



Analysis Of Risk Factors Of Type II Diabetes Mellitus In Siulak Gedang Public Health Center, Siulak District Kerinci Regency

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Abstract. Diabetes is the fourth leading cause of death globally, causing 1.6 million deaths annually. This study aimed to analyze the risk factors for type II diabetes mellitus at the Siulak Gedang Community Health Center, Siulak District, Kerinci Regency. Using a cross-sectional design with accidental sampling, the study involved 250 respondents from the Siulak Gedang area. The results showed that the most significant risk factors for type II diabetes were family history ($p=0.000$), hypertension ($p=0.001$), and obesity ($p=0.000$). No significant relationships were found between age ($p=0.078$), gender ($p=0.134$), and smoking behavior ($p=0.134$). The Population Attributable Risk Percent (PAR%) calculation revealed that 12% of type II diabetes cases in individuals with a family history, 15% in those with hypertension, and 15% in those with obesity could be prevented by improving Body Mass Index (BMI).

Keywords: Risk factors, Type II DM, Diabetes

1 Introduction

Non-communicable disease, also known as non-communicable disease (NCD), is a chronic disease that lasts a long time and is a form of a combination of genetic, physiological, environmental, and behavioral factors. Based on WHO data in 2021, NCDs kill 41 million people each year, or 71% of deaths in the world. Diabetes is the fourth leading cause of death in the world, with a death toll of 1.6 million people each year, followed by cardiovascular disease (17.9 million), cancer (9.0 million), and respiratory disease (3.9 million). These four groups of diseases account for more than 80% of all premature NCD deaths [11].

Based on the report from the International Diabetes Federation (IDF) 2021, the prevalence of DM in the world in 2021 was (10.5%) in 537 million people. In 2030, it became (11.3%) 643 million people, and in 2045, it became (12.2%) 783 people, estimated to increase by 46%. While in the Southeast Asia region, the number of DM sufferers reached (10%) 90 million people, estimated to increase (10.9%). 113 million in 2030 and (11.3%) 151 people in 2045.

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E. Fachrial and S. Suhartomi (eds.), *Proceedings of the 1st International Conference on Lifestyle Diseases and Natural Medicine (ICOLIFEMED 2024)*, Advances in Health Sciences Research 84,

https://doi.org/10.2991/978-94-6463-664-2_6

Many factors can cause high morbidity rates of DMT2. These factors can be divided into 2: unmodifiable factors (cannot be changed) and modifiable factors (can be changed). Based on previous studies, it is known that obesity sufferers have an 8-times risk [5], physical activity has a 1.64-times risk, and female gender has a 2.184-times greater risk of developing DMT2 [3]. Likewise, research by Wardiah and Emilia stated that the older the age, the chance of developing DMT2 is 4.568 times the risk of developing DMT2 compared to younger people [9]. Based on research by Yanada & Taberima, people with hypertension and a family history of diabetes have a 3.00 times and 10.00 times greater risk of developing type 2 diabetes [12].

DM incidents, if not treated immediately, can cause complications. If DM is not controlled and blood sugar levels remain high for a long time, it can cause blood vessels and the nervous system to be disrupted, resulting in damage to the brain, eyes, heart, kidneys, and foot. Complications caused by DM can cause enormous losses, both in the health sector and individually. Direct cost losses, such as care and treatment costs, and indirect costs, such as loss of productivity due to illness, disability, and death, as well as reduced quality of life and enthusiasm for life. According to the International Diabetes Federation, DM costs 548 billion dollars in health costs. The high prevalence of DM cases and the complications caused are a public health problem. For this reason, efforts are needed to prevent and control DM by looking at the risk factors that influence the disease.

2 Literature Review

Diabetes is a chronic disease characterized by blood sugar levels that exceed normal limits. Diabetes mellitus is a group of metabolic disorders characterized by increased blood glucose levels (hyperglycemia) due to damage to insulin secretion, insulin function, or both [1].

Diabetes mellitus is a collection of symptoms caused by increased blood sugar levels. It occurs due to problems with the pancreas's production of the insulin hormone; either the hormone is not produced in the correct amount, or the body cannot use the correct insulin hormone [6].

Classification of Diabetes Mellitus, according to Tandra (2018), is type I DM (Insulin Dependent Diabetes Mellitus, or IDDM). Type 1 diabetes occurs due to damage to pancreatic β (beta) cells to produce enough insulin so that insulin production is reduced. This insulin administration is essential in patients with type 1 DM. Type 1 diabetes mellitus can begin at the age of 4 years and can increase in the age range of 11–13, most of which are autoimmune processes. Multifactorial genetic factors appear to be susceptibility to this disease, but only 10-15% of patients have a history of diabetes in their family.

Type 2 DM (Non-Insulin Dependent DM or NIDDM) Type 2 diabetes mellitus is characterized by tissue resistance to insulin action and relative deficiency in insulin secretion. Affected individuals can be more resistant or experience severe β - cell deficiency. Type 2 DM patients may not require insulin, but 30% of

patients will benefit from insulin therapy. About 10–20% of patients diagnosed with type 2 DM have combination diabetes. In type 2 DM patients, the risk of acute metabolic complications such as ketoacidosis is lower. Other types of DM Diabetes mellitus occurs due to other specific causes that result in increased blood sugar levels, such as infection, genetic syndrome, pressure or stress, genetic defects in pancreatic β cell function, alcohol addiction, drugs, and chemicals that cause damage to pancreatic β cells. Gestational Diabetes Mellitus Gestational Diabetes Mellitus, or Gestational Diabetes Mellitus (GDM), is a blood sugar level disorder that is first found during pregnancy. The placenta and placental hormones cause insulin resistance during pregnancy, usually in the third trimester.

3 Method

This study is an analytical research study with a cross-sectional design that aims to determine the Analysis of Risk Factors for Type II diabetes mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency. It was conducted from October to December 2023.

The population in this study consisted of mothers who had toddlers aged 0-59 months and were at the Hiang Health Center, totaling 500 people. The sampling technique in this study was accidental sampling, where the sampling determination technique was carried out by selecting samples among the population according to what the researcher wanted (the purpose of the problem in the study) so that the sample could represent the characteristics of the population that had been previously known. The inclusion criteria in this study were type 2 diabetes mellitus patients, patients who received treatment at the Siulak Gedang Health Center, and those who could communicate well. The exclusion criteria in this study are not receiving treatment, being domiciled at the Siulak Gedang Health Center, and not being willing to be respondents.

4 Results

Table 1. Characteristics of Respondents at the Siulak Gedang Health Center, Siulak District, Kerinci Regency

No	Information	Total (n)	Percentage (%)
I.	Gender		
1.	Male	108	43,2
2.	Female	93	37,2
II	Age		
1.	≥ 40 years	108	43,2
2.	<40 years	142	56,8

No Information	Total (n)	Percentage (%)
III Education		
1. No school/ not graduated	23	9,2
2. Elementary school	47	18,8
3. Junior high school	66	26,4
4. Senior high school	79	31,6
5. College	35	14,0
IV Occupation		
1. Not working	42	16,8
2. housewife	42	16,8
3. Laborer/ trafer	61	24,4
4. Self-employed	60	24,0
5. Emplotee private	24	9,6
6. ASN	21	8,4
Total	250	100

Based on Table 1, it can be seen that the characteristics of the respondents are mostly male, namely 108 respondents (43.2%), the most age is age range < 40 years, and as many as 142 respondents (56.8%). The highest education is high school, 79 respondents (31.6%), and the most common occupation is laborer/trader, 61 respondents (24.4%).

In the results of the study on 250 respondents, the majority of respondents were in the age range < 40 years as many as 142 respondents (56.8%), the most gender was female as many as 142 respondents (56.8%), had a family history of Type 2 DM as many as 171 respondents (68.4%), had hypertension as many as 175 respondents (70%), had obesity status as many as 182 respondents (72.8%), respondents did not have smoking behavior as many as 142 respondents (56.8%), and lack of physical activity as many as 180 respondents (72%).

The results of the study of 250 respondents showed that the majority of respondents were Type 2 DM sufferers, as many as 157 respondents (62.8%).

Based on Table 4 above, it shows that out of 103 respondents with an age category of ≥ 40 years, 75 respondents (69.4%) experienced Type 2 DM. Meanwhile, out of 142 respondents with an age category of < 40 years, 82 respondents (57.7%) experienced Type 2 DM. The results of the statistical test showed a p-value = 0.078 ($p > 0.05$); in other words, there was no significant relationship between age and the incidence of Type 2 diabetes mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

Based on Table 5 above, it shows that out of 108 male respondents, 74 respondents (68.5%) experienced Type 2 DM. Meanwhile, out of 142 female respondents, 83 respondents (58.5%) experienced Type 2 DM. The results of the statistical test showed a p-value = 0.134 ($p > 0.05$); in other words, there was no significant relationship between gender and the incidence of Type 2 diabetes mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

Based on Table 6 above, it shows that out of 171 respondents with a family history of Type 2 DM, 151 respondents (88.3%) experienced Type 2 DM. Meanwhile, out of 79 respondents with no family history of Type 2 DM, 6 re-

Table 2. Results of In-depth Interviews on the promotion of ISPA control programs according to the ISPA program holder at Pelompek Health Center

No	Characteristics	Total	Percentage
I.	Age		
1.	≥ 40 years	108	43.2
2.	<40 years	142	56.8
II.	Gender		
1.	Male	108	43.2
2.	Female	93	37.2
III.	Family History		
1.	Yes	171	68.4
2.	No.	79	31.6
IV.	Hypertension		
1.	Yes	175	70.0
2.	No.	75	30.0
V.	Obesity		
1.	Obesity	182	72.8
2.	Normal	68	27.2
VI.	Smoking Behavior		
1.	Smoking	108	43.2
2.	Non-smoking	142	56.8
VII.	Physical Activity		
1.	Less	180	72.0
2.	Sufficient	70	28.0
	Total	250	100.0

spondents (7.6%) experienced Type 2 DM. The results of the statistical test showed a p-value = 0.000 ($p < 0.05$), in other words, there is a significant relationship between family history and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

Table 3. Frequency Distribution of Type 2 Diabetes Mellitus Incidents at Siulak Gedang Health Center, Siulak District, Kerinci Regency

No Type 2 DM Incidents		Total Percentage	
1.	Diabetes	157	62,8
2.	No Diabetes	93	37,2
Jumlah		250	100.0

Table 4. In-depth Interview Results on the Discovery and Management of Pneumonia in Toddlers According to the ISPA Program Holder of Pelompek Health Center

No	Type 2 DM Incidents					
	Diabetes			No Diabetes		
	N	%	N	%	N	% p-value
1. ≥ 40 year	5	69,4	33	30,6	108	100
2. <40 year	2	57,7	60	42,3	142	100 0,078
Jumlah	157	62,8	93	37,2	250	100

Table 7. The Relationship Between Hypertension and the Incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency

N0. Hipertensi		Type 2 DM Incidents					
		Diabetes		No Diabetes		p-value	
		N	%	N	%		
1	Hypertension	150	85,7	25	14,3	171	100
2	Not hypertension	7	9,3	68	90,7	79	100
Total		157	62,8	93	37,2	250	100

Based on Table 7 above, it shows that out of 175 respondents with hypertension status, 150 respondents (85.7%) had Type 2 DM. Meanwhile, out of 75 respondents with no hypertension status, 7 respondents (9.3%) had Type 2 DM. The results of the statistical test showed a p-value = 0.000 (p < 0.05), in other words, there is a significant relationship between hypertension and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

Based on Table 4.10 above, shows that out of 182 respondents with obesity status, 155 respondents (85.2%) experienced Type 2 DM. Meanwhile, out of 68 respondents with non-obese/normal status, 2 respondents (2.9%) experienced Type 2 DM. The results of the statistical test showed a p-value = 0.000 (p < 0.05). In other words, there is a significant relationship between obesity and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

Based on Table 9 above, shows that out of 108 respondents with smoking status, 74 respondents (68.5%) experienced Type 2 DM. Meanwhile, out of 142 respondents with non-smoking status, 83 respondents (58.5%) experienced Type 2 DM. The results of the statistical test showed a p-value = 0.134 (p> 0.05)

Table 5. In-depth Interview Results on Supervision According to the ISPA Program Holder at Pelompek Health Center

NO Jenis Kelamin		Type 2 DM Incidents						
		Diabetes				No Diabetes		p-value
		N	%	N	%			
1	Male	74	68,5	34	31,5	108	100	0.134
2	Female	83	58,5	59	41,5	142	100	
Total		157	62,8	93	37,2	250	100	

Table 6. Relationship between family history and the incidence of type 2 diabetes mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency

No. History		Type 2 DM Incidents				p-value
		Diabetes		No Diabetes		
		N	%	N	%	
1	There is	151	88,3	20	11,7	171 100
2	There is not	6	7,6	73	92,4	79 100 0.000
Total		157	62,8	93	37,2	250 100

in other words, there is no significant relationship between smoking and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

Based on Table 10 above, it shows that out of 180 respondents with insufficient physical activity, 154 respondents (85.6%) experienced Type 2 DM. Meanwhile, out of 70 respondents with sufficient physical activity, 3 respondents (4.3%) experienced Type 2 DM. The results of the statistical test showed a $p\text{-value} = 0.000$ ($p < 0.05$), in other words, there is a significant relationship between physical activity and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

5 Discussion

Based on the results of the study, it was shown that out of 103 respondents with an age category of ≥ 40 years, 75 respondents (69.4%) experienced Type 2 DM. Meanwhile, out of 142 respondents with an age category of <40 years, 82 respondents (57.7%) experienced Type 2 DM. The results of the statistical test showed a $p\text{-value} = 0.078$ ($p > 0.05$), in other words, there was no significant relationship between age and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

Type 2 diabetes mellitus was previously called adult-onset diabetes because it mostly occurs at the age of over 40 years. However, nowadays younger people can also suffer from Type 2 DM [10]. In general, at the age of > 40 years, Type 2 DM is caused because at that age there is an increase in glucose intolerance. The ability of pancreatic β cells to produce insulin will decrease as the aging process occurs. Older individuals experience a physiological decrease in mitochondrial

Table 8. Results of In-depth Interviews on Human Resource Capacity Building According to the ISPA Program Holder at Pelompek Health Center

N0. Obesity status		Type 2 DM Incidents					
		Diabetes				No Diabetes	
		N	%	N	%	p-value	
1	Obesity	155	85,2	27	14,8	182	100
2	No obesity	2	2,9	66	97,1	68	100
	Total	157	62,8	93	37,2	250	100

Table 9. Relationship between smoking and the incidence of type 2 diabetes mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency

No. Smoking behavior		Type 2 DM Incidents					
		Diabetes				No Diabetes	
		N	%	N	%	p-value	
1	Smoking	74	68,5	34	31,5	108	100
2	Non-smoking	83	58,5	59	41,5	142	100
	Total	157	62,8	93	37,2	250	100

activity in muscle cells by 35%, this can increase fat levels by 30% and lead to insulin resistance [8].

Many factors can cause Type 2 DM. Age is one of them. Age risk factors are included in the non-modifiable risk factors (cannot be changed), but can be prevented as early as possible by providing health information about DM through counseling to the community, offices, schools that focus on the adolescent and adult age groups, providing information through print and electronic media, and conducting regular health screenings.

Based on the results of the study, it shows that out of 108 male respondents, 74 respondents (68.5%) experienced Type 2 DM. While out of 142 female respondents, 83 respondents (58.5%) experienced Type 2 DM. The results of the statistical test showed a p- value = 0.134 ($p > 0.05$) in other words, there is no significant relationship between gender and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency. This study is in accordance with the research of [3] which states that women suffer more from Type 2 DM compared to men (75.5% vs 24.5%) and based on statistical tests, there is no significant relationship between gender and the incidence of Type 2 DM ($p = 0.063$) [3].

Male and female genders have differences in the spread of health problems caused by differences in anatomy, physiology and behavior. Female gender is at risk of developing Type 2 DM because physically women have a greater chance of increasing BMI (more susceptible to obesity and monthly cycle syndrome (premenstrual syndrome). While male gender is also at risk of developing Type 2 DM because men usually need more calories than women. Men have more muscles, so they need more calories for the burning process (Syamsiyah, 2017). However, if a man does not do enough physical activity and consumes a lot of

Table 10. Relationship between physical activity and the incidence of type 2 diabetes mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency

No. Physical Activity		Type 2 DM Incidents					
		Diabetes			No Diabetes		
		N	%	N	%	p-value	
1	Kurang	154	85,6	26	14,4	180	100
2	Cukup	3	4,3	67	95,7	70	100
	Total	157	62,8	93	37,2	250	100

foods containing calories, there will be a buildup of glucose which triggers Type 2 DM. In addition, men also have a smoking habit, which is a risk factor for Type 2 DM.

Based on the results of the study, it showed that out of 171 respondents with a family history of Type 2 DM, 151 respondents (88.3%) had Type 2 DM. While out of 79 respondents with no family history of Type 2 DM, 6 respondents (7.6%) had Type 2 DM. The results of the statistical test showed a p-value = 0.000 ($p < 0.05$) in other words there is a significant relationship between family history and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

People with a family history of diabetes must increase their vigilance. If one parent has Type 2 DM, the risk of developing Type 2 DM is 15% and if both parents, the father and mother, both have Type 2 DM, the risk of developing Type 2 DM is 75%. This is because the gene inheritance during pregnancy is greater than the mother. If a sibling suffers from DM, the risk of developing DM is 10% and 90% if the sufferer is an identical twin. The occurrence of Type 2 DM is an interaction of genetic and environmental factors. The genetic factors that are owned will manifest into Type 2 DM if supported by environmental conditions that trigger this disease [2].

In this study, the results showed that hypertension has a significant relationship with the incidence of Type 2 DM because the measurement of exposure and effects were not measured simultaneously. High blood pressure can cause the distribution of blood sugar in cells to not work optimally so that there will be an accumulation of blood sugar and cholesterol in the blood. Conversely, if the blood pressure condition is in the normal range, blood sugar will run optimally because insulin acts as a controlling substance for the renin and angiotensin system. Sufficient insulin levels cause blood pressure to be maintained, blood pressure above 120/90 mmHg has a risk of diabetes twice as high as people with normal blood pressure [1].

Obesity measurement can be done by calculating BMI. Until now, BMI is still used to classify overweight and obesity. Body composition measurement is highly recommended, this is because it is important for someone to monitor the progress of weight loss which is part of every effective anti-obesity treatment. Weight loss can be done with healthy lifestyle interventions (diet and exercise), pharmacotherapy, or bariatric surgery (Leitner, et al., 2017). Based on the results

of the study, it was shown that out of 108 respondents with smoking status, 74 respondents (68.5%) had Type 2 DM. Meanwhile, out of 142 respondents with non-smoking status, 83 respondents (58.5%) had Type 2 DM. The results of the statistical test showed a $p\text{-value} = 0.134$ ($p > 0.05$) in other words, there was no significant relationship between smoking and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

In addition, in this study, the researcher did not ask about exposure to cigarettes inhaled by passive smokers, which affected the results of the study on the relationship between smoking and the incidence of DM. Cigarette smoke contains toxins that are similar to those inhaled by smokers, but the exposure is at different temperatures and conditions. Several toxic substances are found in higher concentrations in passive smokers. The greater the exposure inhaled by passive smokers, the greater the risk of developing diabetes. Therefore, further researchers are advised to add exposure to cigarette smoke in passive smokers as a risk factor associated with the occurrence of Type 2 DM. Based on the results of the study, it shows that out of 180 respondents with insufficient physical activity, 154 respondents (85.6%) experienced Type 2 DM. While out of 70

respondents with sufficient physical activity, 3 respondents (4.3%) experienced Type 2 DM. The results of the statistical test showed a $p\text{-value} = 0.000$ ($p < 0.05$) in other words there is a significant relationship between physical activity and the incidence of Type 2 Diabetes Mellitus at the Siulak Gedang Health Center, Siulak District, Kerinci Regency.

The implementation and maintenance of physical activity is an important focus for managing blood glucose and overall health in individuals with diabetes and prediabetes. Physical activity includes all movements that will increase energy use. Physical activity that is carried out daily or at least no more than 2 days between exercise sessions can increase insulin work. Structured lifestyle interventions that include physical activity of at least 150 minutes/week and dietary changes that result in a weight loss effect of 5% - 7% are recommended to prevent or delay the occurrence of Type 2 DM in high-risk and prediabetic populations [1].

6 Conclusion

There is a significant relationship between family history and the incidence of Type 2 Diabetes Mellitus ($p\text{-value} 0.000$), hypertension with the incidence of Type 2 Diabetes Mellitus ($p\text{-value} 0.000$), obesity with the incidence of Type 2 Diabetes Mellitus ($p\text{-value} 0.000$), physical activity with the incidence of Type 2 Diabetes Mellitus ($p\text{-value} 0.000$). At the Siulak Gedang Health Center, Siulak District, Kerinci Regency. The results of the Population Attributable Risk Percent (PAR%) calculation can be concluded that 12% of Type 2 DM cases in the family history group can be prevented by paying attention to the risk factors for family history of diabetes sufferers. In the hypertension-exposed group, 15% of Type 2 DM cases can be prevented by paying attention to the risk factors

for hypertension, and in the obesity group, 15% of Type 2 DM cases can be prevented by improving the Body Mass Index.

7 Acknowledgement

The author would like to express gratitude to all their colleagues for their assistance in finishing this article.

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