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The relationship between stress, emotional eating, and nutritional status in adolescents

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ABSTRAK

Latar Belakang: *Prevalensi gizi lebih pada remaja di Indonesia mengalami peningkatan yang signifikan dari 7,3% di tahun 2013, menjadi 13,5% di tahun 2018. Gizi lebih yang terjadi di usia ini, dapat meningkatkan risiko obesitas dan penyakit degeneratif lainnya di usia dewasa. Stres dan perilaku makan adalah dua faktor yang dapat mempengaruhi status gizi pada remaja. Stres dapat memicu perubahan perilaku makan yang tidak sehat, seperti meningkatnya konsumsi fast food, makanan dan minuman manis atau justru hilangnya nafsu makan. Stres juga dapat memicu perilaku emotional eating, yaitu dorongan untuk makan sebagai mekanisme koping saat seseorang menghadapi stres atau tekanan negatif, yang telah dikaitkan dengan IMT yang lebih tinggi.*
Tujuan: *Penelitian ini bertujuan mengidentifikasi hubungan antara stres, emotional eating dengan status gizi murid SMA 2 Cileungsi Kabupaten Bogor.*
Metode: *Penelitian ini adalah studi kuantitatif dengan pendekatan crossectional. Pengumpulan data dilaksanakan pada bulan September 2023 di SMA 2 Cileungsi Kabupaten Bogor. Data dikumpulkan menggunakan instrumen penelitian berupa Adolescent Stress Questionnaire – Shortened Version (ASQ-S) untuk mengetahui data stres, Dutch Eating Behavior Questionnaire (DEBQ) untuk mengetahui data emotional eating, pengukuran antropometri untuk menentukan status gizi responden, dan Food Frequency Questionnaire (FFQ) untuk mengetahui frekuensi konsumsi responden terhadap sejumlah makanan. Studi ini melibatkan 262 responden yang diperoleh dengan teknik Cluster Random Sampling.*
Hasil: *Hasil penelitian menunjukkan bahwa sebagian besar responden dalam penelitian ini berstatus gizi normal yaitu sebesar 66,0%, gizi kurang 8,4% dan gizi lebih 25,6%. Responden dengan kategori stres sebesar 51,9%, sedangkan 48,1% lainnya adaptif. Ditemukan sebanyak 54,6% responden masuk kategori emotional eating dan 45,4% lainnya bukan emotional eating. Berdasarkan uji bivariat diperoleh hubungan yang signifikan antara stres dengan status gizi (p-value=0,013). Tidak ada hubungan yang signifikan antara emotional eating dengan status gizi (p-value=0,647).*
Kesimpulan: *Stres terbukti secara signifikan berhubungan dengan status gizi.*

KATA KUNCI*:* *emotional eating; remaja; status gizi; stres*

ABSTRACT

Background: *The prevalence of overnutrition among adolescents in Indonesia has significantly increased from 7.3% in 2013 to 13.5% in 2018. Overnutrition at this age can increase the risk of obesity and other degenerative diseases in adulthood. Stress and eating behavior are two factors that might impact nutritional status in adolescents. Stress can trigger unhealthy eating behaviors, such as increased consumption of fast food, sugary foods and drinks, or even loss of appetite. Stress can also lead to emotional eating behavior, which is the urge to eat as a coping method when facing stress or negative pressure, and has been link to a higher BMI.*

Objectives: *This study aims to identify the relationship between stress, emotional eating, and the nutritional status of high school students at SMA 2 Cileungsi Bogor Regency.*

Methods: *This research is a quantitative study with a cross-sectional approach. Data collection was conducted in September 2023 at SMA 2 Cileungsi Bogor Regency. Data were collected using research instruments, including the Adolescent Stress Questionnaire – Shortened Version (ASQ-S) to determine stress data, the Dutch Eating Behavior Questionnaire (DEBQ) to determine emotional eating data, anthropometric measurements to determine the nutritional status of the respondents, and the Food Frequency Questionnaire (FFQ) to assess the frequency of respondents' consumption of various foods. This study involved 262 respondents obtained using Cluster Random Sampling technique.*

Results: *The results showed that most of respondents in this study had normal nutritional status, accounting for 66.0%, while 8.4% were undernourished and 25.6% were overnourished. Respondents categorized as stressed were 51.9%, while the remaining 48.1% were adaptive. It was found that 54.6% of respondents fell in to the category of emotional eating, while 45.4% did not exhibit emotional eating behaviour. Based on bivariate analysis, a significant relationship was found between stress and nutritional status (p-value=0.013). There was no significant relationship between emotional eating and nutritional status (p-value=0.647).*

Conclusions: *Stress has been shown to be significantly associated with nutritional status.*

KEYWORD*:* *adolescents; emotional eating; nutritional status; stress*

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INTRODUCTION

Adolescence is a critical period in an individual's life cycle. During the transition from childhood to adulthood, various developments occur anatomically, physiologically, emotionally, socially, and intellectually (1). There is an acceleration in body growth and development during adolescence, leading to an increased need for nutrients (2). On the other hand, adolescents are currently experiencing a shift in eating behaviors such as the intake of fast food, soda, fried food, and similar products. These behaviors lead to unhealthy eating habits because they are high in calories and fat but low in vitamins and minerals (3). Adolescents also tend to skip meals, snack frequently, and eat to satisfy hunger without considering nutritional balance (4). Therefore, adolescence is a highly vulnerable period for nutritional problems.

Obesity in children and adolescents is currently one of the most alarming worldwide public health concerns. Over the past four decades, the global prevalence of obese children has multiplied by ten. Consequently, there are approximately 124 million obese children and adolescents worldwide at present (5). In Indonesia, according to the results of Riskesdas (2018), the prevalence of excessive nutrition in adolescents aged 16-18 years was 13.5% (9.5% overweight and 4.0% obese). This figure is higher than in 2013, which was 7.3% (5.7% overweight and 1.6% obese) (6), (7).

Childhood and adolescent obesity increase the risk of obesity in adulthood and can also increase the risk of cardiovascular diseases (such as hypertension and dyslipidemia), metabolic disorders (such as glucose intolerance), and psychosocial problems (8), (9).

Stress and eating behavior are two things that might impact nutritional status in adolescents. (10), (11). Academic demands, conflicts with parents, peer adjustment, and relationships with the opposite sex often cause stress in adolescents (12). Stress levels increase significantly during adolescence (13), (14). Stress can trigger changes in a person's eating behavior, such as eating more or eating less. Additionally, stress can alter a person's dietary choices to unhealthy meals that are low in fruits and vegetables and rich in fat, sugar, and salt (15). The hypothalamic-pituitary-adrenal axis is activated by stress, which raises cortisol production. This axis interacts with other hormones to influence food intake (16). Consuming food as a result of stress or "emotional eating" refers to the act of eating flavorful foods in reaction to negative emotions, rather than in response to hunger. Studies show an increasing prevalence of emotional eating behavior in adolescents. These poor eating behaviors can lead to weight gain, obesity, and other health problems in adolescents (17).

Based on the above explanation, further research is necessary to determine how stress, emotional eating, and nutritional status in adolescent are related. A preliminary study at SMAN 2 Cileungsi involving 29 adolescent students showed that 6.9% of adolescents were underweight, 13.8% were overweight, and 20.7% were obese. Hence, the objective of this research is to investigate the correlation between stress, emotional eating, and the nutritional status in adolescents at SMA 2 Cileungsi Bogor Regency.

MATERIALS AND METHODS

This study used a quantitative approach with a cross-sectional study design. Population in this study consists of all students in grades 10 and 11 at SMA 2 Cileungsi Bogor Regency. Subjects in this study were students from SMA 2 Cileungsi Bogor Regency, in grades 10 and 11 who meet the inclusion and exclusion criteria of the study. The inclusion criteria for this study are 1) students from SMA 2 Cileungsi Bogor Regency in grades 10 and 11 who are actively studying; 2) willing to participate as respondents by signing an informed consent form. The exclusion criteria for this study are 1) respondents who are currently on a diet program; 2) respondents who are currently taking antidepressant medication; 3) respondents who are sick or have conditions that prevent anthropometric measurements.

The sampling methodology employed in this study utilized a cluster random sampling technique, resulting in a sample size of 262 respondents. Research instruments used include anthropometric measurements to determine weight and height. Weight was measured using a digital scale with an accuracy of 0.1 kg, and height was measured using a microtoise with an accuracy of 0.1 cm. WHO AnthroPlus software was used to determine the nutritional status of respondents based on z-score values based on BMI/Age. The Adolescent Stress Questionnaire – Shortened Version (ASQ-S) was used to assess respondents' stress levels. It consists of 27 questions with 5 answer choices on a Likert scale: 1 (not stressed), 2 (mild stress), 3 (moderate stress), 4 (severe stress), 5 (very severe stress). Scores were obtained by summing the total answers for each question item and categorized as "stress" if ≥ mean and "adaptive" if < mean (12). The Dutch Eating Behavior Questionnaire (DEBQ) was used to assess respondents' emotional eating behavior. It consists of 13 questions with 5 answer choices on a Likert scale: 1 (never), 2 (seldom), 3 (sometimes), 4 (often), 5 (very often). Scores were obtained by summing the total answers for each question item and categorized as "emotional eating" if ≥ median and “non-emotional eating" if < median (18). The DEBQ covers three aspects of eating behavior: restrained, emotional, and external eating. In this study, only the emotional eating aspect was investigated, as it aligns with the research objective of understanding eating behavior as a response to negative emotions regarding nutritional status. A Food Frequency Questionnaire was used to assess how often respondents consumed certain foods. It was categorized as "often" if consumption was ≥ 3 times per week, "rarely" if consumption was < 3 times per week, and "never" if not consumed in the last month. The list of food items in this questionnaire was determined based on a review of references and observations at the research site.

In this study, data analysis comprises univariate and bivariate analyses. Univariate analysis is utilized to describe each variable, presented through frequency distribution tables. Meanwhile, bivariate analysis employs the Chi-Square test with the aid of SPSS 26 software to explore the association between independent variables, namely stress and emotional eating, and the dependent variable, namely nutritional status. This research has obtained ethical approval from the Health Research Ethics Commission of Universitas Muhammadiyah Purwokerto with registration number KEPK/UMP/115/2023.

RESULTS AND DISCUSSIONS

Characteristic respondent

Respondents involved in this study were 262 students. Referring to **Table 1**, it is evident that the largest portion of respondents (51.5%) are aged 15 years, which falls into the mid-adolescent category (15 to 18 years old) (19). The majority of respondents are female (57.6%) and predominantly students in grade 10 (66.4%). the highest level of education attained by the respondents' mothers and fathers is mostly high school or equivalent, with 51.9% and 55.0%, respectively. Parents' education level contributes to their children's nutritional status. This is related to their knowledge of nutrition, motivation, and provision of food for their children (20).

Table 1. Respondents characteristics

Characteristics	n	%
Age (year)		
14	9	3.4
15	135	51.5
16	105	40.1
17	13	5.0
Sex		
Male	111	42.4
Female	151	57.6
Grade		
10	174	66.4
11	88	33.6
Mother's Education Level		
Did not complete primary school	2	0.8
Completed primary school	13	5.0
Completed junior high school	26	9.9
Completed senior high school	136	51.9
Academy/College/University	85	32.4
Father's Education Level		
Did not complete primary school	1	0.4
Completed primary school	11	4.2
Completed junior high school	10	3.8
Completed senior high school	144	55.0
Academy/College/University	96	36.6
Total	**262**	**100**

Referring to **Table 2**, it can be observed that the majority of respondents have normal nutritional status (66.0%), with 8.4% being undernourished (1.9% severely thin, 6.5% thin), and 25.6% being overnourished (16.0% overweight, 9.5% obese). These results indicate higher figures compared to the national prevalence among adolescents aged 16-18 years, where 9.5% are overweight and 4.0% are obese. This is also higher than the figures in West Java, where 11.3% are overweight and 5.1% are obese. During adolescence, the rate of growth accelerates, making it crucial to pay attention to meeting nutritional needs (6).

Table 2. Distribution of respondents based on nutritional status, stress condition, and emotional eating behavior

Variable	n	%
Nutritional Status		
Undernutrition	22	8.4
Normal nutrition	173	66.0
Overnutrition	67	25.6
Stress Condition		
Adaptive	126	48.1
Stress	136	51.9
Emotional Eating Behavior		
Non-Emotional Eating	119	45.4
Emotional Eating	143	54.6
Total	**262**	**100**

In this study, the largest portion of respondents fall into the category of stress (51.9%), while the remaining 48.1% are adaptive. These results are higher when compared to research by Putri and Widyatuti (2019) involving 360 high school adolescents in Bekasi City, which found that 47.2% of respondents experienced stress and 52.8% were adaptive (21). Study conducted by Langi (2022) on 192 junior high school teenagers in Makassar also obtained lower figures, only 23.4% of respondents categorized as stressed (22). Adolescents are a vulnerable age group prone to experiencing stress. Family conflicts, friendships, academic burdens, and financial issues are some factors that often cause stress in adolescents. Stress itself can be defined as the body's response to pressure (23). In this study, based on the Adolescent Stress Questionnaire – Shortened Version (ASQ-S) result, it was found that 37.8% of respondents experienced mild stress when facing pressure due to unfamiliarity with close friends. Respondents experienced moderate stress when parents argued (35.9%). Meanwhile, severe stress experienced by respondents included frequent arguments at home (27.5%), and very severe stress occurred when there was too much schoolwork (21.8%). These findings are consistent with a qualitative study conducted by Philip, Susan et al (2019), which showed that adolescent stress is more caused by school tasks and conflicts with friends or family rather than socioeconomic difficulties (24). Meanwhile, Rahmadhani and Mahmudiono (2021) using the Educational Stress Scale Adolescents (ESSA) instrument found that 31.6% of adolescents strongly agreed that they felt they had too many school tasks (11).

According to **Table 2**, it is evident that most respondents fall into the category of emotional eating (54.6%), while 45.4% do not engage in emotional eating. This result is consistent with a study by Ramadhani and Mahmudiono (2021) involving 133 high school students from SMAN 6 in Surabaya, where 51.1% of respondents were identified as engaging in emotional eating and 48.9% were not (11). However, research by Juzailah & Ilmi (2022), which involved 62 female teenagers in Jakarta, obtained a lower figure, as many as 40.3% of respondents had a tendency to emotional eating and 59.7% did not (25). Adolescents use various coping mechanisms for stress, one of which is eating. Eating as a stress coping method involves eating to satisfy cravings due to an inability to withstand the pressure faced, rather than due to hunger (emotional eating) (23). Other sources add that emotional eating occurs when a person overeats in an attempt to elevate their mood and reduce discomfort in response to stress, and often associated with larger adipose tissue and higher BMI (26). While some research indicates that emotional eating primarily manifests in response to negative emotions like sadness or anger, recent studies suggest that it can also occur in response to positive emotions such as happiness or joy. This behavior has been associated with binge eating and loss of control over food intake (27).

Tabel 3. The relationship between stress, emotional eating and nutritional status

Variable	Nutritional Status						Total	*P-value*
	Over		Normal		Under			
	n	%	n	%	n	%	n	
Stress Condition								
Stress	39	28.7	92	67.6	5	3.7	136	0.013*
Adaptive	28	22.2	81	64.3	17	13.5	126	
Emotional Eating Behavior								
Emotional Eating	38	26.6	95	66.4	10	7.0	143	0.647
Non-Emotional Eating	29	24.4	78	65.5	12	10.1	119	

*Statistically significant

According to **Table 3**, the analysis of the relationship between stress and nutritional status revealed that the proportion of respondents categorized as overnourished was greater among those who experienced stress (28.7%) compared to those who were adaptive (22.2%). There is a significant relationship between stress and nutritional status, as indicated by the statistical test findings with a p-value <0.05. Similar results were found in a study involving 69 students at Al-Hamid Islamic Boarding School, where a significant association between stress and nutritional status was obtained (p-value=0.000) (28).

Severe stress leads to increased energy intake and a person's preference for foods with crunchy textures and strong flavors. A stressed individual tends to eat frequently but not due to hunger. Longitudinal studies show that higher levels of stress are predictive of greater increases in BMI. Numerous prospective epidemiological studies also suggest a direct correlation between stress and weight gain (29). Individuals experiencing stress tend to increase their consumption of high-calorie foods, consume more snacks between meals, and reduce their intake of low-calorie and nutrient-rich foods such as fruits and vegetables, making them susceptible to overnutrition and even obesity (30), (31). In line with the theory, this study found that respondents under stress conditions tended to consume sugary foods (81.6%), snacks (83.1%), soft drinks (46.3%), and packaged sweet drinks (80.9%) more frequently compared to respondents in the adaptive category (**Table 4**). These types of foods contain high calories that can lead to weight gain.

Table 4. Relationship between stress condition with food compsumption frequency

Variable	Stress Condition		Total n (%)	p-value
	Stress n (%)	Adaptive n (%)		
Fast food				
Often	52 (38.2%)	47 (37.3%)	99 (37.8%)	0.917
Rarely	74 (54.4%)	68 (54%)	142 (54.2%)	
Never	10 (7.4%)	11 (8.7%)	21 (8%)	
Sugary Food				
Often	111 (81.6%)	88 (69.8%)	199 (76%)	0.081
Rarely	24 (17.6)	36 (28.6%)	60 (22.9%)	
Never	1 (0.7%)	2 (1.6%)	3 (1.1%)	
Snack				
Often	113 (83.1%)	93 (73.8%)	206 (78.6%)	0.115
Rarely	22 (16.2%)	29 (23%)	51 (19.5%)	
Never	1 (0.7%)	4 (3.2%)	5 (1.9%)	
Soft drink				
Often	63 (46.3%)	51 (40.5%)	114 (43.5%)	0.516
Rarely	48 (35.3%)	53 (42.1%)	101 (38.5%)	
Never	25 (18.4%)	22 (17.5%)	47 (17.9%)	

Packaged Sweet Drinks				
Often	110 (80.9%)	99 (78.6%)	209 (79.8%)	0.353
Rarely	25 (18.4%)	23 (18.3%)	48 (18.3%)	
Never	1 (0.7%)	4 (3.2%)	5 (1.9%)	
Fruits				
Often	99 (72.8%)	89 (70.6%)	188 (71.8%)	0.928
Rarely	35 (25.7%)	35 (27.8%)	70 (26.7%)	
Never	2 (1.5%)	2 (1.6%)	4 (1.5%)	
Vegetables				
Often	105 (77.2%)	100 (79.4%)	205 (78.2%)	0.899
Rarely	29 (21.3%)	24 (19%)	53 (20.2%)	
Never	2 (1.5%)	2 (1.6%)	4 (1.5%)	

Stress can influence a person's appetite. Adolescents with overnourished status tend to eat larger portion of high-calorie meals, while adolescents with undernourished status tend to eat less or not at all. In a stressful situation, individual responses vary when it comes to eating behavior. Some individuals consume more food when stressed (emotional eating), while others are unaffected or even have decreased appetite (non-emotional eating) (28). In the DEBQ, respondents categorized as non-emotional eating are those who mostly choose answers indicating they rarely or never have the desire to eat when facing negative emotions such as anger, despair, frustration, fear, and so on. Conversely, respondents categorized as emotional eating feel often or very often inclined to eat when experiencing these same emotions. In acute situations, stress triggers the release of corticotrophin-releasing hormone (CRH), which suppresses hunger. The hypothalamus in the brain communicates to the adrenal glands to release adrenaline hormone, which helps initiate the body's response to delay eating (32). In cases of prolonged stress, the adrenal glands release cortisol hormone, which stimulates appetite. Elevated levels of cortisol and insulin lead to an increase in ghrelin hormone levels. This "hunger hormone" communicates to the brain to consume and store calories and fat more efficiently. Glucocorticoid hormones play a role in the activity of lipoprotein lipase in adipose tissue, thus increasing fat storage in the body, especially visceral fat. Consequently, the increase in these hormones presents challenges for weight loss and contributes to tendencies toward emotional eating (33), (34).

Another research study further suggests that the impact of stress on alterations in eating patterns and weight gain, particularly significant weight gain, is connected to emotional eating as a coping strategy, frequently involving the consumption of "comfort foods". Foods rich in fat and carbohydrates that provide high energy levels are often classified as "comfort foods," and research indicates that individuals prone to emotional eating tend to consume greater quantities of such foods (29).

The findings of this study are in contrast to a study by Sukianto, Marjan, and Fauziyah (2020), where no significant correlation was found between stress levels and nutritional status among employees at Universitas Pembangunan Nasional Jakarta (p-value=0.618). However, it is explained that both variables have a positive correlation, meaning that respondents who are not stressed tend to have a non-excessive nutritional status, while respondents who are stressed tend to have excessive nutritional status (35).

As seen in Table 3, the analysis of the relationship between emotional eating and nutritional status revealed that there is no significant correlation between emotional eating and nutritional status, according to the statistical test results with a p-value >0.05. However, the proportion of respondents with overnourished status is higher in the emotional eating category (26.6%) compared to those who are not engaging in emotional eating (24.4%).

These results differ from a study by Rahmawati, Anantanyu, & Kusnandar (2019) involving 140 adolescents in Surakarta, which found a significant relationship between emotional eating, snack behavior, and nutritional status (p-value <0.001). The study found that adolescents with overnourished status were more likely to engage in emotional eating and snacking than adolescents with undernourished and normal nutritional status. This study used different instruments and methods of data analysis, namely the Emotional Eater Questionnaire (EEQ) and binary logistic regression (36).

In this study, no significant relationship was found between emotional eating and nutritional status. While emotional eating can lead to an increase in an individual's nutritional status, it is not the sole factor influencing nutritional status. Emotional eating occurring during stress may not necessarily change a person's daily eating patterns, which would impact their nutritional status. According to theory, imbalanced food intake and infectious diseases are the main causes of nutritional problems. However, this study did not measure such data. The findings of this investigation are consistent with those of studies by Angesti and Manikam (2020) on final-year undergraduate students at the Faculty of Health, Universitas MH Thamrin, and by Wijayanti, Margawati, and Wijayanti (2019) on final-year undergraduate students at the Faculty of Engineering. These studies also found no significant relationship between emotional eating and nutritional status. These studies explain that many factors influence an individual's nutritional status besides emotional eating behavior, such as nutritional knowledge, parental roles, peer influence, and others (37), (38).

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this study, stress has been proven to be significantly associated with nutritional status. Therefore, there is a need for frequent education among adolescents to effectively manage stress to prevent negative impacts on nutritional status. However, the nutritional status of adolescents significantly contributes to their growth and development as well as their future.

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