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The relationship between breakfast habits and nutritional status of adolescent girls: A Cross-sectional study in Tasikmalaya

Hubungan kebiasaan sarapan pagi dengan status gizi remaja putri: Studi cross-sectional di Tasikmalaya

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Abstract

Many adolescents in developing countries have a poor breakfast habit. Poor nutritional status is thought to occur due to poor breakfast habits. This study aimed to analyze the relationship between breakfast habits and nutritional status in female adolescents using the BAZ approach. This was an observational study that used a cross-sectional approach. Three hundred and thirty-six (366) participants were selected from seven State Junior High Schools in Tasikmalaya using the proportional random sampling method. This study was conducted between August and October 2023. Nutritional status was measured using the body mass index-age-Z score (BAZ), and breakfast habits were assessed using a structured questionnaire. Multiple linear regression modeling with a significance of p<0,05 was used for data analysis. From 366 participants, the average frequency of breakfast was 3,4 ± 2,5 times/weeks, with an average BAZ of -0,08 ± 1,2 SD. Breakfast habits were related to nutritional status using BAZ (p=0,031. This study concluded that the frequency of breakfast consumption in a week is negatively related to nutritional status based on BAZ in female adolescents. Therefore, they need to be encouraged to eat breakfast and determine the reasons why they skip breakfast.
Keywords: overweight, nutrition, girl, student

Abstrak

Banyak remaja di negara berkembang mempunyai kebiasaan sarapan pagi yang buruk. Permasalahan gizi kurang diduga terjadi akibat kebiasaan sarapan pagi yang buruk. Penelitian ini bertujuan untuk menganalisis hubungan kebiasaan sarapan pagi dengan status gizi pada remaja putri dengan pendekatan BAZ. Penelitian ini merupakan penelitian observasional dengan pendekatan cross-sectional. Tiga ratus tiga puluh enam (366) subjek dipilih dari tujuh SMP Negeri di Tasikmalaya dengan menggunakan metode proporsional random sampling. Penelitian ini dilaksanakan pada bulan Agustus hingga Oktober 2023. Status gizi diukur dengan menggunakan indeks massa tubuh-usia-Z score (BAZ) dan kebiasaan sarapan pagi diukur menggunakan kuesioner terstruktur. Pemodelan regresi linier berganda dengan signifikansi p<0,05 digunakan untuk analisis data. Dari 366 subjek, rata-rata frekuensi sarapan pagi adalah 3,4 ± 2,5 kali/minggu, dengan rata-rata BAZ sebesar -0,08 ± 1,2 SD. Kebiasaan sarapan pagi berhubungan dengan status gizi menggunakan BAZ dengan p=0,031. Penelitian ini menyimpulkan bahwa frekuensi sarapan pagi dalam seminggu berhubungan negatif dengan status gizi berdasarkan BAZ pada remaja putri. Oleh karena itu, mereka perlu dianjurkan untuk sarapan dan mencari tahu alasan mengapa mereka melewatkan sarapan.
Kata Kunci: kegemukan, gizi, remaja putri, murid sekolah

Introduction

Worldwide, undernutrition and overnutrition remain the main nutritional problems among young women (Getacher et al., 2023). However, the types of nutritional problems that occurred in this group continued to change significantly. In female adolescents, the proportion of stunting and underweight individuals has decreased significantly, whereas the proportion of overweight (overweight and obese) individuals has increased (Mostafa et al., 2021). Overweight and obesity in adolescents under 18 years of age are characterized by a BAZ score of more than +1SD (Kemenkes, 2020).

Nutritional problems are more common in adolescents than in children (Larson 2021). Overweight in adolescents aged 12-19 years is 20,5% greater than overweight in school children aged 6-11 years which is 17,5%, and in kindergarten children aged 2-5 years is 8,9% (Ogden et al., 2018).

Various efforts have been made by teenagers to lose weight, including reducing food intake by skipping breakfast (Clayton et al., 2015). Breakfast is an activity of eating 2–3 h after waking up in the morning (Gibney et al., 2018). Breakfast was defined as eating between 05:00 am and 10:00 am (Park et al., 2023). In the Indonesian guidelines, breakfast is defined as eating and drinking from waking up in the morning to 09:00 a.m. (Khusun et al., 2022). Surveys in five cities in Indonesia showed that 17% of the participants did not eat breakfast and 13% did not eat breakfast every day. The rate of not eating breakfast among adolescents varies from 17% in Jakarta to 59% in Yogyakarta (Hardinsyah & Aries, 2016) and as much as 10% in Bogor (Niswah et al., 2014). Contrary to the general perception of teenagers, research shows that skipping breakfast is associated with a higher risk of being overweight and obese (López-Gil et al., 2022).

Skipping breakfast can increase the risk of overweight (Wicherski et al., 2021). The increased risk of being overweight is thought to be due to increased fat consumption (Wang et al., 2020), whereas fiber consumption tends to be low (Giménez-Legarre et al., 2020) as a result of skipping breakfast. The tendency to overeat during the day can also occur when skipping breakfast (Balushi & Carciofo, 2023). Skipping breakfast is often performed by teenagers, thereby increasing the consumption of snacks at school as a substitute for breakfast (Damara & Muniroh, 2021).

The prevalence of overweight in Indonesia was 21,8% in 2018 (Badan Penelitian and Pengembangan Kesehatan RI, 2018). The West Java Province, the most populous province in Indonesia, is also experiencing an increase in the prevalence of overweight. In 2018, the prevalence rates of overweight and obesity in Indonesia were 12,0% and 4,9% respectively. In Tasikmalaya City, in 2018, the prevalence of overweight based on BAZ in adolescent aged 13-15 was 13,74%, and obesity was 2,49%.

More specifically, for young women, a study by Hidayanti (2023) showed that the prevalence of overweight in Tasikmalaya was 18,3%. This study also found that snack-predominant dietary intake is a risk factor for overweight and obesity (Hidayanti et al., 2023). Therefore, this study aimed to analyze the relationship between breakfast habits and nutritional status as measured by the BAZ in female adolescents in Tasikmalay, focusing on adolescent girls, and comprehensively exploring factors other than breakfast that are associated with the nutritional status of adolescent girls.

Methods

This was an observational cross-sectional study. Participants were female adolescents from a state junior high school in Tasikmalaya. Of the 21 state junior high schools in Tasikmalaya, seven (30%) were selected as samples by simple random sampling. The total population of the seven selected state junior high schools included 2332 female students. Sample calculations resulted in 377 people with an addition of 10% to anticipate nonresponse. In this study, we used proportional random sampling to select participants. Unfortunately, 11 participants did not complete the recall assessment and were excluded from this study. Thus, 366 participants (97 %) were included in the data analysis. All participants and their parents or legal guardians signed informed consent as proof of their willingness to participate in this study. This study was approved by the Research Ethics Committee of Mataram Health Polytechnic, Indonesia (Number LB.01.02/6/2944/2023).

The dependent variable in this study was BAZ among female adolescents. Body mass index according to age, based on the Z-score (BAZ),

was calculated based on the results of measurements of weight and height. The WHO Antro Plus software was used to analyze the BAZ. Body weight was measured using a Seca 803 digital scale and height was measured using a stadiometer.

The independent variable in this study was breakfast habit. Breakfast habit is the average frequency of subjects consuming food at 05:00-09:00am (Khusun et al., 2023) or before going to school for one week. A structured questionnaire was used to obtain data regarding breakfast consumption habits.

In this study, we also measured physical activity variables using the PAQ-A questionnaire and measured screen time and sleep duration in one day. The measured food consumption variables included the snacking habits and macronutrient consumption. Snacking habits are the average frequency of participants consuming snacks in one week, which is divided into rare if consumption is <3 times per week and frequent if consumption of snacks is ≥3 times per week. Macronutrient consumption is the average nutritional intake (energy, protein, fat, and carbohydrates) of participants in a day, as measured by a food recall questionnaire (2 × 24) on weekdays and weekends. Macronutrient analysis was performed using the Nutrsurvey software.

Participant characteristics were also measured, including age, mother's and father's education, mother's and father's occupation, family status, family income, family members, and pocket money. Age is the length of time the subject has lived in the year since birth until the research was conducted. Mothers and fathers' education was formal schooling attended by the participant's mother and father., which is divided into elementary school, junior high school, high school, and university.

Mothers and fathers' employment is the livelihood status of the participant's mother and father, who can earn money, which is divided into working and not working. Family status is the completeness of the family in which the participants live, which is divided into single if the participant lives only with his father or mother and complete if the participant lives with both parents. Family income is the money (IDR per month) generated by the entire family. Family members are the number of people living in the same house as the participants (persons per house). Pocket money is money given to the participants (IDR per day).

The data were analyzed using univariate, bivariate, and multivariate analyses. In the univariate analysis, categorical data (mother's and father's education, mother's and father's employment, and family status) were calculated as percentages. Continuous data (age, family income, number of family members, pocket money, physical activity, breakfast habits, snacking habits, consumption of macronutrients, and nutritional status) were calculated as mean and deviation values.

Spearman's rank test was used to analyze the relationship between breakfast habits and macronutrient consumption (energy, protein, fat, and carbohydrate). One-way ANOVA was used to analyze the differences in BAZ based on the mothers' and fathers' education. Independent t-tests were used to analyze differences in BAZ based on the mothers' and fathers' employment and family status. These two statistical analyses were used because BAZ data were normally distributed. The results of the Kolmogorov–Smirnov test showed that data on age, family income, family members, pocket money, physical activity, breakfast habits, snack habits, and macronutrient consumption were not normally distributed; therefore, Spearman's rank test was used in bivariate analysis. For multivariate modeling, we used multiple linear regression. Statistical significance was set at $p<0,05$.

Result and Discussion

The results of this study showed that the average age of the participants was 13 years, and the average pocket money of the participants was IDR 21,000 per day. Most participants' mothers and fathers were in high school. Most of the participant's mother did not work, but on the other hand, most of the participant's father worked (Table 1).

In this study, participants had an average breakfast three times a week and an average snacking habit of almost five days a week. The average consumption of energy, protein, fat, and carbohydrates was below the RDA, but the average BAZ was still in the good nutrition category (Table 1).

Table 1. Participant's characteristics, physical activity, breakfast habits, snacking habits, macronutrient intake and nutritional status (BAZ) in female adolescent in Tasikmalaya

Variable	n(%) or x̄ (SD)
Age	13,4(0,5)
Mother' education#	
Elementary school	44(12,0)
Junior high school	66(18,0)
Senior high school	174(47,6)
University	82(22,4)
Father' education#	
Elementary school	36(9,8)
Junior high school	63(17,2)
Senior high school	189(51,6)
University	78(21,3)
Mother' employment#	
Not working	274(74,9)
working	92(25,1)
Father' employment#	
Not working	30(8,2)
working	336(91,8)
Family status#	
Single	33(9,0)
Full	333(91,0)
Family income (IDR/month)	2906215,8(40603 07,3)
Family size (person/hause)	5(1)
Pockect money (IDR/day)	21773,2 (11321,7)
Physical Activity	
PAQ-A Scores	2,0(0,5)
Screen time (hour/day)	7,8(3,7)
Sleep duration (hour/day)	7,8(1,7)
Breakfast habits (time/week)	3,4(2,5)
Snacking habits#	
Rare	44(12,0)
Frequent	322(88,0)
Macronutrition consumption	
Energy (kcal)	1050,1(505,0)
Protein (g)	32,5(16,0)
Fat (g)	35,2(21,1)
Carbohydrate (g)	150,5(79,7)
BAZ	-0,08(1,2)

 # data were presented as n (%)

Spearman's rank test showed that there was a relationship between breakfast habits and energy intake (p=0,029) and carbohydrate intake (p=0,018) intake. However, breakfast consumption was not associated with increased protein or fat consumption. In female adolescents, the more frequently they ate breakfast in a week, the lower their energy and carbohydrate consumption (Table 2).

Table 2. Relationship between breakfast habits and macronutrient intake

Variable	p-Value			
	E	P	F	Ch
Breakfast Habits	0,029 (-0,114)	0,082 (-0,091)	0,073 (-0,094)	0,018 (-0,124)

E= Energy; P= Protein; F= Fat; Ch= Carbohydrate

The bivariate statistical test results showed that BAZ did not differ based on participant characteristics (mother 'sand father's education, mother 'sand father's employment, and family status). The results of Spearman's rank test also showed no relationship between participants' characteristics (age, family income, and pocket money) and BAZ in female adolescents in Tasikmalaya City.

Physical activity (PAQ-for Adolescents score) and screen time duration were related to BAZ, while the duration of sleep per day did not show any relationship with BAZ score (p>0,05). Breakfast habits, snacking habits, and macronutrient consumption (energy, protein, fat, and carbohydrates) were associated with the BAZ Scores (p<0,05) (Table 3).

Table 3. Relationship between characteristics of participants, physical activity, and eating habits with BAZ score

Variable	p-value	ρ
Subject characteristics		
Age[c]	0,295	-0,055
Mother's education[a]	0,086	
Father's education[a]	0,413	
Mother's employment[b]	0,931	
father's employment[b]	0.880	
Family status[b]	0.551	
Family income[c]	0,871	-0,009
Family size[c]	0,318	-0,055
Pocket money[c]	0,405	0,044
Physical Activity		
PAQ-A Score[c]	0,032	-0,112
Screen time (hour/day)[c]	0,015	0,128
Sleep duration	0,739	0,017

(hour/day)[c]		
Breakfast habits (x/w)[c]	0,010	-0,135
Snacking habits(x/w)[c]	0,032	
Macronutrient Consumption		
Energy (kcal)[c]	0,024	0,118
Protein (g)[c]	0,006	0,143
Fat (g)[c]	0,007	0,140
Charbohydrates (g)[c]	0,057	0,099

[a]derived from ANOVA; [b]derived from t test; [c]derived from Spearman rank test; x/w was time per week

In the initial modeling stage, nine variables (mother's education, PAQ-A scores, screen time, breakfast habits, snack habits, and energy, protein, fat, and carbohydrate consumption) were included in the model with p<0,25. The most appropriate model was obtained by using seven variables. Of the seven variables, four (mother's education, screen time, breakfast habits, and fat consumption) were related to the BAZ scores after controlling for other variables (p<0,05).

Table 4. Final model of the relationship between breakfast habits and BAZ score

Variable	Standardised coeff β	p-value	R^2
Mother's education	0,110	0,029	0,133
Physical Activity	-0,094	0,068	
Screen time	0,107	0,032	
Breakfast habits	-1,108	0,034	
Energy Consumption	-0,222	0,191	
Protein Consumption	0,141	0,162	
Fat consumtion	0.350	0,016	

Breakfast is an eating activity between waking up at 05:00 am and 09:00 am to fulfill part of the daily nutritional needs (15-30% of nutritional needs) (Khusun et al., 2023). Breakfast is important because it is necessary to activate the body's working power so that it does not get tired quickly (Spence, 2017).

The availability of nutrients, especially energy, is very important for supporting all physical activity in a single day, and breakfast makes an important contribution to providing energy (Kaoutar et al., 2023). Physiologically, breakfast is a unique meal because it is eaten after the longest postprandial fast, in this case overnight fasting (Gibney et al., 2018).

When a person skips breakfast, he actually extends the fasting time, and this condition increases ghrelin levels (De Souza et al., 2021). Ghrelin is associated with feelings of hunger in humans (Anderson et al. 2023). Therefore, an increase in ghrelin levels causes an increase in appetite and excessive hunger, which results in increased food consumption (Howick et al., 2017).

This study showed that the less often female adolescents ate breakfast, the higher their energy and carbohydrate consumption. The results of this study were consistent with those of Zakrzewski-Fruer et al. (2017), who showed that female adolescents who skip breakfast consume excess energy (Zakrzewski-Fruer et al., 2017). This study was also in line with the research by Fanelli et al. (2021), who showed that breakfast skippers consumed significantly more carbohydrates (Fanelli et al., 2021). This suggests that someone who skips breakfast is at a risk of becoming overweight (Peña-Jorquera et al., 2021). Excess energy consumption is the main driver of weight gain (Romieu et al., 2017).

In this study, screen time duration and fat consumption were also related to nutritional status based on BAZ scores in female adolescents. The duration of screen time can reduce physical activity (Sanz-Martín et al., 2022), and low physical activity increases the risk of obesity (Wahyuningsih & Pratiwi, 2019). Therefore, the longer a person is in front of the screen, the lower their energy expenditure, resulting in a positive energy balance (Penso et al., 2020). The duration of screen time will cause an increases risk of obesity .(Haghjoo et al., 2022; Ramírez-Coronel et al., 2023)

This study showed that the average duration of screen time in female adolescents was seven hours per day. Excessive screen time has become a habit among children and teenagers worldwide(Qi et al., 2023). This study was in line with research that stated that long screen time in children and adolescents was associated with an increased risk of being overweight and obese (Priftis & Panagiotakos, 2023). Excessive screen time above the recommended time is associated with higher energy consumption but low fiber content due to

low intake of vegetables and fruits (Shang et al., 2015). Therefore, it is stated that the longer the time spent on screen time, the more unhealthy food consumption will result, which ultimately has an impact on nutritional status (Stiglic & Viner, 2019). In this study, the participants' fat consumption influenced the BAZ score. High-fat consumption causes a positive energy balance because fat provides greater energy than carbohydrates and proteins.

Therefore, increased dietary fat intake provides more energy from fat and the total energy intake (Wali et al., 2023). Recent animal studies have shown that increased fat consumption results in increased total energy intake and excess body fat, whereas increased carbohydrate and protein consumption is not associated with energy consumption and increased adipose tissue (Wang et al., 2020). The results of this study are in line with those of a study conducted in Minangkabau, which stated that fat consumption could increase the risk of obesity in adolescents (Desmawati et al., 2019). This study is in line with previous research showing that fat consumption is positively correlated with BAZ scores (Boniecka et al. 2023).

This study had several limitations. First, the independent variable was measured using a questionnaire, allowing for subject dishonesty. Second, the research design used was cross-sectional, so it cannot show the cause and effect with certainty. However, this study has strengths because it measured other variables that are thought to be related to the incidence of obesity in a more comprehensive manner, both from the daily habits and eating habits of the subjects.

Conclusion

In conclusion, a high frequency of breakfast per week is negatively related to nutritional status based on BAZ in adolescent girls. Therefore, the education department should encourage students to have breakfast before going to school. In addition, the education department can make a movement to bring lunch to school.

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