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THE MACRONUTRIENTS ESSENCE INTAKE AND LEARNING ACHIEVEMENTS IN ADOLESCENT 16-18 YEARS OLD

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Abstract:
Adolescents 16-18 years old have special nutritional needs because they are in late adolescence, intake of nutrients that are balanced and according to the needs of adolescents will help adolescents achieve optimal growth and development. Food is one of the basic needs of every human being. Food contains nutrients needed to grow and develop. Eating adequate and regular food will create a healthy body and glorious achievement, a fit body, and quality human resources. This research contains about the intake of macronutrients such as Carbohydrates, Proteins, and Fats by adolescents that affect learning achievement. This study uses an observational analytic research design with a Cross-Sectional approach. Data removal is done with a nutrient recall questionnaire for 3 days. The sample in this study was 71 students of Senior High School. The results of this study, 63.32% of students have moderate protein intake with good performance, 36.62% of students have moderate fat intake with good learning achievement and 64.79% of students have good carbohydrate intake with good learning achievement. Based on the Pearson product-moment correlation test results, the correlation between protein intake and learning achievement obtained a value of 0.752, it can be seen there is a relationship between protein intake and learning achievement, the correlation between fat intake and learning achievement yields -0.118, then it can be seen there is no relationship of fat intake with learning achievement and the correlation between carbohydrate intake and learning achievement values obtained 0.433, it can be seen that there is no relationship between carbohydrate intake and learning achievement.

Keywords Macro nutrient essence intake , *Food recall,* adolescent

INTRODUCTION

Malnutrition can cause a decrease in intelligence, failure of physical growth, and decreased work productivity. Healthy and quality adolescents are a serious concern for these parents, education practitioners, and students. According to World Health Organization (WHO), adolescents start from the age of 10-19 years. Adolescents aged 16-18 years have special nutritional needs because they are in late adolescence, intake of nutrients that are balanced and according to the needs of adolescents will help adolescents achieve optimal growth and development. Food is one of the basic needs of every human being. Food contains nutrients that are needed to grow and develop. Eating adequate and regular food will make a healthy body and glorious achievement, a fit body, and quality human resources.[1 2]

Evaluation which aims to determine the extent to which the learning and learning process takes place effectively needs to be done to assess learning achievement. Learning achievement is usually shown in the form of grades or achievement index. Factors that affect learning achievement are divided into internal, external, and approach factors. Internal factors include physiological aspects (nutritional status and nutritional intake) and psychological (interest, intelligence, talent, motivation, etc.). External factors include environmental and instrumental factors. Approach factors include learning strategies and methods.[3 4]

Macronutrient intake is a major factor that plays a role in providing energy for the brain to work optimally. Macro energy intake needed by the body from Indonesian consumption is 2,150-kilo calories and 57 grams of protein per person per day, the largest proportion of Indonesia's population intake comes from carbohydrates as much as 57.4%. Carbohydrates are a source of energy and energy reserves through metabolic processes. Carbohydrates are of two types, namely simple carbohydrates and complex carbohydrates. One gram of carbohydrate can produce 4 kcal. Glucose is then carried by the bloodstream to parts of the body that need it, such as the brain, nervous system, heart, and other organs. The brain needs to get an adequate supply of glucose through blood circulation throughout the body because glucose is very important for health, makes it easy for us to concentrate on receiving lessons, as well as the main source of energy for the brain to be able to work optimally so students can improve learning achievement in school. Lack of

energy supply from carbohydrate intake, the body will become weak and lack concentration in learning, this can cause a decrease in student achievement.[5 3 6]

Protein is the most abundant nutrient found in the body. One-fifth of adult weight is protein. Nearly half of the amount of protein in the body is in the muscles, one-fifth is in the bones or cartilage, one tenth is in the skin, and the rest is in other body tissues and body fluids. The relationship with the work process of the brain, proteins in the form of amino acids such as glycine, glutamate, tyrosine, and tryptophan are needed to form neurotransmitters that transmit nerve impulses and affect emotional behavior, self-control, and concentration in learning. [7 8]

Fats produce the highest energy compared to carbohydrates and protein, which is one gram of fat-containing nine kcal. The results of breaking down fats from food are fatty acids and glycerol. Fat in the body will be oxidized through beta-oxidation metabolism to form triglycerides which will be the main fuel reserves for the body. Besides the results of the breakdown of fatty acids such as ketone material will be used as an energy source in the heart and brain. All of this energy output will later be used for activities and also thinking.[9 10]

This research is expected to provide benefits. In this case, students can improve their diet or food intake to increase learning achievement. Research results can also add insight, experience, and knowledge of researchers, which can later apply. Benefits for schools can be as information for schools to provide information to students about food intake such as carbohydrate, protein, and fat intake to improve student achievement.

METHODS

Research Design

This research uses an analytic observational research design with Cross Sectional approach, which is research conducted at one time to find the relationship between two variables,that is the independent variable and the dependent variable. Data removal is done with nutrition recall questionnaire for 3 days. Ethical Clearens No: 356 / EP-FKIK-UMY / VIII / 2018.

RESULTS

The subjects were 240 adolescnets. The subjects were 16-18 years old. Based on the results of the research, obtained data that most (64.79%) subjects aged 17 year old (Table 1).

Table 1. The Characteristic of subject based on Age

Age (years)	(n)	Percentage (%)
16	1	1.41
17	46	64.79
18	24	33.80
Jumlah	71	100

Most of the subjects in this research were female (49%), and the rest were male (Table 2).

Table 2. The Characteristic of subject based on gender

Gender	(n)	Percentage (%)
male	22	30.99
female	49	69.01
Total	71	100

Table 3 showed that the characteristic of protein intake with learning Achievement. Most students (63.3%) have good protein intake with good learning achievement.

Table 3. The characteristic of protein intake with learning achievement

Protein Intake	Learning Achievement				total (n)	Percentage (%)
	Good		less			
	n	Percentage (%)	n	Percentage (%)		
good	45	63.38	0	0	45	63.38
moderate	7	9.86	0	0	7	9.86
less	0	0	2	2.8	2	2.8
Deficit	0	0	17	23.94	17	23.94
Total	52	73.24	19	26.76	71	100

The Pearson product moment correlation test results obtained a value of 0.752, this shows that the strong correlation between protein intake and learning achievement (r>0.5). There was a relationship between protein intake and learning achievement. The higher of the protein intake, then the higher of the learning achievement.

Table 4 showed that the characteristic of fat intake with learning achievement. Most students (36.62%) have moderate fats intake with good performance (Table 4).

Table 4. The Characteristic of Fats intake with learning achievement

Fats intake	Learning achievement				Total	Percentage (%)
	Good		Less			
	n	Percentage (%)	n	Percentage e (%)		
Good	18	25.35	4	5.63	22	30.98
Moderate	26	36.62	11	15.49	37	52.11
less	6	8.45	3	4.23	9	12.68
Deficit	2	2.82	1	1.41	3	4.23
Total	52	73.24	19	26.76	71	100

Table 5 showed that the Characteristic of Carbohydrate intake with learning achievement. Most students (64.79%) have good carbohydrate intake with good learning achievement.

Table 5. The Characteristic of Carbohydrate intake with learning achievement

Carbohydrate intake	Learning achievement				Total (n)	Presentase (%)
	Good		Less			
	Sum (n)	Presentase (%)	Sum (n)	Presentase (%)		
Good	46	64.79	5	7.04	51	71.83
Moderate	5	7.04	7	9.86	12	16.90
Less	1	1.41	4	5.63	4	7.04
Deficit	0	0	3	4.23	3	4.23
Total	52	73.24	19	26.76	71	100

The Pearson product moment correlation test results obtained *p value* = 0.433. There was no relationship between carbohydrate intake and learning achievement.

DISCUSSION

The results showed that most of the subject's protein intake was good, as many as 45 children (63.38%). The Pearson product moment correlation test results obtained a value of 0.752, this shows that the strong correlation between protein intake and learning achievement (r>0.5). There was a relationship between protein intake and learning achievement. The higher of the protein intake, then the higher of the learning achievement.

Nutrient deficiency will affect the concentration and ability of students. Nutritional deficiencies during this period will have an impact on student activities in schools such as weakness, lethargy, growth inhibition, malnutrition, and decreased achievement at school.[11 12]

Some studies showed that showing the relationship between the level of protein intake and the learning achievement. The consumption of protein will improve performance for learning. [13 14] This is contrary which states that there is no relationship between protein intake and learning achievement, because most respondents' protein intake has been fulfilled.[15] Protein is a nutrient that functions as a building block for the formation of new nerve cells including the brain. Related to the work processes of the brain, proteins in the form of amino acids such as glycine, glutamate, tyrosin, and tryptophan are needed to form neurotransmitters that transmit nerve impulses in the brain and can influence behavior such as emotions, self-control and concentration in learning, unction to replace damaged cells and for the growth of body tissues. Protein intake also affects children's learning achievement because it is influenced by the effects of increased levels of amino acids and choline which are neurotransmitter percusors. The secretion can improve mood and psychological conditions so as to improve the reasoning process. Consumption of protein will produce amino acids needed by the brain to produce neurotransmitters (serotonin, neropinephrine, dopamine and acetylcholine) to keep the brain working optimally.[4 16]

The results showed that there were 26 students (36.62%) who had moderate fat intake with good learning achievement. Based on the Pearson product moment correlation test results, the correlation between fat intake and learning achievement yields -0.118, this shows that between fat intake and learning achievement has a weak correlation because it is below 0.5 which means Ho is accepted, then it can be seen there is no relationship fat intake with learning achievement. The negative sign (-) shows the opposite relationship, if the intake of fat is high then the learning achievement is low, conversely.

Fat in the body will be oxidized through beta oxidation metabolism to form triglycerides which will become the body's main fuel reserve. Beta oxidation will produce acetyl CoA. Furthermore, as acetyl CoA from carbohydrate and protein metabolism, acetyl CoA from this result will enter the citric acid cycle to produce energy. Apart from triglycerides, the breakdown of other fatty acids such as ketone bodies are used as energy sources in the heart and brain. In the

brain, ketone bodies are an important source of energy when fasting. All of these energy products will later be used for activities and thinking.[17]

Intake of nutrients such as carbohydrates, protein, fat in the body will produce the highest energy compared to carbohydrates and proteins which contain 9 kcal per gram. The most energy producer in the body is fat. Energy is needed to support the growth process and for daily activities.[18] [19]

The results of this research, it can be obtained that the majority of students (64.79%) have good carbohydrate intake with good learning achievement. There was no relationship between carbohydrate intake and learning achievement. This is contrary to research conducted by Nyaradi et al (2017) which shows that there is a significant relationship between carbohydrate and fat intake with learning achievement.[15]

This research also contradicts research conducted by Jola et al (2019) which shows the results that there is a relationship between carbohydrate intake and learning achievement. Carbohydrates are a source of energy for the body, but also as a good source of energy for the brain to work optimally.[20] Carbohydrates in the digestive process will be broken down into simple sugars, namely glucose. The brain needs to get a supply of glucose through blood circulation throughout the body, because glucose is very important for health, makes it easy to concentrate on receiving lessons, as well as the main source of energy for the brain to be able to work optimally so students can improve learning achievement in school. The lack of energy supply from carbohydrate intake, the body becomes weak and less concentrated in learning, this can cause a decrease in learning achievement. Physical activity is also one of the causes that affects a person's nutritional state. Less physical activity can cause underweight, overweight, and obesity due to the absence of burning calories in one's body.[20] [21] [22]

Fulfillment of nutrients is not the only thing that can affect learning achievement. There are other factors that affect learning achievement including factors in students (basic abilities / intelligence, talents, language skills, feelings, attitudes, interests, physical conditions), family environmental factors (the relationship between parents, teachers and friends), school environment factors (teacher, teacher attitude towards students, curriculum, organization, educational facilities, and the physical state of the school), social environmental factors (social, political, economic, weather and climate conditions). [23] [24] [25] [26]

CONCLUSION AND SUGGESTION

CONCLUSION

a. There is a relationship between protein intake and learning achievement of adolescent aged 16-18 years. The higher the protein intake, the better the learning achievement.
b. There is no relationship between fat intake and learning achievement of adolescent aged 16-18 years. The higher the fat intake, the lower the learning achievement.
c. There is no relationship between carbohydrate intake and learning achievement of adolescent aged 16-18 years.
d. Still there are adolescent aged 16-18 years whose nutrients intake deficit is 23.94% protein deficit, 1.41% fat deficit and 4.23% carbohydrate deficit.

SUGGESTION

Increase the intake of foods that contain high nutritional value according to RDA and reduce eating fast foods and junk food which are low in nutrition and not good for their health

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