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Abdominal Circumference, Body Mass Indeks, and Cholesterol Levels in Patients with Diabetes Mellitus

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ABSTRACT

Background: Obesity is defined as an abnormal increase in body fat. Obesity is a risk factor for diabetes mellitus. Obesity can be detected using Body Mass Index (BMI) and waist circumference. **Object:** The purpose of this study was to determine waist circumference, BMI, blood cholesterol levels, and blood sugar levels in DM patients. **Method:** This descriptive study involved 70 adult patients with DM selected using a purposive sampling technique. Data were analyzed using descriptive analysis. **Results:** The results showed that the respondents' average age was 60 years. The majority of DM patients in this study were female and had no family history of diabetes. The average duration of DM was 5.63 years. The average BMI, LP, blood glucose levels, and cholesterol levels were 26.24, 92.29, 219.57, and 204.90, respectively. DM patients had an average nutritional status, as indicated by a BMI in the overweight range, a waist circumference above normal, blood glucose levels above normal, and cholesterol levels also above normal. **Conclusion:** Based on this data, DM patients are at risk of complications, so they must remain vigilant and follow proper, regular disease management.

Keywords: Body Mass indeks, Waist Circumference, Obesity, Diabetes Mellitus

BACKGROUND

Diabetes mellitus, or simply diabetes, is a chronic condition that occurs when glucose levels in the blood increase because the body is unable to produce or use insulin effectively. Type 2 diabetes is the most common type of diabetes, accounting for about 90% of all diabetes cases (Federation Internasional Diabetes, 2019; Kshanti et al., 2019).

Obesity is understood as an abnormal increase in body fat. The prevalence of obesity continues to increase significantly worldwide. Obesity is strongly linked to risk factors for atherosclerosis, such as hypertension, diabetes mellitus (DM), dyslipidemia, and can lead to atherosclerosis itself by increasing oxidative stress, inflammation,

and endothelial dysfunction (Feller et al., 2010; Song et al., 2021).

Type 2 diabetes is most commonly found in older adults. Still, it is increasingly found in children, adolescents, and young adults due to increased rates of obesity, lack of physical activity, and poor diet (Internatioanl Diabetes Federation, 2017; González-Lleó et al., 2017). As two major public health events of the 21st century, obesity and type 2 diabetes (type 2 diabetes) are closely intertwined (Li et al., 2020). In general, it can be said that overweight and obesity play an essential role in the development of type 2 diabetes mellitus intertwined (Li et al., 2020). Adults with obesity can increase the risk of high blood

pressure and high cholesterol, which are risk factors for heart disease and diabetes mellitus.

Obesity is associated with insulin resistance, changes in lipid metabolism, and metabolic syndrome, particularly when excess adipose tissue is located intra-abdominally or in the upper chest (Han et al., 2022). In diabetic patients, regardless of lipid-lowering drug use, an increase in total cholesterol levels from before to after diagnosis was associated with a higher risk of cardiovascular disease, whereas a decrease was associated with a lower risk. Management of TC levels in diabetic patients may be an important clinical goal for preventing cardiovascular disease (Khill et al., 2023).

General obesity is detected through the BMI indicator of 30.0-34.9, while the waist-to-hip circumference ratio (WLRR) detects central/abdominal obesity. The World Health Organization (WHO) has set the healthy limits for waist-to-hip circumference ratios for Asian countries at 90 cm for men and 80 cm for women (Darsini et al., 2020). Although BMI measures the rate of overweight and obesity, it ignores the distribution of body fat (Li et al., 2022; Han et al., 2022, Lei et al., 2022). Measuring waist circumference is a simple way to assess visceral fat levels. Increased waist circumference is also closely associated with an increased risk of diabetes. (Felle ret al., 2010; Schulze et al., 2006).

The purpose of this study is to determine abdominal circumference, BMI, blood cholesterol levels, and blood sugar levels in DM patients. The data can be used to increase the vigilance of DM patients to prevent the development of complications.

RESEARCH METHODS

Design

This study used an observational descriptive design with a cross-sectional approach. The study described abdominal circumference, BMI, cholesterol levels,

and blood glucose levels in patients with DM.

Samples and sampling techniques

The largest group in this study comprised 70 adult patients with DM, recruited from the Mojo and Menur Health Centers in Surabaya using purposive sampling. The inclusion criteria set for selecting the sample were patients aged > 30 years, with DM of more than 1 year, without mental disorders, and without aphasia.

Data collection

All patients who met the inclusion criteria were recruited as study respondents in June – August 2025. Patients who voluntarily wish to become respondents are asked to fill out a form. If, during the study period, the patient wishes to resign for any reason, the researcher welcomes them.

Instruments

Data collection was conducted using a questionnaire on the characteristics of patients with DM and an observation form on BMI (underweight: below 18.5; healthy weight: 18.5 to 24.9; overweight: 25 to 29.9; obese: 30 or above), abdominal circumference (male: more than 90 cm is an increased risk; female: more than 80 cm is an increased risk), glucose levels, and total cholesterol levels. Characteristic data consisted of age, sex, history, duration, and blood glucose levels.

Data analysis

Data analysis uses descriptive statistics to present frequency distributions and means.

Ethical Approval

The Health Research Ethics Commission has approved this study, No/2288/KEPK-Poltekkes_Sby/V/2024. The respondents were informed of the data collection procedure and obtained written consent.

RESULTS AND DISCUSSION

The study included 70 adult patients with DM. The average age of respondents was

60. The majority of DM patients in this study were women with no history of hereditary DM. The average DM duration is 5.63 years. The average BMI, LP, blood

glucose levels, and cholesterol levels were 26.24, 92.29, 219.57, and 204.90, respectively (Table 1).

Table 1.
Characteristics of DM Patients

Characteristics	Mean (\pm SD)	Frecuency	Percentage (%)
Gender			
Female		50	71.43
Male		20	28.57
Heridetary Hystory			
Yes		26	37.14
No		44	62.86
Age (years)	59,97 (\pm 5.28)		
Duration of DM (years)	5.63 (\pm 5.72)		
BMI	26.24 (\pm 5.28)		
WC	92.29 (\pm 11.37)		
Blood Sugar Level	219.57 (\pm 83.89)		
Cholesterol Level	204.90 (\pm 46.43)		

Tabel 1 showed pain scale results in post-appendectomy patients in the intervention group at RSUD Cilegon City, with 14 respondents out of a total of 28 respondents.

Discussion

Interpretation of Results

The data from the study showed that the average nutritional status of patients, based on BMI, was overweight. Abdominal circumference, blood glucose levels, and cholesterol levels were all more than usual. Based on this data, DM patients are at risk of developing complications. Obesity is generally defined as being overweight due to a chronic calorie imbalance, where more calories are consumed than are expended each day.

Body mass index, or BMI, is a measure used to classify children as overweight or obese (Pulgaron et al., 2015).

Overweight and obesity are strongly correlated with type 2 diabetes. Obesity is the leading cause of insulin resistance, which appears in the early stages of the disease, and is mainly compensated for by hyperinsulinemia (Chobot et al., 2018). Diabetes can cause a variety of serious complications, including cardiovascular disease (CVD), nephropathy, retinopathy, and microangiopathy that lead to limb amputation. Complications such as CVD, apnea, and sleep disorders appear to be strongly related to obesity and diabetes. Weight gain in type 2 diabetes increases the risk of cardiometabolic complications,

which are the leading cause of morbidity in type 2 diabetes (Chobot et al., 2018; Wilding, 2014).

The abdominal circumference indicates the presence of visceral fat. When the abdominal circumference is above standard limits, this is identical to the incidence of obesity experienced and increases the risk of diabetes mellitus by 2.26 times more than in people who are not obese (Darisni et al., 2020). Visceral fat around the organs in the abdomen tends to increase and alter plasma levels of TNF α (necrotic tumor factor-alpha). This, in turn, produces inflammatory cytokines and stimulates marker cells via receptor interactions, leading to insulin resistance. (Darsini et al., 2020; Ravensbergen et al., 2018).

Since the leading risk factor for type 2 diabetes is obesity, the most essential thing in preventing this disease is to avoid excessive weight gain. This prevention should begin even before birth. Knowledge of a balanced diet, physical activity, and lifestyle is essential, and it is evident in research that obese adolescents who meet these guidelines have lower insulin resistance, better glycemic control, and higher rates of prevention of type 2 diabetes (Chobot et al., 2018).

Research Implications

This study examines data on patients with DM to raise awareness among patients, families, and health workers about their condition. Families and health workers are expected to provide ongoing motivation and support to patients so that they continue to manage their diseases appropriately and regularly. In addition, the results of this research can serve as initial data for further studies.

Research limitations:

There are several limitations to this study, primarily due to the descriptive research design, which means it cannot be generalized to the population. Second, the sample size is small, so it is less

representative. Third, abdominal circumference and BMI are measured only once. It is necessary to conduct further research with an analytical design with a large sample.

CONCLUSION

Patients with DM have an average nutritional status based on BMI; they are overweight, with an abdominal circumference that is more than usual, blood glucose levels that are more than normal, and cholesterol levels that are also more than usual. Based on this data, DM patients are at risk of complications, so they must remain vigilant and follow proper, regular disease management.

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