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Nutritional knowledge as a determinant of dietary patterns based on the balanced nutrition guidelines among junior high school students

Pengetahuan Gizi Merupakan Determinan Pola Makan Berdasarkan Pedoman Gizi Seimbang Pada Pelajar Sekolah Menengah Pertama

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ABSTRACT

Background: *Unhealthy dietary patterns are a risk factor contributing to the increasing global health burden and are associated with health problems in adolescents, such as obesity and nutrient deficiencies. Many adolescents still have dietary patterns that do not comply with the recommended portions in the Balanced Nutrition Guidelines.*
Objective: *This study aimed to identify factors associated with dietary patterns based on the balanced nutrition guidelines among junior high school students in a public school in Pandeglang Regency.*
Methods: *This was a quantitative study using a cross-sectional design. The respondents consisted of 7th and 8th-grade students, with a total of 161 participants. Dietary patterns were assessed using a Semiquantitative Food Frequency Questionnaire (SFFQ) through interviews. Nutritional status was measured using a microtoise and a digital scale. Additionally, respondents completed questionnaires covering demographic characteristics, body image, nutrition knowledge, peer influence, and parental influence. Data were analyzed using univariate analysis, bivariate analysis with the chi-square test, and multivariate analysis with multiple logistic regression.*
Results: *The results showed that factors associated with adolescents' dietary patterns were nutrition knowledge and parental role ($p<0.05$). The most dominant factor associated with dietary patterns was nutrition knowledge, with an odds ratio (OR) of 3.11;95% CI(1.26–7.67).*
Conclusions: *Schools are expected to provide health education that emphasizes the importance of a nutritious and balanced diet, while also building good communication and collaboration with parents. In addition, the role of families needs to be strengthened in providing nutritious and balanced foods at home to support healthy dietary patterns among adolescents.*

Keywords: *adolescent, balanced nutrition guidelines, dietary patterns, nutritional knowledge, parental influence*

ABSTRAK

Latar Belakang: Pola makan yang tidak sehat menjadi faktor risiko yang berkontribusi terhadap meningkatnya beban kesehatan di seluruh dunia, yang dikaitkan dengan masalah kesehatan pada remaja, seperti obesitas dan kekurangan zat gizi. Masih banyak remaja yang memiliki pola makan belum sesuai dengan anjuran porsi pedoman gizi seimbang.
Tujuan: Penelitian ini bertujuan untuk mengetahui faktor yang berhubungan dengan pola makan berdasarkan pedoman gizi seimbang pada remaja pelajar SMP Negeri di Kabupaten Pandeglang.
Metode: Penelitian ini merupakan penelitian kuantitatif dengan desain studi *cross sectional*. Respondeni dalam penelitian ini adalah siswa dan siswi kelas VII dan VIII,

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dengan jumlah responden sebanyak *161 orang*. Pola makan diukur menggunakan instrumen *Semiquantitative Food Frequency Questionnaire* (SFFQ) melalui teknik wawancara. Status gizi diukur menggunakan *microtoise* dan timbangan digital. Selain itu, responden mengisi kuesioner yang mencakup karakteristik responden, *body image*, pengetahuan gizi, peran teman, dan peran orang tua. Analisis data menggunakan analisis univariat, bivariat dengan uji *chi-square*, dan multivariat dengan uji regresi logistik berganda.

Hasil: Hasil analisis menunjukkan bahwa faktor yang berhubungan dengan pola makan remaja adalah pengetahuan gizi dan peran orang tua (p<0,05). Faktor yang paling dominan berhubungan dengan pola makan adalah pengetahuan gizi dengan nilai OR = 3,11 ; CI 95% (1,26-7,67).

Kesimpulan: Sekolah diharapkan dapat menyelenggarakan pendidikan kesehatan yang menekankan pentingnya pola makan bergizi dan seimbang, sekaligus membangun komunikasi serta kerja sama yang baik dengan orang tua. Selain itu, diperlukan peningkatan peran keluarga dalam menyediakan makanan bergizi dan seimbang di rumah untuk membentuk pola makan yang baik pada remaja.

Kata kunci: pedoman gizi seimbang, pengetahuan gizi, peran orang tua, pola makan, remaja.

INTRODUCTION

An unhealthy diet is a risk factor contributing to the growing health burden worldwide, contributing to various health problems. The World Health Organization (WHO) confirms that consuming an unbalanced diet can potentially increase the risk of nutritional problems and trigger the development of non-communicable diseases (NCDs), such as diabetes, cardiovascular disease, stroke, and cancer.[1]Previous research conducted in 195 countries showed that unhealthy diets are associated with 1 in 5 deaths worldwide, or the equivalent of 11 million deaths per year.[2]

In Indonesia, unhealthy eating habits are often linked to health problems in adolescents. Teenagers with unhealthy eating habits can lead to nutritional imbalances, which can lead to nutritional problems such as obesity and certain nutrient deficiencies.[3] According to the 2023 Indonesian Health Survey (SKI), 7.6% of adolescents aged 13–15 years were found to be malnourished, and 16.2% were overnourished.[4] The 2018 Riskesdas showed that the incidence of overnutrition in adolescents aged 13-15 years based on BMI/U, including overweight and obesity, experienced a growth of 0.2% from the previous figure of 16%.[5]Nutritional problems in adolescents in Indonesia are influenced by low food intake and poor quality of food consumed.[6]According to the 2023 Indonesian Child Health Survey (SKI), adolescents aged 10-14 years showed the highest proportion of adolescents (16.9%) not consuming fruits and vegetables per day per week. Furthermore, 12.1% of adolescents did not consume carbohydrate sources more than once per day, and some adolescents only consumed protein sources such as meat (24.8%) and fish (20.4%) less than three times per month.[4]

Unhealthy eating patterns are formed through the interaction of various influencing factors, including individual, social, and economic factors. Previous research has shown that adolescent boys tend to have higher food intake than adolescent girls, influenced by differences in growth, development, and muscle mass.[7] In addition, as many as 47.7% of adolescents with negative body image showed poor eating patterns.[8,9] Teenagers who have low nutritional knowledge are at greater risk of following a diet that does not comply with the principles of balanced nutrition.[10] Other research shows that there is a relationship between nutritional status and eating

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patterns in adolescents, where adolescents with abnormal nutritional status more often show poor eating patterns.[11]

Other factors, including pocket money, parental involvement, and peer support, also significantly influence adolescents' eating habits. Higher pocket money is known to increase adolescents' purchasing power for snacks, regardless of their nutritional content.[12] In addition, parental support also shapes adolescents' eating patterns, with the majority of adolescents (96.2%) who have poor eating patterns having parents who are less supportive in providing food.[13] The role of friends can also influence adolescents' food choices and consumption habits.[14]

The 2018 Basic Health Research (Riskesdas) data from Banten Province shows that the nutritional status of both overweight and underweight among junior high school students in Pandeglang Regency is quite high, with 7.15% having overweight and 11.17% having underweight.[15] Nutrition is a condition that is influenced by the balance between food intake and nutritional needs that must be met.[15] Based on the results of a preliminary study conducted on 30 adolescent junior high school students in Pandeglang Regency, it was shown that adolescents did not consume food according to the recommended portion of balanced nutrition guidelines based on age and gender, including carbohydrates (53.34%), animal protein (50%), vegetable protein (56.66%), vegetables (80%), and fruit (76.66%). This indicates that there are still many adolescents with eating patterns that do not follow the recommended portion of balanced nutrition guidelines. Thus, based on the data and problems that have been described, this study aims to analyze factors related to eating patterns based on balanced nutrition guidelines in adolescent junior high school students in Pandeglang Regency.

METHODS

Study design

This study was a quantitative study with a cross-sectional design. The research was conducted at a public junior high school in Pandeglang Regency in April 2025. At the time the study was conducted, the Free Nutritious Meal Program (MBG) had not yet been implemented at the study location.

Data source and sampling procedure

The study population included all grade VII and VIII students at a public junior high school in Pandeglang Regency, totaling 161 students. The sample was determined using a total sampling technique, in which all members of the population were included as respondents.In this study, the sample size was calculated using a two-proportion difference test. The values used were P1 = 0.5 and P2 = 0.528, with a significance level of 5% and a statistical power of 90%, resulting in a minimum sample size of 144 respondents. An additional 10% was added to account for potential dropouts, resulting in a total sample size of 159 respondents. Since the total population was 161, total sampling was applied.[16]

Dietary pattern data were obtained through direct interviews conducted by the researcher with the respondents. Meanwhile, data on respondent characteristics, nutritional knowledge, body image, peer influence, and parental role were collected through self-administered questionnaires completed by the students under the researcher's supervision. Body weight and height data were obtained through direct measurements using a microtoise and a digital scale.

Variables of the study

The independent variables included gender, nutritional status, body image, allowance, peer influence, and parental role. Body image refers to the respondent’s perception of their body shape and physical appearance, which may be positive or

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negative. The body image category was determined based on BSQ questionnaire scores, with positive (score < 38) and negative (score ≥ 38).[17]

Nutritional knowledge is defined as the respondent's understanding of the functions and sources of nutrients. It was categorized as good if the respondent achieved ≥80% correct answers and poor if <80% correct answers. Nutritional status was determined by measuring body weight (BW) and height (BH), then calculating the body mass index-for-age (BMI/A). Nutritional status was categorized into three groups: normal (BMI/A between -2 SD to +1 SD), undernutrition (BMI/A < -2 SD), and overnutrition (BMI/A > +1 SD). Allowance refers to the amount of money given daily by parents or guardians to the respondent. It was categorized based on the median value into low (<10,000) and high (≥10,000).

Peer influence refers to the respondent's perception of peer influence on food choices and portion sizes, including carbohydrate, plant protein, animal protein, fruits, and vegetables. It was measured using a questionnaire consisting of 10 items. Categories were determined based on the mean value (normal distribution): positive influence (score ≥ 30) and no influence (score < 30).

Parental role refers to the respondent's perception of parental involvement in providing food sources such as carbohydrates, animal protein, plant protein, vegetables, and fruits. It was measured using a questionnaire with 5 items. Categories were determined based on the median value (non-normal distribution): supportive (score ≥ 17) and not supportive (score < 17).

Measurement and instrument

Dietary pattern data represent respondents' eating habits over the past week, including type, frequency, and portion size of carbohydrate sources, animal protein, plant protein, vegetables, and fruits, compared to the recommended daily intake for adolescents aged 13–15 years based on the Balanced Nutrition Guidelines (PGS).

Data were collected using a Semiquantitative Food Frequency Questionnaire (SFFQ) equipped with visual aids from the Ministry of Health. Dietary patterns were categorized into two groups: adequate (≥3 portions of nutrient sources meeting PGS recommendations) and inadequate (<3 portions meeting recommendations).[18]
The SFFQ questionnaire had been used in previous studies; therefore, validity and reliability tests were not conducted in this study.[19]

Data collection

Data were collected through direct interviews for dietary patterns and self-administered questionnaires completed by respondents under researcher supervision. Body weight and height were measured directly using a microtoise and a digital scale.

Ethical consideration

This study has met ethical research standards, as evidenced by informed consent and approval from the Health Research Ethics Committee of UIN Syarif Hidayatullah Jakarta with approval number Un.01/F.10/KP.01.1/KE.SP/04.08.041/2025.

Data analysis

Data analysis included univariate, bivariate, and multivariate analyses. Univariate analysis was used to describe the frequency distribution of each variable. Bivariate analysis was conducted to examine the relationship between independent and dependent variables using the Chi-Square test. Multivariate analysis was performed using logistic regression to assess the simultaneous relationship between independent variables and categorical dependent variables. Variables included in the multivariate model were those with a p-value < 0.25 in the bivariate analysis. Data analysis was performed using IBM SPSS Statistics Version 22.

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RESULTS

Figure 1 presents the proportion of eating patterns, which shows that the majority of adolescent junior high school students in Pandeglang Regency have eating patterns that do not comply with the recommended portion sizes in the balanced nutrition guidelines, namely 73.9%.

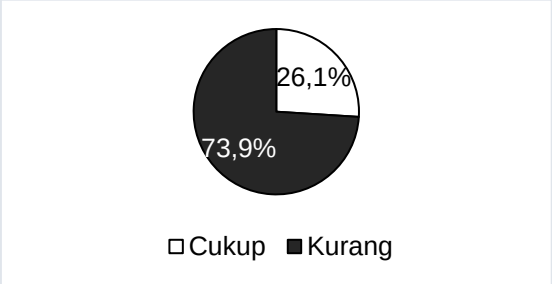

Figure 1. Frequency Distribution of Eating Patterns

Table 1 presents the distribution of gender, body image, nutritional knowledge, nutritional status, pocket money, peer influence, and parental influence. Most of the junior high school students in Pandeglang Regency were male (58.4%), had overweight and underweight (18.0%) nutritional status, received pocket money in the high category (85.1%), had poor nutritional knowledge (83.2%), had negative body image (56.5%), did not have positive peer influence on their eating patterns (50.3%), and did not receive parental support in their eating patterns (47.8%).

Table 1. Respondent Characteristics

Variables	n	%
Gender		
Female	67	41.6
Male	94	58.4
Body Image		
Negative	91	56.5
Positive	70	43.5
Nutrition Knowledge		
Poor	134	83.2
Good	27	16.8
Nutritional status		
Undernutrition	5	3.1
Overnutrition	29	18.0
Normal	127	78.9
Pocket money		
High	137	85.1
Low	24	14.9
The Role of Friends		
No influence	81	50.3
Positive Influence	80	49.7
The Role of Parents		
Does Not Support Food Provision	77	47.8
Supports Food Supply	84	52.2

Table 2 presents the results of a bivariate analysis of the relationship between gender, body image, nutritional knowledge, nutritional status, pocket money, the role of friends, and the role of parents with eating patterns based on balanced nutrition guidelines in adolescent junior high school students in Pandeglang Regency. The

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results of the Chi-Square test showed that there was no significant relationship between gender, body image, nutritional status, pocket money, and the role of friends with eating patterns (p>0.05). In contrast, nutritional knowledge and the role of parents were found to have a significant relationship with eating patterns (p<0.05).

Table 2. Bivariate Analysis Results

Variables	Dietary habit				Total	p-value
	Not enough		Enough			
	n	%	n	%		
Gender						
Female	50	74.6	17	25.4	67	1,000
Male	69	73.4	25	26.6	94	
Body Image						
Negative	71	78.0	20	22.0	91	0.241
Positive	48	68.6	22	31.4	70	
Nutrition Knowledge						
Poor	105	78.4	29	21.6	134	0.009
Good	14	51.9	13	48.1	27	
Nutritional status						
Undernutrition	5	100	0	0	5	
Overnutrition	20	69.0	9	31.0	29	0.344
Normal	94	73.9	33	26.1	127	
Pocket money						
High	101	73.7	36	26.3	137	1,000
Low	18	75.0	6	25.0	24	
The Role of Friends						
No influence	64	79.0	17	21.0	81	0.193
Positive Influence	55	68.8	25	31.2	80	
The Role of Parents						
Does Not Support Food Provision	65	84.4	12	15.6	77	0.006
Supports Food Supply	54	64.3	30	35.7	84	

Table 3. Multivariate Analysis Results

Variables	B	SE	p-value	OR
Nutrition Knowledge				
Poor	1,135	0.460	0.014	3.11 (1.26 - 7.67)
Good				
The Role of Parents				
Does Not Support Food Provision	0.983	0.401	0.014	2.67 (1.21 - 5.86)
Supports Food Supply				
The Role of Friends				
No influence	0.524	0.394	0.184	1.68 (0.70 - 3.65)
Positive Influence				
Body Image				
Negative	0.555	0.390	0.154	1.74 (0.81 - 3.73
Positive				

Table 3 presents the results of a multivariate analysis of the relationship between body image, nutritional knowledge, peer influence, and parental influence on dietary patterns based on balanced nutrition guidelines among adolescent junior high school students in Pandeglang Regency. The analysis showed that nutritional knowledge and parental influence significantly correlated with dietary patterns (p < 0.05). Nutritional

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knowledge was the most dominant factor associated with dietary patterns, with an OR of 3.11 and a 95% CI of 1.26–7.67.

DISCUSSION

The study results showed a high proportion of respondents whose diets did not meet the recommended portion sizes in the balanced nutrition guidelines, at 73.9%. Previous research at YLPI Pekanbaru Middle School showed that 85.5% of adolescents exhibited diets that did not meet the balanced nutrition guidelines.[20] Similar research in Purwosari Village, Laweyan District, also showed that 67% of teenagers reported having poor eating habits.[21] In fact, higher figures were found in research at SMP Negeri 1 Sekayam, Sanggau Regency, which showed that 95% of teenagers had poor eating habits.[22]

Differences in the proportion of eating patterns can be caused by differences in the categorization of eating patterns and the cut-off points used, such as in research conducted at Malang City Middle Schools, which showed a lower proportion of poor eating patterns, namely 41%.[23] The dietary patterns in this study used three categories: good, adequate, and inadequate. Furthermore, the cut-off points used were based on the minimum and maximum scores obtained from all respondents, then divided into intervals to determine the category boundaries. Meanwhile, in this study, dietary patterns were categorized into two categories: adequate and inadequate. The cut-off points used were based on daily portions adjusted according to the recommended balanced nutrition guidelines.

The results of multivariate data analysis showed that poor nutritional knowledge increases eating patterns that do not comply with the recommended portion sizes in balanced nutrition guidelines, with an OR of 3.11. The results of previous research conducted on adolescents in junior high schools in Semarang City showed a relationship between nutritional knowledge and eating patterns based on balanced nutrition guidelines.[24] Another study on adolescents at SMPN 02 Banjarharjo also found a link between nutritional knowledge and eating patterns.[25] The study shows that the level of nutritional knowledge plays a role in shaping adolescents' attitudes and behavior in determining food choices, which then influences their understanding of the nutritional benefits contained in the food they consume.[25]

Knowledge can influence a person's attitude through the process of perception. The perceptions formed become embedded within the individual, so that the attitudes displayed align with their level of knowledge.[26] Adolescents will achieve optimal nutritional status if their food intake can meet the nutritional needs of the body.[27] Adequate nutritional intake in adolescents can be supported and achieved through knowledge that provides information about nutrition, food, and its relationship to health. Therefore, knowledge can shape a person's eating habits, influencing how individuals determine the types and amounts of food they consume.[27] In addition, adolescents with low levels of nutritional knowledge are more likely to have poor eating patterns.[18] If adolescents' knowledge about nutrition is low, their ability to balance food intake with the body's needs will be reduced, potentially leading to poor eating patterns.[28]

The results of the multivariate data analysis also showed that unsupportive parents' role increased dietary patterns that did not comply with the recommended portion sizes for balanced nutrition guidelines, with an OR of 2.67. Previous research conducted on adolescents at Hang Tuah 2 Middle School in Jakarta showed that most adolescents with poor dietary patterns were known to have parents who were less supportive in providing food.[13]The research findings show that the role of parents is related to adolescents' eating patterns.[13]Parents play a crucial role as role models for their children, encouraging them to consume healthy and nutritious foods. One of the most

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visible parental habits supporting their children's eating habits is providing a daily menu with a complete nutritional composition.[29] Therefore, parental involvement is very important as a guide who accompanies children in fulfilling their nutritional needs, as a motivator who arouses children's interest in consuming healthy food, and as a facilitator in ensuring the availability of food at home.[30]

In this study, the variables of body image and peer influence did not show a significant relationship with eating patterns (p>0.05). This finding is supported by other studies, such as one conducted on adolescents at SMPN 12 Semarang, which also showed no significant relationship between body image and eating patterns.[8]Body image can develop through adolescents' interactions with their social environment.[31]This causes the ideal body shape to differ between cultures, so that the eating patterns that are followed are not solely influenced by perceptions of the body, but can be influenced by other factors, such as parenting styles.[8]Parents at home play a role in shaping children's food preferences and eating patterns, where the availability and exposure to certain foods can influence children's food choices and intake. Furthermore, the way parents prepare and serve food at home, and the close social relationships within the family that have been established over time, allow each member to become accustomed to consuming the same types of food.[29]

Meanwhile, the unrelated role of friends in eating patterns may be due to low peer support in encouraging healthy food consumption. Previous research conducted on adolescents at Muhammadiyah 36 Junior High School in Jakarta showed no relationship between the role of friends and eating patterns.[14] Findings from previous research on adolescents in Samarinda also showed that interactions with peers played a significant role in influencing the emergence of the desire to consume unhealthy foods.[32]The results of another study conducted on adolescents at Sultan Agung Islamic Middle School, Semarang also showed that the role of friends has a strong influence on snack consumption.[33]Therefore, in terms of food consumption, the role of friends in adolescents is more influenced by the negative role of friends in consuming unhealthy food compared to the positive role of friends in consuming healthy food.

The bivariate analysis in this study showed that gender, pocket money, and nutritional status were not associated with dietary patterns. This finding is similar to a study conducted on adolescents in Gaza, which showed that although there were small differences in food consumption frequency between boys and girls, these differences were not significant. This could be due to the homogeneity of the social and economic environment, which means that gender is not a dominant factor in shaping adolescent dietary patterns.[34]

The unrelated nature of pocket money in relation to eating patterns may be due to the fact that the money adolescents receive isn't solely allocated to food but also to other needs. Previous research on schoolchildren in Kubu Raya showed that increasing pocket money doesn't affect energy and nutrient consumption, as the money isn't allocated solely to food.[35]

Meanwhile, nutritional status that is not related to eating patterns can be influenced by differences in adolescent perceptions that are not affected by their body shape and size, so that even though adolescents have an excess nutritional status, they do not limit the type or amount of food they eat to achieve an ideal body shape.[35] This finding is supported by the results of research conducted on adolescents at SMPN 12 Semarang, which showed that there was no significant relationship between nutritional status and eating patterns.[8]

This study has the advantage of using a total sampling method in sampling, thus able to describe the actual conditions at the research location, especially if the

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population is limited. However, this study also has limitations. The Semiquantitative Food Frequency Questionnaire (SFFQ) in this study was only used to calculate the amount of nutrients consumed from carbohydrates, protein, vegetables, and fruit. However, data related to sugar, milk, salt, and oil consumption were not collected, so it is not possible to calculate the average daily portion of nutrient sources comprehensively. Furthermore, the use of portion sizes can lead to unequal portion sizes due to different perceptions and differences in the nutritional quality of food ingredients. Nevertheless, this study's findings provide important implications for program planning to support nutritious and balanced diets in school adolescents.

CONCLUSION

The study results showed a high proportion of respondents with dietary patterns that did not meet the recommended portion sizes in the balanced nutrition guidelines (73.9%). Poor nutritional knowledge increased the likelihood of a diet that did not meet the recommended portion sizes in the balanced nutrition guidelines by 3.11 times. Meanwhile, unsupportive parents increased the likelihood of adolescents having a diet that did not meet the recommended portion sizes in the balanced nutrition guidelines by 2.67 times.

Based on the research findings, schools are expected to provide health education that emphasizes the importance of a nutritious and balanced diet for students. Furthermore, schools are expected to build communication and foster good cooperation with parents and guardians to increase the family's role in providing nutritious and balanced meals, for example, by encouraging the habit of bringing healthy lunches from home.

Parents and family members are expected to increase their understanding of the importance of balanced nutrition, thus implementing it in their daily lives and becoming the primary guides in shaping adolescents' eating patterns. Furthermore, it is recommended to provide nutritious and balanced meals at home and to make eating together a habit as a family to monitor and shape adolescents' eating patterns.

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