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RELATIONSHIP BLOOD GLUCOSE LEVELS WITH HIGH DENSITY LIPOPROTEIN COLESTEROL LEVELS IN OBESITY DIABETES MELLITUS PATIENTS

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ABSTRACT

Diabetes mellitus is a disease caused by metabolic disorders in the body. The increase in diabetes mellitus sufferers shows that there are many complications associated with diabetes mellitus such as obesity and endhotel dysfunction. Insulin resistance causes an increase in blood glucose and abnormal fat function as indicated by a decrease in High Density Lipoprotein (HDL) levels. This study aims to determine the relationship between blood glucose levels and HDL cholesterol levels in patients with diabetes mellitus and obesity at Daha Husada General Hospital, Kediri. This research uses cross sectional with purposive sampling technique. The average high blood glucose level in patients with diabetes mellitus is 181.8 mg/dl and the average low HDL level in patients with diabetes mellitus is 35.9 mg/dl. Conclusion: Blood glucose levels and HDL levels obtained a sig value of 0.660 > 0.05, there was no relationship between blood glucose levels and HDL cholesterol levels.

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Keywords: Blood Glucose, Diabetes mellitus, HDL.

INTRODUCTION

Diabetes mellitus is a chronic disease caused by a lack of insulin secreted by the pancreas or the body's ineffectiveness in using the insulin hormone. Diabetes mellitus is fast becoming one of the most common non-communicable diseases globally (Bhatti et al., 2022). Based on Basic Health Research (Riskesdas) in 2016, the prevalence of DM in East Java province in 2016 was 6.9%, namely 17,250 million people, this number has increased compared to the prevalence in 2007 of 5.7%, namely 14,250 million people (Andansari et al., 2023; Kementerian Kesehatan Republik Indonesia, 2014). Based on the report from the Central Bureau of Statistics for the City of Kediri, the prevalence of diabetes mellitus in 2017 was 6464, in 2018 there were 7652 and there was a very large increase in 2019 as many as 9623 cases, one of which was at Daha Husada Hospital Kediri from August to October 2021 there were 985 DM sufferers (Widyowati et al., 2022). Obesity is defined as a condition with abnormal or excessive accumulation of fat in adipose tissue (Farias et al., 2019). The diagnosis of obesity is established by measuring the body mass index (BMI), which is obtained by dividing the body weight in kilograms by the height in meters squared (Das et al., 2020; Oliveira et al., 2023). Someone is diagnosed with obesity if they have a BMI of more than or equal to 30 kg/m^2 (Ding et al., 2016). In people with diabetes mellitus, there is insulin resistance which also causes an increase in blood glucose levels, blood pressure, hyperinsulinemia and abnormal fat function which is characterized by a decrease in High Density Lipoprotein (HDL) cholesterol (Wong et al., 2021).

Previous research by Kim et al., (2019) aimed to evaluate the relationship between

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controlling blood glucose levels and HDL cholesterol levels in type 2 diabetes patients. The study was conducted using a cross-sectional study design and involved 200 type 2 diabetes patients treated at a tertiary care center. The results of this study indicate a significant positive correlation between well-controlled blood glucose levels and high HDL cholesterol levels. This study provides important insights into the importance of optimal blood glucose management in increasing HDL cholesterol levels in type 2 diabetes patients.

A longitudinal study by Lu et al., (2020) was conducted to investigate the relationship between obesity and HDL cholesterol levels in the general population. This study involved 1,000 participants who were followed over a period of 5 years. The results of this study indicate that the presence of early obesity is significantly associated with a decrease in HDL cholesterol levels during the observation period. More importantly, this study provides strong evidence of the importance of obesity prevention and management for maintaining cardiovascular health and optimal HDL cholesterol levels.

Research by Ma et al., (2020) was conducted to evaluate the effects of lifestyle interventions, such as dietary changes and increased physical activity, on blood glucose levels and HDL cholesterol levels in obese patients with type 2 diabetes. This study combines data from 15 randomized controlled clinical trials involving more than 2,000 patients. The results of the meta-analysis showed that a comprehensive lifestyle intervention significantly improved blood glucose control and increased HDL cholesterol levels in the patient population studied. This study provides strong evidence of the positive benefits of lifestyle changes in managing diabetes and improving patients' lipid profiles.

Based on the description above, this study aims to determine the relationship between blood glucose levels and HDL cholesterol levels in patients with diabetes mellitus and obesity at Daha Husada General Hospital, Kediri.

MATERIALS AND METHODS

This study used the research design method of Correlation Study and used a Non-Random Sampling technique in the form of Purposive Sampling and the number of samples obtained during the study were 27 patients.

RESULT AND DISCUSSION

Based on the results of the research that has been done, it was found that 27 patients who were willing and in accordance with the criteria that the researchers applied obtained:

Table 1 Characteristics by Gender

Gender	Respondents	(%)
Male	18	67
Female	9	33
Total	27	100

In **Table 1** it is known that of the 27 respondents 67% were female and the remaining 33% were male. Female sex is more at risk of developing diabetes because physically women have a greater opportunity to increase body mass index and have differences with men in carrying out daily activities. This is in accordance with research by Oliviera et al. (2022) that women have the opportunity to increase their body mass index. One of the differences in hormones in men and women is the monthly cycle and postmenopausal hormones which can make it easy for the distribution of body fat to accumulate due to hormonal processes (Babic et al., 2019, p. 2; X. Ma et al., 2020).

Table 2 Characteristics by Age

Age (Years)	Respondents	(%)
45 - 54	6	22
55 – 64	11	41
65 - 74	10	37
Total	27	100

Based on **Table 2**, it can be seen that of the 27 respondents there are 45-54 years old as many as 6 people (22%), 55-64 years as many as 11 people (41%) and 65-74 years as many as 10 people (37%). Diabetes mellitus disease will increase with age, in older individuals, there is a 35% decrease in mitochondrial activity in muscle cells.

Table 3 Hypothesis Testing of the Relationship of Glucose and HDL in DM Patients with Obesity

Inspection (mg/dl)	Sig. (2-tailed)	Correlation Coefficient
Blood Glucose	0.660	-0.89
HDL	0.660	-0.89

Based on the average high blood glucose (**Tabel 3**) level in patients with diabetes mellitus, namely 181.8 mg/dl. The occurrence of high blood glucose levels will stimulate pancreatic beta cells to secrete insulin. Pancreatic beta cells

that are not functioning result in a lack of insulin secretion which is the cause of high blood glucose levels (Son, 2019). High blood glucose levels then result in a filtration process that exceeds the maximum transport. This situation causes glucose in the blood to enter the urine (glucosuria) resulting in osmotic diuresis characterized by excessive urine output (polyuria). The amount of fluid that comes out causes a sensation of thirst (polydipsia) (M. Ma et al., 2020). While the average low HDL level in patients with diabetes mellitus is 35.9 mg/dl. Theoretically, in patients with diabetes mellitus, abnormalities in lipid metabolism can be found in the form of dyslipidemia, which is an abnormality in lipid metabolism characterized by an increase or decrease in the lipid fraction in plasma. The main lipid fraction abnormalities include increased total cholesterol, triglycerides, LDL, and decreased HDL. HDL also has antioxidant properties so that it can prevent LDL oxidation (Yuan et al., 2021).

The results of this study have similarities with the findings of Aprina (2013) who concluded in his study there was no relationship between glucose levels fasting blood with HDL-cholesterol in type II diabetes mellitus outpatients at Ratu Zalecha Martapura Hospital. In accordance with the theory that the role of blood glucose levels in influencing HDL levels in patients with diabetes mellitus results in changes in fat metabolism due to decreased insulin function. which can cause hormone sensitive lipase in adipose tissue to become active so that triglyceride lipolysis in adipose tissue increases and produces excess free fatty acids. In the liver, free fatty acids will become triglycerides again and become part of VLDL so that triglyceride-rich VLDL is produced (Zhang et al., 2020). VLDL which is rich in triglycerides is exchanged with ester cholesterol from HDL and produces HDL which is rich in triglycerides but poor in ester cholesterol. This form of HDL cholesterol is more easily catabolized by the kidneys so that the amount of serum HDL decreases (Che et al., 2021; Jafarnejad et al., 2019).

CONCLUSION

Based on the results of the study of the relationship between blood glucose levels and HDL cholesterol levels in patients with diabetes mellitus and obesity at Daha Husada Kediri General Hospital, using the Spearman rank test it can be concluded that the average result of examining blood glucose levels is 181.8 mg/Dl, the average result of examining HDL levels was 35.9 mg/dL and the results of the Spearman Rank statistical test showed a sig value indicating no significant relationship between blood glucose levels and HDL levels in patients with diabetes mellitus and obesity at Daha Husada General Hospital, Kediri and the correlation coefficient value of 0.089 (negative) means that the two variables have opposite directions.

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