

RESEARCH ARTICLES

Overweight Among Adolescents in Surakarta City: A Review of Emotional Eating, Snacking Frequency, and Screen Time

Overweight Badan pada Remaja di Kota Surakarta: Tinjauan terhadap Emotional Eating, Frequency, dan Screen Time

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Abstract

Adolescence is a vulnerable period for nutritional problems due to physical and hormonal changes. Overweight is a multifactorial condition that commonly occurs among adolescents. Risk factors for overweight in adolescents include emotional eating, increased snacking frequency, and screen time. This study aimed to determine the relationships between emotional eating, snacking frequency, and screen time and overweight among adolescents in Surakarta City. This case-control study used a multistage random sampling method. The sample consisted of 280 students aged 13–15 years, with a case-to-control ratio of 1:3, from seven junior high schools in Surakarta City. Nutritional status was assessed using BMI-for-age (BMI/A) anthropometric measurements. Emotional eating was assessed using the Emotional Eater Questionnaire (EEQ), snacking frequency using the Food Frequency Questionnaire (FFQ), and screen time using the Screen Time Questionnaire (STQ). Multivariate analysis showed that emotional eating and snacking frequency were significantly associated with overweight. Emotional eating was significantly associated with overweight (OR = 1.589; 95% CI: 1.312–1.925; $p < 0.001$), as was snacking frequency (OR = 1.004; 95% CI: 1.002–1.006; $p < 0.001$). In contrast, screen time was not significantly associated with overweight (OR = 1.006; 95% CI: 0.999–1.013; $p = 0.054$). These findings highlight the importance of addressing eating-related behaviors, particularly emotional eating and snacking frequency, in efforts to prevent overweight among adolescents.

Keywords: emotional eating, frequency snacking, overweight, screen time

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Abstrak

Masa remaja merupakan periode yang rentan terhadap masalah gizi akibat perubahan fisik dan hormonal. Overweight merupakan kondisi multifaktorial yang sering terjadi pada remaja. Faktor risiko overweight pada remaja meliputi emotional eating, peningkatan frekuensi ngemil, dan screen time. Penelitian ini bertujuan untuk mengetahui hubungan antara emotional eating, frekuensi ngemil, dan screen time dengan overweight pada remaja di Kota Surakarta. Penelitian ini merupakan studi case-control dengan metode multistage random sampling. Sampel terdiri atas 280 siswa berusia 13–15 tahun dengan rasio kasus dan kontrol 1:3 yang berasal dari tujuh sekolah menengah pertama di Kota Surakarta. Status gizi dinilai menggunakan pengukuran antropometri IMT menurut umur (IMT/U). Emotional eating diukur menggunakan Emotional Eater Questionnaire (EEQ), frekuensi ngemil menggunakan Food Frequency Questionnaire (FFQ), dan screen time menggunakan Screen Time Questionnaire (STQ). Analisis multivariat menunjukkan bahwa emotional eating dan frekuensi ngemil berhubungan signifikan dengan overweight. Emotional eating berhubungan signifikan dengan overweight ($OR = 1,589$; 95% CI: 1,312–1,925; $p < 0,001$), demikian pula frekuensi ngemil ($OR = 1,004$; 95% CI: 1,002–1,006; $p < 0,001$). Sebaliknya, screen time tidak berhubungan signifikan dengan overweight ($OR = 1,006$; 95% CI: 0,999–1,013; $p = 0,054$). Temuan ini menunjukkan pentingnya memperhatikan perilaku makan, khususnya emotional eating dan frekuensi ngemil, dalam upaya mencegah overweight pada remaja.

Kata Kunci: emotional eating, frekuensi ngemil, overweight, screen time

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Highlight:

- Emotional eating was identified as an important behavioral factor associated with overweight among adolescents in Surakarta City.
- Higher snacking frequency was associated with an increased likelihood of overweight among adolescents.
- Screen time was not independently associated with overweight after adjustment for other variables.

INTRODUCTION

Adolescence is a transitional period between childhood and adulthood. It is one of the critical growth and development periods that determines subsequent developmental stages. Ages 13-15 fall within middle adolescence, which is the peak of growth that affects changes in body composition, physical activity, weight, and bone mass. Adolescence is vulnerable to nutritional problems due to physical and hormonal changes (Simanoah et al., 2022). In order to avoid dietary issues, food consumption must be properly fulfilled. Undernutrition, overweight, and obesity are among the nutritional problems that frequently affect teenagers (Kemenkes, 2018).

Being overweight is a multifactorial disease that occurs as a consequence of the accumulation of excess adipose tissue in the body. This condition occurs because of an imbalance between energy intake and energy expenditure in the form of physical activity. Overweight can be measured by observing z-score results for the body mass

index (BMI) for age, with values between 1 and +2 standard deviations. In comparison, obesity has a standard of +2 standard deviations ([Kemenkes, 2020](#)). According to the World Health Organization (WHO), as many as 340 million children and adolescents aged 5-19 years experience being overweight worldwide. Based on the 2023 SKI results, the prevalence of overweight among teenagers aged 13-15 increased to 12.1% in Indonesia in 2023 and 11.5% in Central Java Province ([Kemenkes, 2023](#)). Surakarta City is one of the cities in Central Java Province, with an overweight prevalence of 11.65% nationally in 2018 ([Kemenkes, 2018](#)). Based on the latest data from the Surakarta City Health Service in 2022, 8.37% of teenagers aged 13-15 experienced overweight ([Dinkes, 2021](#)), and there are three subdistricts with the highest prevalence: Banjarsari Subdistrict (58%), Laweyan Subdistrict (21.4%) and Jebres Subdistrict (13%) ([Dinkes, 2021](#)).

Being overweight is a multifactorial condition in adolescents. It can be caused by several factors, including emotional conditions, an imbalance between energy intake and expenditure, and physical activity. Teenagers will experience a time when emotional tension will occur due to physical, psychosocial, and hormonal changes. A coping strategy for stress is a frequent effort made by teenagers to reduce tension or emotional burden due to stress ([Ajibewa et al., 2021](#)). Emotional eating is one form of coping strategy for stress characterized by abnormal eating behaviour with a tendency to overeat in response to negative emotions, such as anxiety, stress, and depression. Stress conditions influence the hypothalamus-pituitary-adrenal system, which increases cortisol release. High levels of cortisol in the blood will stimulate insulin, leptin, and neuropeptide Y (NPY) systems, which can trigger hunger. A desire for continuous Eating can increase the risk of experiencing excess weight or obesity ([Hsu and Raposa, 2021](#)).

The frequency of snacking refers to how often someone consumes snacks as a food interlude ([Sukianto et al., 2020](#)). A high frequency of snacking can lead to irregular eating patterns and increased energy intake and body fat. The choice of snack types can also significantly impact the body's intake. The choice of snacks among teenagers is influenced by factors such as pocket money, environment, and advertisements on social media. Snacks that teenagers often choose are processed snacks high in sodium, saturated fats, sugar, and calories. At the same time, healthy snacks like fruits and vegetables are rarely consumed. According to [Kemenkes \(2018\)](#), the proportion of sweet-food consumption in Indonesia is very high at 87,9%, and sweet drinks at 91,49%. Based on [Skoczek-Rubińska and Bajerska \(2021\)](#), snacks can contribute 152-320 calories per intake, significantly increasing daily calorie consumption and the risk of being overweight.

Screen time is directly related to low physical activity levels because it is classified as a sedentary activity. Screen time is an activity involving screen exposure, such as playing games, using social media, and watching movies. The low energy expenditure in sedentary activities leads to an excess of energy in the body, which is then stored as fat ([Sari et al., 2023](#)). Accumulation of body fat will cause an increase in weight and obesity. According to the recommendation of the American Academy of Pediatrics (AAP) in 2016, screen time limits for teenagers should not exceed 2 hours per day ([Hill et al., 2016](#)). In order to avoid nutritional issues, food consumption must be adequate and balanced. Undernutrition, overweight, and obesity are among the nutritional problems that frequently affect teenagers ([Pratiwi and Mardiyati, 2018](#)).

Based on these findings, researchers are interested in investigating the connection between emotional eating, snacking frequency, and screen time with

overweight adolescents in Surakarta City. This is because teenagers are a vulnerable group at risk of experiencing nutritional problems, such as being overweight, which various factors, including physical, psychological, and hormonal changes, can influence.

METHODS

This study uses an observational analytic method with a case-control design. The case group in this study consists of students with overweight, while the control group consists of students with normal nutritional status. Subjects were selected based on the specified age criteria. The population in this study consists of all junior high school adolescents aged 13-15 years based on the Basic Education Data for the 2023/2024 academic year in the Banjarsari, Laweyan, and Jebres subdistricts. This study uses a sample size of 280 students. The number of students sampled from each school is 40. This study employs a case-control design with a ratio of 1:3.

The inclusion criteria were adolescents aged 13–15 years who were students of public junior high schools, willing to participate as subjects, and in good health during the six months preceding and at the time of the study. The exclusion criteria were: (1) currently following a special diet, such as a weight-gain or weight-loss diet; (2) having illnesses that affect eating patterns or body weight, such as upper respiratory tract infections (URTIs), heart disease, or gastroenteritis; and (3) currently undergoing treatment. Anthropometric measurements of height and weight were conducted to obtain BMI data. Emotional eating was measured using the Emotional Eater Questionnaire (EEQ) (Özcan and Yeşilkaya, 2021), snacking frequency was assessed using the Food Frequency Questionnaire (FFQ) (Faridi et al., 2022), and screen time was measured using the Screen Time Questionnaire. Screen time is considered high if it lasts more than 2 hours.

Data were analyzed using the Chi-Square test and Conditional Logistic Regression. Conditional logistic regression is usually used for matched case-control, in this study cases are matched with controls based on school of origin. The research was conducted based on research ethics, taking into account the privacy of the subjects and carried out without any intimidation as a form of respect for the subjects. Informed consent is filled out based on the participation and involvement of the subjects in the research. The study received ethical approval under protocol number 805/III/HREC/2024. The study was conducted in accordance with ethical principles, including maintaining participants' privacy, obtaining *informed consent*, and ensuring that participation was voluntary and free from intimidation.

RESULTS AND DISCUSSIONS

Subject characteristics

The characteristics of the research subjects were assessed based on anthropometric measurements and questionnaire responses by 280 subjects who met the inclusion criteria. Based on Table 1, the characteristics of the subjects are viewed by subdistrict, as this study was conducted in three subdistricts with the highest prevalence, allowing for the determination of sample characteristics in each subdistrict. Table 1. shows that the sample proportion in each subdistrict has a ratio of 4:2:1, which is based on the prevalence strata in the research subdistricts.

Table 1. Characteristics of subjects by subdistrict

Variable	Subdistricts		
	Banjarsari	Laweyan	Jebres
Schools			
SMP N 4 Surakarta	40 (25%)	-	-
SMP N 7 Surakarta	40 (25%)	-	-
SMP N 18 Surakarta	40 (25%)	-	-
SMP N 23 Surakarta	40 (25%)	-	-
SMP N 3 Surakarta	-	40 (50%)	-
SMP N 12 Surakarta	-	40 (50%)	-
SMP N 16 Surakarta	-	-	40 (100%)
Gender			
Male	81 (50.63%)	35 (43.75%)	25 (62.5%)
Female	79 (49.38%)	45 (56.25%)	15 (37.5%)
Age			
13 years old	73 (45.63%)	20 (25%)	6 (15%)
14 years old	87 (54.37%)	60 (75%)	34 (85%)
Parents Income			
< Rp 2.269.070	50 (31.25%)	27 (33.75%)	19 (47.50%)
≥ Rp 2.269.070	110 (68.75%)	53 (66.25%)	21(52.59%)
Pocket money			
< Rp15.000	103 (64.38%)	44 (55%)	34 (85%)
≥ Rp 15.000	57 (35.63%)	36 (45%)	6 (15%)

Source: Primary data, 2024

Based on Table 1, the majority of subjects in the Banjarsari and Jebres Sundistricts were male, while in the Laweyan Subdistrict, they were female. Banjarsari Subdistrict has 50.63% male subjects, Jebres Subdistrict has 62.5% male subjects, and Laweyan Subdistrict has 56.25% female subjects. Subjects in this study have an age range of 13-15 years, but in this study, no students were found aged 15 years. Therefore, there were only subjects aged 13 and 14 years. Based on Table 1, most of the subjects in the three districts were 14 years old. Banjarsari Subdistrict has 45.63% of subjects aged 13 years and 54.37% of subjects aged 14 years, Laweyan Subdistrict has 25% of subjects aged 13 years and 75% of subjects aged 14 years, and Jebres District has 15% of subjects aged 13 years and 85% of subjects aged 14 years. Based on the income of the parents of subjects from the three districts, most of them have incomes above the Regional Minimum Wage (UMR) of Surakarta City of Rp 2.269.070. Table 1 also shows that most subjects have pocket money <Rp 15.000 per day, with the percentage of Banjarsari District 64.38% for pocket money <Rp 15.000 and 35.63% for pocket money ≥ Rp 15.000, Laweyan Subdistrict 55% for pocket money <Rp 15.000 and 45% for pocket money ≥ Rp 15.000, and Jebres District 85% for pocket money <Rp 15.000 and 15% for pocket money ≥ Rp 15.000.

Distribution of emotional eating, frequency of snack consumption, and screen time

Univariate analysis was conducted to display the range of values for each variable, including minimum, maximum, average, and standard deviation. This test analyzed the variables of emotional eating, snacking frequency, and screen time.

Table 2. Univariate test results for emotional eating, snacking frequency, and screen time

Variable	N	Min	Max	Mean	Std. Deviation
Emotional eating	280	1	23	9.83	3.82
Snacking frequency	280	45	1925	342.96	229.91
Screen time	280	67	468	218.03	74.99

Source: Primary data, 2024

Based on Table 2, the sample size was 280, and the emotional eating variable showed a standard deviation of 3.82, which was smaller than the mean of 9.83. The results of this study indicate that subjects have emotional eating points with a minimum value of 1 and a maximum of 23. The snacking frequency variable has a standard deviation of 229.91, which is smaller than the mean of 342.96, with a minimum snacking frequency point of 45 and a maximum of 1925. The screen time variable has a standard deviation of 74.99, which is smaller than the mean value of 218.03, with a minimum value of 67 and a maximum of 468.

Association of demographic and behavioral factors with overweight

The bivariate analysis in Table 3 showed that sex, age, and parental income were not significantly associated with overweight. Sex had an OR of 1.020 ($p = 0.943$), age had an OR of 0.969 ($p = 0.930$), and parental income had an OR of 0.911 ($p = 0.760$). In contrast, pocket money was significantly associated with overweight (OR = 2.309; 95% CI: 1.270–4.196; $p = 0.006$), indicating that subjects receiving $\geq$ Rp15,000 in pocket money had 2.309 times higher odds of being *overweight* than those receiving $<$ Rp15,000.

Table 3. Bivariate test results for gender, age, parental income, pocket money, emotional eating, snacking frequency, and screen time

Variable	Normal N (%)	Overweight N (%)	OR	95% CI		<i>p-value</i>
				Lower	Upper	
Gender						
Male	104 (49.52%)	35 (50%)	1.020	0.583	1.783	0.943
Female	106 (50.48%)	35 (50%)				
Age						
13 years old	74 (35.24%)	25 (35.71%)	0.969	0.486	1.932	0.930
14 years old	136 (64.76%)	45 (64.29%)				
Parents Income						
< Rp 2.269.070	71 (33.81%)	25 (35.71%)	0.911	0.502	1.653	0.760
≥ Rp 2.269.070	139 (66.19%)	45 (64.29%)				
Pocket Money						
< Rp15.000	145 (69.05%)	36 (51.43%)	2.309	1.270	4.196	0.006*
≥ Rp 15.000	65 (30.95%)	34 (48.57%)				
Emotional Eating						
Non-emotional Eaters	183 (87.14%)	7 (10%)	1.674	1.426	1.965	0.001*
Emotional Eaters	27 (12.86%)	63 (90%)				
Snacking Frequency						
Score < mean value	157 (74.76%)	3 (4.29%)	1.006	1.004	1.008	0.001*
Score ≥ mean value	53 (25.24%)	67 (95.71%)				

Variable	Normal N (%)	Overweight N (%)	OR	95% CI		<i>p-value</i>
				Lower	Upper	
Screen Time						
Low Screen Time ≤ 2 hours	53 (25.24%)	0				
High Screen Time > 2 hours	157 (74.76%)	70 (100%)	1.009	1.004	1.013	0.001*

Note: Bivariate analysis was performed using conditional logistic regression. The first category of each variable was used as the reference category; OR = odds ratio; CI = confidence interval; N = number of subjects; * indicates $p < 0.05$

Table 3 also shows that among the independent variables, emotional eating, snacking frequency, and screen time were significantly associated with *overweight* in the bivariate analysis. Emotional eating had an OR of 1.674 (95% CI: 1.426–1.965; $p < 0.001$), snacking frequency had an OR of 1.006 (95% CI: 1.004–1.008; $p < 0.001$), while *screen time* had an OR of 1.009 (95% CI: 1.004–1.013; $p = 0.001$).

Association of emotional eating, snacking frequency, and screen time with overweight

The final model in Table 4 presents the results of the multivariable conditional logistic regression analysis for emotional eating, snacking frequency, and screen time. Emotional eating and snacking frequency were significantly associated with overweight, with ORs of 1.589 (95% CI: 1.312–1.925; $p < 0.001$) and 1.004 (95% CI: 1.002–1.006; $p < 0.001$), respectively. In contrast, screen time was not significantly associated with overweight (OR = 1.006; 95% CI: 0.999–1.013; $p = 0.054$). Because the ORs for some variables were close to 1 for a one-unit increase, Table 5 presents the adjusted ORs based on specified unit increases to facilitate interpretation of the magnitude of the associations according to the measurement scale of each variable.

Table 5 presents the adjusted ORs based on a 5-unit increase in emotional eating, a 300-unit increase in snacking frequency, and a 150-unit increase in screen time. These estimates provide a more interpretable measure of the magnitude of the associations for larger changes in each variable. The overall interpretation of statistical significance remains based on the multivariable model presented in Table 4, in which *emotional eating* and snacking frequency were significantly associated with overweight, whereas *screen time* was not significantly associated with overweight.

Table 4. Multivariate analysis for emotional eating, snacking frequency, and screen time

Variable	OR	95% CI		p-value
		Lower	Upper	
Emotional eating	1.589	1.312	1.925	0.000*
Snacking frequency	1.004	1.002	1.006	0.000*
Screen time	1.006	0.999	1.013	0.054

Note: Multivariable analysis was performed using conditional logistic regression; OR = odds ratio; CI = confidence interval; * indicates $p < 0.05$

This study is in line with the results of research by [Rachmawati et al. \(2023\)](#), which found a significant relationship between emotional eating and overweight or obesity (p -value = 0.004; OR = 3.326). The study also concluded that adolescents should pay attention to their eating behavior when experiencing stress or negative

emotions by choosing nutritious foods according to their needs, avoiding excessive food intake, and monitoring their nutritional status to prevent health problems in the future. Shriver et al. (2021) also reported a significant relationship between emotional eating and weight status (p -value = 0.01). Emotional eating is strongly associated with poor dietary intake, including higher consumption of sugar and fat. Therefore, individuals who engage in emotional eating tend to choose high-energy and low-nutrient-density foods in response to their emotional states. Emotional regulation needs to be introduced to children from an early age to reduce the risk of emotional eating during adolescence and adulthood. Emotional regulation in adolescents plays an essential role in developing healthy eating behaviors and preventing obesity.

Table 5. Adjusted odds ratios for overweight according to specified unit increases in emotional eating, snacking frequency, and screen time

Variable	x Unit increase	OR	95% CI		p-value
			Lower	Upper	
Emotional eating	5	10.152	0.420	19.884	0.041*
Snacking frequency	300	3.928	1.110	6.746	0.006*
Screen time	150	2.627	0.046	5.209	0.045*

Note: OR = *adjusted odds ratio*; CI = *confidence interval*; x-unit increase = a specific unit increase in each variable; * indicates $p < 0.05$

Snacking frequency refers to the frequency of consuming snacks or street foods. Snacking involves eating outside the main meal times and is often influenced by individual preferences and taste. Snacks or street foods can contribute to meeting nutritional requirements, with snacks contributing approximately 10–20% of daily energy needs, or 192–384 kcal/day. A high frequency of snack consumption may increase the risk of overweight or obesity. In addition, the types of snacks consumed may also contribute to poor dietary intake among adolescents (Yanti et al., 2024). This finding is consistent with the study by Dewi et al. (2023), which found a significant relationship between the frequency or habit of consuming street foods and the incidence of overweight among adolescents at SMAN 1 Tapung Hilir, with a p -value < 0.001 . The study identified that adolescents who consumed snacks ≥ 4 times/day were more likely to be overweight or obese. This result is also consistent with research by Luthfiya and Nabawiyah (2022), which reported that snacking more than three times per day was associated with a 6.15-fold greater risk of central obesity compared with less frequent snacking.

Based on the multivariate analysis presented in Table 4, screen time was not significantly associated with overweight (OR = 1.006; 95% CI: 0.999–1.013; $p = 0.054$). Although the association did not reach statistical significance, the relatively high screen time observed among the subjects may still indicate a lifestyle pattern that warrants attention. The average screen time among subjects was 3.6 hours per day, which exceeded the AAP recommendation of ≤ 2 hours per day. In this study, screen time was relatively high in both nutritional-status groups, with 74.76% of subjects with normal nutritional status and 100% of overweight subjects reporting screen time > 2 hours per day. The relatively homogeneous distribution of screen time between the groups may have contributed to the lack of a statistically significant association in the multivariate analysis. This finding is also consistent with the study by Bakour et al. (2022), which reported that adolescents who spent four hours using computers or handheld devices had the highest prevalence of overweight/obesity (36.6%), compared

with 29.5% among adolescents who spent 1–3 hours. However, the findings of the present study indicate that screen time was not an independent predictor of overweight after adjustment for other variables in the multivariate analysis.

CONCLUSIONS

There was a significant association between emotional eating and snacking frequency with overweight among adolescents in Surakarta City, while screen time was not significantly associated with overweight in the multivariate analysis. Emotional eating showed the strongest association. These findings emphasize the importance of addressing emotional eating and snacking frequency in overweight prevention. The study was limited by school-related data-collection constraints, a limited sample restricted to eighth-grade students, and the absence of specific nutrient intake measurements such as SQ-FFQ.

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