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Correlation Between Family History Of Type 2 Diabetes Mellitus Patients And Metabolic Syndrome Components In Medan City In 2023

Karolina Br Surbakti[1], Liza Mutia[2]
[1,2]Jurusan Teknologi Laboratorium Medis, Politeknik Kesehatan Kementerian Kesehatan Medan

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ABSTRACT
This study aims to identify the relationship between the family history of people with Type 2 Diabetes Mellitus (DMT2) and the metabolic syndrome component in Medan City in 2023. Metabolic syndrome is a collection of conditions that increase the risk of cardiovascular disease and diabetes, including central obesity, hypertension, dyslipidemia, and insulin resistance. Data was collected through a survey of 400 respondents consisting of individuals with a family history of DMT2 and without a family history of DMT2. Statistical analysis uses logistic regression to determine the relationship between variables. The results showed that individuals with a family history of DMT2 had a higher likelihood of experiencing metabolic syndrome components compared to individuals without a family history of DMT2. These findings confirm the importance of screening and early intervention in individuals with a family history of DMT2 to reduce the risk of metabolic syndrome and related complications. This study suggests the need for more intensive health education and effective prevention programs for the people of Medan City.

Corresponding Author:
Karolina Br Surbakti
Jurusan Teknologi Laboratorium Medis, Politeknik Kesehatan Kementerian Kesehatan Medan
Jl. Jamin Ginting KM. 13,5 Kel. Lau Cih Medan -Tuntungan
surbakti74karolina@gmail.com

INTRODUCTION

The proportion of the incidence of Diabetes Mellitus (DM) in the world and its complications are increasingly found. The proportion of diabetes increased in line with the increase in the age of the community to 111.2 million people (19.9%) at the age of 65-79 years. It is estimated that this figure will continue to rise until it is close to 578 million (2030) and 700 million (2045). Family history describes a useful screening tool and can provide genetic information on the development of DM (James et al., 2020). From several previous studies, there are conflicting results, where in a study conducted in China it was stated that there was a positive correlation between the increased risk of Type 2 DM (DMT2) and the history of DM (Hao et al., 2022). In 2019 in Banyumas, a study was conducted and the results between family history and DM events were negatively correlated with the meaning that there was no meaningful relationship between the two variables. Several studies have shown that individuals with a family history of Type 2 DM have increased triglyceride levels, LDL, HDL

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levels, central obesity and increased body mass index (BMI), insulin resistance and increased risk of hypertension compared to no family history of type 2 DM (Fradina & Nugroho, 2020)

Metabolic Syndrome (SM) is a collection of risk factors for cardiovascular disease. SM assessment criteria based on the provisions of NCEP–ATP III, if a person is found 3 out of 5 approved criteria, including: abdominal circumference of men >120 cm or women >110 cm cm; hypertriglyceridemia (serum triglyceride levels >150 mg/dL), HDL levels> 40 mg/dl; blood pressure ≥130/85 mmHg and fasting blood glucose levels >110 mg/dL. Metabolic syndrome is a global concern because the number of cases continues to rise. Riskesdas data in 2007 determined the incidence of SM in Indonesia at 17.5%, while Riskesdas data in 2013 determined the incidence of SM in Indonesia at 23% (Ledug et al., 2020), survey data at the Medan City Health Center showed an overweight rate of 51.0% (Degenerative Disease survey 2006)

Cohort study research conducted in Bogor found that Metabolic Syndrome Components (central obesity, hyperglycemia, hypertriglycerides, low HDL cholesterol, and hypertension) play a very influential role in the onset of DM. In Makassar, cross-sectional research was found in adults who are not diabetic with the origin of parents with DMT 2 who have multiple metabolic abnormalities (Usman et al., 2020a). In China it was found that a family history of diabetes remained a positive independent factor associated with BC. In Taiwan, a family history of DM is significantly associated with the metabolic syndrome component. Different research results were obtained in research conducted in Samarinda and Makassar that there was no family history relationship with DM.

Based on the description above, the hope for this study is to detect the relationship between the family history of DMT2 patients and the SM component in Medan in 2023 and the special purpose of this study is to compare the relationship between the family history of DMT2 patients and the SM component in Medan in 2023 based on the characteristics of the research sample. Where the urgency of this study is as information to the public, that the metabolic syndrome component is more susceptible to people who have a family history of DM and as a consideration in efforts to prevent the occurrence of diseases caused by metabolic syndrome in an effort to prevent a decline in quality of life and premature mortality (Usman et al., 2020)

METHODS

The method in this study is descriptive analytical research using a cross sectional approach, samples at the age of 17 to 35 years, male or female, totaling 96 people. Then it was divided into 2 groups, group 1 (48 people) had a family history of DM and group 2 (48 people) did not have a history of DM, then the components of metabolic syndrome (abdominal circumference, triglyceride levels, HDL, blood pressure, blood sugar levels) were measured in the two groups.

The characteristics of the respondents in this study and patient data were divided into 2 groups. Group 1 (48 people) had a family history of DM and group 2 (48 people) did not have a family history of DM which would be associated with SM components, namely, Triglyceride levels, HDL, blood pressure, blood sugar levels and abdominal circumference.

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RESULTS AND DISCUSSION

From the results of the study, it was explained about the characteristics of the respondents of the two groups with family history relationships and non-family history relationships. The results of the study were obtained in the age range of the most subjects at the age of 30 to 34 years as many as 32 people (33.33%) and the second in the age range of 26 to 29 years as many as 26 people (27.08%) and the last in the age range of 18 to 21 years and 22 to 25 years old which each had 19 subjects (19.79%)

Figure 1. Overview of subject characteristics by age

Figure 2. Description of subject characteristics by gender

The graph above describes the characteristics of subjects based on gender for two groups of respondents with a history of family relationships and non-family history of DM. The results of the study were obtained by the most Rseponden as many as 66 women (68.8%) and for male respondents as many as 30 people (31.3%)

Table 1. Description of the characteristics of the subject based on the components of metabolic syndrome

		DM History (+)		DM History (-)		*P value*	RO (rasioodds)	IK 95 %	
		n	%	n	%			min	maks
Blood Zinc Levels	< 110 mg/dL	20	41,7	12	25	*0.083*	0.467	0.196	1.113
	> 110 mg/dL	28	58,3	36	75				
Trigliserid a						*0.000*			

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		DM History (+)		DM History (-)		*P value*	RO (rasioodds)	IK 95 %	
		n	%	n	%			min	maks
	< 150 mg/dL	25	52,1	42	87,5		0.155	0.56	0.433
	> 150 mg/dL	23	47,9	6	12,5				
HDL									
	< 40 mg/dl	5	10,4	3	6,3	*0.460*	0.573	0.129	2,547
	>40 mg/dl	43	89,6	45	93,8				
Blood pressure									
	< 130/85 mmHg	34	70,8	44	91,7	*0.009*	0.221	0.067	0.731
	≥ 130/85 mmHg	14	29,2	4	8,3				
Belly circumference	Wanita					*0.768*			
	< 110 cm	22	45,8	23	47,9				
	≥ 110 cm	12	25	8	16,7				
	Laki- laki								
	< 120 cm	7	14,6	8	16,7				
	> 120 cm	7	14,6	9	18,7				
	Chi square test								

Table 1 shows the data of the results of the study which can be seen that the blood sugar level in the group of subjects who have a history of DM with a history of KGD less than 110 mg/dl as many as 20 people (41.7%) and with a KGD of more than 110 mg/dl as many as 28 people (58.3%), for the group of subjects who do not have a history of DM, the results of KGD less than 110 mg/dl were obtained as many as 12 people (25.0%) and with a KGD of more than 110 mg/dl as many as 36 people (75.0%). After conducting a statistical test, the p value was 0.083 > 0.05 which means that the DM's family history is not meaningful with the results of the KGD examination.

In the triglyceride examination for the group that had a family history of DM with a triglyceride result of less than 150 mg/dL as many as 25 people (52.1%) and with a triglyceride result of more than 150 mg/dl as many as 23 people (47.9%) while with a group without a history of DM with triglycerides less than 150 mg/dL as many as 42 people (87.5%) and with a triglyceride result of more than 150 mg/dl as many as 6 people (12.5%) then a statistical test was carried out with a result of p value 0.000 which means that the family history of DM is related to triglyceride levels in the blood. The results of the statistical test when obtained with a value of less than 0.005 and concluded that there was a meaningful relationship between the characteristics of the subject and the components of metabolic syndrome.

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The relationship between respondents and HDL examination was obtained for the group that had a family history of DM with an HDL result of less than 40 mg/dL as many as 5 people (10.4%) and with an HDL result of more than 40 mg/dl as many as 43 people (89.6%) while with a group without a history of DM with HDL less than 40 mg/dL as many as 3 people (6.3%) and with an HDL result of more than the same with 40 mg/dl as many as 45 people (93.8%) After conducting a statistical test, it was found that the p value was 0.714 > 0.05, which means that the family history of DM does not have a significant relationship with HDL levels in the blood.

Blood pressure examination for the group that had a family history of DM with a result of less than 130/85 mmHg as many as 34 people (70.8%) and more than 130/85 mmHg as many as 14 people (29.2%) while with a group without a DM history relationship with a result of less than 130/85 mmHg as many as 44 people (91.7%) and more than 130/85 mmHg as many as 4 people (8.3%) After a statistical test was carried out, a p value of 0.009 < 0.05 was obtained which means that the family history of DM has Significant relationship with blood pressure test Results Data from the abdominal circumference measurement research results from the group who had a history of DM in women with a abdominal circumference of less than 110 cm as many as 22 people (45.8%) and with an abdominal circumference of more than 110 cm as many as 12 people (25%), for men with an abdominal circumference of less than 120 cm as many as 7 people (14.6%) and with an abdominal circumference of more than 120 cm also as many as 7 people (14.6%). In the group that did not have a history of DM in women with an abdominal circumference of less than 110 cm as many as 23 people (47.9%) and with a abdominal circumference of more than 110 cm as many as 8 people (16.7%), for men with an abdominal circumference of less than 120 cm as many as 8 people (16.7%) and with a abdominal circumference of more than 120 cm as well as 9 people (18.7%). Statistical test with P value 0.768 > 0.05, which has a meaning between DM's family history negatively correlated with the subject's abdominal circumference.

Discussion

Based on the most subjects in the group with the age of 30 - 34 years as many as 32 people (33.33%). This shows that with increasing age the possibility of developing DM, where increasing the age of each person will find a continuous decrease in β cells , as a result of which the insulin produced becomes a little resulting in blood glucose levels will increase (Sholikhah, W.S, 2017)

Research data shows that the type of female subject (68.8%) is more common. This is in conjunction with a study conducted by evelyn, 2012 at Dr. Soebandi Jember Hospital where the largest distribution of respondents was women (54%) out of 143 DM patients. Female subjects were found more in this study because of the formation of estrogen hormone degradation in women, especially during menopause. The hormones estrogen and progesterone have the ability to increase the insulin response in the blood. The response to insulin will decrease due to low levels of the hormones estrogen and progesterone at the time of menopause. In addition, there are other factors, including women's body mass indexes that are generally not appropriate which results in a decrease in insulin response sensitivity

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(Berthiana, 2019). In addition, women have more opportunities to check their health compared to men who have a lot of activities outside.

Based on the results of the study in table 3, it can be concluded that the most subjects were obtained from respondents in the group who did not have a history of DM with a KGD result of more than 110 mg/dl as much as (75%) in line with the 2019 Berthiana study in Palangkaraya with 68 subjects obtained results (50%) from families who did not have a history of DM and Fradina at the Palaran Samarida Health Center (2019) out of 37 subjects obtained 59.5% also did not have a history of DM. There is no family history relationship with DM sufferers. This may be because there are other factors that contribute to diabetes besides family history. A lifestyle that consumes a lot of foods such as fast food, junk food, high carbohydrates and sugary drinks, as well as little physical activity and sitting for long periods of time puts a person at high risk of developing DMT2 (Murtiningsih, 2021)

Elevated plasma triglyceride levels are associated with DMT2 and cardiovascular disease. Changes in the lipoprotein lipase gene have a very influential function during the occurrence of dyslipidemia in DMT2 patients. The results of the examination of triglyceride levels were most seen in the group that did not have a history of DM with normal triglyceride levels as many as 42 people (87.5%), then a statistical test was carried out and found a p value of 0.000 which means that the family history of DM is related to triglyceride levels in the blood. This research is supported by research conducted by Wahyuningtyas (2022) at Cengkareng Hospital using 86 DM subjects with blood triglyceride results of 53% normal.

Diabetics with insulin resistance cause triglyceride lipolysis in adipose tissue to increase due to the activation of the lipase enzyme which is sensitive to hormones in adipose tissue. Triglycerides are formed from free fatty acids that are formed in the liver. Very Low Density Lipoprotein (VLDL) in the liver is produced during insulin resistance and is produced in VLDL which is rich in triglycerides. VLDL rich in triglycerides is exchanged with cholesterol esters from HDL and produces HDL rich in triglycerides but poor in cholesterol esters. This form of HDL cholesterlogue is more easily catabolized by the kidneys so that the amount of serum HDL decreases. High triglyceride levels in people with DMT2 can be avoided with initial treatment to lower blood sugar levels and lower triglyceride levels by regulating diet. Reduce foods that contain a lot of carbohydrates such as rice, flour and other sweet foods. By consuming vegetables, a person can slow down the absorption of hydrated charcoal from the intestines into the blood, so that the formation of triglycerides in the liver can be slowed down. (Damanik, 2013, Malau, Sri Rizki, 2014)

Based on the results of the examination of HDL levels, which were the most in the group without a history of elevated DM (more than 40 mg/dl) as many as 45 people (93.8%), with a p value of 0.714 (where the family history of DM did not have a meaningful relationship with HDL levels), Supporting this study, the research conducted by Pratiwi (2021) using an observational research method with a total of 76 subjects, the results of the statistical test obtained a value of p = 0.009 so that conclusions can be drawn that there is a meaningful relationship between KGD and HDL and from the results of research conducted by Nurdin (2022) at Benyamin Guluh Kolaka Hospital with a sample of 30 people, a normal HDL result of 100% was obtained. (Malau, Sri Rizki, 2014)

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The results of blood pressure measurements in subjects were mostly found in groups that did not have a relationship between DM history and normal blood pressure as many as 44 people (91.7) Then the statistical test obtained a p value of 0.009 < 0.05 which means that the family history of DM has a significant relationship with the results of blood pressure examinations, this study was supported by Fradina (2020) using a case control research design obtained statistical test results with a p value of 0, 008 and in line with the research of Setyaningrum Dewi E, Zaenal Sugiyanto (2015) at Tugurejo Hospital Semarang with a sample of 78 people obtained a nilap p value of 0.0039 from these two studies stated that there was a significant relationship between the incidence of DM and hypertension

Hypertension will cause the distribution of glucose in cells β the pancreas does not work properly (insulin resistance), so that there is a collection of glucose and cholesterol in the blood, followed by the burning process by oxygen (oxidation) between blood sugar and proteins in the blood vessels which will result in glycation end products (AGEs). AGEs can cause damage to the inside of the blood vessel walls and secrete cholesterol into the blood vessel walls causing an inflammatory reaction. Coagulation cells (platelets and red blood cells (leukocytes) act in the mechanism of clotting plaque, resulting in inelastic, rigid, hard blood vessels and finally causing blockages that result in impaired blood glucose transport and finally hypertensive hypertension (Fatimah, 2015)

Research conducted by Hairuni (2019) in Samarinda showed that there was no meaningful relationship between KGD and abdominal circumference with a total of 111 respondents obtained a p value of 0.787 and Wijaya alvin, et al. (2019) who conducted a study on 34 FK students of Udayana University, the results of these two researchers were in line with the results of the research conducted by the researcher, namely there was no meaningful relationship between KGD and abdominal circumference. An increase in abdominal circumference can cause an increase in blood sugar because glucogenesis can block insulin activity. Fat in the abdomen has a metabolic result in the form of fatty acids that are released into the veins of the hepatica porta. Acetyl CoA is produced from free fatty acids that circulate excessively to the liver. Acetyl CoA will activate the enzyme pyruvate carboxylase in the liver, which converts pyruvic acid into glucose in the liver, this mechanism is called gluconeogenesis. In addition, increased levels of free fatty acids circulating in the liver can cause a lack of sensitivity of muscle cells to insulin, resulting in insulin resistance. Therefore, muscle cells need more insulin for blood glucose to reach into the muscles. (Rahmadinia, 2018)

In addition to SM, the occurrence of DMT2 describes the relationship between genetic and environmental factors. The genetic factors that are possessed will be indicated to be DMT2 when supported by environmental conditions that can produce DM The genetic inheritance of parents to their offspring is then expressed, including several genes that undergo exchange. Mutations in DMT2 can increase gene expression on Langerhans islands and cause disruption of insulin secretion, reduced plasma insulin, impaired insulin secretion by glucose stimulation, and decreased insulin sensitivity thereby increasing the risk of DM (Paramita & Lestari, 2019).

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CONCLUSION

The conclusion obtained from this study is that the family history of DM does not have a significant relationship with the components of metabolic syndrome because from the results of statistical tests it is obtained that only 2 components (triglycerides and blood tea) are related to the history of DM while the other 3 components of metabolic syndrome do not have a relationship with the history of DM (kgd, hdl, and abdominal circumference).

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