

Original Research

Physical Activity and Knowledge about Nutrition Among Adolescents at Madrasah Aliyah Negeri (MAN) Surabaya City

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Article history

Received: 6 March 2024

Revised: 19 March 2024

Accepted: 19 March 2024

Published Online: 31 March 2024

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How to cite this article: Zulkipli, Nurwijayanti, Suhita BM. Physical Activity and Knowledge about Nutrition in Adolescents Among Madrasah Aliyah Negeri (MAN) Surabaya City. *Health Dynamics*. 2024, 1(3), 65-72. <https://doi.org/10.33846/hd10302>



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ABSTRACT

Background: Adolescents are a window of opportunity for future development, so it is necessary to invest in the health and welfare of adolescents in accordance with the Adolescent Nutrition Program launched by the Indonesian government to adjust the Sustainable Development Goal at the UN meeting with a communication strategy for social change and adolescent behavior. **Methods:** This study used a quantitative design with 196 respondents whose samples were taken with probability sampling techniques in the form of simple random sampling. Physical activity data was taken from the International Physical Activity Questionnaire (IPAQ), data on knowledge of nutrients obtained from the Self Administere Qustionnaire (QuesCa) and intensity of fast food consumption obtained from the Food Frequency Questionnaire while nutritional intake through 24-hour food recall form. Data analysis used multiple linear regression with SPSS 25 statistical tools. **Results:** Based on the t test, it was concluded that there was an effect of physical activity and knowledge of nutrients with a significance value of 0.000 for each of the two variables. While the intensity of fast food consumption has a significance value of 0.968 (more than 0.05) which concludes that there is no effect of the intensity of fast food consumption on nutritional intake. Nutrient knowledge is the factor that most influences nutrient intake with a t-statistic of 5.941. **Conclusions:** In this study, it was concluded that there was an effect of physical activity and nutritional knowledge on nutritional intake, while the intensity of fast food consumption did not affect nutritional intake. The dominant factor affecting nutritional intake in this study was nutritional knowledge.

Keywords: Adolescents; nutritional intake; physical activity; nutritional knowledge; fast food consumption

1. INTRODUCTION

The basic causes of adolescent nutritional problems in Indonesia occur in areas that have not experienced development with poorer households so that adolescent nutritional intake is still below standard. Apart from that, other nutritional status problems faced by teenagers in Indonesia are triggered by the lack of physical activity in teenagers which has an impact on obesity. In fact, teenagers who are active and regularly engage in physical activity tend to have an ideal body weight compared to teenagers who lack physical activity and only spend time lying down, watching TV or playing with gadgets ⁽¹⁾

Malnutrition in adolescents has a negative impact on their life development which is manifested in stunted physical growth and development, low resistance to disease, low levels of intelligence in adolescents, and low work performance and sports performance. The nutritional needs of each teenager are of course different, because there are factors such as age, gender, activities carried out, and other factors that determine their daily nutritional needs. For teenagers aged 10-12 years, they need daily calories of 1900 calories, 60 grams of protein, 0.75 grams of calcium, 8 mg of ferrum, 200 grams of vitamin A, 0.7 mg of vitamin B1 and 25 mg of vitamin C, especially for older adults. Adolescents 13 – 19 years of course have more nutritional needs, with daily calories reaching 2,500 calories, 66 grams of protein and 23 mg of ferrum per day.

One of the schools in the city of Surabaya which has teenagers aged 13 - 19 years is Madrasah Aliyah Negeri (MAN) Surabaya City with a total of 1,235 students in 2023. Researchers have conducted initial research on 30 students in class XI IPA 1 MAN Surabaya City to find out about the types of food that students prefer. Based on the results of the questionnaire, it was found that 21 students (70%) with an age range of 17 - 19 years preferred to consume fast food because it was simple, practical, served quickly, and did not like vegetables or fruit, while 9 students (30%) choose to consume complete foods because they have more flavor variations, are healthier, cheaper and more filling. Apart from that, parents' habits also really support students in consuming complete and healthy meals. These results indicate that the nutritional intake of Madrasah Aliyah Negeri (MAN) Surabaya City students is still lacking because students are more dominantly interested in fast food, even though the cholesterol content in fast food reaches 151.4 mg, salt 4,580 mg, and saturated fat 16.2 gr⁽²⁾.

And the health impacts of consuming fast food too frequently among teenagers include increasing the risk of several diseases, such as obesity, increasing the risk factor for high blood pressure (Hypertension), increasing the risk factor for diabetes, increasing the risk factor for cancer, increasing the risk factor heart disease and increases risk factors for stroke.

According to several experts, nutritional intake in adolescents is influenced by several determinants, including physical activity, knowledge about nutrients and the intensity of fast food consumption. Physical activity is any body movement triggered by skeletal

muscle movements with the aim of increasing the burning of calories which are converted into energy. In general, physical activity is divided into three, namely light, moderate and heavy physical activity which includes activities at school, at home and at work⁽³⁾.

Furthermore, the second determinant that influences adolescent nutritional intake is knowledge about nutrients. Knowledge about nutrition in teenagers is often wrong because teenagers think that a slim body is a dream, especially for teenage girls, so that in order to keep their bodies slim, the majority of teenage girls apply the wrong food restriction settings, such as only eating once a day or eating as little as possible without rice, which results in inadequate nutritional needs, unfulfilled and encourage nutritional disorders⁽²⁾.

Apart from physical activity and knowledge of food nutrition, it turns out another determinant was found that influences teenagers' nutritional intake, namely the intensity of fast food consumption. Consuming fast food has become a lifestyle for Indonesian people, especially teenagers. Fast food often refers to food in the United States that contains fries, burgers and soft drinks⁽⁴⁾. Fast food is food that has no nutrition and nutritional value for the body. Consuming fast food is a wasteful activity and can damage your health.

Students' liking for fast food certainly causes students' nutritional needs to be inadequately met. Conditions like this are triggered by the rise of fast food restaurants among teenagers, excessive promotion on social media about the existence of fast food, and the tastier taste of fast food which certainly attracts teenagers to consume fast food more often than healthy food⁽⁵⁾. This is supported by research conducted by Indahwati, Muftiana and Purwaningrum (2017) where the research results show that teenagers are easily influenced by the times such as fashion and trends that are developing in society, especially in terms of modern food. Teenagers tend to choose the food they like, namely fast food. The passion for fast food is because it does not require a long processing time, is easy to obtain and the price is cheap and affordable, so many teenagers prefer to consume fast food compared to other foods⁽⁶⁾.

The hypothesis in this research is that there is an influence of physical activity, knowledge about nutrients and the intensity of fast food consumption on nutritional intake in adolescents at Madrasah Aliyah Negeri (MAN) Surabaya City.

2. METHODS

The research design in this study uses a quantitative type of research with a cross sectional research design with several variables, including physical activity, knowledge about nutrients, intensity of fast food consumption and nutrient intake in adolescents. This research will prove the truth of the relationship between the independent variables (physical activity, knowledge about nutrients, and intensity of fast food consumption) on the dependent variable (nutrient intake in adolescents). The population referred to in this research is class XI students at Madrasah Aliyah Negeri (MAN) Surabaya City with a population of 384 students. In determining the sample, researchers used the Slovin Formula with a confidence level of 5%. The sampling technique in this research uses a probability sampling technique, namely a sampling technique that provides an equal opportunity for each element (member) of the population to be selected as a sample member. The probability technique used in this research is simple random sampling. Simple random sampling is a simple sampling technique because the sampling of sample members from the population is

carried out randomly without paying attention to the strata in the population⁽⁷⁾.

The data in this research was collected through the use of a questionnaire. The research data that has been obtained will be managed using several procedures, including descriptive statistical analysis, validity, reliability, normality and homogeneity tests as well as the chi square test, multiple linear regression test and T test. Research Ethics in This research uses an informed consent form, anonymity and confidentiality. This research has been approved by the health research ethics commission of the Indonesian STRADA Institute of Health Sciences with number 000665/EC/KEPK/I/12/2023.

3. RESULTS

Multiple linear regression analysis aims to determine the influence of the independent variables, namely physical activity (X1), nutritional knowledge (X2), consumption intensity (X3) on the dependent variable, namely nutritional intake in adolescents (Y). Regression testing results are as follows (Table 1):

Table 1. Results of Multiple Linear Regression Analysis

Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	0.426	0.160		2.668	0.008
	X1_Aktivitas_Fisik	0.286	0.059	0.298	4.841	0.000
	X2_Pengetahuan_Gizi	0.387	0.065	0.416	5.941	0.000
	X3_Intensitas_Konsumsi	0.002	0.057	0.003	0.041	0.968

The form of the regression equation is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

$$Y = 0.426 + 0.286 X_1 + 0.387 X_2 + 0.002 X_3 + 0.160$$

A constant of 0.426 means that if physical activity (X1), nutritional knowledge (X2), consumption intensity (X3) is 0, then the nutritional intake in adolescents (Y) is 0.426. The regression coefficient for the physical activity variable (X1) is 0.286; This means that if the value of other independent variables continues to decrease by unit, then nutritional intake in adolescents (Y) will decrease by 0.286. A positive coefficient means that there is a positive influence on nutritional intake in adolescents. The regression coefficient for the nutritional knowledge variable (X2) is 0.387; This means that if the value of other independent variables continues to decrease by unit, then nutritional intake in adolescents (Y) will decrease by 0.387. A positive coefficient means

that there is a positive influence on nutritional intake in adolescents. The regression coefficient for the consumption intensity variable (X3) is 0.002; This means that if the value of other independent variables continues to decrease by unit, then nutritional intake in adolescents (Y) will decrease by 0.002. A positive coefficient means that there is a positive influence on nutritional intake in adolescents. The standard error value is to minimize errors that occur so that the e value here is 0.160.

The effect of physical activity on nutritional intake has a regression coefficient value of 0.286 and a significance value (Sig.) of 0.000 in the coefficient table with a significant degree value of 0.05, meaning a sig value of $0.000 < 0.05$ or there is a significant influence and the t test shows a calculated t value of 4.841 with a value t table 1.9723, meaning the calculated t value is $4.841 > t$

table 1.9723. From these values, it can be seen that physical activity has a positive and significant effect on nutritional intake. The influence of knowledge about nutrients on nutritional intake has a regression coefficient value of 0.387 and a significance value (Sig.) of 0.000 in the coefficient table with a significant degree value of 0.05, meaning a sig value of $0.000 < 0.05$ or there is a significant influence and the t test shows a calculated t value of 5.941 with a t table value of 1.9723, meaning the calculated t value is $5.941 > t$ table 1.9723. From these values, it can be seen that knowledge about nutrients has

a positive and significant effect on nutritional intake. The influence of the intensity of fast food consumption on nutritional intake has a regression coefficient value of 0.002 and a significance value (Sig.) of 0.968 in the coefficient table with a significant degree value of 0.05, meaning the sig value is $0.968 > 0.05$ or there is a significant influence and the t test shows a calculated t value of 0.041 with a t table value of 1.9723, meaning the calculated t value is $0.041 < t$ table 1.9723. From these values, it can be seen that the intensity of fast food consumption has no effect on nutritional intake.

Table 2. T Test Calculation Results

Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	0.426	0.160		2.668	0.008
X1_Physical_Activity	0.286	0.059	0.298	4.841	0.000
X2_Knowledge_Nutrition	0.387	0.065	0.416	5.941	0.000
X3_Consumption_ Intensity	0.002	0.057	0.003	0.041	0.968

Based on the results above, it can be seen that the variables that have an influence on nutritional intake are physical activity and knowledge about nutrients. Because both have the same significance value, to determine which factor most influences nutritional

intake, look at the regression coefficient and t-count values obtained. So, it was concluded that the factor that most influences nutritional intake is knowledge about nutrients with a regression coefficient value of 0.387 and a t count of 5.941.

Table 3. F Test Calculation Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.301	3	6.434	30.993	0.000 ^b
	Residual	39.857	192	0.208		
	Total	59.158	195			

Based on the table above, the results of the F statistical test show that the calculated F statistical value is 30,993 and the significance value is 0.000, where this result shows that the hypothesis is accepted, which can

be concluded that physical activity, nutritional knowledge and consumption intensity on nutritional intake in adolescents are simultaneously influential.

Table 4. Determination Test Calculation Results

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.571 ^a	0.326	0.316	0.45562

a: Predictors: (Constant), X3_Consumption_ Intensity, X1_Physical_Activity, X2_Nutritional_Knowledge; b: Dependent Variable: Y_Nutritional_Intake

Based on the table above, the R2 (R Square) figure is 0.326 or (32.6%). This shows that the percentage contribution of the influence of the independent variables consisting of physical activity, nutritional knowledge and intensity of fast food consumption to the

dependent variable of nutritional intake in adolescents is 32.6%. Or variations in the independent variables consisting of physical activity, nutritional knowledge and consumption intensity were able to explain 32.6% of the dependent variable of nutritional intake in

adolescents. Meanwhile, the remaining 67.4% is influenced or explained by other variables not included in this research model.

Standard Error of the Estimate is a measure of the number of errors in the regression model in predicting the Y value. From the regression results, the value obtained is 0.45562, this means that the number of errors in predicting Nutrient Intake is 0.45562. As a guideline, if the standard error of the estimate is less than the standard deviation of Y, then the regression model is better at predicting the Y value.

4. DISCUSSION

The research results show that physical activity has a positive and significant effect on nutritional intake. These results are in line with research conducted by Ermona & Wirjatmadi which found a significant relationship between physical activity and nutrient intake and nutritional status in school-aged children⁽⁸⁾. Likewise, Widayantari et al. also found a relationship between physical activity, diet and family income with the incidence of obesity in elementary school children⁽⁹⁾. Furthermore, Nabawiyah et al. found a relationship between eating patterns, physical activity, and sleep quality with nutritional status in female students⁽¹⁰⁾.

Additionally, a study by Ariani & Af revealed a significant relationship between physical activity and body mass index (BMI) in elementary school students, highlighting the impact of physical activity on body weight⁽¹¹⁾. In addition, Noviasty & Susanti emphasize the influence of nutritional knowledge and food choices on a person's nutritional status, which further underlines the importance of eating habits⁽¹²⁾.

On the other hand, it did not find a significant relationship between diet and nutritional status, but found a significant relationship between physical activity and nutritional status in elementary school children. This shows that although diet does not always correlate directly with nutritional status, physical activity consistently plays an important role in determining nutritional status⁽¹³⁾.

Changing lifestyles have also led to changes in diets that are high in calories, fat and cholesterol, which unfortunately are not balanced with physical activity, which will lead to more nutritional problems. A diet high in calories, fat and cholesterol must be balanced with physical activity to ensure balanced nutritional intake. Children's activeness in physical activity will

affect their body mass index so that it will have an impact on reducing the risk of over-nutrition problems. This is because there is a balance between the intake eaten and the intake excreted. The benefit of this physical activity is that it can reduce body fat mass and increase muscle strength so that it can prevent excessive fat accumulation in the body⁽⁸⁾.

Physical activity is any body movement triggered by skeletal muscle movement with the aim of increasing the burning of calories which are converted into energy. In general, physical activity is divided into three, namely light, moderate and heavy physical activity which includes activities at school, at home and at work⁽³⁾. Physical activity is a daily activity carried out for 7 days and is calculated using the duration of minutes. According to the research results, the categorization of physical activity is that if you do <45 minutes/day it is classified as moderate to heavy activity, and if you do physical activity for ≥ 45 minutes/day it is classified as high physical activity (Ermona and Wirjatmadi, 2018). Physical activity can be measured with the International Physical Activity Questionnaire (IPAQ) instrument which can be used to measure the physical activity of a community⁽¹⁴⁾.

This study was dominated by the low level of physical activity carried out by respondents. This is because the majority of respondents carry out physical activities organized by the school once a week, namely during sports lessons. Respondents used break time to buy snacks available inside and outside the school. Apart from that, they spend their break time chatting with their friends in class. Outside of school hours, most respondents spend their time watching television, playing games or studying. This is in line with research which states that the increase in the prevalence of obesity in school children is caused, among other things, by the fact that children are more likely to spend their free time watching television and other activities that do not expend energy. This is what causes their physical activity to be relatively low, which has an impact on the balance of food intake they consume⁽¹⁵⁾.

The research results also show that knowledge about nutrients has a positive and significant effect on nutritional intake. Knowledge is the result of "knowing" and this occurs after people sense a particular object. Sensing through the five senses, namely sight, hearing, smell, taste and touch. Most human knowledge is acquired through the eyes and ears. Knowledge or cognitive is dominant which is very important for the

formation of a person's actions (overt behavior). Nutritional knowledge is what is known about food in relation to optimal health. Nutritional knowledge includes knowledge about selecting and consuming daily food properly and providing all the nutrients needed for normal body function. The selection and consumption of food ingredients affects a person's nutritional status. Good nutritional status or optimal nutritional status occurs when the body gets enough nutrients that the body needs. Malnutrition status occurs when the body experiences a deficiency of one or more essential nutrients. Meanwhile, nutritional status occurs when the body obtains nutrients in excessive amounts, causing harmful effects⁽¹⁶⁾.

Adolescents' knowledge about nutrition is often mistaken due to the perception of a slim body as a dream, especially for female adolescents. This results in inappropriate food restriction practices, such as only eating once a day or no rice, causing malnutrition and health problems⁽⁵⁾. Veronika AP et al (2021) also stated that low nutritional knowledge influences teenagers' attitudes and behavior towards a balanced diet. Increasing nutritional knowledge is positively related to adolescent food choices and healthy eating behavior.

Low nutritional knowledge will have an impact on teenagers' attitudes and behavior regarding balanced nutrition and a person's ability to apply nutritional information in everyday life. Increasing nutritional knowledge will correlate with adolescent attitudes and behavior. Nutritional knowledge influences the choice of food types. Increased knowledge regarding nutritional guidelines is positively correlated with healthy eating behavior⁽¹⁷⁾.

This knowledge can be obtained through any media such as social media, social media can make it easier for teenagers to get information about good and correct nutritional knowledge. Balanced nutrition for teenagers is a daily diet that contains nutrients in types and quantities that suit the body's needs, taking into account the principles of food diversity or variety, physical activity, cleanliness and ideal body weight (BB).

Nutritional knowledge is related to nutritional status. Low physical activity and lack of knowledge about nutrition are factors that contribute to nutritional problems⁽¹⁸⁾. There is a relationship between knowledge of nutrition and food with nutritional status. There is a relationship between nutritional knowledge and energy intake, nutritional status, and attitudes about students' nutrition⁽¹⁹⁾.

The research results also show that the intensity of fast food consumption does not have a positive and significant effect on nutritional intake. Adolescents' liking for fast food results in nutritional deficiencies because this food is high in calories, fat, protein and salt, but low in fiber⁽⁵⁾. This phenomenon is triggered by the rise of fast food restaurants, excessive promotion on social media, and the attractiveness of the taste of the food. Although originally designed for convenience, excessive consumption of fast food can cause health problems such as obesity, cancer, high blood pressure, and diabetes. Even though they know the negative impacts, many teenagers still consume fast food because it is influenced by their social lifestyle and the desire to socialize with peers.

Fast food consumption is positively associated with overweight and obesity due to the very high energy density of these foods. Additionally, a study found a significant relationship between BMI and fast food consumption. Two commonly eaten fast foods such as fried foods and hotdogs have been linked to the risk of obesity and weight gain. Moreover, fast food consumption is linked to general obesity in adolescent girls. Additionally, obesity/overweight was significantly associated with frequency of fast food consumption⁽²⁰⁾.

Hasil ini sejalan dengan berbagai penelitian yang menunjukkan bahwa pola konsumsi fast food yang tinggi dapat berkontribusi pada masalah gizi lebih, terutama obesitas pada⁽²¹⁾. Research by Sativa et al. (2020) shows that there is a positive correlation between consumption of sweet foods or drinks and nutritional status. Research from Vandyousefi examined the relationship between consumption of sweet foods and drinks and the prevalence of obesity in children (1-5 years). Data come from the 2014 Los Angeles County WIC Survey, which included 3707 mothers and their children (1-5 years). The results of this study show that lower levels of obesity occur if the intake of sweet foods and drinks is also low⁽²²⁾.

The percentage of calorie intake from fast food has increased fivefold over the past three decades among teenagers. Additionally, the prevalence of obesity is increasing dramatically worldwide. This is one of the most serious public health problems, especially in childhood and adolescence today. Fast food consumption is experiencing an increasing trend due to convenience, cost, menu choices and taste. About 30% of children and more than 50% of teenagers consume fast food every day. Additionally, more than 33% of adults

and 17% of children and adolescents are obese in the United States. Increased food consumption and substantial changes in eating habits are the most important factors in the obesity epidemic besides poor diet among young people in recent years.

Based on the regression coefficient and t values, it was found that the factor that most influences nutritional intake is knowledge about nutrients. This is because knowledge about nutrients will influence food consumption or the choice of foods that are nutritious or not in fulfilling the body's nutritional needs. The nutritional knowledge obtained is then implemented into behavior and attitudes in consuming food which will have an impact on nutritional status. According to research conducted by Amellia, nutritional awareness family behavior (Kadarzi) influences the nutritional status of toddlers⁽²³⁾. People who already know about the amount, frequency, content, type, method of administration and benefits of nutrients will try to obtain food that contains the appropriate nutrients needed by their body. Prior knowledge influences nutrient consumption. Teenagers prefer foods with high sodium and fat content but low in vitamins and minerals. Snacks (calorie dense) and fast food are foods that many teenagers prefer compared to staple foods that are balanced and good for daily consumption. This causes the adolescent's body to not fulfill optimal nutritional needs. Apart from that, insufficient nutritional intake is also a factor causing the existence of a category of malnutrition status in adolescents. Consuming excess carbohydrates, fats and proteins causes students to have excessive nutritional status. Energy is obtained from food consumption by burning carbohydrates, proteins and fats which are then used for activities, therefore it is important to consume sufficient and balanced food. Energy is needed by the body to maintain life, support growth, and carry out physical activity⁽²⁴⁾.

5. CONCLUSION

There is an influence of physical activity and knowledge about nutrients on nutritional intake in adolescents at Madrasah Aliyah Negeri (MAN) Surabaya City. And there is no effect of the intensity of fast food consumption on nutritional intake in teenagers at Madrasah Aliyah Negeri (MAN) in Surabaya City. The factor that most influences nutritional intake is knowledge about nutrients.

Conflict of Interest

The authors declare no conflict of interest.

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