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Determinant Analysis of the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

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ABSTRACT

Type 2 Diabetes Mellitus is a non-communicable disease whose prevalence continues to increase globally, nationally, and locally. Globally, the International Diabetes Federation reports that the prevalence of diabetes reaches 10.5% in the age group of 20-79 years and is projected to increase to 783.2 million cases by 2045. In Indonesia, the number of people with diabetes reaches around 19.47 million people with a prevalence of 10.6%, placing Indonesia in fifth place in the world. Meanwhile, in Gorontalo Province in 2024, there will be 10,735 cases (4%) of Diabetes Mellitus. This condition shows an increase in the burden of disease, including in the early adulthood age group.

This study aims to analyze the determinants of the incidence of type 2 Diabetes Mellitus in early adulthood at the South City Health Center. This study uses an analytical quantitative design with a cross sectional approach. The sample amounted to 87 respondents who were selected through accidental sampling techniques. Data were collected using questionnaires and direct measurements, then analyzed by Chi-Square test at a 95% confidence level (α=0.05).

The results showed that 35.6% of respondents experienced type 2 Diabetes Mellitus. There was a significant association between hereditary history (p=0.000) and central obesity (p=0.033) with the incidence of type 2 diabetes mellitus. In contrast, physical activity showed no significant association (p=0.614).

It is recommended to health centers to increase early screening of at-risk individuals and strengthen obesity control programs through education and lifestyle interventions.

INTRODUCTION

Diabetes Mellitus (DM) is one of the non-communicable diseases (NCDs) whose number of sufferers continues to increase, both at the global, national, and local levels. Based on data from *World Health Organization* (WHO), Diabetes Mellitus ranks sixth as the highest cause of death in the world (Intan & Makmun, 2025). *International Diabetes Federation* (2024) states that diabetes is increasingly burdening individuals, families, and countries globally. The prevalence reached 10.5% in adults aged 20-79 years, with almost half of cases undetected. This figure is projected to rise to 12.2% or 783.2 million people in 2045.

The number of diabetics in Indonesia is estimated to reach around 19.47 million people out of a total adult population of 179.72 million people, resulting in a prevalence of 10.6%. Based on these figures, Indonesia ranks fifth among the ten countries with the highest number of diabetes cases in the world (Tanati & Nurvita, 2025). In 2024, the number of Diabetes Mellitus sufferers in Gorontalo Province will be recorded at 10,735 people or around 4% of the population who have been diagnosed. The cases are spread across various regions, including Pohuwato Regency with 258 people, Gorontalo City with 1,146 people, North Gorontalo Regency with 1,431 people, Gorontalo Regency with 2,114 people, Boalemo Regency with 2,212 people, and Bone Bolango Regency with the highest number of 3,574 people (Monoarfa et al., 2025).

The South City Health Center is one of the health centers that has a relatively high number of Diabetes Mellitus patient visits. Based on secondary data from the South City Health Center, in 2023 there will be 200 people with Diabetes Mellitus, then in 2024 there will be an increase of 920 people. Then in 2025 from January to August, the total number of people with type 2 Diabetes Mellitus will reach 1,103 people.

Based on the results of observations and interviews with the officer in charge of the DM program, there are 35 people with Type 2 Diabetes Mellitus in the early adult age group at the South City Health Center and the total number of people with degenerative diseases aged 19-44 years is 580 people by 2025.

Although previous studies have identified risk factors such as hereditary history, central obesity, and physical activity as important determinants of type 2 diabetes mellitus, the findings were mostly conducted in older age groups or general populations, rather than specifically in early adulthood. In addition, each region has different environmental, socioeconomic, diet, and lifestyle characteristics so that risk factors can show variations in the strength of associations. The condition of increasing cases of type 2 DM at a young age at the South City Health Center, which is not in line with the general perception that DM is a disease of old age, indicates a change in epidemiological patterns that need to be studied more deeply. Therefore, this research remains important to provide up-to-date and contextual scientific evidence, which not only enriches the literature but also supports risk-based prevention efforts in productive populations in the region.

RESEARCH OBJECTIVES

This study aims to analyze the determinants of the incidence of type 2 Diabetes Mellitus in early adulthood at the South City Health Center.

RESEARCH METHODS

This study uses an analytical quantitative design with a *cross sectional approach* which will be carried out at the South City Health Center in January 2026. The study population was all visitors to the South City Health Center aged 19–44 years who conducted health checks during the study period. The research sample amounted to 87 respondents who were determined using the Lemeshow formula and selected using *accidental sampling techniques*. Data were collected through questionnaires, GPAQ, and abdominal circumference measurements using tape measure. Data analysis was carried out using *the Chi-Square* test with a confidence level of 95% (α=0.05).

RESULTS

Table 1. Distribution by Gender of Type 2 DM Respondents in Early Adulthood at the South City Health Center

No.	Gender	Frequency	Percentage
1.	Male	32	36.8
2.	Women	55	63.2
Quantity		87	100

Based on table 1, it shows that of the 87 respondents at the South City Health Center, the most respondents are female with a frequency of 55 respondents (63.2%).

Table 2. Distribution Based on the Last Education of Type 2 DM Respondents in Early Adulthood at the South City Health Center

No.	Education Level	Frequency	Percentage
1.	SD	12	13.8
2.	Junior High School	7	8.0
3.	High School	40	46.0
4.	College	28	32.2
Quantity		87	100

From table 2 above, it shows that of the 87 respondents, the most have a high school graduate educational background with a frequency of 40 respondents (46.0%), while the fewest respondents who have a junior high school education background are 7 respondents (8.0%).

Table 3. Distribution Based on the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

Occurrence of Type 2 DM	Frequency	Percentage
Normal	56	64.4
Type 2 Diabetes Mellitus	31	35.6
Quantity	87	100

Based on table 3 above, it shows that of the 87 respondents, 56 respondents (64.4%) had normal blood sugar and 31 respondents suffered from type 2 Diabetes Mellitus (35.6%).

Table 4. Chi-Square Test Results of Hereditary History with the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

Hereditary History of Type 2 Diabetes Mellitus	Occurrence of Type 2 DM				Quantity		*p-value*
	DM Type 2		Normal				
	n	%	n	%	n	%	
There	29	55.8	23	44.2	52	100	**0,000**
None	2	5.7	33	94.3	35	100	
Total	31	35.6	56	64.4	87	100	

In table 4, it can be seen that 29 people (55.8%) have a history of hereditary diabetes mellitus and at least 2 people who have a history of hereditary diabetes mellitus but have a history of type 2 diabetes mellitus.

Based on the results of the bivariate analysis in table 4, a *p-value* of 0.000 ($p < 0.05$) was obtained, which shows a significant relationship between the hereditary history of Diabetes Mellitus and the incidence of type 2 DM in early adulthood at the South City Health Center.

Table 5. Results of *the Central Obesity Chi-Square* Test with the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

Abdominal Circumference Status	Occurrence of Type 2 DM				Quantity		*p-value*
	DM Type 2		Normal				
	n	%	n	%	n	%	
Central Obesity	22	46.8	25	53.2	47	100	**0,033**
Normal	9	22.5	31	77.5	40	100	
Total	31	35.6	56	64.4	87	100	

The results of *the Chi-Square* test in table 5 showed a *p-value* of 0.033 ($p < 0.05$), which means that there is a significant relationship between central obesity and the incidence of type 2 DM in early adulthood at the South City Health Center.

Table 6. Chi-Square Test Results of Physical Activity with the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

Physical Activity	Occurrence of Type 2 DM				Quantity		*p-value*
	DM Type 2		Normal				
	n	%	n	%	n	%	
Low	11	40.7	16	59.3	27	100	**0,614**
Medium	13	37.1	22	62.9	35	100	
Height	7	28.0	18	72.0	25	100	
Total	31	35.6	56	64.4	87	100	

Based on the results of bivariate analysis in table 6, a *p-value* of 0.614 ($p > 0.05$) was obtained, which showed that there was no meaningful relationship between physical activity and the incidence of type 2 DM in early adulthood at the South City Health Center.

DISCUSSION

The Relationship between Hereditary History and the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

The results of statistical tests using *the Chi-Square* method showed a significant relationship between family history and the incidence of type 2 Diabetes Mellitus in the early adult age group at the South City Health Center. The p-value obtained was 0.000 ($p < 0.05$), so that the research hypothesis was acceptable. These findings indicate that individuals who have a family history of diabetes have a higher risk of developing type 2 diabetes mellitus compared to those who do not have such a history.

Based on the results of the study, it can be seen that the incidence of diabetes is more found in respondents who have parents with a history of diabetes, both from the mother and father. In contrast, respondents who had no history of diabetes had mostly normal blood sugar levels. These results show that hereditary factors have an important role in the occurrence of type 2 Diabetes Mellitus, even though the age of the respondents is still classified as early adulthood.

Simply put, a history of heredity can affect a person due to genetic factors inherited from parents. Individuals who have parents with diabetes tend to inherit body conditions that are more susceptible to insulin work disorders.

As a result, the body becomes more prone to increased blood sugar levels compared to individuals who do not have a family history of diabetes. This condition can occur even if a person is not old.

In addition to genetic factors, the history of heredity is also often related to life habits in the family. Diet, the habit of consuming sweet or fatty foods, and a lack of physical activity are often formed in the family environment. If these habits are unhealthy and last for a long time, the risk of Diabetes Mellitus will increase, especially in individuals who already have genetic susceptibility.

Respondents who have no history of heredity but suffer from diabetes are likely to be affected by unhealthy lifestyle factors. A diet high in sugar and fat, rarely exercising, and being overweight can cause the body to become less sensitive to insulin. If this condition persists for a long time, blood sugar levels will rise and eventually lead to diabetes, even if there is no family history of diabetes. *American Diabetes Association* states that most cases of type 2 diabetes occur due to lifestyle factors, not solely heredity (ADA, 2020).

On the other hand, respondents who had a history of hereditary but had not yet had diabetes showed that hereditary factors were not a determinant of the exact occurrence of the disease. Family history only increases the risk, but disease can be prevented or delayed if a person adopts a healthy lifestyle, such as maintaining a healthy diet, regular physical activity, and regular health checkups. *The International Diabetes Federation* explains that healthy lifestyle changes can lower the risk of diabetes even if a person has a family history of diabetes.

The results of this study are in line with the research conducted by (Elviza et al., 2025) which states that hereditary factors of diabetes are the dominant risk factor for the incidence of type 2 diabetes mellitus at the age of 15-45 years. This supports the study's findings that diabetes does not only occur in old age, but also in early adulthood.

Other research conducted (Dewanti et al., 2025) It also shows that family history is one of the important factors related to the incidence of Diabetes Mellitus. The study explains that individuals with a family history of diabetes need to be more aware of other risk factors, such as being overweight and lack of physical activity, because they can accelerate the occurrence of diabetes. These findings further strengthen the results of the study that hereditary history has an important role in the incidence of type 2 Diabetes Mellitus.

Although the hereditary history cannot be changed, it does not mean that diabetes will inevitably occur. Many of the respondents in this study had a family history of diabetes but still had normal blood sugar levels. This suggests that a healthy lifestyle, such as maintaining a healthy diet, regular physical activity, and regular health check-ups, can help delay or even prevent the occurrence of diabetes even if a person has hereditary factors.

The Relationship between Central Obesity and the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

The results of statistical testing using *the Chi-Square* method showed a significant relationship between central obesity and the incidence of type 2 Diabetes Mellitus in the early adult age group in the working area of the South City Health Center. The p-value obtained was 0.033 ($p < 0.05$), so that the research hypothesis was accepted. These findings suggest that individuals with central obesity have a greater chance of developing type 2 Diabetes Mellitus compared to individuals who have a normal abdominal circumference.

Based on the results of the study, it is known that the proportion of incidence of type 2 Diabetes Mellitus is higher in respondents who are centrally obese compared to respondents who do not experience central obesity. These findings show that fat accumulation in the abdominal area has an important role in the occurrence of blood sugar level disorders, even though the age of the respondents is still classified as early adulthood.

Respondents who were centrally obese but did not yet have diabetes were likely still in the early stages of metabolic disorders. In this condition, the body is still able to control blood sugar levels even though there is a buildup of fat in the abdomen. However, if central obesity is left unchanged, the risk of developing diabetes will be even greater. The *World Health Organization* states that central obesity is often an early sign before a person develops type 2 Diabetes Mellitus.

Meanwhile, respondents who had a normal abdominal circumference but had diabetes were likely to be affected by other factors, such as a history of heredity, an unhealthy diet, or a history of previous obesity. In Asian societies, including Indonesia, diabetes can occur even if the body size is not too fat due to higher metabolic susceptibility (Dewanti et al., 2025).

The results of this study are in line with the research conducted by (Dewanti et al., 2025) which states that central obesity has a significant association with the incidence of type 2 Diabetes Mellitus. The study explained that abdominal circumference that exceeds the normal limit is a strong indicator of diabetes risk, even stronger than body mass index (BMI). This shows that the distribution of body fat, especially in the abdominal area, has a great effect on metabolic health.

In addition, other studies have also shown that individuals with central obesity have a higher risk of developing impaired glucose metabolism even though their overall weight is still relatively normal. This condition is often unnoticed by individuals of early adulthood because they feel that their bodies are still healthy and active. As a result, central obesity often goes undetected and is only discovered after health problems have arisen, such as elevated blood sugar levels.

Although central obesity is an important risk factor, it does not mean that all individuals with central obesity will necessarily develop Diabetes Mellitus. The results of this study show that there are still respondents with central obesity who have normal blood sugar levels. This indicates that the incidence of Diabetes Mellitus is influenced by various other factors, such as hereditary history, diet, and physical activity.

The Relationship of Physical Activity with the Incidence of Type 2 Diabetes Mellitus in Early Adulthood at the South City Health Center

The results of statistical analysis using *chi-square* in this study showed that there was no meaningful relationship between physical activity and the incidence of type 2 Diabetes Mellitus (DM) in early adulthood in the working area of the South City Health Center. This is shown by a p-value of 0.614 ($p > 0.05$), so the research hypothesis is rejected. This means that statistically physical activity has not been proven to be directly related to the incidence of type 2 DM in early adulthood respondents in this study.

In theory, physical activity plays an important role in controlling blood sugar levels. Physical activity can help improve insulin sensitivity, so glucose can more easily enter the cell to be used as an energy source. Thus, regular physical activity can help lower blood sugar levels and prevent the occurrence of type 2 Diabetes Mellitus. However, the results of this study show that the role of physical activity has not been seen significantly in the group of respondents studied.

The absence of a meaningful relationship between physical activity and the incidence of type 2 diabetes in this study could be due to several factors. One of them is the research design that is *cross sectional*, so that it only describes the condition of physical activity and diabetes status at a certain time.

Respondents with high levels of physical activity but had type 2 diabetes mellitus indicated that physical activity was not always able to completely eliminate the risk of diabetes. This condition can occur if physical activity is carried out after the occurrence of metabolic disorders, so it plays a role as an effort to control, not to prevent disease. In addition, decreased insulin sensitivity due to aging, visceral fat accumulation, and genetic predisposition can still trigger the occurrence of type 2 diabetes mellitus even though individuals have a high level of physical activity. This confirms that the effectiveness of physical activity in diabetes prevention is greatly influenced by the time of exposure and the metabolic condition of the individual (P & Zaenal, 2022).

Respondents who have low physical activity but have not experienced type 2 Diabetes Mellitus can be explained because each person's body's ability to adjust to risk factors varies. Although physical activity plays a role in controlling blood sugar levels, not all individuals who are less active immediately experience an increase in blood sugar. This is influenced by the condition of each individual, such as age, weight and body fat distribution, as well as the presence of other risk factors that play a greater role in the occurrence of diabetes (Fitriq et al., 2024).

The results of this study are in line with the research conducted by (Lestari, 2021) in the city of Surakarta which also showed that there was no relationship between physical activity and the incidence of type 2 Diabetes Mellitus (*p-value* = 0.193). The study concluded that physical activity has not been the main risk factor for the occurrence of type 2 Diabetes Mellitus in the city of Surakarta.

Other research conducted by (Subarkah, 2018) which shows that physical activity has no relationship with the incidence of Diabetes Mellitus in the adult age group of 30-50 years in Nyatnyono Village, West Ungaran District, Semarang Regency. Another supporting research is research (Nuraini & Surpiatna, 2019) with a p value of 0.634, which indicates no meaningful relationship between physical activity and the incidence of Diabetes Mellitus. However, the study found a significant association between diet and the incidence of Diabetes Mellitus.

Regular physical activity can help control weight, reduce fat accumulation in the abdominal area, and increase glucose metabolism. Thus, physical activity still needs to be recommended as part of a healthy lifestyle, especially in the early adult age group.

CONCLUSIONS AND SUGGESTIONS

This study showed that there was a significant relationship between hereditary history and central obesity with the incidence of type 2 Diabetes Mellitus in early adulthood at the South City Health Center, while physical activity did not show a significant relationship. Therefore, the health center is expected to increase promotive and preventive efforts through early screening, healthy lifestyle education, and central obesity control in the early adult age group to prevent an increase in the incidence of type 2 Diabetes Mellitus.

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