Relationship Between Body Image Perception, Eating Habits and Hemoglobin Levels among Adolescent Girls : A Cross-Sectional Study

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ABSTRACT

Adolescence is a critical period marked by rapid physical and psychological changes that contribute to the formation of body image, which may influence health-related behaviors such as dietary habits and nutritional status. This study aimed to examine the relationship between body image perception, dietary habits, and hemoglobin levels among adolescent girls. An analytical observational study with a cross-sectional design was conducted involving 70 tenth-grade female students at Public Vocational School 3 Malang. Body image was assessed using the Multidimensional Body-Self Relations Questionnaire–Appearance Scale (MBSRQ-AS), while dietary habits were evaluated using the Adolescent Food Habits Checklist (AFHC). Hemoglobin levels were measured using standard procedures. Pearson correlation analysis showed a significant relationship between body image perception and dietary habits ($p = 0.046$; $r = 0.24$), whereas no significant association was found between body image perception and hemoglobin levels ($p = 0.983$). These findings indicate that adolescent girls with a more positive body image tend to adopt healthier eating habits, although body image does not directly influence hemoglobin levels. The results suggest that school-based nutrition programs should incorporate body image education as part of adolescent health promotion to encourage healthy dietary behaviors, which may indirectly support optimal nutritional status.

INTRODUCTION

Adolescence is a distinct developmental phase marked by significant biological, psychological, social, and cognitive transformation that occur during the transition from childhood to adulthood, typically between the ages of 10 and 19 (UNICEF, 2021; Walsh & Nicholson, 2022). The multitude of changes that take place in a brief period during adolescence makes individuals in this age group more susceptible to emotional fluctuations and instability. Moreover, adolescents tend to spend more time with their peers. The physical changes experienced during adolescence often lead to unfavorable

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psychological outcomes. Adolescent girls are generally more sensitive than boys, which causes them to frequently compare themselves to others (Denich & Ifdil, 2015).

The presence of ideal body standards that emphasize height and slimness influences adolescent girls' self-perceptions through the perspective of others, especially their peers (Denich & Ifdil, 2015; Nurrahim & Pranata, 2024). Additionally, in this digital era, the ease of communication and the dissemination of information significantly impacts on various aspects of life, including adolescents. This also contributes to the development of body image perceptions among adolescent girls (Fitriani & Purnomo, 2023). Social media is pivotal in the formation of body image in adolescents. Adolescent girls, who are increasingly aware of and attentive to their appearance, are influenced by aesthetic standards on social media, resulting to dissatisfaction with their bodies and negative body image perceptions. Female beauty standards are often based on the ideal slim body, devoid of excess fat. The concept of "beauty" must be achieved through physical attribute such as a V-line facial structure and a slim figure. The worst detrimental effect triggered by this self-concept is a crisis of self-confidence that fosters a negative self-image (Fitriani & Purnomo, 2023; Nurrahim & Pranata, 2024; Zulfa, 2023).

The way a person perceives their body significantly impacts various aspects of their personality. With a positive body image, individuals can accept their body shape as it is, feeling satisfied, comfortable, and confident. This constructive body perception acts as a protective factor, making adolescents less prone to adopting dangerous weight-management strategies, such as extreme dieting or excessively restricting food intake, which can actually diminish nutritional adequacy (Sari et al., 2025; Wowiling et al., 2024). Conversely, a negative body image occurs when someone feels unattractive or fails to meet societal standards. This condition is often associated with low self-confidence. In adolescent girls, poor body image can serve as a precursor to broader mental health challenges, potentially manifesting as increased levels of anxiety or clinical depression in adolescent, decreased self-confidence and self-esteem, disrupt social

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relationships, and even eating disorders (Giriansyah & Sa'id, 2022).

On the other hand, healthy eating habits and behaviors will support the physical and psychological well-being of adolescent girls. Consuming proper nutrition, along with healthy eating practices, can yield numerous benefits, from maintaining health, supporting bodily functions, to achieving ideal body condition. Unfortunately, adolescent girls' lack of understanding of proper eating patterns often prevents them from achieving these benefits (Pristyna et al., 2022; Wati et al., 2021). One common mistake is restricting portion sizes without considering balanced nutrition. A balanced diet should, in fact, be attained by consuming foods that provide the types and amounts of nutrients the body needs, while also ensuring variety in the daily menu (Fitriani & Purnomo, 2023; Nurrahim & Pranata, 2024).

The quality of nutritional intake plays a crucial role in brain development. If the food consumed lacks sufficient nutrients over an extended period, metabolic changes in the brain may occur, impairing its function. Malnutrition can adversely affect brain structure and function (Cahyanto et al., 2021). Inadequate nutritional intake also impacts physical growth retardation, cognitive decline, and diminished immunity. Adolescents in poor health or those who frequently fall ill tend to tire more easily, feel sleepy, struggle to concentrate, and show a lack of motivation for studying. As a result, they are more likely to miss school (Rawung et al., 2020).

Beyond eating habits, UNICEF reported in 2021 that adolescents in Indonesia currently face triple burden of malnutrition. This phenomenon encompasses the simultaneous challenges of undernutrition, obesity, and deficiencies in essential micronutrients, with anemia being a primary concern (UNICEF, 2021). Anemia, a micronutrient deficiency, particularly iron (Fe), is prevalent among adolescents and results from low hemoglobin levels in erythrocytes (Winurini, 2025). The presence of anemia among adolescent girls is frequently linked to increased lethargy, reduced ability to concentrate during educational activities, and increased susceptibility to infectious diseases, thereby reducing productivity and academic performance. Chronic anemia

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that remains unaddressed during adolescence may extend into adulthood, posing serious risks such as elevated maternal mortality, preterm deliveries, and the occurrence of low birth weight (LBW) infants (Prasetya et al., 2019).

According to the 2023 Indonesian Health Survey (SKI 2023), anemic conditions affect 15.5% of the population aged 15 to 24, highlighting a significant health concern for late adolescents and young adults, with 18% for girls and 14% for boys. Although this prevalence has decreased from 32% five years earlier, according to the 2018 Basic Health Research (Riskesdas), 15.5% remains quite high. Iron deficiency anemia disproportionately affects adolescent girls, making them a particularly high-risk group within the general population (Kementerian Kesehatan RI, 2023).

The factors contributing to low hemoglobin levels in female adolescents remain a topic of debate and require further investigation, as multiple factors are involved. Body image is closely related to adolescent girls. For them, body image can be particularly important due to numerous physical changes during puberty, often leading to discomfort with these transformations. This encompasses perceptions of body shape, size, weight, and overall physical appearance (Hutasuhut & Supriati, 2022). Body image is a factor rarely associated with blood hemoglobin levels, and few studies have established a ties between body image perception and the presence of anemia or hemoglobin levels in adolescent girls.

Despite extensive research on body image and eating behavior, limited studies have examined its association with hemoglobin levels among adolescent girls, particularly in Indonesian settings. While previous studies have focused on the psychological and behavioral consequences of body image perception, the potential physiological implications—specifically relating to anemia risk—remain underexplored in this population.

Based on adolescent girls' perceptions of their bodies (body image), many aspects of their lives can be affected, particularly their eating habits and hemoglobin levels, which are important factors for health. Therefore, this study focuses on how body image relates to eating habits and hemoglobin levels in adolescent girls.

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RESEARCH METHODS

Conducted in August 2025, this research employed an analytical observational design with a cross-sectional, quantitative framework. The number of samples in this study was 70 respondents determined through calculations using the Slovin formula. The research respondents were female students of Public Vocational School 3 Malang. Subject selection was performed through a purposive sampling method, guided by specific inclusion and exclusion criteria. The inclusion criteria for respondents included female students aged 14-19 years, healthy, and willing to take a hemoglobin examination and fill out a questionnaire. The exclusion criteria included other female students with chronic diseases (e.g., thalassemia) or severe anemia who had received therapy. Ethical clearance for this research was granted by the Health Research Ethics Committee at STIKes Patria Husada Blitar, as documented under certificate number 06/PHB/KEPK/318/08.25.

This study was designed to examine the association between body image with eating habits, and hemoglobin levels among young girls. To measure body image, the Multidimensional Body-Self Relations Questionnaire-Appearance Scale (MBSRQ-AS) was employed, while the Adolescent Food Habit Checklist (AFHC) served as the tool for evaluating the participants' nutritional behaviors. The MBSRQ-AS and AFHC questionnaires used were modified by Purba (2022) and tested for validity and reliability. Hemoglobin levels were measured using a hemoglobinometer (*Easytouch HbCG*) by taking a fingertip blood sample.

The collected data were then analyzed. Univariate and bivariate analyses were generated through SPSS v. 20. Additionally, the Kolmogorov-Smirnov normality test was applied to evaluate the distribution of the research data, which found a normal distribution. Univariate analysis included the frequency distribution of body image (MBSRQ-AS questionnaire's score), dietary habits (AFHC questionnaire's score), and hemoglobin levels (gr/dL). The data scale for each variable was ratio. Bivariate analysis were evaluated using the Pearson test. Findings were considered significant if the p-value was below the 0.05 alpha level.

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RESULTS AND DISCUSSION

Focusing on 70 students at Public Vocational School 3 Malang, this research was designed to examine the correlations between body image perception with dietary patterns, and hemoglobin concentrations among adolescent females.

Table 1. Data Distribution of Respondents' Age

Variable	Mean	SD	Min	Max
Age (years)	15,2	0,55	14	16

Table 1 illustrates the frequency distribution of respondents' ages. The respondents were female adolescents (students at Public Vocational School 3 Malang). According to UNICEF (2021), the age limit for adolescents is 10-19 years. Based on the data obtained, all respondents were adolescents because their age range was 14-16 years. The mean age of the respondents was 15.20 years (SD = 0.55), indicating that most participants were in a relatively homogeneous age group. The minimum age was 14 years and the maximum age was 16 years, showing a narrow age range among the respondents.

Table 2. Data Distribution of Respondents' Body Image, Diet, and Hemoglobin Levels

Variable	Mean	SD	Min	Max
Body Image (MBSRQ-AS score)	74	8,2	52	94
Eating Habits (AFHC score)	54,7	4,5	43	67
Hemoglobin Levels	12,5	1,89	8,6	19,5

Table 2 illustrates the frequency distribution of respondents' body image, eating habits, and hemoglobin levels. Body image was assessed using the MBSRQ-AS questionnaire. The average MBSRQ-AS score for all respondents was 74, with the lowest score being 52 and the highest being 94. This indicates that the average respondent had a positive body image. This contrasts with research conducted by Hutasuhut & Supriati (2022), where a higher percentage of adolescent girls with a negative body image (78.5%) was found, compared to 21.5% of adolescent girls with a positive body image (14 respondents).

The formation of an adolescent girls' perception of their physical condition is highly personal and subjective. The construction of a positive body image has been empirically proven to be a separate dimension and not simply the opposite of a negative body image. The characteristics of a positive body image

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are manifested through several indicators, including: (1) body appreciation, (2) understanding of the body's functional capabilities, (3) self-care aligned with needs, and (4) the ability to filter out toxic cultural messages related to appearance (Guest et al., 2022) The perceived gap between actual physical condition and idealized body shape standards can lead to perceptions of physical deficits or deficiencies. This condition has the potential to hinder self-acceptance of one's body shape and ultimately shape negative body image perceptions (Zulfa, 2023).

Eating patterns were assessed using the AFHC questionnaire. The average AFHC score for all respondents was 54.7, with the lowest score being 43 and the highest being 67. This indicates that the average respondent has a healthy diet. This contrasts with research conducted by Hutasuhut & Supriati (2022), where a higher percentage of adolescent girls had unhealthy diets, at 81.5% (53 respondents), compared to 18.5% (12 respondents) who had healthy diets.

Adolescence is a critical phase in the formation of lifestyle and nutritional behaviors that have the potential to determine future health status. A fundamental aspect supporting optimal growth in adolescents is the implementation of nutritious and balanced consumption patterns. Research shows that low health literacy, including knowledge about nutrition, remains a problem among adolescents. The most frequently reported dietary errors include irregular eating (e.g., skipping breakfast), inadequate dietary composition, and high intake of processed foods and sugary drinks (Mizia et al., 2021).

Hemoglobin levels are measured through peripheral blood tests using a hemoglobinometer. Hemoglobin levels in adolescents are categorized as normal and anemic. Adolescents are considered anemic if their hemoglobin levels are below 12 g/dL. Hemoglobin levels ≥ 12 g/dL are considered normal (E. Sari, 2023). Respondents exhibited hemoglobin levels ranging from 8.6 to 19.5 g/dL, resulting in an overall average of 12.5 g/dL for the entire respondents. These results contradict the research by Hutasuhut & Supriati (2022). In their research, 52 respondents (80%) had anemia, while 13 respondents (20%) did not. Within the reproductive age group, the highest

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rates of anemia worldwide are observed among middle adolescents, specifically those between the ages of 15 and 19 (Safiri et al., 2021). This is due to the accelerated growth and development during adolescence, which increases the need for iron. Additionally, adolescent girls experience monthly menstruation, further increasing the risk of iron deficiency (Cunningham et al., 2018).

Anemia represents a medical state where the concentration of hemoglobin or the total number and size of red blood cells are insufficient to meet physiological requirements. This condition disrupts the blood's ability to bind and distribute oxygen to various body tissues. The etiology of anemia is often multifactorial, particularly related to poor nutritional status and comorbidities. In adolescents, anemia has the potential to negatively impact cognitive development and growth and development. From an epidemiological standpoint, iron deficiency stands as the primary cause of anemia on a global scale. It is estimated that nearly half of all global anemia cases are directly attributable to a lack of iron (Habtegiorgis et al., 2022)

Table 3. Pearson's Test Result of Body Image and Eating Habits' Relationship among Adolescent Girls

Variable	Mean	SD	Min	Max	p-value	r
Body Image (MBSRQ-AS score)	74	8,2	52	94	0,046	0,24
Eating Habits (AFHC score)	54,7	4,5	43	67		

Table 3 highlights how the way adolescent girls perceive their bodies is linked to their specific eating habits, suggesting a clear association between the two variables. Statistical evaluation via Pearson's test revealed that body image perceptions significantly correlate with the eating habits of adolescent girls ($p = 0.046$). This finding satisfies the $p < 0.05$ criterion for statistical significance. Additionally, the correlation coefficient (r) between two variables was 0.24, suggesting a weak positive linear relationship. It means their body image is negative due to a lack of confidence and satisfaction with their current appearance, leading them to pursue a diet for an ideal body shape, which subsequently affects their eating patterns and behaviors (Tan & Ibrahim, 2020).

These findings are consistent with a previous cross-sectional study by Purba (2022) involving 70 ninth-grade adolescent respondents at Public Junior High School 2 Siborongborong, which

indentified a correlation between eating habits and body image, indicated by a significance value of 0.000 ($p<0.05$). The significant link between body image and eating habits observed in this study is further supported by the work of Santos et al. (2021) and Azli et al. (2024). Their respective cross-sectional analyses similarly concluded that self-image plays a vital role in determining eating behaviors. Respondents with unhealthy eating habits exhibited negative perceptions of their bodies. Body image dissatisfaction was prevalent among adolescents with higher body standards, linked to contemporary cultural patterns and beauty ideal that emphasize thin and athletic bodies (Santos et al., 2021).

According to Purba (2022), adolescents who possess self-awareness tend to have positive perceptions of their body shape. Female adolescents who maintain a favorable perception of their physical appearance are reflected in their healthy eating habits and behaviors, as they recognize that maintaining health is a top priority during adolescence.

This is supported by research conducted by Abdurrachim et al. (2018), which demonstrated that while many adolescents possess ideal body sizes, they frequently perceive their bodies as being either fatter or thinner than they truly are. Most adolescents prioritize their body weight and shape over the quality and nutritional content of the food they consume. Consequently, they develop the habit of inappropriately restricting their food intake. This restriction, applied without regard the principles of balanced nutrition, negatively impacts adolescents' nutritional status.

Dissatisfaction with their body shape, particularly the perception of being overweight, drives adolescents to lose weight through unhealthy methods. Many of them control their weight through strict diets or excessive exercise in an achieve their ideal body (Abdurrachim et al., 2018). Conversely, a constructive self-perception of one's physical appearance promotes the adoption of healthy eating patterns and the maintenance of balanced nutrition, while a negative body image often leads to inappropriate food intake restriction (Ma'sunnah et al., 2021).

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Table 4. Pearson's Test Result of Body Image and Hemoglobin Levels' Relationship among Adolescent Girls

Variable	Mean	SD	Min	Max	p-value	r
Body Image (MBSRQ-AS score)	74	8,2	52	94	0,983	0,003
Hemoglobin Levels	12,5	1,89	8,6	19,5		

Based on the data presented in Table 4, no statistically significant association was found between the body image perceptions of adolescent girls and their hemoglobin concentrations. Statistically, this study found no evidence of a link between how female adolescents perceive their bodies and their hemoglobin status, as the Pearson test yielded a non-significant p-value of 0.983. This suggests that in this sample, psychological perception does not influence these specific blood parameters. This suggests that a more positive body image perception in adolescent girls does not necessarily result in higher hemoglobin levels. These findings are also corroborated by a prior cross-sectional investigation conducted by Wowiling et al. (2024) explored the correlation between body image perception and the occurrence of anemia among a group of 50 adolescent females, using the MBSRQ-AS as a body image measurement tool. The fifth subscale of body image, which includes Appearance Evaluation (AE), Appearance Orientation (AO), Body Areas Satisfaction (BAS), Overweight Preoccupation (OP), and Self-Classified Weight (SCW), did not significantly correlate with the incidence of anemia.

This is also supported by a study conducted by Anisa et al. (2023), which found no significant relationship between perceived body image and hemoglobin levels in 26 adolescent girls (p-value 0.795, $p < 0.05$). That evidence indicates that dissatisfaction with body image does not always translate into a reduction in food intake within this demographic. Zulfa (2023) explained a similar finding, stating that body image is not a primary factor in determining the occurrence of anemia in female adolescents. However, these findings contradict research by Hutasuhut & Supriati (2022), which showed a significant relationship between body image and the incidence of anemia in female adolescents.

Perception of body image is one factor influencing hemoglobin levels in adolescent girls, but it is not the primary factor. Body image serves as an indirect factor affecting hemoglobin levels in

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this group. Adolescent girls' hemoglobin levels are influenced by numerous factors, so understanding anemia status requires examining direct factors such as diet, nutritional intake, and activity patterns (Hutasuhut & Supriati, 2022; Wowiling et al., 2024; Zulfa, 2023). A study by Sigit et al. (2024) found that both nutritional status (BMI and MUAC) alongside the intake of fruits and vegetables, share an inverse relationship with the occurrence of anemia. Underweight adolescent girls had more than double the risk of anemia. Furthermore, fruit and vegetable consumption has a protective effect against anemia. Green leafy vegetables, especially those rich in iron, are good for hemoglobin regeneration. Fruits high in vitamin C enhances iron absorption in the digestive tract.

A study examining factors related to adolescent girls' eating behaviors in preventing anemia found that body image was not correlated with eating behaviors aimed at preventing anemia. Adolescents with a positive body image often engaged in poor eating behaviors to avoid anemia. Adolescent girls who are satisfied with their ideal body image may protect their bodies through various methods, such as irregular eating patterns, strict diets, and avoiding certain foods, which can lead to reduced iron intake and anemia (Hutasuhut & Supriati, 2022; Wowiling et al., 2024; Zulfa, 2023).

According to Wowiling et al. (2024), the self-size classified weight subscale is more closely associated with anemia than other subscales. Self classified weight is a body perception subscale where respondents evaluate how they perceives their body weight, ranging from very thin to overweight. A negative perception of self classified weight indicates that the individual views their body weight as either overweight or underweight compared to their actual weight. Lee & Lee (2016) stated that adolescent females frequently pursue rapid weight loss strategies, often resorting to hazardous weight-management practices to achieve quick results such as prolonged fasting, eating only once a day, taking weight loss medication without a prescription; these actions are very dangerous and can increase the risk of anemia.

This study has several limitations that should be considered when interpreting the findings. The cross-sectional design of this research

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precludes the establishment of causal or temporal relationships, which would require longitudinal studies to confirm.nAdditionally, several potential confounders remained unmeasured, including direct iron intake, menstrual status and blood loss, iron supplementation history, infection markers, and socioeconomic factors.

CONCLUSIONS

This study found a statistically significant but weak correlation (r = 0.24) between body image perception and eating habits among adolescent girls. However, the small effect size indicates that body image plays only a limited role in determining dietary behaviors. No significant association was found between body image and hemoglobin levels (p = 0.983), suggesting that body image is not a primary determinant of anemia status in this population.

These findings indicate that while promoting positive body image may have modest benefits for encouraging healthy eating habits, interventions targeting anemia prevention in adolescent girls should focus on more direct factors such as iron intake, nutritional education, iron supplementation programs, and addressing menstrual health. A multifaceted approach addressing the complex etiology of anemia is necessary rather than relying solely on body image interventions. Future research should employ longitudinal designs with more balanced sample distributions and comprehensive assessment of dietary intake, menstrual patterns, and other physiological factors to better understand the interplay between psychological, behavioral, and biological determinants of adolescent health.

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