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THE RELATIONSHIP BETWEEN MACRO NUTRITION INTAKE AND PHYSICAL ACTIVITY WITH NUTRITIONAL STATUS IN ADOLESCENTS AT MTSN 1 DELI SERDANG

[1*]Mahdiah, [2]Angel Rebecca Sigalingging, [3]Kharisna Chairani Koto
[1,2,3]Nutrition Study Program, Poltekkes Kemenkes Medan
Email : didimahdiah14@gmail.com

ABSTRACT:
Adolescence is a period of transition from childhood to adulthood which is characterized by increased muscle mass, changes in body tissue fat and hormonal changes. Physical activity will affect nutritional status because excessive energy intake and not balanced with balanced energy expenditure with less physical activity will cause weight gain. The purpose of this study was to analyze whether there is a relationship between energy intake, protein, fat and physical activity with the nutritional status of adolescents at MTSN 1 Deli Serdang. This research method uses an observational research design with a cross-sectional research design. The number of respondents in this study were 43 people. Food intake data was collected using the 24-hour recall method for 3 non-consecutive days and physical activity data using the 24-hour physical activity recall method. The statistical test used is Chi-Square. Statistical test results showed that there was a relationship between energy intake and nutritional status (P = 0.018), there was a relationship between protein intake and nutritional status (P = 0.003), there was a relationship between fat intake and nutritional status (P = 0.014), there was a relationship between carbohydrate intake and nutritional status. (P = 0.019), and there is a relationship between physical activity and nutritional status (P = 0.026). There is a relationship between intake of energy, protein, fat, carbohydrates, and physical activity, with the nutritional status of adolescents at MTSN 1 Deli Serdang.

Keywords: Energy Intake, Protein, Fat, Physical Activity, Nutritional Status

INTRODUCTION

Adolescence is a period of transition from childhood to adulthood which is characterized by increased muscle mass, changes in body fat tissue and hormonal changes. Nutritional problems in adolescents are caused by wrong intake of nutrients, namely an imbalance between intake of nutrients and the recommended adequacy of nutrients.Novianty (2021).

Nutritional problems that occur in adolescence are undernutrition and overnutritionRachmayani (2018). Malnutrition occurs when the body lacks nutrients, which consist of carbohydrates, proteins, fats, vitamins, minerals, and fiber. Overnutrition occurs when the body gets excessive amounts of nutrients.

Adolescents need proper food intake in terms of quality and quantity. This causes adolescents to have to eat a variety of foods so that nutrients are fulfilled which will have an impact on nutritional status. Nutritional status is a picture of the nutritional balance in a person's body, namely the balance between intake and nutritional needs. A person's nutritional status is influenced by direct factors, namely food intake and illness. Intake of food that enters the body will undergo a metabolic process that will be converted into energy. Excessive energy intake or insufficient energy use is the cause of obesity in adolescents.

Based on the 2018 Basic Health Research (Riskesdas) the prevalence of wasting in adolescents aged 16-18 years in Indonesia was 8.1% (6.7% was thin and 1.4% was very thin), the prevalence of normal nutritional status was 78.3%, while nutritional problems such as 13.5% obesity (9.5% fat and 4.0% obesity). Nutritional status of adolescents aged 16-18 years by sex, with male sex with a prevalence of thin 9.5%, very thin 2.3%, normal 77%, obese 7.7%, and obese 3.6 %. And the nutritional status of adolescent girls showed a prevalence of underweight 3.8%, very thin 0.5%, normal 79.8%, obese 11.4%, and obesity 4.6%. Based on Basic Health ResearchRiskesdas (2018)in Deli Serdang Regency the prevalence of very thin was 2.25%, the prevalence of thin was 8.28%, the normal was 71.66%, and the overweight was 9.25%.

Factors causing nutritional status in adolescents are multifactorial, including excessive intake of macronutrients, always consuming fast food, lack of physical activity, unbalanced diet, and not having breakfast. Many teenagers do not understand the nutritional content of food and its benefits, so they often consume high-calorie sweet foods and drinks and consume other fast food. Adolescents' knowledge of nutritional knowledge is a person's understanding of the science of nutrition, nutrition, and the interaction between nutrients on nutritional and health statusTelisa (2020).

Poor adolescent nutritional intake can cause serious health problems both as adolescents and adults, and decrease the impact on the next generation. Low nutritional intake usually causes weakness, lack of enthusiasm, and lack of motivation to learn so that learning productivity is disrupted. Not only malnutrition, but excess nutrition can also be a problem. Excessive energy intake can cause overweight and obesity. Overweight and obesity that are not treated in adolescence can continue into adulthood.

Physical activity will affect nutritional status because excessive energy intake and not balanced with balanced energy expenditure with less physical activity will cause weight gain (Roring, 2020).

Lack of physical activity is one of the main causes of obesity in adolescence (Alihar, 2018). Conversely, if you do excessive physical activity, the body will be able to break down fat reserves that are used to meet energy needs so that fat in the body will decrease (Ministry of Health, 2022). The incidence of overwight in adolescents is multifactorial. Increased food consumption, physical activity, sleep quality are things that contribute to changes in energy balance leading to overweight (Yusnira & Lestari, 2021).

Physical activity will affect nutritional status because excessive energy intake and not balanced with balanced energy expenditure (with less physical activity) will cause weight gain.(Roring, 2020). Physical activity is very useful for mental and physical health. If food intake or calories that enter the body is high while activity is low then our body will have excess calories, the number of calories that are not used can lead to obesity, if done continuously it will cause obesity, due to an imbalance between calories used and calories stored in the body (Sobarna, 2021).

RESEARCH METHODS

This research is an observational study with a cross-sectional research design which was carried out in May 2023 at MTSN 1 Deli Serdang. The research population was class VIII students of MTSN 1 Deli Serdang, totaling 218 people. The sample size was calculated using the slovin formula with a population of 218 students and a sample of 43 students was taken using random sampling method. Research variables include nutritional status, energy intake, protein intake, fat intake, carbohydrate intake and physical activity.

Data collection techniques were carried out by interviews using recall 3x24 hours not consecutively, then analyzed using nutrisurvey and categorized into less (average intake <80% RDA), sufficient (average intake 80-110% RDA), and more (average intake > 110% RDA). Nutritional status is obtained through anthropometric assessment. Body weight was measured using a digital scale with an accuracy of 0.1 kg. Height was measured using a stadiometer with an accuracy of 0.1 cm.

Nutritional status was assessed using the Z-score indicator, namely malnutrition (<-3 SD), malnutrition (-3 to <-2 SD), normal (-2 to 1 SD), risk of over nutrition (>1 s /d 2 SD), over nutrition (> 2 to 3 SD), and obesity (> 3 SD). Physical activity was carried out by interview using physical activity recall for 24 hours and then assessed using the formula*Physical Activity Level*(PAL)

RESULTS AND DISCUSSION

Characteristics of Respondents

Based on the subject identity data which can be seen in Table 1, it shows that the age category is more than 14 years old with 30 (33.7%) subjects, the gender category is more male with 23 (25.8%) subjects.

Table 1
Frequency distribution of subject characteristics

Characteristics of Respondents	Total (n=43)	Percentage %
Age		
13	12	13.5
14	30	33,7
15	1	1,1
Gender		
Woman	20	22.5
Man	23	25,8

Univariate analysis

a. Nutrient Intake

Nutrient intake was obtained from interviews with food intake using Food Recall. Which then the data is processed using Nutrisurvey to analyze the amount of energy, protein, fat, and fiber intake. The distribution of respondents' nutritional intake can be seen in the following table:

Table 2
Distribution of Respondents' Energy, Protein, Fat and Fiber Intake

intake	**Energy**		**Proteins**		**Fat**		**Carbohydrate**	
	n	%	n	%	N	%	n	%
Not enough	22	51,1	15	34,9	11	25,6	29	67,4
Enough	19	44,2	15	34,9	18	41.9	12	27,9
More	2	4,7	13	30,	14	32.	2	4,7

					3		2		4	5		
Total	4	100	4	100	4	100	43	100				
	3		3		3					

Based on the results of the study in table 2, it shows that 22 respondents (51.1%) had less energy intake, 19 respondents (44.2%) had sufficient energy intake, and 2 respondents (4.7%) had more energy intake. The respondent's energy intake is categorized as good if the energy intake is 80-110% of the total requirement based on the RDA for adolescents aged 13-15 years for boys and girls.

Based on the results of the study in table 2, it shows that 15 respondents (34.9%) had less protein intake, 15 respondents (34.9%) had sufficient protein intake, and 13 respondents (30.2%) had more protein intake. The respondent's protein intake is categorized as good if the protein intake is 80-110% of the total requirement based on the RDA for adolescents aged 13-15 years for boys and girls.

Based on the results of the study in table 2, it shows that 11 respondents (14.6%) had less fat intake, 18 respondents (41.9%) had sufficient fat intake, and 14 respondents (32.5%) had more fat intake. The respondent's fat intake is categorized as good if the fat intake is 80-110% of the total requirement based on the RDA for adolescents aged 13-15 years for boys and girls.

Based on the results of the study in table 2, it shows that 29 respondents (67.4%) had less carbohydrate intake, 12 respondents (27.9%) had sufficient carbohydrate intake, and 2 respondents (4.7%) had more carbohydrate intake. The respondent's carbohydrate intake is categorized as good if fat intake is 80-110% of the total requirement based on the RDA for adolescents aged 13-15 years for boys and girls.

b. Nutritional status

BMI measurement results obtained from the results of measuring height (TB) and weighing (BB). The average height of the respondents was 155.07 cm with a minimum height of 142 cm and a maximum height of 177.30 cm. The average body weight of the respondents was 48.46 kg with a minimum body weight of 30 kg and a maximum body weight of 78.85 kg. Data on the nutritional status of respondents in the following table:

Table 3
Distribution of Respondents' Nutritional Status

Nutritional status	n	%
Malnutrition	18	41.9
Good Nutrition	16	37,2
Obesity	9	20,9
Total	43	100

Based on table 3 shows that most of the respondents had good nutritional status as many as 16 people (37.2%) and less nutritional status as many as 18 people (41.9%), and obesity as many as 9 people (20.9%).

The results of this study are in line withRahmawati (2017)which shows that out of 40 respondents, there were 52.5% whose nutritional status was normal, 17.5% were underweight, 22.5% were overweight and 7.5% were obese. Besides that, researchPrincess (2022)which shows that out of 88 respondents, 84.09% had normal nutritional status, 1.14% had poor nutritional status, 11.36% had more nutritional status and 3.41% had obesity. .

c. Physical Activity

Physical activity is a movement produced by the muscles of the body and requires energy, including activities carried out while working, playing, doing household activities and recreational activities.

Table 4
Distribution of physical activity

Physical Activity	n	%
Light	34	38,2
Currently	6	6,7
Heavy	3	3,4
Total	43	100

From the table above it can be seen that 34 people (38.2%) had light physical activity, while 6 people (6.7%) had moderate physical activity and 3 people (3.4%) had heavy physical activity. This was obtained through a recall of physical activity carried

out by adolescents at MTSN 1 Deli Serdang for 24 hours.

From the results of the recall of physical activity in MTSN 1 Deli Serdang adolescents, it shows that many adolescents have mild physical activity because they rarely do physical activity.

Of the 43 samples, there were 34 people who had light physical activity, such as sitting for 6-8 hours, lying down for 2-4 hours, sleeping for 8-11 hours, walking for 10 minutes-3 hours and writing for 6-8 hours a day. Six people did moderate physical activity, namely lying down for 1-3 hours, sleeping for 8-9 hours and sitting for 3-8 hours. 3 other people had heavy physical activity which included heavy physical activity, namely sitting for 6-10 hours, swimming for 1-3 hours, writing for 1-8 hours, sleeping 8 hours, watching TV 30 minutes-1 hour, playing volleyball 1 -2 hours, jogging for 30 minutes -3 hours and cycling for 1-2 hours.

These results are in line with research(Energy,2022)Respondents have moderate physical activity (54.5%), light activity as many as 20 respondents (45.5%). The highest number is the sample belonging to moderate physical activity, then light activity (45.5%). Mild activity occurs due to lack of physical activity or exercise.

According to research(Dinas & Palu, 2018)there were 23 teenagers (76.7%) who were not active. this happens because the activities that are often carried out are light activities such as learning activities in the dormitory.

Bivariate Analysis

a. Energy Intake and Nutritional Status

The results showed that 8 respondents (18.6%) had good nutritional status but lacked energy intake and 8 respondents (18.6%) had good nutritional status but good energy intake. Respondents who had poor nutritional status but lacked energy intake were 13 people (30.2%). Respondents with sufficient energy intake but poor nutritional status were 5 people (11.6%), the same number as those who were obese but had sufficient energy intake, 5 people (11.6%). And the respondents who had obesity nutritional status but lacked energy intake were 2 people (4.7%) the same number as those who were obese nutritional status but had more energy intake as many as 2 people (4.7%).

The distribution of respondents according to energy intake and nutritional status and statistical test analysis can be seen in the following table:

Table 5
Distribution of Respondents According to Energy Intake and Nutritional Status

utritional status	Energy intake						Total		*p-values*
	Enough		Not enough		More				
	n	%	N	%	n	%	n	%	
alnutrition	5	11,6	13	30,2	0	0	18	41.8	0.018
od nutrition	8	18,6	8	18,6	0	0	16	37,2	
esity	5	11,6	2	4,7	2	4,7	9	21	
nount	18	41.8	23	53.5	2	4,7	43	100	

Based on the results of statistical tests using Chi-Square, the value of p = 0.018 was obtained. It can be concluded that there is a relationship between energy intake and nutritional status. There is a relationship between energy intake and nutritional status because most students do not have breakfast and often consume snacks where the snacks chosen have low energy content, for example drinks and instant noodles.

The results of this study are in line with the research conductedWinerungan (2018), namely there is a significant relationship between the adequacy of energy intake and the nutritional status of adolescents at SMP Spectrum Manado and Christian Middle School Lahai Roi Manado. In line with the results of the studyHarvi (2017)which states that there is a relationship between energy intake and the nutritional status of public and private junior high school adolescents in the West Ungaran sub-district

b. Protein Intake and Nutritional Status

The results showed that respondents with good nutritional status had the largest percentage of respondents who had adequate protein intake, namely 11 people (25.6%), respondents with poor nutritional status but insufficient protein intake, namely 11 people (25.6%) had a greater percentage than with adequate protein intake. Respondents who are obese but eat more protein have the largest percentage, namely 5 people (11.6%).

The distribution of respondents according to protein intake and nutritional status and statistical test analysis can be seen in the following table:

Table 6
Distribution of Respondents According to Protein Intake and Nutritional Status

Nutritional status	Protein intake						Total		*p-values*
	Enough		Not enough		More				
	N	%	n	%	n	%	n	%	
Malnutrition	3	6,9	11	25,6	4	9,3	18	41.8	0.003
ood nutrition	11	25,6	2	4,7	3	6,9	16	37,2	
Obesity	2	4,7	2	4,7	5	11,6	9	21	
Amount	16	37,2	15	35	12	27,8	43	100	

Based on the results of statistical tests using Chi-Square, p = 0.003, it can be concluded that there is a relationship between protein intake and nutritional status. There is a relationship between protein intake and nutritional status due to: often consume foods that contain lots of protein such as eggs, tempeh and tofu.

The results of this study are in line with the research conductedHerawati (2023), that is, there is a significant relationship between the adequacy of protein intake and the nutritional status of adolescents in Posyandu, Pangkalan Jambi Village, Bukit Batu District. In line with the results of the studyIIIslamy (2021)which states that there is a relationship between protein intake and the nutritional status of young women in MA Mambaul Khoiriyatil Islamiyah.

c. Fat Intake and Nutrition Status

The results showed that respondents with good nutritional status had the largest percentage of respondents who had sufficient fat intake, namely 11 people (25.5%), respondents with poor nutritional status but sufficient fat intake, namely 6 people (14%). Respondents who were obese but consumed more fat had the largest percentage, namely 6 people (14%), while respondents whose nutritional status was poor but intake sufficient fat had the same percentage with less and more fat intake, namely 6 people (14%).

The distribution of respondents according to fat intake and nutritional status and statistical test analysis can be seen in the following table:

Table 7
Distribution of Respondents According to Fat Intake and Nutritional Status

Nutritional status	Fat intake						Total		*p-values*
	Enough		Not enough		More				
	n	%	n	%	n	%	n	%	
Malnutrition	6	14	6	14	6	14	18	42	0.014
good nutrition	11	25.5	4	9,3	1	2,3	16	37,1	
Obesity	1	2,3	2	4,6	6	14	9	20,9	
Amount	18	41.8	12	27,9	13	30,3	43	100	

Based on the results of statistical tests using Chi-Square, p = 0.014, it can be concluded that there is a relationship between fat intake and nutritional status. There is a relationship between fat intake and nutritional status because the number of servings and the frequency of eating the respondents lack. The majority of fat consumption comes from the use of oil in foods that are fried or sautéed.

The results of this study are in line with the research conductedKhoerunisa (2021), that is, there is a significant relationship between the adequacy of fat intake and the nutritional status of adolescents at SMP PGRI 12 Bogor City. In line with the results of the studyRorimpandei (2020)which states that there is a relationship between fat intake and the nutritional status of young women in Kayuuwi Village and Kayuuwi Satu Village, West Kawangkoan District.

d. Carbohydrate Intake and Nutritional Status

The results showed that respondents with good nutritional status had the largest percentage of respondents who had sufficient carbohydrate intake, namely 8 people (18.6%), respondents with poor nutritional status but sufficient carbohydrate intake, namely 4 people (9.3%). Respondents who were obese but had adequate carbohydrate intake had the largest percentage, namely 4 people (9.3%), while respondents who had poor nutritional status but lacked carbohydrate intake had the largest percentage, namely 14 people (32.5%).

The distribution of respondents according to fat intake and nutritional status and statistical test analysis can be seen in the following table:

Table 8
Distribution of Respondents According to Carbohydrate Intake and Nutritional Status

Nutritional status	Carbohydrate intake						Total		*p-values*
	Enough		Not enough		More				
	N	%	n	%	n	%	N	%	
Malnutrition	4	9,3	14	32.5	0	0	18	41.8	0.019
good nutrition	8	18,6	8	18,6	0	0	16	37,2	
Obesity	4	9,3	3	7.0	2	4,7	9	21	
Amount	16	37,2	25	58,1	2	4,7	43	100	

Based on the results of statistical tests using Chi-Square, p = 0.019, it can be concluded that there is a relationship between carbohydrate intake and nutritional status. There is a relationship between carbohydrate intake and nutritional status because teenagers often consume foods that contain carbohydrates such as rice and instant noodles.

The results of this study are in line with the research conductedRarastiti (2023), that is, there is a significant relationship between the adequacy of carbohydrate intake and the nutritional status of adolescents at SMP Negeri 8 Semarang City. In line with the results of the studyDodik (2020)which stated that there was a relationship between carbohydrate intake and the nutritional status of young women at SMK Ciawi Bogor.

e. Physical Activity and Nutritional Status

Table 9
Distribution of Respondents According to Physical Activity and Nutritional Status

No	physical activity	Nutritional status								*p*value
		Malnutrition		ood nutrition		Obesity		Total		
		n	%	n	%	N	%	n	%	
1	Light	11	32.3%	14	41.1%	9	26.4%	34	100%	0.026
2	Currently	6	100%	0	0%	0	0%	6	100%	
3	Heavy	1	33.3%	2	66.6%	0	0%	3	100%	

The results showed that respondents with good nutritional status found the largest percentage of respondents with mild physical activity, namely 14 people (41.1%), respondents with poor nutritional status but light physical activity, namely 11 people (32.3%). Respondents who were obese but had heavy physical activity had the largest percentage, namely 9 people (26.4%), while respondents with poor nutritional status but

moderate physical activity, namely 6 people (100%) and for good nutritional status and obesity but moderate activity, there were 0 people. . Respondents with good nutritional status but heavy activity have a percentage of 2 people (66.6%). Respondents with poor nutritional status who had heavy physical activity were 1 person (33.3%) and respondents with obese nutritional status with heavy physical activity were 0 people.

Based on the results of statistical tests using Chi-Square, p = 0.026, it can be concluded that there is a relationship between physical activity and nutritional status. There is a relationship between physical activity and nutritional status because adolescents with obese nutritional status have light physical activity while those with poor nutritional status have mild physical activity.

This research is in line with(Khoerunisa & Istianah, 2021)Physical activity showed a significant relationship with nutritional status in adolescents with p=0.001, which means that subjects with strenuous activity will have abnormal nutritional status 4 times greater than those with moderate physical activity. This is because a person's nutritional status depends on the nutritional intake consumed and the physical activity carried out

CONCLUSION

In the above study it can be concluded that there is a relationship between energy intake and the nutritional status of adolescents at MTSN 1 Deli Serdang. There is a relationship between protein intake and the nutritional status of adolescents at MTSN 1 Deli Serdang. There is a relationship between fat intake and the nutritional status of adolescents at MTSN 1 Deli Serdang. There is a relationship between carbohydrate intake and the nutritional status of adolescents at MTSN 1 Deli Serdang. There is a relationship between physical activity and the nutritional status of adolescents at MTSN 1 Deli Serdang.

BLIBLIOGRAPHY

Alihar, F. (2018). THE RELATIONSHIP BETWEEN EATING AND PHYSICAL ACTIVITY WITH OBESITY AT SMPN 30 PADANG, 2018, 66, 37–39. Https://Www.Fairportlibrary.Org/Images/Files/Renovationproject/Concept_Cost_Estimate_Accepted_031914.Pdf

Dias Novianty, F., Muzarofatus Sholikhah, D., Purnama Pribadi, H., Nutrition Studies, P., & Health University of Muhammadiyah Gresik, F. (2021). The Correlation Between Nutritional Knowledge, Physical Activity And Nutrient Intake With Adolescents Nutritional Status Of High School In Gresik District. 3(1), 234–244.

Dinas, B., & Palu, S. (2018). Description of Physical Activity, Nutritional Status and Blood Pressure of Adolescents Assisted by the Palu Social Service in 2018. 1(April 2019), 12–16.

Dodik Briawan, Widya Lestari Nurpratama, W. Ri. (2020). Indonesian Journal Of Human Nutrition. Indonesian Journal Of Human Nutrition, 7(2), 139–152.

Energy, A., Protein, A., & Dan, AF (2022). Energy Intake, Protein Intake, Physical Activity and Nutritional Status in Young Women. 2(3), 995–1003.

Harvi, SF, D. (2017). The Correlation Between Energy And Fat Of Streer Food Towards The Nutritional Status Of Students Age 13-15 Years Old In West Ungaran. Journal of Nutrition and Health, 9(21), 11–22.

Herawati, V., Rizqi, ER, & Afrinis, N. (2023). The Relationship between Energy Protein Intake and Knowledge of Balanced Nutrition with the Nutritional Status of Adolescents at the Youth Posyandu in Pangkalan Jambi Village, Bukit Batu District. Tambusai Journal of Health, 4(1), 65–77.

Iislaamy, TZ, Endah Yani, RW, & Ningtyias, FW (2021). Relationship between protein intake and nutritional status in female adolescents. Multidisciplinary Journal, 4(1), 21. Https://Doi.Org/10.19184/Multijournal .V4i1.27472

Khoerunisa, D., & Istianah, I. (2021). The Relationship between Intake of Macronutrients and Physical Activity with Nutritional Status in Adolescents. Journal of Food, Health and Nutrition, University of Binawan, 2(1), 51–61. Https://Doi.Org/10.54771/Jakagi.V2i1. 236

Research, AH, Rachmayani, SA, Kuswari, M., & Melani, V. (2018). Indonesian Journal Of Human Nutrition. 5(2), 3–9.

Putri, MP, Dary, D., & Mangalik, G. (2022). Intake of Protein, Iron and Nutritional Status in Young Women. Journal Of Nutrition College, 11(1), 6–17. Https://Doi.Org/10.14710/Jnc.V11i1.3 1645

Rahmawati, T. (2017). The Relationship between Nutrient Intake and Nutritional Status of Semester 3 Nutrition Students at STIKes Pku Muhammadiyah Surakarta. Profession (Professional Islam): Research Publication Media, 14(2), 49. Https://Doi.Org/10.26576/Profesi.148

Rarastiti, CN (2023). Relationship between Carbohydrate Adequacy Level and Nutritional Status in Adolescents. Indonesian Journal Of Nutrition Science And Food, 2(1), 30–34.

Riskesdas. (2018). Key Results of Basic Health Research. Ministry of Health of the Republic of Indonesia, 1–100. Https://Doi.Org/1 December 2013

Rorimpandei, CC, Kapantow, NH, Malonda, NSH, Health, F., University, M., & Ratulangi, S. (2020). Relationship Between Intake of Macronutrients and Nutritional Status of Young Women in Kayuuwi and Kayuuwi Satu Villages, West Kawangkoan District. Public Health, 9(4), 125–130.

Roring, NM, Posangi, J., & Manampiring, AE (2020). Relationship Between Nutritional Knowledge, Physical Activity, And Exercise Intensity With Nutritional Status. 12(28), 110–116.

Sobarna, A., Asmara, H., Sunarsi, D., Sanusi, A., & Suharja, S. (2021). Analysis of Physical Activity in Obese People Using a Smartwatch. JPPI (Indonesian Education Research Journal), 7(1), 28–34. Https://Doi.Org/10.29210/02021767

Telisa, I., Hartati, Y., & Haripamilu, AD (2020). Risk Factors for Obesity in High School Teenagers. Faletehan Health Journal, 7(03), 124–131. Https://Doi.Org/10.33746/Fhj.V7i03.160

Winerungan, R., Punuh, MI, & Karwengian, S. (2018). Relationship Between Energy Intake and Nutritional Status of Middle School Students in the Malalayang I Region, Manado City. Journal of KESMAS, 7(5).

Yusnira, Y., & Lestari, M. (2021). Correlation between Energy Intake, Sleep Quality, and Physical Activity with the Incidence of Overweight at SMKN 1 Bangkinang. Tambusai Journal of Education, 5(3), 5723–5736.