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The Relationship Between Stress Levels, Body Image, and High Sodium Eating Behavior with Nutritional Status Among Female Adolescents at SMA Negeri 2 Palu

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ABSTRACT

Adolescent girls are a group vulnerable to nutritional problems due to physical, psychological, and social changes that influence eating patterns. Nutritional status plays an important role in supporting optimal health. This study aims to evaluate the relationship between stress levels, body image, high sodium food consumption behavior, and nutritional status in adolescent girls in Palu City. This study employed a cross-sectional design with a sample of 110 adolescent girls aged 15–18 years selected using simple random sampling at a State Senior High School in Palu City. Data collection was performed using the Perceived Stress Scale (PSS) questionnaire to measure stress levels, the Body Shape Questionnaire (BSQ) to assess body image, and the Food Frequency Questionnaire (FFQ) to evaluate high-sodium eating behavior. Nutritional status was measured based on BMI-for-age. Bivariate analysis was conducted using the Spearman rank test, while multivariate analysis utilized ordinal logistic regression. The results of the univariate analysis revealed that the majority of adolescent girls had a good nutritional status (78.2%), moderate stress levels (83.6%), and a negative body image (70.0%). The frequency of high sodium food consumption was mostly found in the rare category (39.1%). Bivariate analysis revealed no significant relationship between stress levels (p-value = 0.379) or body image (p-value = 0.838) and nutritional status. However, high sodium eating behavior had a significant relationship with nutritional status (p-value 0.002). Multivariate analysis also demonstrated that high sodium eating behavior remained a significant factor associated with the nutritional status of adolescent girls.

Key Messages:

- This study establishes that high sodium consumption behavior constitutes a significant determinant of nutritional status among adolescent girls in Palu City, whereas psychological variables—specifically stress levels and body image perception—do not exhibit a statistically significant association.

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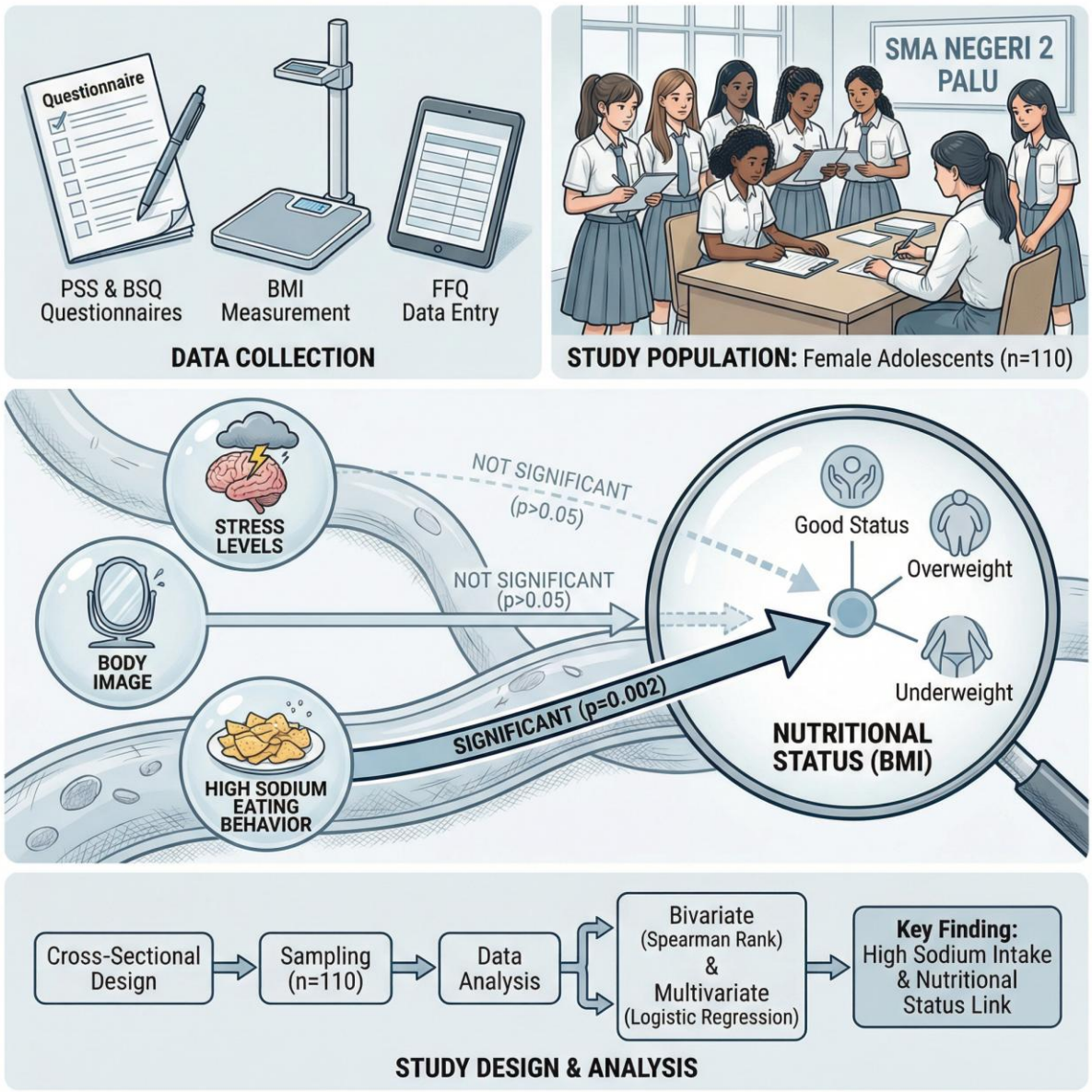
GRAPHICAL ABSTRACT



INTRODUCTION

Adolescents are a group that is highly vulnerable to nutritional problems, including both undernutrition and overnutrition. This condition is more frequently experienced by adolescent girls who are undergoing significant physical and psychological developmental acceleration (1). If nutritional intake is able to meet daily needs and body metabolism, then optimal nutritional status can be achieved (2). Based on global data, the prevalence of obesity in adolescents reached 15.1%, and underweight was 5.7%(3). In Indonesia, Riskesdas (2018) reported that 8.1% of adolescents aged 16–18 years fell into the thin to very thin category, while another 13.6% were classified as overweight (4).

Puberty induces major changes in the physical and psychological state of adolescent girls. Psychologically, adolescents experience identity crises, unstable emotions, and dissatisfaction with their body shape (5). This situation drives adolescent girls to be more at risk of experiencing nutritional problems due to lifestyle changes made in an effort to obtain an ideal body shape (6). The increase in sodium intake and instant food consumption among adolescents is also influenced by an increased preference for salty tastes during periods of rapid growth (7,8). Fast food is known to increase the risk of obesity and other health disorders due to its high composition of calories, fat, and sodium (9).

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During early to mid-adolescence, girls tend to focus more attention on their body shape (10). Physical, psychological, and social changes can impact adolescent eating patterns(11). Psychological factors such as stress and body image also contribute significantly to influencing eating behavior in adolescent girls (12). Negative body image is commonly associated with eating styles that do not support health and can trigger psychological disorders such as anxiety, depression, and self-dissatisfaction(13). Adolescent girls have a three times higher probability of experiencing stress compared to adolescent boys, primarily caused by academic pressure(14).

Based on a preliminary study of 10 female students at a State Senior High School in Palu City, one student was found to have an underweight nutritional status, and three had a mild overweight nutritional status. From the interview results, data were obtained indicating that 40% had low stress levels, 40% had moderate stress, and 20% had high stress. A total of 60% had a negative body image and 40% positive. Furthermore, the majority of students consumed high-sodium foods such as chips, instant noodles, and ready-to-eat foods. Based on these conditions, the researcher is interested in conducting a study on "The Relationship between Stress Levels, Body Image, and High Sodium Eating Behavior with Nutritional Status in Adolescent Girls in Palu City" by conducting a case study at one of the State Senior High Schools in Palu City.

METHODS

This research is a quantitative study with a cross-sectional design conducted at SMA Negeri 2 Palu starting in April 2025. The study population totaled 518 adolescent girls aged 15–18 years, with a sample of 110 individuals determined using the Lemeshow formula and selected through simple random sampling. This study used variables with interval and ratio data scales. Stress levels were measured using an interval scale, while body image, high sodium eating behavior, and nutritional status were initially ratio scales. For multivariate analysis, the nutritional status variable was converted into an ordinal form to suit the statistical method used.

Nutritional status was determined based on the Z-Score of Body Mass Index for Age (BMI/A). The BMI/A classification was determined based on the standards of Permenkes (2020) (15). The independent variables included stress levels measured by the Perceived Stress Scale (PSS) questionnaire, body image by the Body Shape Questionnaire (BSQ), and high sodium eating behavior using the FFQ for salty foods. In this study, stress levels were classified based on the total score, with categories of mild stress (0–13), moderate (14–26), and severe (27–40). Body image was distinguished into two categories: positive if the score was <80 and negative if the score was ≥80. Nutritional status was determined based on the BMI/A z-score, with categories of underweight (< -3 SD to < -2 SD), normal weight (-2 SD to < +1 SD), overweight (+1 SD to +2 SD), and obesity (> +2 SD). Meanwhile, high sodium eating behavior was assessed based on consumption frequency, ranging from never, rare (<3 times/month), sometimes (1–2 times/week), often (1 time/day), to very often (>1 time/day). The statistical analysis used included univariate, bivariate with the Spearman rho test, and multivariate using ordinal logistic regression. This study has received ethical approval from the Ethics Committee of the Faculty of Medicine, Tadulako University, with permit number 2164/UN28.10/KL/2025.

RESULTS

The majority of respondents were 15 years old (40.9%), while others were 16 years old (32.7%) and 17 years old (26.4%)

Table 1. Characteristics (Age) of Adolescents

Age	n	%
15 Years old	45	40.9
16 Years old	36	32.7
17 Years old	29	26.4

Most adolescents had a good nutritional status (78.2%), while 11.8% were classified as underweight, 7.3% as overweight, and 2.7% as obese. Regarding stress levels, the majority of adolescents

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were in the moderate stress category (83.6%), while 10.9% experienced severe stress, and only 5.5% experienced mild stress. In terms of body image, it was found that the majority of adolescents (70.0%) had a negative body image, while the remainder (30.0%) had a positive body image. Among adolescents consuming high-sodium foods, the majority did so with a frequency of 'rarely' (39.1%), followed by 'sometimes' (23.6%), 'often' (18.2%), 'never' (13.6%), and only a small portion consumed them 'very often' (5.5%)

Table 2. Frequency Distribution of Variables

Variable	n	%
Nutritional Status		
Underweight	13	11.8
Normal	86	78.2
Overweight	8	7.3
Obesity	3	2.7
Stress Level		
Mild	6	5.5
Moderate	92	83.6
Severe	12	10.9
Body image		
Positive	33	30
Negative	77	70
High Sodium Food Consumption		
Never	15	13.6
Rare	43	39.1
Sometimes	26	23.6
Opten	20	18.2
Very often	6	5.5

Based on statistical tests, high sodium eating behavior had a p-value of 0.002 (<0.05), indicating a significant relationship with adolescent nutritional status. Conversely, stress levels and body image were not significantly related to nutritional status.

The results of the stress level questionnaire showed that question number 1, “In the last month, how often have you been upset because of something that happened unexpectedly?”, received the answer “Very Often” (score 4) from 41 respondents, the highest number among all questions. This indicates that the majority of respondents frequently experienced situations triggering sudden anger due to events beyond their expectations. This high frequency reflects exposure to stressors that are unexpected and difficult to control. The body image questionnaire showed that the question “Has feeling bored made you brood about your shape?” received the answer “Always” (score 6) from 20 respondents, the highest number among all questions. This indicates that many respondents tend to focus attention on their body shape when feeling bored. This reflects a relationship between emotional conditions and body perception, where situations without activity or external stimuli encourage individuals to engage in more intense self-reflection.

Table 3. The Relationship of Stress Levels, Body Image, and High Sodium Eating Behavior with Nutritional Status

	Variable	Sig. (p-value)	Pearson Correlation Coefficient(r)
Nutritional Status	Stress Level	0.37	-0.08
	Body Image	0.83	-0.02
	High Sodium Eating Behavior	0.002*	0.29

*p-value <0.05

Multivariate analysis results continued to show the same finding: high sodium eating behavior is significantly related to adolescent nutritional status after being analyzed concurrently with stress level and body image variables. The p-values for stress level (0.101) and body image (0.551) indicate that neither is

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related to the nutritional status of adolescent girls.

Table 4. Logistic Regression Test

	B	Sig.	Wald	Exp(B)	95% C.I for EXP(B)	
					Lower	Upper
Stress Level	-0.09	0.10	2.69	0.91	0.81	1.01
Body Image	-0.00	0.55	0.35	0.99	0.98	1.01
High Sodium Eating Behavior	0.79	0.001*	11.24	2.21	1.39	3.52

***p-value <0.05**

DISCUSSION

The majority of adolescents had good nutritional status, followed by the underweight category, then the overweight category, and the fewest were in the obesity category. Adolescent nutritional status in Indonesia based on the 2023 Indonesian Health Survey (SKI) data shows that in the 13–15 age group, the prevalence of overweight was 12.1% and obesity 4.1%, while underweight (thin) was 5.7% and severe underweight 1.9%. In the 16–18 age group, the prevalence of overweight was recorded at 9.5% and obesity at 4.0%, while nutritional deficiency was 6.7% (thin) and 1.4% (severe underweight), respectively. Meanwhile, in Central Sulawesi, at ages 13–15, the majority of adolescents had normal nutritional status (77.0%), with an overweight prevalence of 9.6%, obesity 5.9%, thin 6.8%, and severe underweight 0.7%. In the 16–18 age group, the percentages of individuals with normal nutritional status, overweight, obesity, thinness, and severe underweight were 78.4%, 8.3%, 6.5%, 5.3%, and 1.5%, respectively. These findings indicate that the nutritional status of adolescents in this study had a higher percentage of underweight, while the percentages of overweight and obesity were below both the national and Central Sulawesi averages. Thus, the prevalence of underweight among adolescents in this study is still within the national and Central Sulawesi range, whereas the prevalence of overweight and obesity appears lower compared to national and Central Sulawesi prevalence.

The majority of adolescent girls experienced moderate stress, followed by severe stress, while mild stress was experienced by the fewest number of respondents. This finding is in line with the study by Nurrahmani et al. (2022) on students at SMAN 3 Bulukumba, which showed that the majority of students experienced moderate stress, followed by mild stress, while severe stress was the least frequently found category (16). The majority of adolescents in this study demonstrated a negative body image, while positive body image was possessed by only a small portion of respondents. This finding contrasts with the study by Walanda et al. (2025) at SMAN 5 Palu, which showed that the majority of adolescents felt satisfied with their physical appearance, while only a few expressed dissatisfaction.

Based on the results of the bivariate analysis in this study, it is known that there is no significant relationship between stress levels and adolescent nutritional status. According to Sinha and Jastreboff (2013), severe stress can trigger the activation of the HPA axis (hypothalamus–pituitary–adrenal) and increase cortisol, a hormone that stimulates appetite and the tendency to choose foods high in fat and sugar. This condition causes some people to overeat when stressed, risking obesity, while others lose their appetite, experience sleep disturbances, or have other physical complaints that can cause reduced nutritional intake and lead to underweight (17). This study is consistent with Juzailah and Ilmi (2022), who found no significant relationship between stress and BMI/A. Differences in how students manage stress cause the impact on nutritional status to vary Juzailah dan Ilmi (2022).

The results of this study also showed that there was no significant relationship between body image and adolescent nutritional status. According to Bandura (1997), self-perception, including body image, is formed through social learning and self-efficacy. Individuals learn through interactions between personal, behavioral, and environmental factors. Adolescents with high self-efficacy tend to be able to control eating, while those with low self-efficacy are more easily dissatisfied with their bodies and find it difficult to control eating. The researcher did not find a relationship between body image and nutritional

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status possibly because body image does not directly influence nutritional status, but rather operates through eating patterns (18)., This result aligns with Rahmatullah and Hardiansyah (2023), which showed that a positive body image does not always align with normal nutritional status (19). Adolescents often misjudge their bodies, leading to disrupted nutritional intake (20). Additionally, satisfaction with body image can make them ignore excess body weight (21).

In this study, it was also found that nearly one-third of adolescent girls often consume high sodium foods. Based on the WHO global report (2023), the average sodium intake of the world community currently reaches around 4310 mg per day or equivalent to 10.78 g of salt, which means it is more than double the recommended limit (<2000 mg per day). This condition indicates that the majority of the global population (more than 85%) still has a high sodium diet, which can have a negative impact on overall health. Meanwhile, based on Riskesdas (2018), the proportion of salty food consumption in Central Sulawesi Province shows that 32.0% of the population consumes salty food ≥1 time per day, 42.8% consumes 1–6 times per week, and 25.2% consumes ≤3 times per month. In the 15–19 age group, the proportion of salty food consumption ≥1 time per day was recorded at 29.7%, consumption 1–6 times per week at 42.1%, and consumption ≤3 times per month at 28.2% (4). These findings suggest that the high sodium food consumption behavior among adolescents in this study is below the global and national averages.

There is a significant relationship between high sodium foods and adolescent nutritional status based on bivariate analysis (p=0.002). This finding is consistent with the results of the multivariate analysis which showed a significance value of 0.001 (p<0.05), indicating a positive and significant relationship. Kanah (2020) states that adolescents tend to prefer foods high in sodium and fat content, but low in vitamins and minerals. Adolescents prefer snacks and junk food over balanced staple foods, so their nutritional needs are not adequately met. This finding is in accordance with Saleh (2020), which showed a significant relationship (p = 0.01) between high sodium consumption and nutritional status (22) Adolescent girls with overnutrition tend to overeat junk food and fried foods, triggering fat accumulation(23). Meanwhile, ultra-processed foods high in sodium can also cause undernutrition because they are low in essential nutrients(24).

The results of this study are not in line with the research of Istianah & Rolag (2023), who did not find a significant relationship between salt consumption patterns and the nutritional status of SDIT An-Najah students, with a p-value of 0.276 (p >0.05)(25). This difference in results is likely due to variations in respondent characteristics, measurement methods, and differences in social and cultural environments that influence sodium consumption habits in each region.

The strength of this study lies in its discussion of the relationship between stress levels, body image, high sodium eating behavior, and nutritional status in adolescent girls, an important topic in maintaining adolescent health. The results provide evidence that psychological factors and eating habits, including high sodium food consumption, can impact the balance of nutritional status. The focus on adolescent girls as a vulnerable group makes these findings relevant as a basis for nutrition education and health promotion programs in schools. Limitations of the study include its cross-sectional design, which only measures data at one point in time, and therefore cannot establish a cause-and-effect relationship. The study also did not control for external factors such as physical activity, sleep quality, socioeconomic status, and social media exposure, which potentially act as confounding variables and influence the validity of the relationship between the main variables.

CONCLUSION

Research at SMA Negeri 2 Palu shows that the majority of adolescents have good nutritional status and moderate stress levels, and the majority have a negative body image. High-sodium eating behavior is significantly related to nutritional status, as the majority of adolescent girls in Palu City rarely consume high-sodium foods. Nutritional interventions are necessary to maintain good nutritional status, manage stress levels, and enhance body perception through nutrition education, mental health coaching, and the promotion of a balanced diet tailored to adolescent needs.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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