Association between nutritional knowledge and body image with the risk of eating disorders among adolescent girls in Malang City

Hubungan tingkat pengetahuan gizi dan citra tubuh dengan risiko gangguan makan pada remaja putri di Kota Malang

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Abstract

Nutrient intake during adolescence plays an essential role in supporting optimal growth and development of the body. Eating disorders are common problems experienced by adolescent girls. Several factors may contribute to the occurrence of eating disorders, including the level of nutritional knowledge and body image perception. This study aimed to analyze the relationship between nutritional knowledge and body image and the risk of eating disorders among adolescent girls in Malang City. This study employed an analytical observational design with a cross-sectional approach. A total of 160 adolescent girls from five public vocational high schools in Malang City were selected using cluster sampling. The study will be conducted from August 2024 to January 2025. Nutrition knowledge was assessed using a 14-item questionnaire adapted from previous studies, body image was measured using the Body Shape Questionnaire (BSQ-34), and the risk of eating disorders was determined using the Eating Attitudes Test (EAT-26). Data were analyzed using the Spearman's correlation test. The results showed a significant correlation ($p < 0.05$) between nutrition knowledge ($r = -0.292$) and body image ($r = 0.368$) and the risk of eating disorders among adolescent girls in Malang City. These findings indicate that eating disorders among adolescent girls are influenced not only by nutritional aspects but also by psychological factors.

Keywords: Eating disorder, adolescent girls, nutrition knowledge, body image

Abstrak

Asupan gizi pada usia remaja berperan dalam membantu tumbuh kembang yang optimal. Salah satu masalah yang kerap terjadi pada remaja putri adalah gangguan makan. Beberapa faktor dapat menjadi penyebab gangguan makan, termasuk tingkat pengetahuan gizi dan citra tubuh. Penelitian ini bertujuan untuk menganalisis hubungan antara tingkat pengetahuan gizi dan citra tubuh dengan risiko *eating disorder* pada remaja putri di Kota Malang. Metode penelitian ini menggunakan observasional analitik dengan pendekatan *cross sectional*. Sebanyak 160 remaja putri dari 5 SMK Negeri di Kota Malang dipilih menggunakan teknik pemilihan *cluster sampling*. Jangka waktu penelitian ini dilakukan pada bulan Agustus 2024 – Januari 2025. Tingkat pengetahuan gizi diukur dengan mengadopsi kuesioner penelitian terdahulu sebanyak 14 soal, informasi citra tubuh diperoleh dari kuesioner BSQ-34, dan data risiko *eating disorder* didapatkan dengan kuesioner EAT 26. Data yang terkumpul dilakukan analisis menggunakan uji korelasi *Spearman's*. Hasil korelasi menunjukkan nilai signifikan ($p < 0.05$) antara variabel tingkat pengetahuan gizi ($r = -0.292$) dan citra tubuh ($r = 0.368$) dengan risiko *eating disorder* pada remaja putri di Kota Malang. Hasil menunjukkan

gangguan makan remaja putri tidak hanya menjadi aspek gizi tetapi juga faktor psikologis remaja putri.

Kata Kunci: Eating disorder, remaja putri, pengetahuan gizi, citra tubuh

Introduction

Nutrition is an important aspect of creating a healthy society (Yusnitasari et al., 2023). An imbalance between nutrient intake and excretion by the body is a characteristic of malnutrition (Fitriani et al., 2023). Based on data from the 2023 Indonesian Health Survey (SKI), 6.6% of adolescents aged 16-18 years were underweight (BMI/U), while 8.8% were overweight. In general, the nutritional status of adolescents is influenced by their eating patterns. However, other factors, such as psychosocial factors, eating behavior, and lifestyle, also contribute to the nutritional status of adolescents (Agustina et al., 2021). Based on these data, adolescent nutrition should become a priority and be included in health sector plans, strategies, and policies (Rah et al., 2021).

Lifestyle factors and dietary patterns adopted by adolescents influence the fulfillment of nutritional intake appropriate to adolescent needs (Hafiza et al., 2021). The rapid development of information media often puts adolescents at risk for eating disorders. Standards created for women regarding the ideal body shape have an impact on food intake that is far from the daily calorie requirements (Suhag & Rauniyar, 2024). A person's psychological condition can affect their eating habits. Emotions such as happiness, boredom, sadness, and stress can affect the amount of food consumed (Cheikh et al., 2022). On the other hand, healthy teenage girls are expected to contribute to a healthy generation, thereby producing high-quality human resources (Rahayu, 2020).

Eating Disorders (ED) are psychological and clinical problems that cause abnormal eating habits to control body weight (Asna & Syah, 2021). In a study conducted in Bogor, 42.5% of adolescents experienced eating disorders with poor nutritional status. Anorexia Nervosa (AN) and Bulimia Nervosa (BN) are examples of eating disorders commonly found in adolescents (Arfah et al., 2024). Additionally, another type of eating disorder is quite prevalent, namely Binge Eating Disorder (BED) (Bohon, 2019). Research conducted by Diwananda Islamy and Cahyanti (2021) shows that 16.3% of adolescent girls have a high tendency for AN. Previous research conducted in Malang City on adolescent girls showed that 50% of respondents experienced BED and 7% experienced BN (Puspita & Estiningtyas, 2024).

The factors causing eating disorders in adolescent girls are diverse. In addition, eating behavior, nutritional status, increasing age, and body image also contribute to eating disorders among adolescent girls (Yani et al., 2022). The risk of eating disorders can increase due to limited knowledge and nutrition education (Tunga, 2022). It is not uncommon for a person's eating patterns to be influenced by concerns about their body condition. This condition refers to the fact that individuals with insufficient energy intake may feel more satisfied with their body conditions (Zahrah & Muniroh, 2020).

Teenagers experience a lot of interaction, attention, and acceptance in their social environment, which affects their perception of their body image. A positive body image indicates that adolescent girls accept the changes that occur in their bodies. Research conducted in Malang shows that a positive body image can increase self-esteem in teenagers (Agustiningsih et al., 2020). In contrast, research conducted in Manado City on subjects aged 18-25 years often experiences negative body image due to stress conditions. Stress triggers in adolescents can occur through various sources, ranging from academic pressure to lifestyle patterns that impact body dissatisfaction (Makal et al., 2021; Yani et al., 2023).

Data from the Malang City Central Statistics Agency (BPS) show that the number of female residents aged 15-19 years in 2023 was 29,690. This number indicates a significant number of teenage girls in Malang City. Research conducted by Puspita and Estiningtyas (2024) found that 50% of respondents experienced binge eating disorder, Yuhasnara & Muslihah (2024) found a prevalence of eating disorder risk of 32.6%, and Noe et al. (2019) showed that 14.3% of respondents experienced eating disorder. Several studies in Malang City have shown that the factors influencing eating disorders in adolescent girls are academic pressure and body image (Noe et al., 2019; Puspita & Estiningtyas,

2024; Yuhasnara & Muslihah, 2024). Additionally, research on the level of nutritional knowledge and body image in relation to the risk of eating disorders is rarely conducted among students in Malang City.

Based on this background, this study aimed to analyze the relationship between nutritional knowledge and body image and the risk of eating disorders among adolescent girls in Malang City. The existing knowledge gap in the field of adolescent nutrition makes research on eating disorders expected to have a positive impact and be widely needed in the future. Therefore, this study is important for strengthening previous findings regarding the relationship between knowledge levels and body image and the risk of eating disorders in adolescent girls.

Methods

This study used an analytical observational cross-sectional approach. This study supports the FIKES UB priority program for 2023-2027 on the topic of preventing and handling double nutrition problems. The study will be conducted from August 2024 to January 2025, or for 7 months.

The research population consisted of female adolescents in public high/vocational schools in Malang City. The research sample consisted of 160 female adolescents selected from public high/vocational schools in Malang City using cluster sampling techniques in one representative high/vocational school in each sub-district of Malang City. The schools used were SMKN 1, SMKN 2, SMKN 4, SMKN 6, and SMKN 12 Malang City. The sample size calculation for this study used the Lemeshow formula.

$$n = \frac{Z^2 \times P(1 - P)}{d^2}$$

The formula calculation used a confidence level of 95% (Z = 1.96), proportion of subjects from previous studies of 10% (P = 0.10), and precision level of 5% (d = 0.05). The calculation results showed that the minimum sample size was 139 respondents. To anticipate dropouts, the sample size was increased, resulting in a final sample size of 160. The inclusion criteria for this study were female adolescents aged 15–18 years, enrolled as students at the target school, and willing to participate. The exclusion criteria for this study were respondents who were absent during the research process.

The variables in this study were nutritional knowledge and the risk of eating disorders. The data source for this study was primary data collected using a structured questionnaire. The knowledge level questionnaire was adopted from previous research with adolescent subjects and consisted of 14 true or false statements with a maximum score of 14. The knowledge level questionnaire had a Cronbach's alpha value > 0.6, indicating that the questionnaire had good reliability (Fitria et al., 2022). The Eating Disorder Risk Questionnaire used the EAT 26. There are three factors in the EAT-26, namely eating patterns, bulimia and obsession with food, and oral control. The use of this instrument can be an initial screening that also covers psychometric aspects (Rogoza et al., 2016). Respondents' body image was measured using the BSQ-34 questionnaire to assess their attitudes towards their body shape. The Cronbach's alpha value of the BSQ-34 is 0.9, indicating high reliability. The score range obtained is between 34 and 204 (Lians et al., 2025; Sitepu et al., 2020).

Data on nutritional knowledge levels and eating disorder risk were descriptively analyzed. Knowledge level variables were categorized based on the median value, where scores > median (11) were classified as good knowledge and scores ≤ median (11) were classified as poor knowledge (Fitria et al., 2022). The eating disorder risk variable was categorized based on the total score. A score > 20 indicated a risk of eating disorders (Asna & Syah, 2021). The body image variable was categorized based on the total score, which described an individual's concern about their body shape. A score ≤ 80 indicates no concern, a score of 81–110 indicates mild concern, a score of 111–140 indicates moderate concern, and a score > 140 indicates severe concern (Sitepu et al., 2020).

Data analysis was performed using IBM SPSS Statistics 25 software. Data were analyzed both univariately and bivariately. Univariate analysis was performed to determine the distribution of demographic data, nutritional knowledge, risk of eating disorders, and body image of the respondents descriptively. Bivariate analysis was performed to determine the relationship between nutritional knowledge and body image and the risk of eating disorders in adolescent girls in Malang City. The collected data were not normally distributed; therefore, Spearman's correlation test was used to determine the relationship between variables.

This study was approved by the Ethics Committee of the Faculty of Dentistry, Airlangga University (No. 1051/HRECC). FODM/X/2024. Before the study was conducted, all respondents provided informed consent, which included an explanation of the purpose, procedures, and benefits of the study. All data provided by the respondents will be kept confidential by the researchers.

Result and Discussion

Respondent Characteristics

The number of respondents involved in this study was 160 female adolescents from one state vocational school in each sub-district of Malang City. The results of the respondent characteristics are presented in Table 1.

Table 1. Respondent Characteristics

Characteristics	n	
Respondent Age		
14 years	3	1.9
15 years	67	41.9
16 years	69	43.1
17 years old	19	11.9
18 years	2	1.3
Daily Allowance		
<IDR 15,000	58	36.3
IDR 15,000 – Rp20,000	81	50.6
IDR 20,001 – Rp25,000	14	8.8
IDR 25,001 – Rp50,000	7	4.4
Nutrition Knowledge Level		
Insufficient	88	55
Good	72	45
Risk of eating disorder		
No risk	131	81.9
At Risk	29	18.1
Body Image		
No concerns	106	66.3
Has mild concerns	28	17.5
Moderate concerns	19	11.9
Severe concerns	7	4.4

Based on Table 1, the age distribution of respondents was in the range of 14–18 years, with the majority being 16 years old, totaling 69

respondents. In this age group, there is a strong emergence of body image concerns that drive adolescents to deliberately avoid eating, which ultimately develops into eating disorders(Merita et al., 2020). Based on the amount of pocket money, 81 respondents (50.6%) had pocket money in the range of Rp15,000-Rp.20,000. The amount of pocket money affects weight gain; students with higher pocket money tend to buy more food outside the home, a habit that risks causing overnutrition due to uncontrolled food consumption (Fitriani 2023). The most common eating disorders are bulimia nervosa (BN) and binge eating disorder (BED)(Stabouli et al., 2021). In terms of knowledge level, 88 respondents (55%) were categorized as having insufficient knowledge, and 72 respondents (45%) were categorized as having good knowledge of the disease. Good nutritional knowledge can change adolescents' negative perceptions of their body shape, where negative body image perception is one of the signs that a person is experiencing an eating disorder (Ma'sunnah et al., 2021).

The results showed that the measurement of eating disorder risk using the EAT 26 questionnaire found that the majority of respondents were not at risk of eating disorders (131 respondents), while 29 respondents were at risk of eating disorders. The results of measuring nutritional knowledge using a nutritional knowledge questionnaire showed that 88 respondents had poor nutritional knowledge, and 72 respondents had good nutritional knowledge. The results of measuring respondents' body image showed that 106 respondents had no concerns, and 7 respondents had serious concerns about their body shape.

Correlation between Nutrition Knowledge and Body Image with Eating Disorder Risk in Adolescent Girls

The variables of nutritional knowledge and body image with eating disorder risk were tested for correlation to determine the relationship between them. The results of the correlation tests are presented in Table 2.

Table 2. Results of the correlation test of nutritional knowledge level and body image with the risk of eating disorders in adolescent girls in Malang City

Variable	Risk of Eating Disorders		p-value	r	OR (95% CI)
	Not at risk	At risk			
Level of Nutrition Knowledge			0.000	-0.292	1.55 (1.47 – 1.62)

Insufficient	81 (50.6%)	7 (4.4%)			
Good	50 (31.3%)	22 (13.8%)			
Body image					
No concerns	97 (60.6%)	9 (5.6%)			
Mild concerns	20 (15.3%)	8 (5%)	0.000	0.368	1.54 (1.4 – 1.67)
Have moderate concerns	10 (6.3%)	9 (5.6%)			
Severe concerns	4 (2.5%)	3 (1.9%)			

Table 2 shows a significant correlation (p=0.000) between nutritional knowledge and the risk of eating disorders among adolescent girls in Malang City, with a correlation coefficient of -0.292, indicating that the two variables have a weak and negative relationship. These results show that the higher the level of nutritional knowledge, the lower the risk of eating disorders in adolescent girls. Conversely, the lower the level of nutritional knowledge, the higher the risk of eating disorders among adolescent girls was. In the group with low nutritional knowledge, 81 respondents were not at risk of eating disorders, and seven respondents were at risk of eating disorders. Meanwhile, in the group with good nutritional knowledge, 50 respondents were not at risk of eating disorders, and 22 respondents were at risk of eating disorders.

Adolescence is a phase when individuals begin to pay attention to their body shape. For adolescent girls, the ideal body shape is often portrayed as thin. This often leads adolescent girls to try various methods to achieve their ideal weight according to their personal perceptions (Marlina & Ernalia, 2020). It is important for adolescents to have sufficient nutritional knowledge so that they can make healthy food choices that impact their nutrition and health (Ma'sunnah et al., 2021). Knowledge related to balanced nutrition can encourage adolescents to understand and be aware of fulfilling their nutritional needs (Aulia, 2021). Sufficient nutritional knowledge does not necessarily guarantee eating behaviors in line with balanced nutrition guidelines; nutritional knowledge must be accompanied by good attitudes and practices, as well as strong motivation (Rahman, 2016). In addition, eating disorders have multiple causes, one of which is the amount of pocket money that children receive. Students with high pocket money tend to buy fast food snacks, which can lead to overweight(Zogara et al., 2022). Easy access and taste preferences often trigger snack consumption, whereas time constraints lead adolescents to choose fast food over nutritious meals (Azzahra et al., 2025). Conversely, adolescents with low allowances have limited purchasing power and tend to choose inexpensive foods without considering their nutritional content (Rahma & Noerfitri, 2022). The influence of peers is also significant in shaping unhealthy eating behaviors and risky diets to meet beauty standards (Puspita 2024). Social media reinforces dissatisfaction with body shape through self-objectification, which includes body shame, body surveillance, anxiety, and internalization of ideal body standards that are thin (Rachmah et al., 2022). As a result, adolescents tend to focus on foods that taste good, look appealing, and are popular among their peers. Additionally, the tendency to have a slim body shape often leads adolescents to restrict the amount and frequency of their meals (Puspita 2023).

Therefore, knowledge of nutrition plays an important role in anticipating disturbances in the growth and development process of adolescents (Syafei & Badriyah, 2019). Nutrition education is not only provided at one time, but routine information provision has been proven to increase knowledge and nutritional practices among adolescent girls (Azhari et al., 2025; Al Rahmad & Shavira, 2024). Supporting these results, according to the Social Cognitive Theory (SCT) developed by Bandura (1989), human behavior is influenced by personal factors, the environment, and the behavior itself (Schunk & Dibenedetto, 2020). Human behavior and the environment interact and influence each other, leading to behavioral changes, including changes in eating behavior (Salsabilla & Sulistyowati, 2021).

Eating disorders are a common nutritional problem that often occurs during adolescence. Eating disorders not only cause disturbances in eating behavior but also affect the mind, attitude, and emotions, which in turn cause physiological disturbances (Sharan & Sundar, 2015). Eating disorders are common in adolescent girls. In this study, the majority of respondents (18.1 %) were at risk of developing ED. This result is in line with a study of adolescents in Brazil, which found that

5.4% of adolescent girls were at risk of developing ED compared to adolescent boys (Uchôa et al., 2019). These findings are relevant to the results of a study at SMA IT-Al Madinah Cibinong, Bogor Regency, which stated that adolescent girls are prone to stress and have an ED risk 1.8 times higher than adolescent boys who rarely experience stress (Marhaliyanda, 2023). Eating disorders that occur over a long period affect the consumption levels of adolescents. Imbalanced consumption levels among adolescents can affect their nutritional status (Zahirah & Wirjatmadi, 2024). A study conducted in Central Java states that the consumption levels of plant-based and animal-based protein among adolescent girls are far below the daily recommendations. Additionally, the habit of eating breakfast can help meet daily nutritional needs, which can prevent anemia and other negative health effects (Masfiah et al., 2021).

These findings show that most respondents had a low level of nutrition knowledge. However, the correlation test results indicated a correlation between the level of nutritional knowledge and the risk of eating disorders in adolescent girls. Similar findings can also be seen in Rizka et al. (2023) with the subject of vocational high school students in Jakarta, which states that there is a correlation between the level of knowledge related to balanced nutrition and student eating behavior. Disordered eating behaviors can be influenced by a lack of nutritional knowledge (Rizka et al., 2023). Additionally, another study mentioned a correlation between nutritional knowledge and eating disorders among high school students in Kendal. Individuals with good nutritional knowledge and positive attitudes toward choosing food ingredients can reduce the risk of eating disorders among students (Lestari, 2022).

These findings show that the majority of respondents had poor nutritional knowledge but were not at risk of developing eating disorders. Nutritional knowledge does play a role as one of the factors for individuals to apply in their daily eating behaviors. However, other factors support adolescents in not developing eating disorders, even though they have poor nutritional knowledge. Researchers assume that the tendency of adolescent girls not to adopt eating patterns that lead to eating disorders may be the reason why they are not at risk of developing eating disorders. On the other hand, even though

adolescents have good nutritional knowledge, they may not adopt appropriate eating patterns, which can also increase the risk of developing eating disorders. Attitudes, desires, and motivation are factors that influence a person's ability to practice eating behaviors in accordance with balanced nutritional recommendations to satisfy their nutritional needs. Schools, as entities closely connected to adolescent girls, can provide a combination of programs, ranging from educational initiatives to the provision of lunches tailored to their nutritional needs of adolescent girls (Rimbawan et al., 2023).

Referring to Table 2, the p-value is 0.000, so it can be concluded that there is a relationship between body image and the risk of eating disorders in adolescent girls in Malang City. The correlation strength was 0.368, indicating that the two variables had a weak relationship in a positive direction. These results show that the higher the level of concern about body image, the higher the risk of eating disorders among adolescent girls. Conversely, the lower the level of concern about body image, the lower the risk of eating disorders among adolescent girls. This study shows that the group of adolescent girls who did not have concerns about body image, consisting of 97 respondents, were not at risk of eating disorders, while nine respondents were at risk of eating disorders. In the group with a low level of concern, 20 respondents were not at risk of eating disorders, and eight respondents were at risk of eating disorders. For moderate levels of concern, 10 respondents were not at risk of eating disorders, and 9 respondents were at risk of eating disorders. In the group of adolescent girls with high levels of concern, four respondents were not at risk of eating disorders, and three respondents were at risk of eating disorders.

The correlation between body image dissatisfaction and the risk of eating disorders in adolescents can be explained by the feelings that arise from the discrepancy between ideal body perception and actual body condition. During adolescence, girls generally experience an increase in their body fat. This change causes their body shape to deviate further from their ideal body image (Kurniawan et al., 2015). Adolescent girls dissatisfied with their physical appearance, particularly those influenced by social and media beauty standards, often feel pressured to change their bodies through

unhealthy means, such as extreme dieting or irregular eating behaviors. The risk of eating disorders is more common among adolescent girls due to obesity, high body fat, and low muscle mass (Assyifa & Riyadi, 2023). Social factors, such as peer influence and body representation in the media, exacerbate this condition, making adolescents more vulnerable to developing eating disorders. Supporting this statement, a study conducted (Baker et al., 2023) with 363 female and 56 male participants showed that women tend to have higher Body Image Concerns (BIC) than men. Individuals who are very concerned about their appearance and have certain standards for an ideal body tend to control their weight excessively. Research findings on new medical students at Diponegoro University indicate that individuals who are appearance-oriented are three times more likely to experience eating disorders, while individuals who are obese are four times more likely to experience eating disorders because they are dissatisfied with their body shape (Natarijadi & Hadiati, 2021).

Conclusion

The findings of this study indicate a significant correlation between nutritional knowledge and body image and the risk of eating disorders among adolescent girls in Malang City. The better the level of nutritional knowledge accompanied by a positive perception of body image, the lower the risk of adolescent girls developing eating disorders. Conversely, low nutritional knowledge and body image dissatisfaction increase the likelihood of unhealthy eating behaviors. These findings reinforce the theory that nutritional knowledge plays an important role in changing perceptions of body shape and preventing eating disorders among adolescent girls. In addition, stress levels, social influences, and excessive nutritional status are factors that can increase the risk of eating disorders among adolescent girls.

In practical terms, the results of this study show the importance of interventions that not only focus on nutritional aspects but also consider psychological factors, such as body image and eating disorders. Therefore, a comprehensive education program is needed in schools that covers understanding balanced eating behaviors and self-acceptance. In its implementation, collaboration between guidance counselors, nutritionists, and school psychologists can provide counseling and guidance. Thus, school programs are expected to support the physical and mental well-being of adolescent girls.

Acknowledgments

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