

# Association of Body Image, Eating Behavior, and Physical Activity among Adolescents with Wasting

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## Abstract

**Background:** Wasting remains a significant public health problem among adolescents, particularly in developing countries, including Indonesia, where its prevalence is still relatively high. This condition can interfere with adolescent growth and development. **Objective:** This study aimed to analyze factors associated with the degree of wasting among adolescents, particularly body image, eating behavior, and physical activity. **Method:** This study employed a quantitative analytic cross-sectional design among adolescents at *SMPN 15 Pekanbaru*. The sample consisted of 48 adolescents with wasting, selected using a total sampling technique. Data were collected through anthropometric measurements and standardized questionnaires (BSQ, DEBQ, and PAQ-A) and analyzed using the Chi-square test. **Result:** Most respondents were 14 years old with a balanced gender distribution, and the majority experienced moderate wasting. Most had low body image, positive eating behavior, and light physical activity. The main findings indicated no significant relationships between body image ( $p = 1.00$ ), eating behavior ( $p = 0.44$ ), and physical activity ( $p = 1.00$ ) and the degree of wasting. **Conclusion:** Body image, eating behavior, and physical activity were not significantly associated with the degree of wasting among adolescents. **Recommendation:** Wasting among adolescents may be influenced by factors beyond body image, eating behavior, and physical activity.

**Keywords:** Adolescents, Body Image, Eating Behavior, Physical Activity, Wasting

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## INTRODUCTION

Adolescence is a critical stage of human development characterized by rapid physical, psychological, and social changes that require adequate nutrition and healthy lifestyle behaviors. However, modern lifestyles have influenced adolescents' habits, including increased consumption of fast food, unhealthy eating patterns, and reduced physical activity, which increase the risk of nutritional problems (1). Adolescents aged 10-19 years represent a large population group that plays an important role in future human resource development (2).

Wasting is one form of acute malnutrition characterized by low weight-for-height according to WHO growth standards (3). Globally, about 45 million children and adolescents experience wasting, with the highest prevalence reported in South Asia and Sub-Saharan Africa (4). In Indonesia, the prevalence of wasting among adolescents reached 7.6%, while in Riau Province it was recorded at 7.9% (5). These findings indicate that wasting remains a public health concern that requires further attention.

Several factors may influence adolescents' nutritional status, including body image, eating behavior, and physical activity. Negative body image and unhealthy eating behavior may lead to energy deficiency and weight loss, while low physical activity may disrupt energy balance and affect nutritional status (6).

Previous studies by Zuharna, Purnama, and Az-Zahra et al. have shown that body image, eating behavior, and physical activity are associated with adolescent nutritional status (7-9). However, these variables have mostly been examined separately and have not specifically focused on the degree of wasting. There is still limited research that simultaneously analyzes these factors in relation to the degree of wasting, particularly among adolescents in Indonesia.

In addition, based on data from the *Pekanbaru* Health Office and local health centers, SMPN 15 *Pekanbaru* has a relatively high prevalence of wasting compared to other schools. This condition highlights the urgency of conducting further research to explore the factors associated with wasting among adolescents in this area. Therefore, this study

aims to analyze factors associated with the degree of wasting among adolescents, particularly body image, eating behavior, and physical activity.

## OBJECTIVE

The objective of this study is to analyze factors associated with the degree of wasting among adolescents at SMPN 15 Pekanbaru, including body image, eating behavior, and physical activity

## METHODS

### Design

This study used a quantitative analytic observational design with a cross-sectional approach. The independent and dependent variables were measured at the same time to identify factors associated with wasting among adolescents.

### Sample size and sampling technique

The population of this study consisted of adolescents at SMPN 15 Pekanbaru. The sample included adolescents who met the inclusion criteria and were identified as wasting based on weight-for-height Z-score  $< -2$  SD. A total sampling technique was applied, in which all eligible adolescents were included, resulting in 48 respondents participating in the study.

The relatively small sample size may have limited the statistical power to detect significant associations. However, cross-sectional studies are commonly used to describe population characteristics and examine relationships at a single point in time (28). The adequacy of sample size in such studies depends on several factors, including study objectives and population characteristics (29). Therefore, the findings of this study should be interpreted with caution, although the study remains appropriate for exploratory analysis (12).

The inclusion criteria were adolescents with wasting based on weight-for-height Z-score  $< -2$  SD, while the exclusion was applied to minimize potential confounding factors that may influence nutritional status independently of the studied variables.

### Data collection process

The instrument has been tested for validity and reliability, showing acceptable internal consistency. Body image was measured using the Body Shape Questionnaire (BSQ), which consists of 33 items covering several aspects of body perception, including appearance evaluation, appearance orientation, body areas satisfaction, overweight preoccupation, and self-classified weight. The BSQ has been tested for validity and reliability, with a Cronbach's alpha value of >0.693, indicating good internal consistency. Responses were measured using a Likert scale ranging from "strongly disagree" to "strongly agree" (1-4). The total score was obtained by summing all items, where a higher score indicates a higher level of body dissatisfaction.

The instrument has demonstrated good validity and reliability in previous studies. Eating behavior was measured using the Dutch Eating Behavior Questionnaire (DEBQ), which consists of 16 questions covering three aspects: restrained eating, emotional eating, and external eating. This instrument has been validated and has good reliability with a Cronbach's alpha value >0.843. The questionnaire uses a Likert scale, and the total score is obtained by summing all responses, where a higher score indicates a stronger tendency toward the eating behavior.

Physical activity was measured using the Physical Activity Questionnaire for Adolescents (PAQ-A), which consists of 9 questions assessing physical activity during leisure time, at school, on weekends, and over the past seven days. The PAQ-A has been proven to be valid and reliable with a Cronbach's alpha value >0.78. Scoring uses a 5-point scale, where a higher score indicates a higher level of physical activity.

The degree of wasting is determined through anthropometric measurements using digital scales to measure body weight and a microtoise to measure height. Nutritional

status is assessed based on the weight-for-height Z-score (WHZ), where a Z-score of < -2 SD is classified as wasting.

### Data analysis

Data were analyzed using the Chi-square test to examine the relationship between body image, eating behavior, physical activity, and the degree of wasting among adolescents. The Chi-square test was used because all variables were categorical. Univariate analysis was used to describe the characteristics of respondents using frequency distributions and percentages. Bivariate analysis was conducted using the Chi-Square test to determine the relationship between body image, eating behavior, physical activity, and the level of wasting, because all the variables studied were categorical. Therefore, the chi-square test was considered appropriate to assess the association between independent and dependent categorical variables.

### Ethical consideration

This study received ethical approval from the Ethics Committee of Hang Tuah University Pekanbaru (024/KEPK/UHTP/XII/2025). Informed consent was obtained from all respondents before data collection.

## RESULTS

The average age of respondents was 14.17 years, ranging from 13 to 15 years. The distribution of respondents based on gender showed an equal number of males and females, with 24 participants (50%) each. The average height of respondents was 156.31 cm (range 137-172 cm), The average weight was 37.72 kg (range 26.30-46.30 kg). Most respondents had no history of illness.

The characteristics of respondents are presented in Table 1.

**Table 1. Characteristics of Respondents**

No	Variable	Mean	Median	Standard deviation	Minimum	Maximum
1	Age (years)	14.17	14	0.66	13	15
2	Body weight (kg)	37.72	37.8	4.40	26.30	46.30
3	Height (cm)	156.31	157	8.46	137	172

**Table 2. Distribution of Respondent Characteristics**

No	Variable	Category	Frequency	%
1	Gender	Male	24	50%
		Female	24	50%
2	Degree of Wasting	Moderate Wasting	43	89.6%
		Severe Wasting	5	10.4%
		<b>Total</b>	48	100%

The distribution of respondents based on gender was equal, with 24 males and 24 females (50% each). The majority of

respondents experienced moderate wasting (89.6%), while 10.4% experienced severe wasting.

**Table 3. Distribution of Study Variables**

No	Variable	Category	Frequency	%
1.	Body Image	High	1	2.1%
		Low	47	97.9%
		<b>Total</b>	48	100%
2.	Eating Behavior	Negative	5	10.4%
		Adequate	43	89.6%
		<b>Total</b>	48	100%
3.	Physical Activity	Light	46	95.8%
		Heavy	2	4.2%
		<b>Total</b>	48	100%

The distribution of study variables is presented in Table 3. Most respondents had low body image (97.9%), while only 2.1% had high body image. The majority of respondents had adequate eating behavior (89.6%), whereas 10.4% had negative eating behavior. In terms of physical activity, most respondents had light physical activity (95.8%), while only 4.2% had heavy physical activity.

Table 4 shows the distribution of respondents based on body image, eating behavior, and physical activity across the degree of wasting. Most respondents with low body image experienced moderate wasting. Similarly, respondents with adequate eating behavior and light physical activity were predominantly classified as having moderate wasting.

The results of the Chi-square test showed that there was no significant relationship between body image ( $p = 1.00$ ), eating

behavior ( $p = 0.44$ ), and physical activity ( $p = 1.00$ ) with the degree of wasting. Although respondents with negative eating behavior had a higher risk (PR = 2.44; 95% CI: 0.21-27.43), this association was not statistically significant. These findings indicate that the studied variables were not significant determinants of wasting in this population.

## DISCUSSION

The majority of respondents were 14 years old with a balanced gender distribution. Most adolescents experienced moderate wasting. In terms of study variables, most respondents had low body image, positive eating behavior, and light physical activity. These findings indicate that respondents had relatively similar characteristics, which may influence the variability of the data.

This study found that body image, eating behavior, and physical activity were not significantly associated with the degree of wasting among adolescents. These findings suggest that these variables may not be the primary determinants of wasting in this population. The absence of significant associations may be influenced by several factors. First, the relatively small sample size may have limited the statistical power of the

study. Second, the homogeneity of respondents, particularly the dominance of moderate wasting and light physical activity, may have reduced data variation. Additionally, wasting is an acute condition that is more directly influenced by short-term factors such as dietary intake, recent illness, and infection rather than behavioral or psychological factors alone.

**Table 4. The Association Between Body Image, Eating Behavior, Physical Activity, and Wasting Among Adolescents**

No	Variable	Category	Moderate [n (%)]	Severe [n (%)]	Total (N=48)	PR (95% CI)	p-value
1.	Body Image	Low	42 (89.4)	5 (10.6)	47	n.a	1.00
		High	1 (100)	0 (0)	1		
2.	Eating Behavior	Negative	4 (80)	1 (20)	5	2.44 (0.21-27.43)	0.44
		Adequate	39 (90.7)	4 (9.3)	43	reff.	
3.	Physical Activity	Light	41 (89.1)	5 (10.9)	46	n.a	1.00
		Heavy	2 (100)	0 (0)	2		

Previous studies have reported inconsistent findings regarding the relationship between behavioral factors and nutritional status. Some studies found significant associations, while others reported no relationship, indicating that the determinants of wasting may vary depending on population characteristics and study settings.

Previous studies, such as Whitfield et al., reported that physical activity was associated with underweight status among adolescents. These differences suggest that the impact of physical activity on nutritional status may depend on the balance between energy intake and expenditure, as well as other contributing factors.

However, the findings of this study are consistent with those reported by Zuhasma et al., which found no significant association between body image and wasting among adolescents. This suggests that body image may not directly influence acute nutritional conditions such as wasting, which are more likely determined by short-term factors such as recent dietary intake and health status.

### Body Image

Body image is an individual's perception of their body shape, which can influence eating behavior and lifestyle. Adolescents with negative body image tend to feel dissatisfied with their bodies, which may lead to restrictive eating patterns or unbalanced diets (10). This dissatisfaction can reduce food intake and increase the risk of energy deficiency, contributing to weight loss and potentially triggering wasting (11). During adolescence, body image is also shaped by external factors such as social media, peer pressure, and societal standards (12), which may lead to maladaptive eating behaviors affecting nutritional status (13).

In contrast, Alfiyah et al. reported a significant relationship between eating behavior and undernutrition among adolescents. This difference indicates that the association between eating behavior and nutritional status may vary depending on population characteristics, measurement methods, and study settings.

However, this study found no significant relationship between body image and the degree of wasting. This may be due to wasting being an acute condition influenced more by short-term factors such as dietary intake and health status than psychological factors. The relatively homogeneous characteristics of respondents may also have limited data variability (26). These findings are consistent with previous studies and have also been reported in other adolescent populations (27).

These findings are also consistent with Zuharna and Hastuti et al. (7,13), who reported no significant relationship between body image and wasting. In contrast, studies by Alfiyah et al., Karno et al., and Purnama (14,15,8) reported significant associations between body image and nutritional status. These differences may be attributed to the use of different indicators, where previous studies commonly used BMI to assess long-term nutritional status, while wasting reflects acute malnutrition. Therefore, body image may have an indirect influence on nutritional status; however, its direct effect on wasting appears to be limited.

### **Eating Behavior**

Eating behavior is influenced by both internal factors, such as nutritional knowledge, body image, and psychological conditions, and external factors, including family eating patterns, school environment, and media exposure (16). Although eating behavior plays an important role in nutritional status, it generally reflects long-term dietary patterns rather than short-term energy intake (30). In contrast, wasting is an acute condition that is more closely related to recent energy intake and health status, such as infection or illness (31). This may explain why eating behavior did not show a significant relationship with the degree of wasting in this study.

Previous international studies have also shown that adolescent dietary behavior is often associated with long-term nutritional outcomes rather than acute conditions such as wasting (35).

In addition, although respondents with negative eating behavior showed a higher risk of wasting (PR = 2.44), this association was not

statistically significant, which may be influenced by the relatively small sample size and limited variability among respondents. This suggests that while eating behavior may contribute to nutritional risk, its effect may not be directly observable in acute conditions such as wasting (32).

Furthermore, adolescent nutrition is influenced by multiple interacting factors, including biological, behavioral, and environmental determinants, which may weaken the direct relationship between a single variable and acute nutritional status (36).

This finding is consistent with Purnama (8), who reported no significant relationship between eating behavior and adolescent nutritional status. However, it differs from studies by Alfiyah et al. and Ratih et al. (14,17), which found significant associations. These differences may be explained by the use of different indicators, where wasting reflects acute malnutrition, while other indicators such as BMI reflect long-term nutritional conditions.

In this study, eating behavior was measured based on general dietary habits, which may not accurately capture short-term energy deficits that directly contribute to wasting. Therefore, the absence of a significant relationship does not indicate that eating behavior has no role in nutritional status, but rather suggests that its effect may not be directly observed in acute conditions such as wasting.

### **Physical Activity**

Physical activity plays an important role in maintaining energy balance and supporting adolescent growth. It requires energy and contributes to metabolic processes, including nutrient metabolism. Adequate physical activity is generally defined as at least 30 minutes per day or 3-5 days per week (25). Regular activity helps increase metabolism and maintain a balance between energy intake and expenditure (18), and also supports nutrient utilization and calorie expenditure, thereby contributing to optimal nutritional status (19).

However, its impact on nutritional status depends on the balance between energy intake

and expenditure (20,21). Wasting, as an acute condition, is more directly influenced by short-term energy intake and health status rather than physical activity alone (31). In line with this, the results of this study showed no significant relationship between physical activity and the degree of wasting among adolescents. Although low levels of physical activity can increase the risk of nutritional problems (24), this does not necessarily lead to wasting when energy intake remains sufficient.

International evidence suggests that physical activity contributes to overall health and metabolic balance, but its direct association with acute malnutrition is often limited (37).

These findings are consistent with previous studies reporting no significant relationship between physical activity and undernutrition among adolescents (9,22). Such findings suggest that factors such as dietary intake, socioeconomic conditions, and sedentary behavior may play a more dominant role in determining nutritional status (33). However, this result differs from other studies that found a significant association between physical activity and underweight (23). These inconsistencies may be explained by differences in study populations, measurement of nutritional status, and contextual factors (34).

In addition, global studies have highlighted that adolescent health outcomes are influenced by complex interactions between lifestyle and environmental factors rather than a single determinant (38).

This study has several limitations. The cross-sectional design does not allow for causal inference between variables. Data collection using self-report questionnaires may introduce recall bias and subjectivity bias. The relatively small sample size may have limited the statistical power to detect significant associations. In addition, the measurement of eating behavior only reflected general dietary habits and did not capture actual energy and nutrient intake related to acute wasting. Furthermore, this study did not examine other important factors such as infection status, socioeconomic conditions, and detailed dietary intake.

Similar limitations have been reported in cross-sectional studies, particularly regarding the inability to establish causal relationships and limited statistical power in smaller samples (39).

Therefore, future studies are recommended to use longitudinal designs and more comprehensive measurements to better understand the determinants of wasting among adolescents.

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