Genetic Factors, Obesity, Age, and Lifestyle on the Prevalence of Diabetes Mellitus

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ABSTRACT

Diabetes mellitus (DM) is a degenerative disease that continues to increase in prevalence throughout the world, with most cases classified as type 2 diabetes mellitus. Globally, the number of diabetes mellitus sufferers in 2021 is estimated at 537 million adults aged 20-79 years and is estimated to be 643 million people in 2030. This study aims to determine the relationship between genetics, obesity, age, and lifestyle with Diabetes mellitus patients at Bhakti Dharma Husada Hospital. The research design used an analytical survey with a cross-sectional approach. The population consisted of patients with type 2 Diabetes mellitus cases in March 2024, totaling 7,805 patients, with a sample size of 100 respondents. The sampling method used was accidental sampling, and data was collected using a questionnaire. Data analysis used the chi-square test with a confidence level of 95%. Of the 100 respondents, 70 people (70%) suffered from type 2 diabetes mellitus. Based on the results of statistical tests, it was found that there was no relationship between genetic factors and the incidence of diabetes (p-value = 0.826), there was no relationship between obesity factors and the incidence of diabetes (p-value = 0.406), there was an age factor with the incidence of diabetes (p-value = 0.001), and there was no relationship between lifestyle factors and physical activity factors (p-value = 0.787); cigarette factor components (p-value = 0.104); alcoholic beverage factor components (p-value = 0.824); and diet factor components (p-value = 0.617). Age factors need to be considered in carrying out diabetes care.
Keywords: Genetics, Obesity, Lifestyle, Prevalence Diabetes Mellitus

INTRODUCTION

Hospitals are one of the health service facilities that provide health services, outpatient units, inpatient units, and emergency units managed by the government and the private sector. Medical record management is part of the health service process to fulfill administrative/management requirements in an effort to improve the quality of health services (Astuti et al., 2011). This requires a process of complete and accurate data recording and processing to produce accurate and continuous information. Every hospital has an emergency unit, inpatient unit, and outpatient unit that are integrated to facilitate service.

All diagnoses and actions obtained from patients must be included in medical records as documentation and reporting materials as stipulated in PERMENKES Number 1171 of 2011 concerning the Hospital Information System. The SIRS reporting form consists of 5 (five) Report Recapitulations (RL). At Bhakti Dharma Husada Regional General Hospital, there are 5 RLs containing data on the 10 most common diseases entered through SIRS East Java. The outpatient unit at Bhakti Dharma Husada Regional General Hospital has 26 polyclinics, with the highest number

of visits to the internal medicine polyclinic with the diagnosis code E11.9 (non-insulin dependent diabetes mellitus without complications) or Non-Insulin Dependent Diabetes Mellitus (NIDDM).

Table 1. Number of NIDDM Patient Visits

No	Year	Number of Visits
1	2020	15,017
2.	2021	19,844
3.	2022	15,512

Source: BDH General Hospital Profile 2023

Table 1 shows that during 2020-2022, the top position was held by the highest number of visits based on the top 10 outpatient diseases (RL 5) at the internal medicine clinic, with cases of NIDDM or type 2 diabetes mellitus at Bhakti Dharma Husada General Hospital in Surabaya.

Globally, the number of people with diabetes mellitus in 2021 reached approximately 537 million people aged 20-79 years, and it is estimated that by 2030, this number will reach 643 million people (IDF, 2021). Type 2 diabetes mellitus is a common type of diabetes, usually occurring in adults, but the incidence of type 2 diabetes mellitus in children and adolescents is estimated to be increasing. In type 2 diabetes mellitus, the tissue cells in the body and muscles of the patient are resistant to insulin (Kistianita et al., 2018). Risk factors for type 2 diabetes include race, ethnicity, age, gender, family history, hypertension, obesity, lifestyle, an unbalanced diet, and lack of physical activity (Indonesian Ministry of Health, 2020). Nutrition is an important factor in the development of type 2 diabetes, as obesity clearly increases a person's likelihood of developing diabetes. The need for exercise or physical activity can reduce the risk of developing type 2 diabetes mellitus. The occurrence of type 2 diabetes mellitus can be influenced by hereditary/genetic factors that cannot be changed, but environmental factors related to lifestyle, such as lack of physical activity and overeating, are factors that can be improved (Nuraini & Supriatna, 2019).

Among several factors that can cause diabetes mellitus, there are factors that influence the community to develop type 2 diabetes mellitus, which can lead to an increase in the number of patients. The factors that cause diabetes mellitus are genetic factors, obesity, age, and lifestyle, with a greater impact if we cannot control type 2 diabetes mellitus.

METHOD

The type of research used was an analytical survey with a cross-sectional approach, in which the cause-and-effect variables or cases occurring in the research objects were measured and collected simultaneously (at the same time). The location of this research was at the Bhakti Dharma Husada Regional General Hospital in Surabaya. In this study, the population used was 7,805 patients from the internal medicine outpatient clinic at Bhakti Dharma Husada Regional General Hospital in Surabaya in March 2023, with a sample of 100 respondents determined using the Slovin formula. The technique used in sampling was accidental sampling, where the activity was carried out by collecting data on patients who happened to be present or available in a place in accordance with the research context. The research instrument used a questionnaire that had undergone validation in Fatimah's (2016) research. The chi-square test was used with the help of the SPSS application with a confidence value of 95%, namely $\alpha = 0.05$. If the p-value is <0.05, then Ho is rejected and Ha is accepted, which means that there is a relationship between the independent

variable and the dependent variable. Conversely, if the p-value is >0.05, then Ho is accepted and Ha is rejected, which means that there is no relationship between the independent variable and the dependent variable.

RESULTS AND DISCUSSION

The following are the results of research conducted from April to July 2023 at the internal medicine clinic of Bhakti Dharma Husada Hospital in Surabaya. Of the 100 research respondents, 70 were diagnosed with diabetes mellitus, yielding the following results:

1. Results of the Analysis of the Relationship between Genetic Factors and the Incidence of Diabetes Mellitus at Bhakti Dharma Husada General Hospital in Surabaya.

Table 2. Relationship Between Genetic Factors and the Incidence of *Diabetes Mellitus*

Genetic Factors	Incidence of *Diabetes Mellitus*				Total		p-value
	DM		No DM				
	N	%	N	%	N	%	
Yes	31	31.0	14	14.0	45	45.0	
No	39	39.0	16	16.0	55	55.0	0.826
Total	70	70.0	30	30.0	100	100	

Based on Table 2, it is known that respondents suffering from diabetes mellitus are more likely to have no genetic/hereditary factors, namely 39 respondents (39%), compared to those with diabetes mellitus who have a genetic/hereditary history, namely 31 respondents (39%). Based on the statistical results using the chi-square test, the p-value = 0.826 > α = 0.05, so H0 is accepted and Ha is rejected, which means that there is no relationship between genetics/heredity and the incidence of diabetes mellitus at the internal medicine clinic of Bhakti Dharma Husada Hospital in Surabaya.

2. Results of the Analysis of the Relationship between Obesity Factors and the Incidence of Diabetes mellitus at Bhakti Dharma Husada General Hospital in Surabaya.

Table 3. Relationship Between Obesity Factors and the Incidence of *Diabetes Mellitus*

Factor Obesity	*Diabetes Mellitus* Incidence				Total		p-value
	DM		No DM				
	N	%	N	%	N	%	
Pre-obesity	22	22.0	13	13.0	35	35.0	
Class I Obesity	45	45	15	15	60	60.0	
Class II Obesity	3	3	2	3.0	5	5.0	0.406
Total	70	70.0	30	30.0	87	10	

Based on statistical results using the chi-square test, the p-value = 0.406 > α = 0.05, so H0 is rejected and Ha is accepted, which means that there is no relationship between obesity and the incidence of diabetes mellitus at the internal medicine clinic of Bhakti Dharma Husada Hospital in Surabaya.

3. Results of the Analysis of the Relationship Between Age and the Incidence of Diabetes Mellitus at Bhakti Dharma Husada General Hospital in Surabaya.

Table 4. Relationship between Age Factor and *Diabetes Mellitus* Incidence

Age Factor	*Diabetes Mellitus* Incidence				Total		p-value
	DM		No DM				
	n	%	N	%	N	%	
≥ 45 years	69	69.0	24	24.0	93	93.0	
< 45 years	1	1.0	6	6.0	7	7.0	0.001
Total	70	70.0	30	30.0	100	100	

Based on Table 4, it is known that respondents suffering from diabetes mellitus were more numerous in the ≥ 45 age group, with 69 respondents (69%), compared to the < 45 age group, with only 1 respondent (1%). Based on the statistical results using the chi-square test, the p-value = 0.001 < α = 0.05, so H0 is rejected and Ha is accepted, which means that there is a relationship between age and the incidence of diabetes mellitus at the internal medicine clinic of Bhakti Dharma Husada Hospital in Surabaya.

4. Results of the Analysis of the Relationship between Lifestyle Factors and the Incidence of Diabetes Mellitus at the Hospital

Table 5. Relationship between Lifestyle Factors and the Incidence of Diabetes Mellitus

Healthy Lifestyle Factors		Incidence of DM				Total		p-value
		DM		No DM				
		N	%	N	%	N	%	
Physical Activity	Good	26	26.0	12	12.0	38	38.0	
	Less	44	44.0	18	18.0	62	62.0	0.787
	Total	70	70.0	30	30.0	100	100	
Smoking	Frequently	7	7.0	4	4.0	11	11.0	
	Rare	2	2.0	4	4.0	6	6.0	0.104
	Non-smoker	61	61.0	22	22.0	83	83.0	
	Total	70	70.0	30	30.0	100	100	
Drinks Hard	Frequently	0	0	0	0	0	0	
	Rare	3	3.0	1	1.0	4	4.0	0.824
	No drinking	67	67	29	29.0	96	96.0	
	Total	70	70.0	30	30.0	100	100	
Pattern Eating	Good	67	67.0	28	28.0	95	95.0	
	Less	3	3.0	2	2.0	5	5.0	0.617
	Total	70	70.0	30	30.0	100	100	

Based on statistical results using the chi-square test, the p-value for all components was found to be 0.787; 0.104; 0.824; 0.617 > α = 0.05, H0 is accepted and Ha is rejected, which means that there is no relationship between physical activity, smoking, alcohol consumption, and healthy eating patterns with the incidence of diabetes mellitus at the internal medicine clinic of Bhakti Dharma Husada Hospital in Surabaya.

DISCUSSION
1. Genetic Factors

This study aligns with the findings of Nuraini and Surpiatna (2019) on the relationship between dietary patterns, Physical Activity, and Family History of Disease on Type 2 Diabetes Mellitus, which found a p-value of 0.102 with 34

respondents who did not have a family history of diabetes, 23 (92%) of whom stated that there was no relationship between hereditary/genetic factors and the incidence of type 2 diabetes mellitus. This is not in line with the research by Maimunah, Arsinawaty, and Rahman (2020), which obtained a p-value of 0.000 with 60 respondents found to have a hereditary history of 44 respondents (64.7%) who stated that there was a relationship between hereditary/genetic factors and the incidence of type 2 diabetes mellitus.

Hereditary factors are factors that cannot be changed because they influence the occurrence of diabetes mellitus, but environmental factors related to lifestyle, such as lack of physical activity, excessive nutritional intake, and obesity, are factors that can be improved. A person whose parents have diabetes mellitus is more likely to develop diabetes than a person whose parents do not have diabetes. Similarly, if one of the parents has diabetes, it is possible that one of their children will also have diabetes. However, this does not mean that if both parents do not have diabetes, their children will not develop diabetes.

Environmental factors greatly influence the occurrence of diabetes mellitus. A sedentary lifestyle, lack of physical activity, obesity, and overeating can all accelerate the onset of diabetes mellitus (Nuraini & Supriatna, 2019). A family history of disease is unconsciously ingrained in a person if one of their family members has diabetes mellitus. However, diabetes will not develop if the person with the predisposition to the disease can maintain a healthy lifestyle. It is necessary to maintain a healthy lifestyle, including a healthy diet and physical activity, in order to keep the body in good condition.

2. Obesity Factor

In this study, 45 respondents were classified as having obesity level I with a BMI calculation of 25.0–29.9, with an average weight of 64 kg and an average height of 154 cm. People who are obese and suffer from type 2 diabetes mellitus are caused by a lack of awareness of their health condition, lack of activity, not regularly checking their health, and most respondents always feel that they are healthy and do not feel that they are obese. Unhealthy eating patterns, such as the habit of eating late at night, especially foods high in carbohydrates, are one of the factors causing respondents to develop diabetes. This is supported by research stating that obese individuals are 5.4 times more likely to develop type 2 diabetes mellitus; the higher the BMI, the higher the risk of developing type 2 diabetes mellitus (Prasetyani & Sodikin, 2017).

In a previous study, Suwinawati (2020) on the Relationship between Obesity and Diabetes mellitus at the Kendal Community Health Center in Ngawi Regency showed that the p-value = 0.016 with 37 respondents suffering from obesity with BMI calculations indicating that there is a relationship between obesity and diabetes. Nearly 80% of people with type 2 diabetes mellitus are over 40 years old and are usually overweight. Being overweight increases the body's need for insulin. Overweight adults have larger fat cells in their bodies, and larger fat cells do not respond well to insulin. In Lase's (2022) study on the Relationship Between Obesity and the Incidence of Type 2 Diabetes Mellitus at the Gunungsitoli District Health Center, the p-value was 0.004 with 40 respondents suffering from diabetes. Obesity is strongly associated with diabetes, particularly Type 2 Diabetes Mellitus, and is an independent risk factor for dyslipidemia, hypertension, and cardiovascular disease, which are further complications and the main causes of death for

individuals with Type 2 Diabetes Mellitus. The risk of Type 2 Diabetes Mellitus is higher, and the prevalence of Type 2 Diabetes Mellitus increases in line with the rise in obesity prevalence; approximately 80% of individuals with Type 2 Diabetes Mellitus are obese.

3. Age Factor

This is because aging causes changes in carbohydrate metabolism and insulin release due to glucose in the blood and the inhibition of glucose release into cells. The results of this study are in line with the study conducted by Arania (2021), which showed a p-value of 0.016 with 93 respondents suffering from diabetes mellitus (73.8%). The symptoms and signs of aging that occur during the transition stage become more apparent. This stage is called the clinical stage, which occurs at the age of 45 and above and includes a decline in all bodily systems, including the immune, metabolic, endocrine, sexual and reproductive, cardiovascular, gastrointestinal, muscular, and nervous systems. Degenerative diseases begin to be diagnosed, and activity and quality of life decrease due to severe physical and psychological impairment.

In line with Masruroh's (2018) research, statistical testing using the chi-square test yielded a p-value of 0.000 with 30 respondents suffering from diabetes mellitus. Age can increase the incidence of type 2 diabetes mellitus because aging can decrease insulin sensitivity, which can affect blood glucose levels. Individuals will experience progressive pancreatic β-cell depletion. Generally, humans experience a dramatic physiological decline after the age of 40, one of which affects the pancreas itself.

4. Healthy Lifestyle Factors

This study is in line with research conducted by Ramadhan (2020), which states that there is no relationship between physical activity and the incidence of diabetes mellitus, resulting in a p-value of 0.966. Physical activity in the form of regular exercise is indeed good for controlling blood sugar levels. In this case, physical activity is not the only factor that can influence a person's susceptibility to diabetes; there are other related triggering factors, namely diet. An imbalance between physical activity and diet can cause a person to develop diabetes mellitus. Most sufferers only engage in light physical activity such as walking around the house, so the number of calories burned is low and the amount of sugar absorbed by the body is also low compared to the energy intake.

The absence of a relationship between smoking and alcohol consumption and type 2 diabetes mellitus may be due to the fact that most of the respondents in this study were female (62 respondents) compared to male respondents (25 respondents). Furthermore, the results of the study on the smoking factor component showed no relationship with the incidence of diabetes, in line with the results of a study by Irnayanti (2021), which stated that there was no relationship between smoking and type 2 diabetes mellitus, with a p-value of 0.208. Active smokers tend to be thinner than non-smokers, but smokers tend to gain weight when they quit smoking, and former heavy and moderate smokers will be fatter than former light smokers. Therefore, it is necessary to start reducing daily cigarette consumption until the stage of quitting smoking through education provided by health agencies to avoid the risk of type 2 diabetes mellitus.

The results of the study on dietary patterns, with a p-value of 0.778, indicate that there is no relationship between dietary patterns and the incidence of type 2 diabetes mellitus. These research results are in line with previous research, according to Yosmar (2018), with a p-value of 0.779, stating that there is no relationship between dietary patterns, such as consuming fruits or

vegetables, and diabetes. However, it is known that consuming fiber-rich foods such as fruits and vegetables every day can reduce body fat, thereby preventing obesity, which can increase the risk of diabetes. Increased fiber intake has been seen as a common reason for increased consumption of fruits and vegetables. Increased fiber intake can improve glycemic control in diabetes mellitus. This may be because although most respondents consume fruits or vegetables every day, they also consume a lot of foods rich in carbohydrates and fats, which can trigger diabetes mellitus.

In a study by Dafriani (2017), it was stated that the results of the study showed a relationship between diet and the incidence of type 2 diabetes mellitus with a significant value of 0.047. Diet planning is a major component in the successful management of diabetes mellitus. Meal planning aims to help people with diabetes improve their eating habits so they can control their glucose, fat, and blood pressure levels. Meal planning for patients with diabetes mellitus is very necessary. This is intended to regulate the amount of calories and carbohydrates consumed each day.

CONCLUSIONS AND SUGGESTIONS

The conclusion of this study is that there is no relationship between genetic factors and the incidence of diabetes mellitus at Bhakti Dharma Husada Hospital in Surabaya (p-value = 0.826). There is no relationship between obesity and the incidence of diabetes mellitus at Bhakti Dharma Husada Hospital in Surabaya (p-value = 0.406). There is a relationship between age and the incidence of diabetes mellitus at Bhakti Dharma Husada Regional General Hospital in Surabaya (p-value = 0.001). There is no correlation between healthy lifestyle factors and the incidence of type 2 diabetes mellitus at Bhakti Dharma Husada General Hospital in Surabaya for the physical activity factor (p-value = 0.787), the smoking factor (p-value = 0.104), the alcohol consumption factor (p-value = 0.824), and the diet factor (p-value = 0.617). Among the factors of genetics, obesity, age, and lifestyle in diabetes cases, only age was significantly associated with the occurrence of type 2 diabetes mellitus at Bhakti Dharma Husada General Hospital in Surabaya.

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