

Metabolic Syndrome Indicators in Semarang Health Polytechnic Students During the Covid-19 Pandemic Period

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Abstract:- Metabolic syndrome consists of a set of symptoms including increased waist circumference, increased blood triglyceride levels, decreased levels of high-density lipoprotein (HDL)-blood cholesterol, high blood pressure, and glucose intolerance. Risk factors for metabolic syndrome include lifestyle (diet, alcohol consumption, smoking, physical activity), socioeconomic and genetics, as well as stress. This research is to determine the determinants of the incidence of metabolic syndrome in Semarang Health Polytechnic students during the Covid19 pandemic. The independent variable is physical activity, and the dependent variable is a metabolic syndrome which includes: waist circumference, BMI, blood glucose levels and blood HDL. The research sample was 31 students. The results indicate that students of Semarang Health Polytechnic are 70.97% in light activity; 77.45% with average waist circumference; 87.10% with normal BMI, 74.19% in normal blood glucose and 35.48% with normal blood HDL during the covid19 pandemic. However, there is no relationship between physical activity carried out by Semarang Health Polytechnic students and changes in waist circumference, BMI, blood glucose and blood HDL during the covid19 pandemic.

Keywords:- Metabolic Syndrome; Covid19 Pandemic; Students; Physical Activity.

I. INTRODUCTION

Corona Virus Disease 19 (COVID-19) is a disease caused by a new coronavirus (SARS-CoV-2) since December 2019 and was declared a pandemic by the World Health Organization (WHO). The pandemic conditions limit a person's space to stay at home to prevent the spread of the virus. The COVID-19 pandemic has resulted in students doing all activities at home, such as online lectures. Feeling bored must be experienced by students because they have been sitting at home for too long. Not to mention, according to them, lecturers continuously give assignments, so indirectly, it becomes psychological pressure for the students[1].

The pandemic directly affects a person's lifestyle, including eating habits, diet, and physical activity that will affect physical and mental health. Restriction of these activities causes irregular eating patterns so that there is an increase in energy intake and the risk of obesity. Emotional outbursts such as fear and sadness related to the desire or motivation to eat can also pose a risk of obesity[2].

Obesity is an indicator of metabolic syndrome, dyslipidemia, hypertension and hyperglycemia. Epidemiological data states that 1 in 5 adults suffer from metabolic syndrome. It is estimated that 20–25% of the adult population suffers from metabolic syndrome. Data from the Indonesian Obesity Study Association shows the prevalence of the metabolic syndrome is 13.13%. This situation then develops into cardiovascular diseases such as coronary heart disease and coronary heart disease, stroke and type 2 diabetes mellitus and other diseases such as cancer[3].

Metabolic syndrome in recent years has become a global concern due to the increasing number of cases[5]. Metabolic syndrome consists of symptoms, including an increase in waist circumference, increased blood triglyceride levels, decreased levels of high-density lipoprotein (HDL), blood cholesterol, high blood pressure, and glucose intolerance[4]. The prevalence of metabolic syndrome tends to vary due to differences in the criteria set by several world institutions. The bodies include WHO, IDF (International Diabetes Federation), and NCEP-ATP III (The National Cholesterol Education Program Adult Treatment Panel III)[6].

Based on the NCEP-ATP III criteria, the diagnosis of metabolic syndrome can be made if at least three of the five criteria for metabolic syndrome. The five criteria for metabolic syndrome are central obesity, increased blood pressure, increased blood glucose, increased triglycerides and decreased HDL cholesterol (High-Density Lipoprotein)[7].

Based on the things above, researchers are interested in conducting research on indicators of metabolic syndrome in college students during the COVID19 pandemic. For policymakers, the results of this study are expected to be input

into the metabolic syndrome prevention and control program during the COVID19 pandemic.

II. MATERIALS AND METHODS

This research is a descriptive-analytic study. The research design used was cross-sectional, namely the independent variables (cause) and the dependent variable (effect) collected at the same time [8]. The independent variables are physical activity, and the dependent variable is metabolic syndrome which includes: waist circumference, BMI, blood glucose levels and blood HDL. The sample size used in this study was 31 respondents determined by calculating weight, height and Z-score using WHO Anthroplus software. Waist circumference data was obtained by measuring the sample closest to the sample. Data on blood glucose and HDL levels were obtained from capillary blood measurements by health workers at the health clinic closest to the sample house. Some were examined in the laboratory of the Health Analyst Department of Health Polytechnic of the Ministry of Health Semarang. Physical activity data were taken using the International Physical Activity Questionnaires (IPAQ) method. Participants record the activities carried out in a day for one week.

Univariate analysis was carried out to describe the characteristics of the sample, which included: gender, physical activity, waist circumference, BMI, blood glucose levels and blood HDL. Bivariate analysis was conducted to determine the relationship between the two variables. The independent variable is physical activity. The dependent variable is the metabolic syndrome which includes: waist circumference, BMI, blood glucose levels and blood HDL. In this bivariate analysis, the variables were tested using the chi-square test with $\alpha = 0.05$.

III. RESULTS AND DISCUSSION

The following section describes the result and discussion of the study.

A. Univariate Test Results

Most of the respondents in this study were female, namely 23 people (74.19%), while the remaining 8 people were male (25.81%). 22 respondents (70.79%) had relatively light daily activities. A person's light physical activity causes the energy produced from their daily food not to be released so that the energy will form fat. In contrast to those who often do strenuous activities, the heavy physical activity allows energy that enters the body to be released through physical activity so that fat is not formed in the body [9]. Lack of physical activity also increases the risk of suffering from hypertension because it increases being overweight. Inactive people also tend to have a higher heart rate, so the heart muscle has to work harder with each contraction. The more complicated and the more often the heart muscle has to pump, the greater the pressure placed on the arteries.

In relation to the incidence of waist circumference, fat accumulated is around the abdominal cavity and deposits in the body. 24 respondents (77.45%) in this study had an average waist circumference, while 7 (22.55%) were abnormal. The

presence of some people who have an abnormal waist circumference can be due to the consumption of fat that is in the composition of the daily menu. A person can also be caused by a lack of activity in their daily lives. Respondents in this study had activities classified as light, as many as 22 people (70.79%).

A person's light physical activity causes the energy produced from their daily food not to be released so that the energy will form fat. In contrast to those who often do strenuous activities, heavy physical activity it allows energy that enters the body to be released through physical activity so that fat is not formed in the body [9].

27 respondents (87.10%) in this study had a body mass index (BMI) which was classified as normal, while the other 4 people had an abnormal BMI (obesity). A person's BMI is closely related to fat tissue. To assess the degree of fat tissue, waist circumference measurements can be carried out because fat accumulation is around the pelvis and waist, indicating central obesity). Waist circumference has a high correlation with intra-abdominal fat [10]. Fat deposits in a person's body can also be caused by a lack of activity in their daily lives. Respondents in this study had activities classified as light, as many as 22 people (70.79%). A person's light physical activity causes the energy produced from their daily food not to be released so that the energy will form fat. In contrast to those who often do strenuous activities, the heavy physical activity allows energy that enters the body to be released through physical activity so that fat is not formed in the body⁹. Most of the respondents had normal fasting blood glucose levels, as many as 23 people (74.19%). According to the International Diabetes Federation, fasting blood glucose levels are a component of metabolic syndrome. Fasting blood glucose level < 100 mg/dL is categorized as normal. Some respondents' abnormal fasting blood glucose levels could be due to respondents frequently consuming high-calorie foods. The wrong diet can cause an increase in blood glucose levels which can increase the risk of insulin resistance in adolescents with central obesity.

Sufficient physical activity can increase membrane permeability to increase blood flow, thereby opening more capillary membranes so that insulin receptors become active, which will affect blood glucose levels. Calories stored in the body are the main factors causing pancreatic dysfunction [11].

Research respondents who had normal HDL levels in their blood were 11 people (35.48%), while 20 respondents had abnormal HDL levels in their blood. The increase in HDL levels in the blood is strongly influenced by the consumption of food sources of fat, especially foods with a fairly high content of unsaturated fatty acids, especially fat sources derived from vegetable ingredients. The more frequent consumption of fatty foods with unsaturated bonds, the lower the blood's HDL levels.

HDL cholesterol plays a role in transporting cholesterol in the walls of blood vessels back to the liver.

HDL can prevent the accumulation of lipids in blood vessels. HDL will suck up the cholesterol deposits in the tissue and then throw it into the bile. An increase in HDL levels is an

essential indicator of a reduced risk of CHD. HDL is protective against the occurrence of atherosclerosis [12].

In addition, physical activity can also increase high-density lipoprotein (HDL-C) cholesterol levels, so it is very beneficial in patients with hypercholesterolemia. A similar conclusion was put forward by other scholars on their research subjects aged 12-19 years. The high risk of HDL cholesterol and triglyceride levels will decrease with an increase in the number of minutes of moderate to heavy physical activity[13].

B. Bivariate Analysis Test Results

The effect of physical activity on the waist circumference of Semarang Health Polytechnic students during the Covid19 Pandemic is presented in Table 1.

TABLE 1. EFFECT OF PHYSICAL ACTIVITY ON WAIST CIRCUMFERENCE

Activity	Waist size		P-value
	Normal	Abnormal	
Light	5	16	1.000
Medium-Heavy	3	7	

Concerning the incidence of waist circumference, the fat stored is fat around the abdominal cavity. Abnormal waist circumference can be caused by fat consumption on the daily menu. Besides that, fat deposits in a person's body can also be caused by a lack of activity in daily life. A person's light physical activity causes the energy produced from their daily food not to be released so that the energy will form fat. In contrast to those who often do strenuous activities, heavy physical activity allows energy that enters the body to be released through physical activity so that fat is not formed in the body[9]. Although research shows some respondents are with abnormal waist circumferences, this is not solely due to lack of activity during the COVID-19 pandemic but because of other factors, such as genetics. From the Chi-Square test results with a 95% confidence level, we got a p-value of 1.000 (higher than 0.05) which means there is no effect/relationship between physical activity and an increase in the incidence of changes in waist circumference.

The effect of physical activity on BMI of Semarang Health Polytechnic students during the Covid-19 pandemic is presented in Table 2.

TABLE 2. EFFECT OF PHYSICAL ACTIVITY ON BMI

Activity	BMI		P-value
	Normal	Abnormal	
Light	9	12	0.658
Medium-Heavy	6	4	

A person's BMI is closely related to fat tissue. To assess the degree of fat tissue, waist circumference measurements can be carried out because fat accumulation is around the pelvis and waist, indicating central obesity. Waist circumference has a high correlation with intra-abdominal fat[10].

Fat deposits in a person's body can also be caused by a lack of activity in their daily lives. A person's light physical activity causes the energy produced from their daily food not to be released so that the energy will form fat; in contrast to those who often do strenuous activities, heavy physical activity allows energy that enters the body to be released through physical activity so that fat is not formed in the body[9]. Although research shows that there are also respondents who have abnormal waist circumferences, this is not solely due to a lack of activity during the COVID-19 pandemic but due to other factors, such as genetics and waist circumference. From the Chi-Square test results with a 95% confidence level, we got a p-value of 0.658 (higher than 0.05) which means there is no effect/relationship between physical activity and an increase in the incidence of changes in Body Mass Index (BMI).

The effect of physical activity on fasting blood sugar of Semarang Polytechnic students during the Covid19 Pandemic is presented in Table 3.

TABLE 3. EFFECT OF PHYSICAL ACTIVITY ON FASTING BLOOD SUGAR

Activity	BMI		P-value
	Normal	Abnormal	
Light	5	17	0.540
Medium-Heavy	3	6	

Sufficient physical activity can increase membrane permeability to increase blood flow, thereby opening more capillary membranes so that insulin receptors become active, which will affect blood glucose levels. Calories stored in the body are the main factors causing pancreatic dysfunction [11].

The Chi-Square test results with a 95% confidence level obtained a p-value of 0.540 which means there is no effect/relationship between physical activity and blood sugar levels. The absence of this relationship could be because many respondents who took part in the study had relatively light daily activities.

The effect of physical activity on blood HDL of Semarang Polytechnic students during the covid19 pandemic is presented in Table 4.

TABLE 4. EFFECT OF PHYSICAL ACTIVITY ON BLOOD HDL

Activity	BMI		P-value
	Normal	Abnormal	
Light	11	7	0.641
Medium-Heavy	9	4	

The results of the previous study [13] on the research subjects aged 12-19 years stated that physical activity could increase high-density lipoprotein (HDL-C) cholesterol levels so that it is very beneficial in patients with hypercholesterolemia [12]. However, the Chi-Square test results with a 95%

confidence level obtained a p-value of 0.641, which means that there is no effect/relationship between physical activity and respondents' blood HDL levels. The absence of this relationship could be because many respondents who took part in the study had relatively light daily activities.

IV. CONCLUSIONS

Semarang Health Polytechnic students who had light activities during the COVID-19 pandemic were 22 people (70.97%). Students who have average waist circumference during the covid19 pandemic are 24 people (77.45%). Further, students with an average BMI during the covid19 pandemic are 27 people (87.10%). Those who had normal blood glucose levels during the covid19 pandemic are 23 people (74.19%). Finally, among respondents, students who had normal blood HDL levels during the covid19 pandemic were 11 people (35.48%). However, there is no relationship between physical activity carried out by Semarang Health Polytechnic students with changes in waist circumference, BMI, blood glucose and blood HDL. There is a need for further research with a larger sample size by also considering genetic factors.

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