ISSN. 2338-7475
E-ISSN. 2620-7869
Hearty
Jurnal Kesehatan Masyarakat
Berinan, Tulus, Sepenuh Hati,Berbesar Hati, Jujur, Sehat dan Kuat
Vol. 14 No. 4, Agustus 2026, Hal. 1184-1190

ANALYSIS OF THE RELATIONSHIP BETWEEN RISK FACTORS AND THE INCIDENCE OF DIABETES MELLITUS AT KLANGENAN COMMUNITY HEALTH CENTER IN 2025

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Abstract

Diabetes Mellitus is a chronic disease caused by elevated blood glucose levels and has become a serious public health problem. Data from ePuskesmas Klangenan recorded an increase in cases from 288 to 574 in 2025, indicating that the control of risk factors at the primary healthcare level is not yet optimal. This study aimed to analyze the risk factors of Diabetes Mellitus at Klangenan Public Health Center using a quantitative analytical method with a case–control design and a retrospective approach conducted from January to December 2025. The sample consisted of case and control groups selected using simple random sampling. The independent variables included age, sex, family history, obesity, smoking habits, and physical activity, and data were analyzed using the Chi-square test. The results showed significant associations between gender (p=0.027; OR=1.928), family history (p=0.01; OR=4.80), and obesity (p=0.01; OR=3.111) with the incidence of Diabetes Mellitus, while age (p=0.656), smoking habits (p=0.619), and physical activity (p=0.663) did not show significant associations. In conclusion, female gender, family history, and obesity were identified as risk factors for Diabetes Mellitus at Klangenan Public Health Center in 2025 and should be prioritized in early detection programs.

Keywords: Diabetes Mellitus, ePuskesmas, Chi-Square, Epidemiology, Risk Factors

Introduction

Diabetes mellitus (DM) merupakan penyakit kronis akibat gangguan metabolisme yang ditandai hiperglikemia karena ketidakseimbangan insulin, di mana insulin berperan membantu glukosa masuk ke sel sebagai energi.1 DM termasuk penyakit tidak menular (PTM) utama penyebab kematian global bersama penyakit jantung, kanker, dan PPOK.2,3 WHO melaporkan 537 juta penderita DM usia 20–79 tahun pada 2023 dan diprediksi meningkat menjadi 783 juta pada 2045.4 SKI 2023 menunjukkan peningkatan prevalensi DM Indonesia dari 2,0% (2018) menjadi 2,2% (2023).5 Di Jawa Barat, kasus DM berfluktuasi dari 848 ribu (2019) hingga sekitar 640 ribu (2023), menunjukkan pengendalian belum stabil.6 Kabupaten Cirebon mencatat lebih dari 14.000 kasus DM pada 2023, menunjukkan distribusi kasus dipengaruhi faktor sosial, lingkungan, dan perilaku.7 Di Puskesmas Klangenan terjadi peningkatan signifikan dari 288 kasus (2024) menjadi 574 kasus (2025) berdasarkan ePuskesmas, serta DM naik dari peringkat 11 menjadi peringkat 4 dalam 10 besar penyakit.8 Kondisi ini menunjukkan peningkatan risiko dan lemahnya deteksi dini karena masih banyak kasus ditemukan saat sudah terjadi komplikasi seperti penyakit jantung, stroke, dan gagal ginjal.9 Kejadian DM dipengaruhi faktor risiko

Submitted: June-2026 Received: June-2026 Available Online: August-2026

Method

This study employed a quantitative analytical approach using a case-control design to examine the association between risk factors and the incidence of Diabetes Mellitus (DM). A retrospective case-control design was applied by comparing two groups, namely patients diagnosed with DM (case group) and non-DM patients (control group), to identify the relationship between several risk factors and the occurrence of DM.

The study population consisted of all patients registered in the electronic medical record (ePuskesmas) database at Klangenan Community Health Center, Cirebon Regency, in 2025. The case population included 574 patients diagnosed with Diabetes Mellitus, while the control population consisted of 2,583 patients without Diabetes Mellitus. The study sample comprised 190 respondents, including 95 cases and 95 controls, selected using simple random sampling with a 1:1 case-control ratio. The sample size was determined using the unmatched case-control formula based on the odds ratio reported by Nasution et al. (2021). The inclusion criteria were patients aged ≥18 years, registered in the ePuskesmas system, and having at least one visit in 2025. Records with incomplete data, duplicate entries, or missing primary variables were excluded.

Secondary data were obtained from the electronic medical records of the ePuskesmas system. The dependent variable was the incidence of Diabetes Mellitus, while the independent variables included age, sex, family history of Diabetes Mellitus, obesity, smoking habits, and physical activity. Data were collected using a checklist form to extract the required information from the electronic medical records.

Data were analyzed using IBM SPSS Statistics version 31. Univariate analysis was conducted to describe the frequency distribution and percentage of each variable. Bivariate analysis was performed using the Chi-square test to assess the association between risk factors and the incidence of Diabetes Mellitus. Statistical significance was determined at a p-value of <0.05.

Results

This study aimed to determine the association between risk factors, including sex, age, family history, body mass index (BMI), smoking habits, and physical activity, and the incidence of Diabetes Mellitus at Klangenan Community Health Center using a case-control design. A total of 190 respondents participated in the study, consisting of 95 cases (patients with Diabetes Mellitus) and 95 controls (patients without Diabetes Mellitus). Secondary data were obtained from the electronic medical records (ePuskesmas). The study variables included sex, age, family history of Diabetes Mellitus, body mass index (BMI), smoking habits, and physical activity. The data were processed through editing, coding, data entry, and data cleaning before being analyzed using IBM SPSS Statistics. Univariate analysis was conducted to describe the distribution of respondents' characteristics, while bivariate analysis was performed using the Chi-square test to examine the association between the independent variables and the incidence of Diabetes Mellitus. In addition, Odds Ratios (ORs) were calculated to estimate the magnitude of risk associated with each risk factor. The findings of the study are presented below.

3.1 Analisis Univariat

Tabel 1. Frequency Distribution of Study Variables on the Association Between Risk Factors and the Incidence of Diabetes Mellitus at Klangenan Community Health Center in 2025

Variable	Category	Frequency (n)	Percentage (%)
Diabetes Mellitus Status	Cases	95	50.0
	Controls	95	50.0
Age	Adults	115	60.5
	Elderly	75	39.5
Sex	Male	79	41.6
	Female	111	58.4
Family History	Yes	85	55,3
	No	105	44,7
Obesity	Normal	104	54.7
	Obese	86	45.3
Smoking Habit	Yes	49	25.8
	No	141	74.2
Physical Activity	Adequate	101	53.2
	Inadequate	89	46.8

Source: Secondary Data (2025)

As presented in Table 1, a total of 190 respondents were included in this study, with an equal distribution between the case and control groups, consisting of 95 respondents (50.0%) in each group. Based on respondents' characteristics, the majority were female, accounting for 111 respondents (58.4%), while 79 respondents (41.6%) were male. In terms of age, most respondents were adults, comprising 115 respondents (60.5%), whereas 75 respondents (39.5%) were elderly. Regarding family history, most respondents had no family history of Diabetes Mellitus, accounting for 105 respondents (55.3%), while 85 respondents (44.7%) reported having a family history of the disease. Based on body mass index (BMI), the majority of respondents had a normal BMI, with 104 respondents (54.7%), whereas 86 respondents (45.3%) were classified as obese. Based on smoking habits, most respondents were non-smokers, accounting for 141 respondents (74.2%), while 49 respondents (25.8%) reported smoking. In terms of physical activity, the majority of respondents had adequate physical activity, with 101 respondents (53.2%), whereas 89 respondents (46.8%) had inadequate physical activity.

3.2 Analisis Bivariat

Bivariate analysis was conducted to determine the association between the independent variables, including sex, age, family history of Diabetes Mellitus, body mass index (BMI), smoking habits, and physical activity, and the incidence of Diabetes Mellitus using the Chi-square test at a 95% confidence level ($\alpha = 0.05$). In addition, Odds Ratios (ORs) were calculated to estimate the magnitude of the risk associated with each factor. The results of the bivariate analysis are presented in Table 2.

Table 2. Association Between Risk Factors and the Incidence of Diabetes Mellitus at Klangenan Community Health Center in 2025

Risk Factors	Category	Cases	%	Controls	%	OR	CI 95 %	P-Value
Age	Adults	59	51,3%	56	48,7%	0,876	0,489-	0,656
	Elderly	36	48,0%	39	52,0%		1,568	
Sex	Male	32	40,5%	47	59,5%	1,928	1,073-	0,027
	Female	63	56,8%	48	43,2%		3,462	
Family History	No Family History	35	33,3%	70	66,7%	4,80	2,586-	0,01
	Family History	60	70,6%	25	29,4%		8,908	
Obesity	Normal	39	37,5%	65	62,5%	3,111	1,716-	
	Obese	56	65,1%	30	34,9%		5,642	0,01
Smoking Habit	Smoker	23	46,9%	26	53,1%	0,848	0,442-	
	Non-smoker	72	51,1%	69	48,9%		1,626	0,619
Physical Activity	Adequate	52	51,5%	49	48,5%	1,135	0,642-	
	Inadequate	43	48,3%	46	51,7%		2,008	0,663

Source: Secondary Data (2025)

Based on Table 2, the results of the bivariate analysis showed that sex, family history of Diabetes Mellitus, and obesity were significantly associated with the incidence of Diabetes Mellitus ($p < 0.05$). Sex had an odds ratio (OR) of 1.928 (95% CI: 1.073–3.462), indicating that males had a higher risk of developing Diabetes Mellitus than females. Family history had an OR of 4.800 (95% CI: 2.586–8.908), indicating that respondents with a family history of Diabetes Mellitus were at a higher risk of developing the disease. Furthermore, obesity had an OR of 3.111 (95% CI: 1.716–5.642), indicating that obese respondents had a higher risk of developing Diabetes Mellitus compared with those with a normal body mass index (BMI).

Discussion

4.1. Relationship Age and the Incidence of Diabetes Mellitus

The results of the study showed no relationship between age and Diabetes Mellitus. Theoretically, age increases the risk of DM due to decreased metabolic function and insulin sensitivity; however, in this study, it was not significant (p-value > 0.05). This finding is consistent with previous studies that also found no significant relationship42, but differs from other studies that identified age as a major risk factor33. This difference may be due to the use of secondary data, homogeneous sample characteristics, and the dominance of other factors such as family history and obesity. Therefore, $H0_1$ is accepted and Ha_1 is rejected.

4.2. Relationship Between Gender and DM

There is a relationship between gender and DM, where females are more at risk compared to males (OR 1.928; p=0.027). This result is consistent with previous studies2,43 which state that females are more vulnerable due to hormonal factors, lower physical activity, and differences in insulin sensitivity. Therefore, $H0_2$ is rejected and Ha_2 is accepted.

4.3. Relationship Between Family History and DM

There is a significant relationship between family history and DM (OR 4.80; p=0.01). Individuals with a family history have a higher risk due to genetic factors and family lifestyle patterns. This finding is consistent with previous studies44,11. Therefore, $H0_3$ is rejected and Ha_3 is accepted.

4.4. Relationship Between Obesity and DM

Obesity is significantly associated with DM (OR 3.111; p=0.01). Theoretically, obesity causes insulin resistance due to increased body fat and metabolic disturbances. This result is consistent with previous studies2,11. Therefore, $H0_4$ is rejected and Ha_4 is accepted.

4.5. Relationship Between Smoking and DM

There is no relationship between smoking and DM (p>0.05). Theoretically, smoking can trigger insulin resistance; however, it was not significant in this study. This finding is consistent with previous studies45, possibly due to limitations of secondary data, lack of data on smoking intensity, and the influence of more dominant factors such as obesity and family history. Therefore, $H0_5$ is accepted and Ha_5 is rejected.

4.6. Relationship Between Physical Activity and DM

There is no relationship between physical activity and DM (p>0.05). Theoretically, physical activity increases insulin sensitivity; however, the results were not significant. This finding is consistent with previous studies46 and differs from other studies that found a relationship. The difference may be due to limitations of secondary data and lack of detailed information on respondents' physical activity. Therefore, $H0_6$ is accepted and Ha_6 is rejected.

Conclusion

Based on the results of this study on the relationship between risk factors and the incidence of Diabetes Mellitus at Klangenan Public Health Center in 2025, it can be concluded that the characteristics of respondents were dominated by females, adults, individuals without a family history of Diabetes Mellitus, those with normal body mass index, non-smokers, and those with adequate physical activity. This condition indicates that the study population has a sufficiently diverse range of risk factors for further analysis in relation to the incidence of Diabetes Mellitus.

The analysis results show that not all studied risk factors have a significant relationship with the incidence of Diabetes Mellitus. Age did not show a significant relationship, indicating that the occurrence of Diabetes Mellitus is not only influenced by increasing age but also by other more dominant factors in the context of this study. In contrast, gender showed a significant relationship, where females tend to have a higher risk compared to males. This strengthens the assumption that biological and hormonal factors, as well as differences in activity patterns, may contribute to increased disease risk.

In addition, family history was proven to have a significant relationship with the incidence of Diabetes Mellitus, indicating the role of genetic factors as well as possible similarities in lifestyle within families. Individuals with a family history of Diabetes Mellitus have a greater likelihood of developing the disease compared to those without such a history. Obesity also showed a significant relationship, confirming that increased body mass index is associated with metabolic disorders and insulin resistance that can trigger Diabetes Mellitus.

On the other hand, smoking habits and physical activity did not show a significant relationship with the incidence of Diabetes Mellitus in this study. The lack of significance of these two factors is likely related to data limitations, particularly because the available information does not describe in detail the intensity, duration, and quality of physical activity and smoking habits of respondents. In addition, the presence of more dominant factors such as family history and obesity may also influence the absence of observed relationships for these variables.

Overall, it can be understood that the incidence of Diabetes Mellitus in this study is more influenced by genetic factors and metabolic conditions rather than certain behavioral factors. These findings emphasize that Diabetes Mellitus prevention efforts need to be focused on high-risk groups, especially individuals with a family history and obesity, through lifestyle modification approaches and early detection. The results of this study are expected to serve as a basis for developing more targeted prevention programs at the primary healthcare level, particularly in efforts to reduce the incidence of Diabetes Mellitus in the community.

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