



The 1st Cirebon International Health Symposium: Faculty of Medicine, Universitas Swadaya Gunung Jati  
*Update on Non-Communicable Diseases: Global Perspective on Health Challenges and Innovation*

## The Influence of Body Image and Energy Intake on Nutritional Status in Adolescents at SMAN 1 Cirebon City, Indonesia

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DOI: [10.35898/ghmj-741090](https://doi.org/10.35898/ghmj-741090)

### ABSTRACT

**Background:** Adolescents are among the groups vulnerable to nutritional problems. These issues can arise due to restrictive diets, self-assessment (body image), lifestyle choices, energy intake, physical activity, and knowledge of balanced nutrition. According to the WHO (2018), the prevalence of overnutrition among adolescents aged 15–19 years has risen significantly from 4% to over 18%. The increase was observed in 18% of females and 19% of males.

**Aims:** This research aims to examine the correlation between body image, energy intake, and nutritional status among adolescents at SMAN 1 in Cirebon City.

**Methods:** A quantitative approach with a descriptive research design was employed in this study. The sampling technique used was purposive sampling. Primary data were collected through questionnaires, 24-hour food recall interviews, and measurements of body weight and height. Statistical analyses included univariate and multivariate analysis.

**Results:** The findings indicate that most adolescents had a negative body image (60.1%), good energy intake (44.0%), and normal nutritional status (70.2%). Data analysis using the Ordinal Logistic Regression test revealed that body image significantly affects nutritional status ( $p < 0.001$ ), and energy intake also significantly affects nutritional status ( $p < 0.001$ ).

**Conclusion:** This study concluded that body image and energy intake significantly influence the nutritional status of adolescents. Statistical analysis demonstrated that adolescents with a positive body image and good energy intake are more likely to have normal nutritional status.

**Keywords:** *Adolescents, Body image, Energy intake, Nutritional status.*

**Received:** 25 September 2024 **Reviewed:** 16 October 2024 **Revised:** 30 November 2024 **Accepted:** 12 December 2024.

## 1. Introduction

Nutritional status is a measure of a person's body shape, as seen from the food consumed and the use of nutrients in the body. Determination of nutritional status in a person can be done directly in the form of anthropometric, clinical, biochemical, and biophysical or indirectly in the form of food consumption surveys, vital statistics, and ecological factors (Winerungan et al. 2018). One of the indicators used to assess health status in adolescents is nutritional status. Nutritional status in adolescents occurs due to incorrect nutritional behavior, which is an imbalance between nutrient consumption and nutrient adequacy. Adolescents are one of the groups that are vulnerable to nutritional problems, and nutritional problems that occur in adolescents are malnutrition and overnutrition (Insani 2022).

Data from the World Health Organization in 2018 states that the prevalence of nutritional problems in adolescents aged 15-19 years has increased significantly from 4% to more than 18%, an increase that occurred in the female group as much as 18% and men 19% (WHO, 2018). In Indonesia, the prevalence of nutritional status in adolescents aged 16-18 years according to the 2018 Basic Health Research based on IMT / U is 1.4% in the very thin category, 6.7% are in the thin category, 78.3% have normal nutritional status, 9.5% are in the fat category, and 4.0% are in the obese category. The prevalence of adolescent nutritional status in West Java province ranks 22nd, which is relatively good normal nutritional status, especially in Cirebon City which has an excellent normal adolescent nutritional status category (Risksedas, 2018).

Adolescence is a period of very unique and continuous physical changes. These physical changes will make adolescents begin to occupy themselves and pay more attention to their body shape, which physical changes in adolescents are the most prominent problems that become one of the primary sources of problems in adolescents (Nurleli 2019). Nutritional problems in adolescents can be caused by restrictive diets, self-assessment (body image), lifestyle, energy intake, physical activity and knowledge of balanced nutrition (Ovita, Ade Nur, dkk, 2019).

The formation of self-concept in the form of body image is one of the changes in adolescents that can cause them to lack energy intake due to the wrong diet. This change is formed due to the body image the teenager has believed in, a perspective called negative body image, which happens because of comments and responses from people around the teenager. In the end, the teenager will withdraw and feel more comfortable being alone than hanging out with people around him. The changes that occur will disturb the teenager's psychological aspects and make their behavior change, where a person will try to lose weight due to dissatisfaction with his body. The problem will grow and can affect the lives of many adolescents. The problem will continue into adulthood if not appropriately addressed during adolescence (Nurleli 2019).

This problem will encourage adolescents to diet under the recommendations and will later have eating disorders. The strict diet carried out by adolescents will cause them to lose energy because the metabolism of nutrients is not correctly formed. This energy intake can affect development and growth in adolescents, if the energy intake needs are not met, they will impact the body's functional system. Meanwhile, if the energy intake is excessive, it will result in weight gain or even obesity if it is not balanced with physical activity as a step for energy expenditure. It means that these two things must be balanced in order to have no problems regarding nutritional status (Makhrajani 2018).

The problem of an adolescent's body image and energy intake can cause various kinds of health problems, especially changes in behavior regarding nutritional fulfillment. This behavioral change usually occurs in middle adolescents aged 15-18 who are still in high school. There are differences between the research to be conducted by researchers and other studies such as place, year of research, analytical tests used, and samples used. Not many studies have raised the effect of body image and energy intake on nutritional status. So, this research is very important and useful for adolescents, because with this, adolescents can solve body image and energy intake problems that occur in their teenage years. Based on this, this research will conduct a study entitled The Effect of Body Image and Energy Intake on Nutritional Status in Adolescents at SMAN 1 Cirebon City.

## 2. Methods

### ***Study design/ Research procedures***

This study was conducted at SMAN 1 Cirebon City from December 2023 - July 2024. This type of research is quantitative research with a descriptive research design. This study was conducted to determine the effect of body image and energy supply on nutritional status in adolescents at SMAN 1 Cirebon City. The population in the study was 11th-grade students. Based on calculations using the Slovin formula, 168 respondents were obtained. The sampling method used a purposive sampling technique, which had previously been selected following the predetermined inclusion criteria, specifically those who were willing to become respondents and be present at the time of the study.

### ***Measurements***

Researchers collect data using questionnaires about body image, 24-hour food recall interviews, and anthropometric measurements. In the first step, the researcher gathers prospective respondents in one place and then explains the research. Then, after the prospective respondent understands, the prospective respondent is asked for permission with Informed consent. If the prospective respondent agrees, informed consent and research brochures are left to ask for approval from the respondent's parents on the next day. After approval of the informed consent, the prospective respondent gets approval from the parents, and then the research data is collected directly.

### ***Statistical techniques***

The characteristics of respondents in this study were filling out questionnaires about body image, 24-hour food recall interviews, and anthropometric measurements according to predetermined criteria. Data were then analyzed using SPSS software using univariate analysis to determine frequency distribution and multivariate analysis for ordinal scale data with Logistic Regression test. The ordinal Logistic Regression test is used to see the dominant variable by analyzing the correlation between the response variable and the predictor variable, where the variable is ordinal scale, so this test is appropriate for this study because all variables are ordinal scale. Validity and reliability tests were not carried out, because the questionnaire used in this study has been tested, namely using the Body Shape Questionnaire (BSQ) 34. Resulted in the reflective indicators used in this study.

### ***Ethical Clearance***

The research was conducted in accordance with the research flow and was carried out after obtaining a research permit obtained after passing the thesis proposal examination. This study has been ethically approved by the Ethic Committee of Faculty of Medicine, Universitas Swadaya Gunung Jati, following the seven WHO standards, with number 86/EC/FKUGJ/VI/2024, on June 6th, 2024.

## 3. Results

This study was conducted at SMAN 1 Cirebon City with the number of respondents taken was 168 students using purposive sampling methods and respondents who participated in this study have met the inclusion and exclusion criteria that have been determined previously. The characteristics of respondents in this study are described based on age, gender, weight, height, and energy intake. The data used in this study were primary data obtained directly by researchers through questionnaires, 24-hour food recall interviews, and measurements of body weight and height.

### ***Respondent Characteristics***

Based on Table 1, The gender distribution obtained in this study showed that out of 168 respondents, 71 were male (42.3%) and 97 were female (57.7%). The ages of respondents ranged from 14-17 years; among the 168 respondents, 1 person (0.6%) was 14 years old, 21 people (12.5%) were 15 years old, 127 people (75.6%) were 16

years old, and 19 people (11.3%) were 17 years old. Body image measurements using the Body Shape Questionnaire (BSQ) indicated that, among the 168 respondents, 67 (39.9%) had a positive body image, and 101 (60.1%) had a negative body image. Based on energy intake measurements through 24-hour food recall interviews, it was found that of the 168 respondents, 51 (30.4%) had energy intake categorized as low, 74 (44.0%) as sufficient, and 43 (24.6%) as high. Measurements of body weight and height according to anthropometric standards based on BMI-for-age (BMI/U) revealed nutritional statuses as follows: very thin for 7 people (4.2%), thin for 12 people (7.1%), normal for 118 people (70.2%), overweight for 26 people (15.5%), and obese for 5 people (3.0%).

**Table 1.** Respondents Characteristics

Category	N	%
<b>Gender</b>		
Male	71	42.3
Female	97	57.7
<b>Age</b>		
14	1	0.6
15	21	12.5
16	127	75.6
17	19	11.3
<b>Body Image</b>		
Positive (score <110)	67	30.4
Negative (score ≥110)	101	60.1
<b>Energy Intake</b>		
Less (score ≤80%)	51	30.4
Good (score 81-110%)	74	44.0
More (score ≥110%)	43	24.6
<b>Nutritional Status</b>		
Very thin (<-3 SD)	7	4.2
Thin (-3 SD to <-2 SD)	12	7.1
Normal (-2 SD to +1 SD)	118	70.2
Fat (>+1 SD to 2 SD)	26	15.5
Obese (>2 SD)	5	3.0
<b>Total per Category</b>	<b>168</b>	<b>100.0</b>

**Multivariate Analysis**

Based on Table 2, multivariate analysis between body image and energy intake on nutritional status, it can be seen that after the Ordinal Logistic Regression test, the body image variable has a significance value of ( $p < 0.001$ ) which can be concluded that body image affects nutritional status. The energy intake variable has a significance value of ( $p < 0.001$ ), and it can be concluded that energy intake affects nutritional status.

**Table 2.** Multivariate Analysis of Body Image and Energy Intake on Nutritional Status

Variable	Coefficient	S.E.	Wald	Df	p value	OR	IK 95%	
							Min	Max
<b>Body Image</b>	0.366	0.161	3.767	1	0.000	0.25	0.14	1.01
<b>Energy Intake</b>	0.453	0.097	7.099	1	0.000	0.47	0.23	2.48
<b>Constant</b>	1.589	0.064	9.859	1	0.000	5.16		

**4. Discussion**

Based on the results of this study, the frequency distribution on gender and age found that the most significant gender was female and the frequency was between the ages 14 and 17 years. In this gender and age range, respondents are included in the middle adolescent phase. Where appearance becomes the most essential factor for adolescents, they try to increase attention to their body shape by doing something to improve their physical appearance. This finding is supported by the results of research conducted by Nurleli, which states that

dissatisfaction with body shape is more common in adolescents, especially females. The result is that mass media more easily influence adolescents (Nurleli 2019). Indonesia's rich and diverse culture had a significant influence on students' body image and eating habits. Beauty norms in Indonesia were often shaped by local culture, which emphasized certain body types. For example, in some cultures, a fuller body was considered more attractive and healthy, while in others, a slim body might have been more valued. The family, as the first social unit, played a role in teaching these values to children. Parents often instilled expectations of physical appearance that aligned with beauty standards prevalent in their society. In Javanese families, for instance, there was an emphasis on modesty and proper appearance as part of cultural identity. This influenced how students viewed their bodies and how they tried to meet those expectations. (Rochayanti, Pujiastuti, and Warsiki 2012)

#### **Body Image of adolescents of Grade 11 SMAN 1 Cirebon City**

Based on the study results, it can be seen that most respondents have a negative body image, namely 101 people (60.1%), while respondents with a positive body image are 67 people (39.9%). This means that almost all adolescents feel dissatisfied with their appearance, especially regarding their body image. These teenagers think that they are fatter/thinner than they really are. A teenager wants an ideal body shape and looks attractive when looking, but in reality they feel dissatisfied with the shape and size of their body. This finding aligns with the results of research conducted by Ni Nyoman Ayu and Wigutomo in 2021, which showed that adolescents were dissatisfied with the shape and size of their bodies (Astini and Gozali 2021).

Body image is a person's image of their body shape and size. Knowledge about adolescent body image perceptions is still inaccurate, which causes changes in behavior in adolescents. They consider having a body shape that looks fatter/thinner but has an ideal body shape. This aligns with the results of research conducted by Nurleli in 2019, which found that many adolescents have the wrong perception of body image (Nurleli 2019). Everyone has an assessment of the shape and size of their respective bodies, the desire to have an ideal body is a very desirable matter. Teenagers are susceptible to their appearance, and it is not uncommon for them to constantly reflect on their body shapes and sizes, their faces, and whether other people like them, especially when someone compares their body condition. This is one of the main reasons teenagers lose confidence (Astini and Gozali 2021). Adolescents with a positive body image apparently would act positively without being affected by their body shape. Positive body image can encourage a person to behave healthily by exercising habits, having positive personal experiences, and having stable mental and emotional conditions, which will give a better perception. A negative body image will encourage a person to do things that can harm themselves by dieting strictly. In addition, body image dissatisfaction can encourage a person to consume drugs that are not balanced with exercise and consumption of unhealthy foods that can cause damage to the liver and kidneys (Siregar 2023).

#### **Energy Intake of adolescents of Grade 11 SMAN 1 Cirebon City**

Based on the study's results, it can be seen that most respondents have good energy intake, namely 74 people (44.0%). However, some have less energy intake as many as 51 people (30.4%) and more energy intake as many as 43 people (24.6%). This finding aligns with research conducted by Richard Winerungan, et al. in 2019, which showed that most respondents had good energy intake. Energy can be obtained from metabolizing nutrients such as carbohydrates, fats, and proteins. Energy can be obtained from foods that contain macronutrients, which are then processed in the body. Nutrients in food will fulfill energy needs in the body (Winerungan et al. 2018).

Parents should pay attention to their children's food intake, not only to nutritional value, but also the difficulty for body to digest. The total amount of nutrients needed also depends on the quality of the food, the ability to absorb, and the use of nutrients by the body, which is influenced by the composition and condition of the food as a whole (Winerungan et al. 2018). Adolescents' requirements for energy and other nutrients vary widely, even when factors such as weight, height, gender, age and other factors are considered. This energy intake can affect development and growth in adolescents. Lack of energy will make the body experience a negative balance. As a result, the body weight will be reduced from the weight that should be. Meanwhile, excess energy will be converted into body fat, resulting in excess weight. The imbalance of nutrient intake in adolescents is the basis for the emergence of nutritional status problems (Siregar 2021).

**Nutritional status of adolescents of Grade 11 SMAN 1 Cirebon City**

Based on the study's results, it can be seen that most respondents have normal nutritional status as many as 118 people (70.2%). In addition, some respondents had a fragile nutritional status of 7 people (4.2%), thin as many as 12 people (7.1%), fat as many as 26 people (15.5%), and obese as many as 5 people (3.0%). This is in line with research conducted by Wulan Nur Insani in 2022, which showed that most respondents had normal nutritional status (Insani 2022). Nutritional status results from a balance between food intake and nutrient absorption. Inaccurate intake of nutrients will affect a person's nutritional status. The nutritional intake needs of each individual are different, depending on age, gender, weight, height, physical activity, and others (Siregar 2021). A good nutritional status will contribute to health, while nutritional problems can cause several negative impacts that a person's eating behavior can influence. Nutritional problems that occur in adolescents are malnutrition and overnutrition. Malnutrition occurs due to insufficient consumption of nutrients and energy that cannot meet the body's needs. Meanwhile, overnutrition is caused by food intake exceeding the body's daily needs (Ovita, Ade Nur, dkk, 2019).

**Effect of body image on adolescent nutritional status**

The study results show that most respondents have normal nutritional status, 118 respondents (70.2%), and negative body image, namely 101 respondents (60.1%). The results of the analysis test using the ordinal logistic regression test obtained a significance value of  $p < 0.001$ , so it can be concluded that body image affects the nutritional status of adolescents. This is in line with research conducted by Nurleli in 2019 (Nurleli 2019) and Salsabila Siregar in 2023 (Siregar, 2023), which states that there is an influence between body image assessment and nutritional status. This study states that adolescents have a normal nutritional status and a negative body image. This means that many adolescents still have a wrong perception of body image. They may feel they have a fat/thin body shape and a normal nutritional status. This is in line with research conducted by Wulan Nur Insani in 2022, which shows that these adolescents have an ideal body shape but tend to judge their body shape as larger than their actual body shape. The age factor that adolescents have is also easily influenced by today's mass media, which causes adolescents to constantly feel dissatisfied with their body shape and size (Insani 2022). The formation of self-concept in the form of body image in adolescents causes most adolescents to lack food intake due to the wrong diet and causes adolescents to be disrupted in their eating patterns, low self-esteem, depression, anxiety, and various other emotional disorders (Siregar 2023).

**Effect of energy intake on adolescent nutritional status**

The results showed that most respondents had normal nutritional status, 118 respondents (70.2%) and good energy intake, 74 respondents (44.0%). The results of the analysis test using the ordinal logistic regression test obtained a significance value of  $p < 0.001$ , so it can be concluded that energy intake affects the nutritional status of adolescents. This is in line with research conducted by Richard Winerungan, et al. in 2018 (Winerungan et al. 2018) and Lia Amirta Siregar in 2021 (Siregar, 2021), which states that there is an influence between energy intake assessment on nutritional status.

Everyone is advised to consume sufficient foods in energy content so that they can carry out activities. A well-chosen daily diet will provide all the nutrients the body needs to function normally. Nutrients provide energy, help the growth process, and maintain body condition (Winerungan et al. 2018). The imbalance of nutrient intake in adolescents is the basic problem of nutritional status in adolescents. If adolescents consume foods with sufficient energy for their needs, there is no energy storage in the body. In contrast, if adolescents consume more energy than their body needs, it will be stored as energy reserves, and if adolescents lack energy, it can cause a negative energy balance. The energy consumption category is consuming food during the last 24 hours, then converted into energy or nutritional adequacy per day for each individual (Siregar 2021).

Physical activity levels significantly impacted energy intake among adolescents. The higher the level of physical activity performed, the greater the energy needs. Intensive or heavy physical activity increased calorie expenditure, thus requiring a higher energy intake to support such activities. Adolescents with low energy intake tended to be unable to meet their daily caloric needs, especially if they were physically active. This could lead the

body to break down fat reserves to meet energy demands, potentially resulting in weight loss. Adolescents with low physical activity levels often experienced nutritional issues, including obesity, due to an imbalance between calorie intake and energy expenditure. Physically inactive adolescents had a higher risk of becoming obese. Research showed that obese adolescents spent more time engaging in light activities and less in moderate or intense activities. When energy intake was high but not balanced by adequate physical activity, it could lead to excess weight gain (Islami, Yanti, and Hariati 2023).

### Limitations of the research

In the process of collecting data and working on it, researchers faced several obstacles which became one of the limitations that still needed to be improved in further research. Limitations in this study are caused by several factors including many factors that can affect nutritional status, but were not studied such as physical activity, infectious diseases, nutritional knowledge, mass media, sleep quality, economic factors, and stress conditions and this study was conducted for 1 day to collect data, due to the limited time given by the school.

The results of this study were expected to serve as baseline data that could be further developed into better research. Other researchers could choose schools located in intermediate areas, as the food consumed there is more diverse, and to achieve more comprehensive results. Additionally, they could explore the cause-and-effect relationships of each variable, making the focus clearer and providing a deeper understanding of the factors that could influence nutritional status in adolescents.

## 5. Conclusion

This study concludes that there is an influence between body image and energy intake on adolescent nutritional status. The results of this study can be applied in every school and health service, such as health centers, as a preventive and promotive development effort. This research can also be used as a reference for further research and can be developed into further research by completing the cause-and-effect relationship of each variable so that it is more focused and can find out more factors that can affect nutritional status in adolescents.

### Conflict of Interest

The authors declare no conflicts of interest for the results.

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**Cite this article as:**

Kurniasih, F. G., Wahidin, M. D. S., & Fachrudin, D. (2024). The Influence of Body Image and Energy Intake on Nutritional Status in Adolescents at SMAN 1 Cirebon City, Indonesia. *GHMJ (Global Health Management Journal)*, 7(4), 271–278. <https://doi.org/10.35898/ghmj-741090>