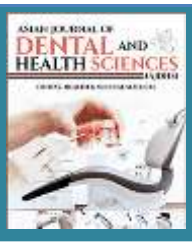

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Relationship between family history, diet and sedentary behavior with the incidence of diabetes mellitus

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Abstract

Diabetes Mellitus (DM) is a degenerative disease that is a public health problem throughout the world. Diabetes mellitus has become one of four non-communicable diseases that will cause around 6.7 million people to die in 2021. Currently, the number of cases and prevalence of diabetes mellitus continues to increase. There are several risk factors that can cause diabetes mellitus, including family history, food patterns and sedentary behavior. This study aims to determine the relationship between family history, diet and sedentary behavior on the incidence of diabetes mellitus. The population in this study were all patients aged 45- 75 years who were treated at the Chronic Disease Management Program (Prolanis), Public Health Rebo District Market Center. Samples were taken as many as 68 respondents with a purposive sampling technique. The data was collected using a questionnaire and then analyzed using the chi square test. The results showed that there is a relationship between family history (p-values = 0.003 with OR = 5.061), diet (p-values = 0.002 with OR = 5.667) and sedentary behavior (p-values = 0.011). with OR value = 3829) with the incidence of diabetes mellitus

Keywords: Family History, Food Patterns, Sedentary Behavior, Diabetes Mellitus, Incidence

INTRODUCTION

Diabetes mellitus (DM) is one of the degenerative diseases that affect the health of individuals worldwide. Diabetes mellitus is a metabolic disorder caused by hyperglycemia (increased blood sugar levels) that occurs due to decreased insulin secretion, impaired insulin metabolism, or both. This makes blood sugar in the blood unable to be utilized by the body's cells as energy resulting in hyperglycemia.[1,2]

Diabetes mellitus is one of the four non-communicable diseases which will cause around 6.7 million deaths in 2021. Currently, diabetes mellitus continues to increase every year. According to a report by the International Diabetes Federation (IDF), the number of people with diabetes mellitus worldwide in 2021 has reached 537 million. It is estimated that the number of people with diabetes mellitus in Indonesia will continue to increase in 2045 to 28.6 million sufferers. Indonesia is the only country in Southeast Asia on the list. Thus, Indonesia has a significant contribution to the incidence of diabetes mellitus in Southeast Asia.[3]

According to the 2018 Basic Health Research, the incidence of diabetes mellitus in Indonesia according to doctors' diagnoses at the age of ≥ 15 years has increased to 2%. This figure represents that there was an increase in cases of diabetes mellitus previously in 2013, which was 1.5%. Meanwhile, the prevalence of diabetes mellitus based on blood sugar examination results in 2018 increased in percentage from 6.9% to 8.5%. DKI Jakarta has the highest incidence of diabetes mellitus at 3.4%.[4] According to data the author obtained from the Pasar Rebo District Health Center, the number of people with diabetes mellitus during the July-December 2021 period was 3,038 sufferers. Diabetes mellitus is the second most common disease in the Pasar Rebo Health Center.

One of the risk factors that cause diabetes mellitus is a family history of diabetes mellitus. Judging from the results of research conducted by Irwan et al it is said that individuals with a family history of diabetes mellitus, especially parents and siblings, are at higher risk of developing diabetes mellitus than someone who has no family history. In addition, there are other studies which explain that if one of the two parents suffers from diabetes mellitus, there is a 15% risk of suffering from diabetes. However, if both parents have diabetes mellitus, the risk of developing diabetes mellitus increases to 75%.[5,6]

Diet can also contribute to the occurrence of diabetes mellitus. Diet is the accuracy and consistency of the patient in controlling the type, amount and frequency of eating. A person can be said to have a healthy diet if they follow dietary guidelines such as type, amount and frequency. Conversely, if someone does not do less than these three indicators, then the eating pattern of people with diabetes mellitus will be bad.

Based on the results of research conducted, it was found that someone who has a bad diet is twice as likely to suffer from diabetes mellitus compared to those who have a healthy diet. This unhealthy eating pattern is about people who often eat foods high in calories, fat and cholesterol, such as fast food.[1,7,8]

The results of the 2018 Basic Health Research stated that there was an increase in the number of people who were less active, including sedentary behavior, namely by 33.5%, compared to 26.1% in 2013. Sedentary behavior is a risky behavior that can cause metabolic syndrome, namely coronary heart disease, diabetes mellitus, and stroke. Based on the results of a research study conducted by Yusfita, explaining that someone who engages in sedentary behavior ≥ 6 hours per day has a 16 times greater risk of metabolic syndrome, one of which is diabetes mellitus, compared to people who engage in sedentary behavior < 6 hours per day.[4,9–11]

Based on the description above, the researcher is interested in proving that there is a correlation between family history, diet, and sedentary behavior on the incidence of diabetes mellitus at the Pasar Rebo District Health Center, East Jakarta City.

METHODS AND MATERIALS

The research used an analytic observational study and used a cross sectional design. The population in this study were all polyprolanis patients at the Pasar Rebo District Health Center. The sample calculation in this study used a simple size application with the results of 68 respondents consisting of patients who suffer from diabetes mellitus and do not suffer from diabetes mellitus. The sampling technique used was purposive sampling. The research began in mid-May 2022 at the Pasar Rebo District Health Center.

Data collection was carried out by collecting primary data in the form of questionnaires given to respondents and secondary data in the form of patient visit data. The questionnaires used in this study were the Food Frequency Questionnaire (FFQ) and the Sedentary Behavior Questionnaire (SBQ). Prior to conducting the research, the researcher obtained ethical approval from the health research ethics committee of the Poltekkes Kemenkes Jakarta III and obtained the Ethic Number LB.02.02/KEPK/029/2022.

Data analysis was carried out in a univariate manner, namely to explain data on the characteristics of the respondents (age, gender, education level, occupation) and research variables (family history, diet, sedentary behavior). Bivariate analysis was conducted to determine the relationship between the independent variables and the dependent variable. Processing with Chi Square statistical test.

RESULTS AND DISCUSSION

Table 1 shows that most of the respondents are in the middle adult range (45-65 years) (77.9%), where the majority of respondents are female (61.8%). As for the educational level of the majority of the respondents, the majority of respondents had basic education, and in the employment category, most of the respondents did not work (57.4%).

Table 1: Characteristics of respondents

Characteristics	Frequency	%
Age		
45-65	53	77.9
≥65	15	22.1
Gender		
Male	26	38.2
Female	42	61.8
Level of education		
Basic education	30	41.1
Higher education	38	55.9
Employment		
Work	29	42.6
No work	39	57.4

Based on table 2, it can be seen that most of the respondents were patients with diabetes mellitus (66.2%), where the majority of respondents had a family history of diabetes mellitus (54.4%). As for the eating patterns of the majority of respondents, the majority of respondents had unhealthy eating patterns (52.9%), and the sedentary behavior of most respondents had sedentary behavior ≥ 6 hours/day (60.3%).

Table 2: Frequency Distribution Based on Research Variables

Characteristics	Frequency	%
Incidence of Diabetes Mellitus		
Yes	23	33.8
No	45	66.2
Family history of diabetes mellitus		
Yes	30	44.1
No	38	55.9
Dietary habit		
Good	32	47.1
Bad	36	52.9
Sedentary Behavior		
< 6 hours/day	24	39.7
≥ 6 hours/day	41	60.3

Table 3: Relationship of Respondent Characteristics with the Incidence of Diabetes Mellitus

Variable	Incidence of Diabetes Mellitus						p-value	OR (CI95%)
	Yes		No		Total			
	f	%	f	%	f	%		
Age								
45-65	22	41.5	31	58.5	53	100	0.012	9.935
≥65	1	6.7	14	93.9	15	100		(1.215-81.21)
Gender								
Male	14	53.8	12	46.2	26	100	0.006	4.279
Female	9	21.4	33	78.6	42	100		(1.273-12.43)
Level of education								
Basic education	16	46.7	14	33.3	30	100	0.003	0.198
Higher education	7	18.4	31	81.6	38	100		(0.006-0.527)
Employment								
Work	15	51.7	14	48.3	29	100	0.007	0.241
No work	8	20.5	31	79.5	39	100		(0.083-0.699)

In this study it was found that the average age of the respondents was mostly in the middle adult age range (45-60 years) (57.4%). However, almost all of the respondents in the late adult age range (> 65 years) suffered from diabetes mellitus (93.9%). The results showed that there was a relationship between age and the incidence of diabetes mellitus (p-value = 0.012). The results of this study are in line with research conducted by Riris and Siregar, namely that there is a relationship between age and the incidence of diabetes mellitus (p-value = 0.001). Likewise with the research conducted by Arania et al, that there is a relationship between age and the incidence of diabetes mellitus (p-value = 0.032 <0.05), where a person aged > 45 years has a 5.6 times greater risk of suffering from diabetes mellitus. Referring to the research by Setyorogo and Trisnawati (2013), that at the age of more than 50 years, most patients suffer from diabetes mellitus due to lifestyle factors. At that age began to occur increased glucose intolerance. The aging process causes a decrease in the ability of pancreatic β cells to produce insulin accompanied by lifestyle impacts in adolescents and productive ages, thereby increasing the risk of suffering from diabetes mellitus. In addition, in older individuals, there is a 35% decrease in mitochondrial activity in muscle cells. This is related to an increase in fat content in the muscles by 30% and triggers insulin resistance. There is another theory that suggests that as we get older, the ability of the tissues to take up glucose in the blood decreases. This is what causes diabetes mellitus to occur more in people aged over 40 years. The assumption of the researchers based on the results of the study is that the older you get, the greater the risk of suffering from diabetes mellitus.[12–14]

The results showed that there was a relationship between gender and the incidence of diabetes mellitus (p-value = 0.006), where female respondents had a 4.297 times greater risk of suffering from diabetes mellitus than male respondents. In this study it was known that the majority of respondents were female (61.8%). These results are in line with research conducted by Rosita et al, that there is a relationship between gender and the incidence of diabetes mellitus (p-value = 0.012). The main cause of the large number of women affected by diabetes mellitus is because women gain weight more easily. In addition, women experience a decrease in the hormone estrogen, especially during menopause. The hormones estrogen and progesterone have the ability to increase insulin response in the blood. At the age of menopause, insulin response will decrease due to low estrogen and progesterone hormones. However, there are other opinions which state that people with male sex are more at risk of suffering from diabetes mellitus. Musdalifah and Nugroho's research, explains that this difference in risk is caused by the amount of fat in the body, in which men accumulate a lot of fat around the abdomen, causing central obesity which is more at risk of causing metabolic disorders, in other words, men are more at risk for diabetes. The researcher's assumption based on the research results is that gender can influence the occurrence of diabetes mellitus in a person. Women have a greater risk of suffering from diabetes mellitus than men. However, this returns to each individual, if a person has a bad lifestyle, such as eating sweet foods and rarely exercising, both women and men have the same risk of developing diabetes mellitus.[15,16]

In this study it was known that most of the respondents had primary education (55.9%). The results showed that there was a significant relationship between education level and the incidence of diabetes mellitus (p-value = 0.003), where respondents with a basic education level had a 0.198 times greater risk of suffering from diabetes mellitus than respondents with a higher education level. These results are based on research by Arania et al, that the level of learning is associated with the incidence of diabetes, with a relative value of -0.304, a negative value is obtained, which means that the higher the level of education, the lower the incidence of diabetes.[13] This phenomenon is also based on the research of Pahlawati et al. (2019), that there is a relationship between grade grade and the incidence of diabetes mellitus with a p-value of 0.002. Education is one of the efforts to develop personality and abilities inside and outside of school and lasts a lifetime. Education affects the learning process, the higher a person's education, the easier it is for that person to receive information, both from other people and from the mass media, the more information that comes in, the more knowledge one gets.[17,18] Irwan also argues that there is an attachment between people with a higher level of education where they are more able to accept themselves as sick if they experience

symptoms related to an illness compared to groups of people who have lower education. It is also indicated that people with higher levels of education seek help from the health team more quickly than people with lower social status. From the description above, the researchers assume that the level of education greatly influences the incidence of diabetes mellitus. Those with basic education are more at risk of suffering from diabetes mellitus than those with higher education, because someone with higher education has better knowledge about diabetes mellitus and its effects on health so they have awareness to take better care of their health.[5]

In this study it is known that most of the respondents do not work (60.3%). The results showed that there was a significant relationship between work and the incidence of diabetes mellitus (p-value = 0.007), where respondents who worked had a 0.241 times greater risk of suffering from diabetes mellitus than respondents who did not work. These results are in line with research conducted by R. Mahmud (2018), that there is a relationship between work and the incidence of diabetes mellitus (p-value = 0.003). Research conducted by Cahyaningrum and Sugiharti, also argues that there is a relationship between work and the incidence of diabetes mellitus (p-value = 0.04). Based on research by Hanif et al. entitled Gender - Specific Epidemiology of Diabetes states that a person's job affects the level of physical activity which affects health so that he is at risk of suffering from diabetes mellitus. Someone who doesn't work, such as housewives, unemployed, and retirees, spends more time at home so they have less movement and can trigger obesity. This can lead to insulin resistance because the body's tissues are less sensitive to the effects of insulin. Thus, blood sugar levels in cells increase. The researcher's assumption based on the research results is that work has a significant relationship with the incidence of diabetes mellitus. someone who does not work has a greater risk of suffering from diabetes mellitus than those who work.[19,20]

Table 4: Relationship of Research Variables with the Incidence of Diabetes Mellitus

Variable	Incidence of Diabetes Mellitus						p-value	OR (CI95%)
	Yes		No		Total			
	f	%	f	%	f	%		
Family history of diabetes mellitus								
Yes	16	53.3	14	46.4	31	100	0.006	5.061
No	7	18.8	31	81.6	37	100		(1.702-15.04)
Dietary habit								
Good	17	53.1	15	46.9	32	100	0.003	5.667
Bad	6	16.7	30	83.3	36	100		(1.852-17.33)
Sedentary Behavior								
< 6 hours/day	14	51.9	13	48.1	24	100	0.011	3.829
≥ 6 hours/day	9	22.0	32	78.0	41	100		(1.331-11.01)

The results showed that there was a significant relationship between family history and the incidence of diabetes mellitus (p-value = 0.003), where respondents who had a family history had a 5.061 times greater risk of developing diabetes mellitus than respondents who did not have a family history. The results of this study are in line with research conducted by Irwan, genetic factors are associated with the incidence of diabetes mellitus with a p-value = 0.000. In this research it is also said that someone who has a family history has a 4 times greater risk of suffering from diabetes mellitus.[5]

A family history of diabetes mellitus is closely related to genetics and is thought to affect pancreatic beta cells, insulin action, and glucose metabolism. People who have a history of diabetes mellitus in the family have a 1.093 times greater chance of suffering from type 2 diabetes mellitus than people who do not have a history of diabetes mellitus in the family, the family in question is father, mother and siblings.[21,22] Gene inheritance mainly occurs from the mother's side while in the womb. However, because the genes of the child and his siblings come from the mother and father, even if the father has DM, the risk of a child suffering from DM is still there. The risk of getting DM from a mother is 10-30% greater than a father with DM. If a sibling suffers from DM, the risk of suffering from DM is 10% and 90% if the sufferer is an identical twin.[6]

There is another opinion which says that family history is closely related to the incidence of type 2 diabetes mellitus, this is inseparable from environmental habits. For example, parents with healthy eating habits tend to pass them on to the next generation. Unhealthy eating habits accompanied by infrequent physical activity are more at risk of experiencing high sugar levels, so they are at risk of developing type 2 diabetes mellitus when they are at productive age or the elderly.[23] Unlike previous studies, Cahyaningrum and Sugiharti stated that family history had no relationship with the incidence of diabetes mellitus (p value = 0.117).[19] Wardiah and Emilia explain that diabetes mellitus can occur in individuals who have a family history of diabetes, but do not rule out the possibility for individuals who do not have a family history. Individuals who do not have a family history of diabetes may suffer from diabetes mellitus if their lifestyle deviates, such as frequently consuming foods high in sugar and fat and rarely doing physical activity. From the description above, researchers assume that there is a relationship between family history and the incidence of diabetes mellitus. However, it is possible for someone who has no family history to suffer from diabetes mellitus, because diabetes mellitus can be influenced by other risk factors such as unhealthy diet and lack of physical activity.[24]

The results of this study indicate that there is a significant relationship between diet and the incidence of diabetes

mellitus (p-value = 0.002). Where it is known that most of the respondents in this study had a bad diet (57.1%). So it can be seen that respondents who have a bad diet have a tendency to suffer from diabetes mellitus. This finding is in line with research conducted by Isnaini and Ratnasari, that there is a relationship between diet and the incidence of diabetes mellitus at the Wangon I Public Health Center with p = 0.031. In a study conducted by Hariawan et al, it was also stated that there was a relationship between diet and the incidence of diabetes mellitus (p-value = 0.023). In this study it was found that most of the respondents often consumed foods containing carbohydrates.[22,25] Suprapti in his research stated that someone who has a frequent carbohydrate diet has a risk 4 times higher than those who have a rare carbohydrate diet. Carbohydrate intake that exceeds the need will further increase blood sugar and cannot be controlled within normal limits. In carrying out its functions, the body needs energy obtained from potential energy in the form of chemical energy stored in food ingredients. The energy will be released after experiencing metabolic processes in the body. Carbohydrates are foods that can meet energy needs. Carbohydrates will be absorbed by the body in the form of glucose in the process of metabolism. In this metabolic process, insulin is needed to enter glucose and other nutrients into cells to be used as fuel and become energy. If insulin is lacking or cells are resistant to insulin, blood sugar levels will increase.[26,27]

Diet is defined as a person's accuracy in controlling the type, amount and frequency of food to maintain health. Diet is a modifiable risk factor and is closely related to diabetes mellitus. People who cannot control their eating patterns will be more susceptible to disease than people who are careful in consuming food. In accordance with the Guidelines issued by PERKENI (2021), the recommended carbohydrate intake for DM patients is 45-68% of total calories in food. Adjusting eating patterns such as a healthy diet with balanced nutrition is very important for controlling blood sugar, but people with diabetes mellitus still often consume foods or drinks high in carbohydrates. It is important for people with diabetes mellitus to start consuming less food or drinks that are high in carbohydrates by reducing the amount and frequency, for example someone who usually drinks tea (3-4 times a day) should reduce tea consumption (1-2 times a day). This should also be applied to rice intake and other eating habits.[24] Based on the description above, researchers assume that diet greatly influences the occurrence of diabetes mellitus. someone who has a bad diet is more at risk of suffering from diabetes mellitus than those who have a good diet.

In this study it was found that the majority of respondents (68.8%) performed sedentary behavior < 6 hours/day. The results showed that there was a relationship between sedentary behavior and the incidence of diabetes mellitus (p-value = 0.011). Respondents who engage in sedentary behavior ≥ 6 hours/day have a 3.829 times greater risk of developing diabetes mellitus compared to respondents who engage in sedentary behavior < 6 hours/day.

The results of this study are in line with research conducted by Irwan et al that sedentary behavior carried out for ≥ 6 hours/day is associated with diabetes mellitus with a p-value = 0.000.[5] In addition, research conducted by Yanti also obtained the same results as this study, namely that there was a significant relationship between sedentary behavior and the incidence of diabetes mellitus at the Fish Market Health Center in Bengkulu City in 2016 with p-values = 0.049. Someone who is physically active for 150 to 300 minutes per week, will probably engage in sedentary behaviors such as sitting for several hours a day at work or during their leisure time. According to Henson et al, those who do not do much physical activity and have high sedentary behavior have twice the risk of developing type 2 diabetes mellitus. The effect of physical activity is directly related to increasing the speed of muscle glucose recovery (how much muscle takes glucose from the bloodstream). blood). When doing physical activity, the muscles use glucose stored in the muscles and if glucose is reduced, the muscles fill the void by taking glucose from the blood. This will result in a decrease in blood glucose thereby increasing blood glucose control. Therefore, lack of physical activity will cause an increase in blood sugar levels so that it can cause diabetes mellitus.[28–30]

Physical activity is any bodily movement produced by skeletal muscles that requires energy. Activities such as spending a lot of time watching tv and lying down make the energy in the body not much used, meanwhile the energy that comes from food continues to increase. This causes an imbalance between incoming energy and used energy. Excess energy can lead to excess body weight (obesity). According to the Indonesian Ministry of Health, central obesity is a risk factor that can cause chronic diseases including diabetes mellitus. The researcher's assumption based on the results of the study is that sedentary behavior that is carried out ≥ 6 hours can cause diabetes mellitus. If this behavior is carried out continuously it can cause various diseases such as diabetes mellitus, cardiovascular disease, obesity and so on. For this reason, it is important to do physical activity such as exercising for 30-45 minutes 3-5 days a week so that blood sugar levels can be controlled.[31]

CONCLUSION

Based on the results of the study, it was found that there was a relationship between age (p-value = 0.012), gender (p-value = 0.003), education (p-value = 0.003) and occupation (p-value = 0.003) and the incidence of diabetes mellitus. In addition, it was also found that there was a relationship between family history (p-value = 0.003), diet (p-value = 0.002), and sedentary behavior (p-value = 0.011) with the incidence of diabetes mellitus. It is hoped that the results of this study can be used as a guideline for health services in order to further improve counseling or health education for patients with diabetes mellitus.

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