

The Relationship between Body Weight and Fasting Blood Glucose Levels in Students of the Faculty of Medicine, Tadulako University, Class of 2022

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ABSTRACT

Introduction: Obesity and excess body weight are predisposing factors to insulin resistance which can cause an increase in blood sugar levels resulting in type 2 diabetes mellitus.

Objective: To determine the relationship between body weight and fasting blood glucose levels in students of the Faculty of Medicine Untad Batch 2022

Methods: This type of research is analytic observational using a cross sectional research design. Total population of 159 people. The sampling technique used total sampling and obtained a total sample of 139 which met the inclusion and exclusion criteria. Data were obtained by measuring body mass index and taking peripheral blood using a glucometer. Then the data obtained were analyzed using the Spearman test.

Results: The results of the analysis showed that there was no significant relationship between body weight and fasting blood glucose levels in Tadulako University Medical Faculty students class of 2022 with a p value of 0.39. The results of the analysis on the relationship between BMI and fasting blood glucose levels in 2022 Faculty of Medicine students showed no significant relationship with a p value of 0.24.

Conclusion: It can be concluded from the study that there is no significant relationship between body weight and fasting blood glucose levels in Tadulako University Medical Faculty students class of 2022. This is because the majority of the sample has normal weight.

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1. INTRODUCTION

Lifestyle changes have a fairly broad impact, including for the world of health, especially the incidence of diseases that occur, from several risk factors that arise, obesity factors are found quite a lot, not even among adults but among toddlers can also be found (1).

Obesity and overweight are not only increasing in developed countries but also in developing countries. Nearly 35 million overweight children are in developing countries and 8 million are in developed countries. In the world's population, 25% of the population is obese, while the national prevalence of over nutrition in Indonesia among people aged ≥ 15 years is 10.3% (2).

Human civilization continues to develop along with the changing times, this of course will have a direct impact on the pattern or style of human life. The lifestyle adopted by many modern humans in consuming food they choose to consume ready-to-eat food or drinks obtained through fast food restaurants, as well as

through instant food. Fast food types have undergone the cooking process beforehand, so that a lot of important nutrients are lost, such as vitamins and minerals, nutrients that should be digested and processed in the digestive tract are no longer carried out (3). Erratic eating patterns can disrupt metabolic circadian rhythms (4).

Obesity is one of the causes of an unhealthy lifestyle, people themselves do not consider obesity as a disease but a natural thing (3). Obesity is a condition in which a person's body has too high levels of fat. Too high levels of fat in the body can cause various health problems. One of the risks faced by obese people is diabetes mellitus (DM). According to several research results, DM is closely related to obesity. In DM sufferers, the pancreas produces sufficient amounts of insulin to maintain blood glucose levels at a normal level, but this insulin cannot work optimally to help the body's cells absorb glucose because it is disturbed by the complications of obesity, one of which is high blood fat levels. Especially cholesterol and triglycerides (4).

Sampai saat ini penderita Penyakit Tidak Menular Diabetes Melitus (DM) Di Provinsi Sulawesi Tengah mencapai 16.456 kasus. Kasus-kasus tersebut terbagi menjadi kasus lama, kasus baru di 2015 dan kasus kematian, yang tersebar di 13 kabupaten dan kota. Rincian untuk kasus lama DM sebanyak 11.203 yakni Kota Palu 3.122 kasus, Kematian yang diakibatkan oleh DM mencapai 169 kasus yakni Kota Palu 42 kasus (5).

Glucose is a form of carbohydrate metabolism that functions as the main energy source controlled by insulin. Excess glucose is converted into glycogen then stored in the liver and muscles as a reserve if needed by the body. Blood glucose levels are influenced by endogenous and exogenous factors. Endogenous factors are humoral factors such as the hormone insulin, glucagon, cortisol, receptor systems in muscles and liver cells, while exogenous factors that influence are food intake and physical activity. Low levels of glucose in the blood are called hypoglycemia and high levels of glucose in the blood are called hyperglycemia. The recommended normal blood glucose level is 120-140 ml/dL during fasting and 80-100 ml/dL during fasting. If a person's blood sugar level exceeds normal levels, he is at risk of developing diabetes mellitus (DM) (8). GLP-1R agonists are widely used in the treatment of type 2 diabetes mellitus with obesity, which can reduce body weight and control blood glucose (9). Insulin resistance is part of a series of disorders that are often referred to as the "metabolic syndrome". Some features of the metabolic syndrome include: (1) obesity, especially abdominal fat accumulation, (2) insulin resistance, (3) fasting hyperglycemia, (4) lipid abnormalities such as increased blood triglyceride levels and decreased blood high-density lipoprotein cholesterol and (5) hypertension (16).

Diabetes is a complex chronic disease and requires ongoing medical care with multi-factor risk reduction strategies beyond glycemic control (10). Patients with diabetes mellitus with uncontrolled blood sugar show an increased susceptibility to bacterial, fungal and viral infections, this is caused by an aberrant immune response as a result of hyperglycemia (12).

Type 2 Diabetes Mellitus is diabetes caused by the body's failure to utilize insulin leading to weight gain and decreased physical activity (13). Risk factors for type two diabetes mellitus include age, physical activity, body mass index (BMI), blood pressure, stress, lifestyle, family history, cholesterol, gestational diabetes, history of glucose abnormalities and other disorders (14).

Diabetes is a multifactorial and complex disease associated with other metabolic and health complications (11). Diabetes will usually appear when you are at a vulnerable age, namely ≥ 45 years who are overweight, so that the insulin in the body does not respond. Degenerative factors, namely decreased body function in someone aged ≥ 45 years can experience an increased risk of developing diabetes mellitus and glucose intolerance. In particular, the ability of β cells in glucose metabolism to produce insulin (15).

Type 2 Diabetes Mellitus (Type 2 DM) is a chronic disease characterized by blood sugar levels ≥ 126 mg/dl (19). Management of Diabetes Mellitus can be grouped into five pillars, namely education, meal planning, physical exercise, pharmacological interventions and blood sugar checks (18). Unbalanced eating habits will lead to obesity. In addition to an unbalanced diet and excess nutrition, physical activity is also a major risk factor in triggering DM (20).

This study aims to determine the relationship between body weight and fasting blood glucose levels in students of the Faculty of Medicine Untad Class of 2022.

2. METHOD

This study used the analytical observational research method with a cross sectional approach to determine the relationship between body weight and blood glucose levels. This study uses primary data. The population of this study was students of the Faculty of Medicine, Tadulako University, and Batch of 2022. The sampling technique in this study was the total sampling technique, namely the entire population that met the inclusion and exclusion criteria.

3. RESULTS

The normality test is carried out on the data that has been obtained to determine whether the data is normally distributed or not. The research data was tested using the Kolmogorov-Smirnov normality test. The

normality test results for weight and fasting blood sugar data for Untad medical faculty students class of 2022 showed that the data were not normally distributed ($p = 0.001$), so data analysis would be continued with a non-parametric test, namely the Spearman's rho test.

3.1. Body weight relationship with fasting blood glucose levels

Table 1. Results of the Spearman's rho test for body weight and GDP

| BB | GDP | | | | | | Total | P-value | r |
|--------------|--------|------|--------|------|--------|------|-------|---------|-------|
| | Rendah | | Normal | | Tinggi | | | | |
| | N | % | N | % | N | % | | | |
| ≤40 | 1 | 12,5 | 6 | 75 | 1 | 12,5 | 8 | 0,39 | 0,073 |
| 41-50 | 9 | 18,8 | 37 | 77,1 | 2 | 4,2 | 48 | | |
| 51-60 | 5 | 11,9 | 36 | 85,7 | 1 | 2,4 | 42 | | |
| 61-70 | 4 | 19 | 16 | 76,2 | 1 | 4,8 | 21 | | |
| 71-80 | 0 | 0 | 10 | 90,9 | 1 | 9,1 | 11 | | |
| >80 | 0 | 0 | 8 | 88,9 | 1 | 11,1 | 9 | | |
| Total | | | | | | | 139 | | |

(Data primer, 2022)

The data shows an insignificant relationship between the two variables which is indicated by a p value > 0.05 , so the decision on the test results is that H_0 is accepted and H_1 is rejected.

3.2. The relationship between BMI and GDP

Table 2. The relationship between BMI and GDP

| IMT | GDP | | | | | | Total | P-value | r |
|--------------|--------|------|--------|------|--------|-----|-------|---------|-------|
| | Rendah | | Normal | | Tinggi | | | | |
| | N | % | N | % | N | % | | | |
| <17,0 | 1 | 7,7 | 12 | 92,3 | 0 | 0 | 13 | 0,24 | 0,099 |
| 17,0-18,4 | 2 | 22,2 | 7 | 77,8 | 0 | 0 | 9 | | |
| 18,5-25,0 | 13 | 15,3 | 68 | 80,0 | 4 | 4,7 | 85 | | |
| 25,1-27,0 | 1 | 9,1 | 9 | 81,8 | 1 | 9,1 | 11 | | |
| >27,0 | 2 | 9,5 | 17 | 80,0 | 2 | 9,5 | 21 | | |
| Total | | | | | | | 139 | | |

(Data primer, 2022)

The data shows an insignificant relationship between the two variables which is indicated by a p value > 0.05 , so the decision on the test results is that H_0 is accepted and H_1 is rejected.

4. DISCUSSION

Results Table 1. Relationship between body weight and fasting blood glucose levels. Based on the results of data analysis using Spearman's Rho, this study found no significant relationship between body weight and fasting blood glucose levels in Tadulako University medical faculty student's class of 2022. This is because the majority of respondents have body weight 41-50 kg. Results Table 2. Relationship between BMI and GDP based on the results of an analysis using Spearman's rho in this study. There is also no significant relationship between body mass index and fasting blood glucose levels in Tadulako University medical faculty student's class of 2022. This is because the majority of respondents have normal BMI. These results are in line with research by Wahyuni et., al (2021) which showed that there was no relationship between body mass index and fasting blood sugar levels because most respondents had normal BMI so it did not affect the increase in fasting blood sugar levels. In addition, according to research by Astiti and Dwipayana (2018) it showed that there was no relationship between BMI and fasting blood sugar levels due to an increase in fasting blood sugar in this study occurring in students with normal BMI. According to Astusti (2013) what influences glucose levels is medication adherence, diet adherence, fat consumption, knowledge related to Diabetes Mellitus and positive family support. According to the study of Arif et., al (2014) the results showed that there was no significant relationship between body mass index and fasting blood sugar levels. This is probably because BMI is also influenced by the level of bone and muscle density apart from body fat levels. In addition, even though BMI shows the level of overweight and obesity, BMI does not show the distribution of body fat. For example, visceral fat is metabolically more active than non-visceral fat and secretes more hormones and cytokines, which are responsible for increasing blood sugar levels. Other factors related to fasting blood sugar levels are age, hereditary history, gender, and diet. The age factor is related to the physiology of old age where the older the age, the body's functions also decrease,

including the work of the insulin hormone so that it cannot work optimally and causes high blood sugar levels. Another risk factor is gender (Rahayu, 2020). Nutritional status affects blood glucose levels, especially over nutrition. In a state of over nutrition, there is an imbalance between energy intake and expenditure, so that excess energy is stored in the form of fat (Harsari, 2018).

The results of this study are inconsistent with the results of a study by Polii et., al (2016) that there is a weak significant relationship between fasting blood sugar levels and obesity in adolescents because the BMI results show that adolescents in group 1 are the most obese while the least are in the normal BMI group. The results of research by Masrurroh (2018) found that there was a relationship between nutritional status or BMI and blood sugar levels. In addition, according to Dewi's research (2019) there was a significant correlation between BMI and fasting blood sugar levels in visitors to the Niti Mandala Renon field in July 2018 because the respondents' average BMI of 67 subjects was 21.25 kg/m² in the overweight category.

5. CONCLUSION

This study concludes that regarding the relationship between body weight and fasting blood glucose levels in Tadulako University medical students class of 2022 it can be concluded as follows: There is no significant relationship between body weight and fasting blood glucose levels in Tadulako University Medical Faculty students class of 2022.

6. ADVICE

It is hoped that future researchers can analyze other variables besides body weight that can affect fasting blood glucose.

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