develop DM compared to those without such a history.

Table 4. Association between Body Mass Index and the Incidence of Type 2 Diabetes Mellitus

Indeks Body Mass	Incidence of Type 2 Diabetes Mellitus				Total		*P value*
	DM Type 2		No DM				
	N	%	N	%	N	%	
Normal	8	13,8	50	86,2	58	100	0,0001
Underweight	3	42,9	4	57,1	7	100	
Overweight	14	82,4	3	17,6	17	100	
Obesitas	6	85,7	1	14,3	7	100	
Total	**31**	**34,8**	**58**	**65,2**	**89**	**100**	

Table 4 shows that 85.7% of obese and 82.4% of overweight respondents had type 2 DM, while only 13.8% of those with normal BMI had the condition. The chi-square test result (p = 0.0001) indicates a significant relationship between BMI and type 2 diabetes mellitus. This aligns with Prasetyani & Sodikin (2017), who also reported a significant association between BMI and DM in a study conducted at Cilacap Tengah 2 Health Center. Field observations suggest that poor dietary habits—such as high consumption of fatty, sugary, and low-nutrient foods—contribute to overweight and obesity.

Table 5. Association between Physical Activity and the Incidence of Type 2 Diabetes Mellitus

Physical Activity	Incidence of Type 2 Diabetes Mellitus				Total		*P value*
	DM Tipe 2		No DM				
	N	%	N	%	N	%	
Light	5	8,5	54	91,5	59	100	0,0001
Medium	21	84,0	4	16,0	25	100	
Heavy	5	100,0	0	0,0	5	100	
Total	**31**	**34,8**	**58**	**65,2**	**89**	**100**	

According to Table 5, 100% of those engaging in vigorous activity and 84.0% of those with moderate activity levels had type 2 DM, while only 8.5% of those with light activity had the condition. The p-value of 0.0001 indicates a strong association between physical activity and the incidence of type 2 diabetes mellitus. This supports findings by Fharitz R. (2018) at Mokopido Hospital, Toli-Toli. Although respondents reported physical activity, it may have lacked structured exercise, which is essential for improving insulin response and regulating blood sugar.

Table 6. Association between History of Hypertension and the Incidence of Type 2 Diabetes Mellitus

History of Hypertension	Incidence of Type 2 Diabetes Mellitus				Total		*P value*
	DM Tipe 2		No DM				
	N	%	N	%	N	%	
No	3	5,5	52	94,5	55	100	0,0001
Yes	28	82,4	6	17,6	34	100	
Total	**31**	**34,8**	**58**	**65,2**	**89**	**100**	

From Table 6, 82.4% of respondents with a history of hypertension had type 2 DM, compared to only 5.5% of those without such history. The p-value of 0.0001 confirms a significant association. This aligns with research by Kabosu, Adu & Hinga (2017) at Bhayangkara Hospital, Kupang. Field observations indicated that unhealthy lifestyles—including high salt and sugar intake and limited physical activity—contributed to this association.

Table 7. Association between Education Level and the Incidence of Type 2 Diabetes Mellitus

Level of education	Incidence of Type 2 Diabetes Mellitus				Total		*P value*
	DM Type 2						
	N	%	N	%	N	%	
Low (SD, SMP)	23	51,1	22	48,9	45	100	0,002
High (SMA,Sarjana)	8	18,2	36	81,1	44	100	
Total	**31**	**34,8**		**65,2**	**89**	**100**	

As shown in Table 7, 51.1% of respondents with lower education levels had type 2 diabetes, compared to only 18.2% among those with higher education. The chi-square test revealed a p-value of 0.002, indicating a significant association. This finding aligns with research by Annisa & Purwo (2019) in Palaran Health Center, Samarinda. Field findings suggest that lower education limits health knowledge and awareness, thus affecting lifestyle choices. Individuals with higher education tend to be more proactive in seeking health information and practicing diabetes prevention behaviors.

CONCLUSION

This study concluded that several factors were significantly associated with the incidence of type 2 diabetes mellitus in women at Kayen Regional Public Hospital, Pati Regency. There was a significant association between age and the incidence of type 2 diabetes mellitus, with women aged both over and under 45 years showing statistical relevance (p-value = 0.0001 < 0.05). A significant relationship was also found between genetic history and type 2 diabetes mellitus (p-value = 0.0001 < 0.05), as well as between body mass index (BMI) and the disease (p-value = 0.0001 < 0.05).

Furthermore, physical activity was significantly associated with the incidence of type 2 diabetes mellitus (p-value = 0.0001 < 0.05), as was a history of hypertension (p-value = 0.0001 < 0.05), and educational level (p-value = 0.0001 < 0.05). Therefore, the risk factors influencing the incidence of type 2 diabetes mellitus among women in this study were age, genetic predisposition, body mass index, physical activity level, history of hypertension, and level of education.

It is recommended that greater attention be paid to the issue of type 2 diabetes mellitus in order to prevent an increase in its prevalence. Since these risk factors are already known, early prevention can be implemented effectively. This can be achieved through coordination between healthcare institutions and patients with type 2 diabetes to ensure they receive regular medical care.

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