The Relationship between Students' Stress Levels, Physical Activity, Energy and Nutrient Intake with Nutritional Status During the Covid-19 Pandemic

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Abstract:- Recently, the world has been in shock with the Covid-19 pandemic. The government established physical restrictions to reduce the impact and efforts to stop the spread. The Indonesian government implemented online learning or distance learning during the Covid-19 emergency. This learning model triggers students to feel stressed, has low activity and unbalanced intake that affect nutritional status. This research determines the relationship between stress levels, macronutrient intake, and physical activity with nutritional status in class X and XI at Public High School VIII in Depok, Indonesia, during the Covid-19 pandemic. This study used an observational method with a cross-sectional design. Purposive sampling of 58 samples was employed. The data collected are identity, nutritional status, macronutrients (energy, protein, fat and carbohydrates), physical activity and stress obtained with online questionnaires. The Chi-square test tested the results of the analysis. The research indicates no significant relationship between energy intake and nutritional intake with nutritional status.

Keywords:- Nutritional Status; Food Intake; Physical Activity; Stress Level.

I. INTRODUCTION

At the end of 2019, the world was shocked by the emergence of the Covid19, where more than 114 countries have been infected with this virus [1]. WHO declares the coronavirus as PHEIC (Public Health Emergencies International Concern), an extraordinary event that poses a risk to public health transmission between countries and requires an international response [2]. On March 2, 2020, the first case of covid-19 was found in Indonesia. It was recorded that as of May 8, 2020, there were at least 12,776 cases with 930 deaths; this made the Indonesian state continue to prevent and educate the public. In Indonesia, the government has tried in various ways, including (1) Self-isolation for residents suspected of being infected (2) Physical distancing, which means keeping a distance between people [3].

Currently, Indonesia is facing a double burden of malnourished: the problem of malnutrition on one side and another nutritional problem increasing from year to year. The prevalence of thinness in adolescents aged 16-18 years has decreased in 2018 to 8.1% (1.4% very thin and 6.7% thin) but experiencing an increase from 2013 to 2018. The prevalence of obesity in several places of Indonesia show a high over nutrition and undernutrition in school-age children [4]. One of them is the province of West Java, especially in the city of Depok. Based on the West Java Provincial Report, in West Java, adolescents aged 16-18 years have fragile nutritional status as much as 2.02%, underweight nutritional status 6.61%, obese nutritional status 12.32%, and obese nutritional status 5.46%. This figure is higher than the national prevalence of undernutrition and overnutrition. A preliminary study at Public High School VIII Depok found a score of 52.2% experienced weight loss. It is suspected that 45.8% of students at Public High School VIII Depok experienced a decrease in the frequency of eating during the Covid-19 pandemic.

One of the groups vulnerable to nutritional problems is teenagers, as they require more energy and nutrients to support accelerated growth and body development [5]. Therefore, adolescents need adequate food not only in terms of quantity but also in terms of quality. The more varied or diverse the food consumed by adolescents, the fulfillment of nutritional adequacy will be guaranteed, which will have an impact on their nutritional and health status [6]. Adolescent dietary status is critical to support growth and development. The optimal nutritional status will form healthy and productive adolescents. Malnutrition can decrease academic achievement and result in reproductive system disorders that have a terrible impact later on [7].

Adolescent nutritional status is influenced by various factors (multifactorial). One that is related to nutritional status is stress. When a person is under stress, eating behavior will increase and contribute to obesity. Psychological stress is often associated with increased food consumption, especially high-fat foods. Stress can increase body weight because it increases blood cortisol levels, activates fat storage enzymes and signals hunger to the brain [8].

Another factor related to nutritional status is macronutrient intake. The intake of macronutrients, namely protein, fat and carbohydrates, will produce the energy needed by the body. Energy can be obtained from protein, fat and carbohydrates in food. Fat is the highest energy source, 9 kcal, while protein and carbohydrates provide an energy source of 4 kcal. The level of food intake per the needs will make the nutrients needed are also sufficient. However, if there is a lack or excess of nutrients, it will cause less nutritional status or more nutritional status. There is a significant relationship between energy, protein and carbohydrate intake with nutritional status. The higher the intake of energy, protein and carbohydrates, the nutritional status will increase [9].

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Based on the theoretical study and data above as well as the results of the preliminary survey at Public High School VIII Depok above, which was then a lot of research conducted on adolescents related to their nutritional status, but there is still very little research on nutritional status in adolescents during the covid-19 pandemic, the researchers are interested in researching the relationship between stress levels, physical activity, and energy and nutrient intake with nutritional status in class X and XI adolescents at public high school VIII Depok during the Covid-19 pandemic.

II. MATERIALS AND METHODS

The research design is a cross-sectional study design that aims to study the relationship between the causative factors, namely stress levels, macronutrient intake and physical activity and the consequent factors, namely the nutritional status of Class X and XI Adolescents at Public High School VIII during the Covid-19 pandemic simultaneously. The type of research used tests the relationship that aims to find out how and why a phenomenon occurs through statistical correlation analysis [11]. The sampling method was carried out using a non-probability sampling technique, namely purposive sampling. The sampling of respondents who met the inclusion and exclusion criteria continued until they met the required number of samples. The research subjects meeting the inclusion criteria were 58 people.

Data collection was carried out by distributing questionnaires, interviews, and direct observations. The data includes: 1) Student identity, including name, gender, age, 2) Anthropometric data, 3) stress level, (4) Macronutrient intake, and (5) physical activity level. Nutritional status data was measured by directly assessing nutritional status with anthropometric measurements using BMI indicators. The data obtained were tested using the Chi-Square Test.

III. RESULTS AND DISCUSSION

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

A. Univariate Test Results

From 58 respondents, most of the respondents who were taken as samples were teenagers aged 16 years (56.9%), while based on gender, most of the respondents who were taken as samples were female (74.1%). 10 respondents had abnormal nutritional status (17.2%), indicating the prevalence of respondents with abnormal nutrition at the school. 39.7% (n=23) respondents have good energy intake levels, while 60.3% (n=35) respondents are in poor energy intake levels.

Further, 51.7% (n=30) have good protein intake, and 48.3% (n=38) are with poor protein intake. 34.5% (n=20) of respondents have a good level of fat intake, and 65.5% (n=38) of respondents have a bad level of fat intake. A total of 37.9% (n=22) respondents had a good level of carbohydrate intake, and 62.1% (n=36) respondents had a bad level of carbohydrate intake. 24.1% (n=14) respondents had good activity, 75.9% (n=44) respondents had a bad activity level. 48.3% (n=28) respondents had a stress level in the non-stress category, as many as 51.7% (n=30) respondents had a stress level category..

B. Bivariate Analysis Test Results

The relationship of macronutrient adequacy level with nutritional status is presented in Table 1.

TABLE 1. EFFECT OF ENERGY ADEQUACY LEVELS WITH NUTRITIONAL STATUS

Energy Adequacy levels	Nutrition Level		P-value
	Normal	*Abnormal*	
Good	19 (40%)	4(40%)	1.000
Poor	29 (60%)	6 (60%)	
Total	48	10	

Table 1 shows that 19 respondents with normal nutrition had a good level of energy adequacy (40%). But respondents with normal nutrition having a poor energy level are 29 (60%).

The results of statistical tests obtained p-value = 1.000. Since the value = 1.000 (> 0.05), it is concluded that there is no relationship between the level of energy adequacy and the nutritional status of adolescent students in Public High School VIII Depok.

The results showed that respondents who had normal nutritional status but not good energy intake were 29 people more than those with normal nutritional status but not good energy intake, namely 19 people. Likewise, respondents who have abnormal nutritional status but have poor energy intake are more than those who have abnormal nutritional status but have good intake. It was found that respondents with abnormal nutritional status but good energy intake were 4 (40%) due to

unbalanced energy intake with good exercise or activity. Meanwhile, it was found that respondents with normal nutritional status but poor energy intake due to the current state of nutritional status reflects overall energy intake from food sources of carbohydrates, fats and proteins. This shows that respondents who are currently in a good nutritional state have a risk of experiencing a decrease in nutritional status. There is no relationship between energy intake and nutritional status because, during recall, respondents forget what they have consumed. So that the amount of intake calculated does not show conformity with the nutritional status of the respondent.

This study is not in line with previous research conducted there is a relationship between energy intake and nutritional status [9], [10].

The relationship of macronutrient adequacy level with nutritional status of students during the Covid-19 pandemic is presented in Table 2.

TABLE 2. EFFECT OF PROTEIN ADEQUACY LEVELS WITH NUTRITIONAL STATUS

Protein Adequacy Level	Nutrition Level		P-value
	Normal	*Abnormal*	1.000
Good	25(52%)	5(50%)	
Poor	23(48%)	5(50%)	
Total	48	10	

Table 2 shows that 25 respondents with normal nutrition had a good level of protein adequacy (52%). But respondents with normal nutrition have a poor protein adequacy level are fewer (48%).

The results of statistical tests obtained p-value = 1. 000. Since the value = 1.000 (> 0.05), it is concluded that there is no relationship between the level of protein adequacy and the nutritional status of adolescent students in Public High School VIII Depok.

The relationship of macronutrient adequacy level with nutritional status students during the Covid19 Pandemic is presented in Table 3.

TABLE 3. EFFECT OF FAT ADEQUACY LEVELS WITH NUTRITIONAL STATUS

Fat Adequacy Level	Nutrition Level		P-value
	Normal	*Abnormal*	1.000
Good	17(35%)	3(30%)	
Poor	31(65%)	7(70%)	
Total	48	10	

Table 3 shows that 17 respondents with normal nutrition had a good level of fat adequacy (35%). But respondents with normal nutrition in a poor fat adequacy level are more significant (65%).

The results of statistical tests obtained p-value = 1. 000. Since the value = 1.000 (> 0.05), it is concluded that there is no relationship between the level of fat adequacy and the

nutritional status of adolescent students in Public High School VIII Depok.

The relationship between carbohydrate adequacy level with nutritional status of students during the covid19 pandemic is presented in Table 4.

TABLE 4. EFFECT OF CARBOHYDRATE ADEQUACY LEVELS WITH NUTRITIONAL STATUS

Carbohydrate Adequacy levels	Nutrition Level		P-value
	Normal	*Abnormal*	0.481
Good	17 (40%)	5(50%)	
Poor	31 (60%)	5 (50%)	
Total	48	10	

Table 4 shows that 17 respondents with normal nutrition had a good level of carbohydrate adequacy (35%). But respondents with normal nutrition have a poor fat adequacy level are greater (65%).

The results of statistical tests obtained p-value = 0. 481. Since the value = 0.481 (> 0.05), it is concluded that there is no relationship between the level of carbohydrate adequacy and the nutritional status of adolescent students in Public High School VIII Depok. This study is in line with previous research conducted there is a relationship between carbohydrate adequacy and nutritional status [9], [10]. During the Covid-19 pandemic, it is necessary to fulfill food intake needs to increase body system immunity. Increasing endurance is one of the keys not to contracting the Covid-19 virus. During the Covid-19 pandemic, students must carry out online learning to limit students from doing activities outside the home. This policy resulted in student life patterns, one of which was eating patterns. Feelings of stress, boredom and anxiety while at home cause changes in student eating patterns [12].

The relationship between students' stress levels and the nutritional status of students during the covid19 pandemic is presented in Table 5.

TABLE 5. EFFECT OF STRESS LEVELS WITH NUTRITIONAL STATUS

Stress Level	Nutrition Level		P-value
	Normal	*Abnormal*	0.038
Under stress	28 (58%)	2(20%)	
No stress	20 (42%)	8 (80%)	
Total	48	10	

Table 5 shows that 28 respondents with normal nutrition are under stress (58%). But respondents with normal nutrition experiencing no stress are more minor (42%).

The results of statistical tests obtained p-value = 0. 038. Since the value = 0.038 (> 0.05), it is concluded that there is a relationship between the level of stress and the nutritional status of adolescent students in Public High School VIII Depok. This study is in line with previous research conducted there is a relationship between stress and nutritional status [12]. Further statistical tests to examine the relationship between physical activity and nutritional status of students during the

covid19 pandemic obtain p-value = 0.050 indicating the acceptance of the alternative hypothesis that physical activity significantly affects nutritional status. Physical activity, which includes all kinds of body activities, including sports, is an effort to balance the expenditure and intake of nutrients, especially as a source of energy in the body. During the COVID-19 pandemic, students are required to do school online. Some students do not do activity physically heavy at home, and only some do physical activity weight for approximately 1 hour. Activity moderate physical activity at least 1 day / week with a duration of 30 minutes. Physical activity is being done in doing housework such as washing clothes, sweeping, and mopping floors. This finding supports the previous research that there is a relationship between physical activity and obesity status [4].

IV. CONCLUSIONS

Based on the results of research on the relationship between stress levels, physical activity, and intake of energy and nutrients with nutritional status in class X and XI adolescents at Public High School VIII Depok during the Covid-19 pandemic, it can be concluded that there is no significant relationship between energy adequacy levels ($p = 1,000$), protein ($p = 1,000$), fat ($p = 1,000$), carbohydrates ($p = 0.451$). However, there is a significant relationship between the level of physical activity ($p = 0.050$) and stress levels ($p = 0.038$) to nutritional status.

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