RELATIONSHIP OF PHYSICAL ACTIVITY AND BALANCED DIET WITH NUTRITIONAL STATUS OF STUDENTS AT SMA NEGERI 3 BALIKPAPAN DURING ONLINE LEARNING

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ABSTRACT

The students experience the impact of the COVID-19 virus transmission. One of it was school from home. Online learning conditions allow adolescents to experience shifts in physical activity and diet patterns. This study analyzed the relationship between physical activity and a balanced nutritional diet with nutritional status in students at SMA Negeri 3 Balikpapan. This type of research was quantitative research with explanatory surveys and using a cross-sectional design. In this research, all active students of SMA Negeri 3 Balikpapan were involved as a population. The number of samples obtained was 92 people using purposive sampling techniques. An instrument for measuring activity level variables was the International Physical Activity Questionnaire-Short Form (IPAQ-SF). A balanced nutrition diet was assessed using Semi Quantitative-Food Frequency (SQ-FFQ) and the Balanced Nutrition Index 3 Levels (IGS3-60). Measurement of nutritional status through self-reporting based on body mass index by age z-score (BMI/Age). The statistical test used was a chi-square to test the research hypothesis. Based on the results of the chi-square statistical test, there was a relationship between physical activity and nutritional status (p=0,014), and there was no relationship between a balanced nutritious diet and the nutritional status (p=0,212). Physical activity is closely related to the nutritional status of adolescents. Therefore, to maintain optimal nutritional status, implementing a healthy lifestyle and physical activity patterns are need to be done.

Keywords: physical activity, balanced nutrition diet, nutritional status

INTRODUCTION

The SARS-Cov-2 virus pandemic has had an impact on most aspects in various worldwide from late 2019. Coronavirus Disease (COVID-19) is a disease caused by the SARS-Cov-2 virus transmission. The virus could affect the human respiratory system and is transmitted by droplets, air, and contaminated surfaces. (Kim et al., 2020; Chan et al., 2020; Huang et al., 2020). The government of the Republic of Indonesia conducted a large-scale social restriction policy (PSBB) that were stated in the Regulation of the Minister of Health of the Republic of Indonesia number 9 of 2020 to overcome and break the COVID-19 transmission chain. This regulation directly influences student learning in schools, where students are expected to transition to online learning methods from home entirely (Goldschmidt, 2020).

Nutritional problems in Indonesia, such as undernutrition and overnutrition, had a fairly high prevalence long before the COVID-19 pandemic (UNICEF, 2019). Adolescents are one age group at risk of malnutrition. According to Aflah (2010), factors that cause malnutrition in adolescents include unbalanced food intake and physical activity and lack of attention to other integrated aspects such as psychological aspects, namely body image, depression, and gender. This is in accordance with the research of Iftita & Merryana (2018) which states that there are changes in social behavior, lifestyle, and even diet in adolescence. According to Indonesian Basic Health Research (2018), the prevalence of obesity among adolescents aged ≥15 Indonesia were 21.8 %. According to the Health Research and Development Agency of the Indonesian Ministry of Health, 8.1 percent of adolescents aged 16 to 18 years in Indonesia were thin and very thin (Ministry of Health of the Republic of Indonesia, 2018).

Adolescents conditions such as psychological and consumption behaviors may change due to the COVID-19 pandemic's impact (Marwoko, 2019). Based on studies that analyzed food consumption in adolescents during the pandemic and online

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learning due to restricted access constraints, most of the respondents seldom consumed balanced, nutritious food. (Dewi et al., 2020). That can undoubtedly trigger various nutritional problems both undernutrition and overnutrition due to an unbalanced diet pattern (Almatsier, Soetardjo, & Soekatri, 2011).

It is essential to enhance healthy living behaviors such as exercise, not smoking, and consume healthy and nutritious foods throughout social limitations to prevent the transmission of COVID-19 (Atmadja, 2020). The Ministry of Health has recommended a balanced nutrition menu during the COVID-19 pandemic. In each food menu contains complete nutrients, include macronutrients such as carbohydrates, proteins, fats, and micronutrients from vitamins and minerals. (Kemenkes RI, 2020).

The demands of online learning activities have a profound impact on students' activity levels. Utami et al. (2021) stated from the results of her study, 85.1% of respondents experienced a decrease in physical activity due to the tendency of limited activity, such as sitting > 8 hours a day during online learning. Reduced levels of physical activity contribute to increased body weight, then increasing the risks of obesity. Even worse, , obesity had potential to increase the risk of complications due to SARS-Cov-2 infection. According to Rebello, Kirwan, & Greenway (2020), excess body weight was a significant risk factor for diabetes, cardiovascular disease, and lung disease that were often found as a concomitant disease in individuals infected SARS-Cov-2 virus.

SMA Negeri 3 Balikpapan is a secondary school under the Ministry of Education and Culture of East Kalimantan Province's auspices. East Kalimantan province has overnutrition problems higher than the national prevalence in 2013 (RISKESDAS, 2013). In our knowledge, the agency of SMA Negeri 3 Balikpapan has never received information related to the level of physical activity and balanced diet from local health officials. Besides SMA Negeri 3, Balikpapan applied an online learning policy to all of students during a period of social restrictions.

Based on the description above, it is known that physical activity and a balanced nutritious diet are very important to improve the nutritional status of adolescents, especially in conditions of social restrictions due to the COVID-19 pandemic. Therefore, this study was conducted to determine the relationship between physical activity and a balanced diet with the nutritional status of students during the online learning period.

METHOD

This research used a cross-sectional design and was conducted at SMA Negeri 3 Balikpapan, East Kalimantan, in June 2021. The population of this study was 1041 students at SMA Negeri 3 Balikpapan. The sampling technique used in this study was purposive sampling, with the number of the sample were 92 students. The inclusion criteria in this study were students aged <17 years and ≥ 17 years, actively studying at SMA Negeri 3 Balikpapan, and did not consume appetite-lowering supplements or laxatives during the study. Characteristics of parents measured including parental education, parental occupation, and family income. Characteristics of students include age, grade level, and gender. Exclusion criteria in this study was students who are sick and are undergoing a certain diet in order to minimize bias.

The instrument used for data collection was the International Physical Activity Questionnaire-Short Form (IPAQ-SF). Physical activity variables were divided into three categories: low activity (<600 MET/minute), medium (600-1499 MET/minute), and high (≥1500 MET/minute) (Prijo, 2013). To determine balanced nutritional intake, we used semi-quantitative food frequency (SQ-FFQ), consisting of 52 items of food items and a Balanced Nutrition Index of 3 Levels (IGS3-60). The categorization of balanced nutrition diet into three categories, namely unbalanced diet (score<32), moderate diet (score 33-41), and balanced diet (score≥41). These three categories were modifications of Rahmawati (2015), which categorized balanced nutrition diets into five categories based on *Mutu Gizi Pangan* (MGP). For the nutritional status, we measured based on Body Mass Index by age z-score, <-2 SD to <-3 SD (undernutrition), -2SD to +1SD (normal nutrition), and >+1SD (overnutrition) (Ministry of Health of the Republic of Indonesia, 2020). To collect data on the weight and height of students

in order to remain valid, students send evidence of measurements to the researcher.

The measurement data were analyzed descriptively to see the frequency distribution and analyzed statistically inferential to see the relationship between variables using the chi-square test. The significance of the chi-square test was determined if the p-value of the test was ≤ 0.05. The entire analysis process used SPSS 20 version software. The Ethics Commission of the Faculty of Dentistry, Airlangga University, Surabaya, has approved this research with reference number 317/HRECC. FODM/VI/2021 on June 21, 2021.

RESULTS AND DISCUSSION

Table 1 presented the characteristics of 92 respondents, including respondent data and family characteristics. Based on the data, the majority of respondents (75%) have normal nutritional status. The rest are respondents with undernutrion (9.8%) and respondents with overnutrition (15.2%).

Table 1. Characteristics of Families and Students

Variable	Nutritional Status							p-value
	Total	Undernutrition		Normal		Overnutrition		
	n (%)	n	(%)	n	(%)	n	(%)	
N	92 (100)	9	9.8	69	75	14	15.2	
Students Characteristic								
Gender								
Male	32 (34.8)	2	2.2	25	27.2	5	5.4	0.584
Female	60 (65.2)	7	7.6	44	47.8	9	9.8	
Age (Years)								
<17	68 (73.9)	11	12	45	48.9	12	13	0.149
≥17	24 (26.1)	7	7.6	16	17.4	1	1.1	
Grade Level								
First level	46 (50)	2	2.2	37	40.2	7	7.6	
Second level	27 (29.3)	2	2.2	19	20.7	6	6.5	0.045*
Third level	19 (20.7)	5	5.4	13	14.1	1	1.1	
Family Characteristic								
Family Income								
Low (<Minimum Wage)	60 (65.2)	6	6.5	46	50	8	8.7	0.584
High (≥Minimum Wage)	32 (34.8)	3	3.3	23	25	6	6.5	
Father's Occupation								
Employed	81 (88)	9	9.8	60	65.2	12	13	0.447
Unemployed	11 (12)	0	0	8	8.7	2	2.2	
Mother's Occupation								
Employed	24 (26.1)	2	2.2	20	21.7	2	2.2	0.538
Unemployed	68 (73.9)	7	7.6	49	53.3	12	13	
Father's Education								
Did not graduated from high school	(26 (28.3)	4	4.3	17	18.5	5	5.4	0.849
Graduated from high school	66 (71.7)	5	5.4	52	56.5	9	9.8	
Mother's Education								
Did not graduated from high school	28 (30.4)	2	2.2	23	25	3	3.3	0.814
Graduated from high school	64 (69.6)	7	7.6	46	50	11	12	

Note: UMK or *Upah Minimum Kerja* (Minimum Wage). *Significant p-value: <0.05

Among the characteristics of respondents and families in Table 1, only respondents' education showed a significant relationship with nutritional status ($p<0.05$).

Respondent Characteristics

The age of adolescents in this study was divided into two, namely those aged <17 years and >17 years. Most of the adolescents aged <17 years had problems of undernutrition or overnutrition. . Adolescents are one of the age groups that are prone to nutritional problems. At this stage, adolescents are in rapid development and growth cycles that require many nutrients (Setyawati et al., 2015).

Table 1 showed a significant relationship between the respondent's grade level and nutritional status ($p=0.045$). First grade was dominated respondents who experienced nutritional problems. This is related to the lowest level of first grade education compared to respondents with other grade levels. The higher the education, the more comprehensive the knowledge of nutrition (Kurniasari, 2017). That is in line with Hakim (2016), who stated a significant relationship between the education level and nutritional status.

In this study, adolescents who experienced undernutrition (7.6%) and overnutrition (9.8%) problems were girls . Girls are at risk of malnutrition because, physiologically, girls have higher body fat levels (22-26%) compared to boys (Sutriani, 2013). Moreover, girls pay more attention to body image than boys (Brown, 2011). A study in India by Mitra and Nao (2017) proves that adolescent girls are more at risk of experiencing nutritional problems than boys. The results of this study showed an insignificant relationship between gender and nutritional status ($p=0.584$). This is in line with Hakim (2016)'s research which states that there is no relationship between gender and nutritional status.

Family Characteristics

Related to the respondent's family characteristics, the researchers collected data such as family income level, father's education level, and maternal level of education. On employment status, most fathers are working, and most mothers are not working. The family income level was calculated by the number of Minimum Wage in East Kalimantan province, Rp 3,069,315. Table 1 shows that the family income level is relatively low (<Rp 3,069,315) and more dominant adolescents with undernutrition and overnutrition problems. Nutritional status is not directly influenced by family income. The small amount of income in a family can affect daily consumption patterns—high income were in line with the food purchase expenditure (Desi et al., 2018).

In table 1, the level of education of fathers and mothers is mainly dominated by high school graduation rates of 67.4% and 64.1%. Nutritional status can also indirectly be influenced by parents' level of education, but the level of parents' education can describe the level of knowledge. The high level of education is in line with the knowledge possessed (Kurniasari, 2017). Parents with a high degree of education have attitudes that align with the nutritional quality of the food given, resulting in improved family nutrition (Permaesih, 2005).

Table 2. Frequency Distribution of Physical Activity Level, Balanced Diet, and Nutritional Status

Variable	Total	
	n	(%)
Physical Activity Level		
Low	34	36.9
Medium	25	27.2
High	33	35.9
Balanced Nutritional Diet		
Unbalanced	68	73.9
Moderate	19	20.7
Balanced	5	5.4
Nutritional Status		
Undernutrition	9	9.8
Normal	69	75
Overnutrition	14	15.2

Table 2 showed the distribution of variables studied, that are physical activity, balanced nutritional diet, and nutritional status. The results showed that the majority of respondents had a low level of physical activity (36.9%). Low level of physical activity are possible due to social restriction policies and the demands of online learning that require sitting all day. In comparison, the measurement of a balanced nutritional diet resulted in most respondents having an unbalanced diet during the online learning period (73.9%). The low quality of balanced nutrition in the diets of respondents is possible due to the decrease in

purchasing power of food and a lack of knowledge about balanced nutrition (Nobre et al., 2012). Then, for the results of nutritional status measurement obtained, most respondents had a normal nutritional status (75%).

Table 3. Relationship between Physical Activity and Balanced Nutritional Diet with Nutritional Status

Variable	Nutritional Status						Total		p-value
	Undernutrition		Normal		Overnutrition				
	n	(%)	n	(%)	n	(%)	N	(%)	
Physical Activity Level									
Low	2	2.2	24	26.1	8	8.7	34	36,9	0.014*
Medium	2	2.2	18	19.6	5	5.4	25	27.2	
High	5	5.4	27	29.3	1	1.1	33	35.9	
Balanced Nutrition Diet									
Unbalanced	8	8.7	50	54.3	10	10.9	68	73.9	0.212
Moderate	1	1.1	16	17.4	2	2.2	19	20.7	
Balanced	0	0	3	3.3	2	2.2	5	5.4	
Total	9	9.8	69	75	14	15.2	92	100	

Note: Significant p-value <0.05

Table 3 shows the relationship between physical activity and balanced nutritional diet with the nutritional status of students at SMA Negeri 3 Balikpapan. The majority of respondents had low levels of physical activity (36,9%). This situation is in line with the results of research by Deschasaux-Tanguy et al. (2020), where there was a decrease in physical activity levels (53%) and an increase in sedentary activity rate (63%) during the COVID-19 pandemic.

Overall, the percentage of respondents with normal nutritional status was very dominant at all respondents' physical activity levels. The tendency for undernutrition (2.2%) and overnutrition problems (8.7%) was found in mild activity. That is undoubtedly a concern for researchers because the high percentage of mild activity in respondents can cause overnutrition problems (Mainous, et al. 2019). A number of studies have also shown that low physical activity can reduce immunity (Luzi & Radaelli, 2020). Therefore, maintaining physical activity patterns is very important during the COVID-19 pandemic because, indirectly, physical activity affects the body's immunity (Jones & Davison, 2018).

In the results, it can be seen that the tendency of respondents with low physical activity to have normal nutritional status. This is not in accordance with similar studies which explain that individuals with low physical activity should have an overnutrition (Suryadinata et al., 2019; Hasnizar et al., 2020).

Regarding the phenomenon in this study, Fadhilah et al. (2018) stated that the factors that affect the nutritional status of adolescents are eating behavior, knowledge, attitude, availability of facilities, physical activity, pocket money, role teachers and the role of parents. It can be seen that nutritional status is not only influenced by physical activity.

Statistical test results with chi-square test showed p-value=0.014 ($p<0.05$). It can be concluded that there was a relationship between physical activity and the nutritional status of students at SMA Negeri 3 Balikpapan during online learning. The respondents' low level of physical activity was due to compliance with social restriction regulations, lack of knowledge regarding the importance of physical activity, and the demands of learning activities that require sitting throughout the day (Fredriksson, 2018; Utami et al. 2021) . However, we do not measure the respondents' level of physical activity knowledge during the online learning period. The results of this study are certainly in line with research conducted by Rukmana et al. (2021), who stated that there is a relationship between physical

activity and the nutritional status of adolescents during the COVID-19 pandemic.

Analysis of chi-square test data between balanced nutritional diet variables and nutritional status did not result in a significant relationship. The result of the p-value was obtained at 0.212 (p>0.05). In Table 3, respondents with an unbalanced diet dominated the occurrence of undernutrition problems (8.7%) and overnutrition problems (10.9%). On the other hand, most respondents with normal nutritional status also have an unbalanced diet (54.3%). This result is similar to the study by Hafiza et al. (2020) and Pujiati et al. (2015) which resulted in the dominance of respondents with poor diets having normal nutritional status. There are several factors that affect nutritional status directly i.e., food intake and infection while indirectly i.e., resistance family food, parenting and health environment (Bakri, B., Fajar, I., & Supariasa, D. N. 2013). Research by Putri (2014) stated that there is no relationship related to diet with nutritional status. Respondents who have nutritional status in the normal category have a diet pattern in the unbalanced category than the respondents who have over or under nutritional status.

The results of this insignificant test are in line with research by Sagala & Noerfitri (2021), which found there is no significant relationship between diet pattern and balanced nutritional knowledge with nutritional status. Another study that strengthens the results of statistical tests is research conducted by Noviyanti (2017) and Matias et al. (2017) in Brazil, which reported no relationship between diet pattern and nutritional status in adolescents.

This study has several limitations. First, the use of cross-sectional studies limits our view of causal relationships between variables. However, the collection of research data is very up-to-date in accordance with online learning conditions due to the COVID-19 pandemic. Second, anthropometric data collection is self-reported which allows for data bias. However, this policy was taken by researchers in order to minimize physical contact that allows the transmission of SARS-Cov-2.

CONCLUSIONS

In this study, it was found that the majority of respondents had normal nutritional status. Most of the respondents' education levels were at the first level. The level of education relates to the respondent's nutritional knowledge. Therefore, the education level of respondents plays a role in the nutritional status.

Based on the results of the data analysis there was a relationship between physical activity and nutritional diet balanced with nutritional status at SMA Negeri 3 Balikpapan during the online learning period, students' level of physical activity has a relationship with nutritional status. At the same time, the test of the relationship between a balanced nutritional diet also has no relationship with nutritional status. Therefore, the recommendations are that students be more to increase their physical activity and maintain a balanced diet to improve their nutritional status during the online learning period.

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