

NUTRITIONAL STATUS, TASTE PERCEPTION, ENERGY AND MACRONUTRIENTS INTAKE OF CANTEEN FOOD AMONG SMAN 104 EAST JAKARTA STUDENTS

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ABSTRACT

Adolescent nutrition remains a significant issue in Indonesia. This study aims to describe the nutritional status, taste perception, energy, and macronutrient content of canteen food among students at SMAN 104 East Jakarta. Using a descriptive cross-sectional design, 85 samples were selected through simple random sampling. Data were collected via anthropometric measurements, taste perception questionnaires, and canteen food nutrient analysis. Chi-square analysis was used to test the relationship between characteristics and taste perception. Results showed 78.8% of respondents had good nutritional status, with significant differences between genders and age groups. Taste perception was generally good (97.6%), varying by age but not significantly by gender. Macronutrient analysis revealed varying content, with some menus exceeding 30% of the daily nutritional needs for lunch. Significant relationships were found between nutritional status, age ($p=0.047$), and gender ($p=0.009$). In conclusion, while most students have good nutritional status and taste perception, there is room for improvement in macronutrient balance in canteen menus.

Keywords: *Nutritional status, Taste perception, Adolescents*

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INTRODUCTION

Adolescence is a critical transition period from childhood to adulthood marked by various physical, psychological, and social changes (1). During this phase, adolescents experience rapid growth and development, making adequate nutritional intake crucial for their overall health and well-being. However, nutritional problems in adolescents remain a significant public health challenge in Indonesia, encompassing both malnutrition and overnutrition. According to data from the Nutritional Status Monitoring (PSG) by the Indonesian Ministry of Health in 2017, the prevalence of malnutrition among adolescents aged 13-15 years was 9.3% nationally, while it reached 16.4% in DKI Jakarta. Similarly, the 2018 Basic Health Research (Riskesdas) reported that 8.7% of adolescents aged 13-15 years were classified as thin or underweight, while 16.0% were overweight or obese (2). These statistics highlight the coexistence of multiple nutritional problems in Indonesian adolescents, necessitating urgent and targeted interventions.

Adolescent nutritional issues are influenced by various direct and indirect factors (3). Among these, food consumption patterns and the availability of food in the school environment play a significant role in shaping adolescents' nutritional status. School canteens, as primary providers of meals and snacks during school hours, hold a strategic position in influencing students' food choices. Several studies have demonstrated a correlation between the quality of food provided by school canteens and the nutritional status of students. For example, a study by Wahyusa et al. (2020) in Semarang found that students who frequently consumed varied and balanced nutritional menus from canteens tended to exhibit better nutritional status (4). Beyond nutritional quality, students' perceptions of the taste of canteen food significantly affect their food consumption patterns.

The perception of food taste encompasses several sensory factors, including appearance, flavor, aroma, texture, and temperature. These factors collectively influence students' decision-making when selecting food from school canteens. Macronutrients—comprising carbohydrates, proteins, and fats—are essential components of canteen food, serving as primary sources of energy. According to the 2012 National Food and Nutrition Work Report X, an optimal dietary pattern should derive 50-65% of energy from

carbohydrates, 10-20% from protein, and 20-30% from fats (5). Hardinsyah et al. (2012) similarly recommended that adolescents aged 10-18 years maintain an energy distribution of 55% carbohydrates, 15% protein, and 30% fats. Therefore, school canteens have a dual responsibility: to meet students' nutritional needs while also satisfying their taste preferences (6).

Research has indicated that demographic factors, such as age and gender, can influence taste perception. For instance, women generally have higher taste sensitivity than men, while sensory thresholds tend to increase with age. Nevertheless, a gap often exists between students' perceptions of the taste of canteen food and its actual nutritional quality. Juniarsih (2016), in a study conducted at the Daarul Hikmah Islamic Boarding School, reported that many students disliked the appearance of certain food items, such as animal side dishes (69.8%), vegetable side dishes (61.9%), and vegetables (41.3%). Furthermore, 58.7% of respondents felt the food menu lacked variety, (7). These findings underscore the need to balance taste preferences with nutritional adequacy in school canteen offerings.

SMAN 104 East Jakarta, located in a bustling urban area, has a school canteen that is heavily frequented by students during break times. However, no comprehensive research has been conducted to assess the nutritional status of its students, their perceptions of the taste of canteen food, and the macronutrient composition of the available menu. This study seeks to address these gaps by evaluating the nutritional status, taste perceptions, and macronutrient content of school canteen food at SMAN 104 East Jakarta. The findings of this study aim to provide valuable insights for schools and canteen managers to improve the nutritional quality and acceptability of canteen food. Additionally, this research hopes to contribute to the formulation of evidence-based school nutrition policies and programs that can positively impact adolescent health outcomes.

RESEARCH METHOD

This study used a quantitative approach with a cross-sectional design. The population of the study were 575 students in grades 10 and 11 of SMAN 104 East Jakarta and total sample was 85 respondents. The study employed a simple random sampling technique, ensuring

each eligible participant had an equal chance of being selected, based on the Slovin formula calculation with a 10% confidence level. Inclusion criteria include: (1) Registered as students in grades 10 and 11 of SMAN 104 East Jakarta, (2) Willing to be respondents, (3) Present when the study was conducted. Exclusion criteria: (1) Respondents who are sick, (2) Students who have transferred schools, (3) Not willing to participate in the study in full. The selection process was carried out using a random number generator applied to the complete list of potential participants, thus enhancing transparency and minimizing selection bias.

For the operationalization of variables, macronutrient intake was analyzed using standardized food composition tables, and the types of food included were representative of the local dietary patterns. Detailed macronutrient analysis involved calculating carbohydrate, protein, and fat content in consumed food items based on participants' dietary records. The data collection process was conducted over a two-month period, involving trained nutritionists who measured anthropometric data and collected dietary intake using validated food frequency questionnaires. Measurements were performed during school hours, with prior coordination with school administrators to ensure smooth data collection.

For statistical analysis, bivariate analysis was performed using the Chi-Square test, as it is suitable for evaluating associations between categorical variables. This test was chosen to assess the relationship between dietary intake and nutritional status, with results interpreted based on p-values to determine statistical significance. The study adhered to ethical procedures, securing approval from the Health Polytechnic Jakarta II Health Research Ethics Committee as well as the participating schools to ensure compliance with ethical standards. Informed consent was obtained from all participants and their guardians before data collection began. Finally, validity and reliability testing was conducted for the data collection instruments. The reliability of the questionnaires was evaluated using Cronbach's alpha (α), with a threshold value of 0.70 considered acceptable, while validity was determined through Pearson correlation (r) values, ensuring all items were appropriately correlated with the constructs they measured.

The research variables consist of independent variables (perception of taste and macro nutritional value of canteen food), dependent variables (nutritional status), operational definition of variables (Nutritional status measured using the Body Mass Index by Age (BAZ), categorized into malnutrition, undernutrition, good nutrition, overnutrition, and obesity; Taste perception assessed using a questionnaire covering aspects of food appearance (color, shape, portion) and food taste (aroma, seasoning, texture, temperature); and Macronutrient value calculated using Nutrisurvey software based on the cooked weight of food converted to raw weight. Data collection was carried out through anthropometric measurements (weight and height), food taste perception questionnaire, and weighing canteen food for macronutrient analysis. The research instrument in the form of a questionnaire has been tested for validity using Pearson Product Moment Correlation and reliability using Alpha Cronbach, with valid results ($r_{count} > r_{table}$) and reliable ($\alpha = 0.865$). Data analysis includes univariate analysis was carried out in describing the characteristics of respondents, nutritional status, taste perception, and nutritional value of canteen food and bivariate analysis using the Chi-Square test to analyze the relationship between respondent characteristics and taste perception and nutritional status.

RESULT AND DISCUSSION

This study involved 85 respondents of students of SMAN 104 East Jakarta. Respondent characteristics include age, gender, and nutritional status.

Tabel 1. Subject's Characteristics (Gender and Age)

Characteristic	n	%
15-16 years old	40	47.1
17-20 years old	45	52.9
Total	85	100
Male	37	43.5
Female	48	56.5
Total	85	100

Based on Table 1, most respondents were aged 17-20 years (52.9%) and female (56.5%). The dominance of respondents in the 17-20 age group indicates that the majority of respondents are in their late teens. In this phase, adolescents experience significant

cognitive and psychosocial development, which can affect their food perceptions and preferences. This is in line with Erikson's developmental theory which states that late adolescents are in the stage of identity formation, including in terms of diet and lifestyle (8). Research by Apriadji. (2019) shows that late adolescents tend to pay more attention to physical appearance and body image, which can influence their food choices (9). The distribution of gender dominated by women (56.5%) may affect the results of the study, given the differences in nutritional needs and food preferences between men and women. Previous research by Wardle et al. (2004) showed that women tend to pay more attention to health and food quality aspects than men (10).

Tabel 2. Student's Nutritional Status

Nutritional Status	n	%
Underweight	4	4.7
Normal	67	78.8
Overweight	8	9.4
Obesity	6	7.1
Total	85	100

Respondents' nutritional status Table 2 shows that the majority (78.8%) have good nutritional status. However, there are 4.7% of respondents with undernutrition and 16.5% with overnutrition (including obesity). Compared to the 2018 Riskesdas data, the prevalence of undernutrition in respondents is lower, but the prevalence of overnutrition and obesity is higher (11). This indicates a tendency for excess energy intake in some students, which can have an impact on long-term health. Good eating habits and nutritious and safe food intake are very important to maintain the nutritional status of school-age children and adolescents. In addition, eating habits during adolescence will also have an impact on health in adulthood and old age. (12)

The majority of respondents (97.6%) assessed the perception of the taste of food in the canteen as good. This shows that the food served in the SMAN 104 East Jakarta canteen generally meets students' expectations in terms of taste. This finding is in line with research (Contento, 2008) which confirms that positive taste perceptions correlate with higher levels

of food consumption among adolescents (13). Further analysis of aspects of taste such as color, shape, portion size, seasoning, aroma, temperature, and texture of food showed that most respondents gave positive assessments. This indicates that the school canteen has successfully served food that meets students' sensory preferences.

Macronutrient analysis shows variations in energy, protein, fat, and carbohydrate content in the menus served in the canteen. Most menus meet >80% of the energy requirement for lunch (30% RDA), except for crushed chicken rice which tends to be low in energy for all age groups and genders. Menus such as chicken noodles and grilled chicken rice meet protein needs well (>80% RDA), while other menus such as crushed chicken rice and chicken soto tend to be low in protein content. There is significant variation in fat content between menus. Some menus such as grilled chicken rice have high fat content (>100% RDA), while other menus such as chicken soto have relatively low fat content.

Most menus meet carbohydrate needs well, especially for the female age group. This variation in nutrient content shows the importance of a balanced menu served in the school canteen. According to the General Guidelines for Balanced Nutrition (PUGS), balanced energy and nutrient consumption is very important to support physical activity and metabolic function of adolescents. An imbalance in nutritional intake, either a deficiency or an excess, can result in long-term health problems.

Table 3. Nutritional Status with Age

Age	Nutritional Status									
	Underweight		Normal		Overweight		Obesity		Total	
	n	%	n	%	n	%	n	%	n	%
15-16 years old	1	2.5	33	82.5	5	12.5	1	2.5	40	100
17-20 Years old	3	6.7	34	75.6	3	6.7	5	11.1	45	100
Total	4	4.7	67	78.8	8	9.4	6	7.1	85	100

The results of the analysis showed a significant relationship between age and nutritional status ($p < 0.05$). Respondents aged 17-20 years tended to have better nutritional status compared to the 15-16 year age group. This may be due to increased awareness and knowledge of the importance of nutrition among older adolescents, as well as changes in more balanced diets. This finding is in line with research by Cole et al. (2000) which showed that nutritional status in adolescents is influenced by various factors including age, with increased nutritional needs during late adolescence (14). However, it should be noted that although nutritional status tends to improve with age, there is still significant variation in nutritional status in both age groups.

Tabel 4. Nutritional Status with Gender

Gender	Nutritional Status								Total	
	Underweight		Normal		Overweight		Obesity			
	n	%	n	%	n	%	n	%	n	%
Male	3	8.1	23	62.2	7	18.9	4	10.8	37	100
Female	1	2.1	44	91.7	1	2.1	2	4.2	48	100
Total	4	4.7	67	78.8	8	9.4	6	7.1	85	100

Table 5. Age with Taste Perception

Taste Perception	Age				Total	
	15-16 years old		17-20 years old			
	n	%	n	%	n	%
Poor	2	100	0	0	2	100
Good	38	45.8	45	54.2	83	100
Total	40	47.1	45	52.9	85	100

Analysis of the relationship between nutritional status and gender showed a significant difference ($p < 0.05$). Women tend to have better nutritional status than men, with 91.7% of women having good nutritional status compared to 62.2% of men. Gender can influence a person in choosing the food intake they will consume (15). This finding is consistent with research by Alman et al. (2018) which indicates that women often pay more

attention to food and nutrition intake than men (16). This difference can be caused by biological factors, such as differences in body composition and energy needs, as well as socio-cultural factors that influence eating patterns. Gender factors can arise from variations in consumption patterns between boys and girls. The nutritional and energy requirements of boys and girls differ significantly due to their distinct growth and development characteristics. This is evident in the fact that boys typically have greater muscle mass than girls (17). Gibney et al. (2015) also emphasized that men tend to prefer foods that are high in fat, carbohydrates, and protein, while women prefer foods such as fruits, vegetables, and low-fat products (18). This difference in preference can contribute to differences in nutritional status between men and women.

The results of the analysis showed no significant relationship between the age of respondents and the perception of food taste ($p > 0.05$). This indicates that taste preferences are not significantly influenced by differences in age groups in adolescents. This finding is in line with the research of Krolak et al. (2015) which states that age does not always have a significant influence on taste preferences and perceptions in the adolescent age group. This may be due to the relatively narrow age range in this study (15-20 years), where the development of taste preferences may not be very different (19). Previous research also supports this finding, stating that age does not always have a significant influence on taste preferences and perceptions (20).

Tabel 6. Gender with Food Taste Perception

Food Taste Perception	Gender				Total	
	Male		Female			
	n	%	n	%	n	%
Poor	1	50	1	50	2	100
Good	36	43.4	47	56.6	83	100
Total	37	43.5	48	56.5	85	100

Analysis of the relationship between gender and taste perception showed no statistically significant difference ($p > 0.05$). However, descriptive data showed that females tend to have a more positive taste perception than males. This result is consistent

with research (Marsellita et al., 2012) which found that females tend to be more sensitive to taste and more critical in assessing food than males (21). However, this difference was not significant enough to conclude that there was an effect of gender on the taste perception of food in the SMAN 104 East Jakarta canteen.

This study revealed that most students of SMAN 104 East Jakarta had good nutritional status and positive taste perceptions of the food served in the school canteen. However, there was variation in the macronutrient content of the menu served, which requires special attention to ensure nutritional balance. This finding has several important implications. First, there is a need to increase the variety of menus in school canteens to meet the balanced nutritional needs of all groups of students. Second, nutrition education, especially for male students, is crucial to raise awareness of the importance of a balanced diet. Third, periodic evaluation of the canteen menu is needed to ensure a balance between student-preferred taste and optimal nutritional value. Finally, the development of school-based nutrition intervention programs that take into account differences in nutritional needs based on age and gender needs to be implemented.

The nutritional status of adolescents is closely linked to their dietary patterns, which are influenced by their taste perceptions and the nutritional quality of the food available. Students' positive perceptions of taste (e.g., preference for sweet or salty flavors) often align with the consumption of energy-dense but nutrient-poor foods. This preference can lead to imbalances in macronutrient intake, contributing to overweight or underweight status. For instance, high carbohydrate and fat consumption combined with inadequate protein intake can impair growth and development during adolescence. Additionally, psychosocial factors, such as peer influence and the school environment, likely play a role in shaping students' food choices, reinforcing the need for school-based nutrition interventions. A more in-depth analysis of these interrelated mechanisms can further illuminate how perceptions of taste influence actual consumption patterns and nutritional outcomes.

This study has several limitations that should be acknowledged. Firstly, the cross-sectional design prevents the establishment of causality between taste perceptions,

nutritional intake, and nutritional status. Secondly, the study relied on self-reported perceptions of taste, which may be subject to recall or response bias. Additionally, the sample was limited to a single school (SMAN 104 East Jakarta), which restricts the generalizability of the findings to other schools in urban or rural settings. Finally, the macronutrient analysis of canteen food was limited to the menu provided on the survey day and may not represent the variety of food offered throughout the school year.

The results of this study underscore the urgent need for schools to implement nutrition-focused policies to improve the health outcomes of students. Specific recommendations include: **Developing Balanced Menus:** School canteens should prioritize offering balanced menus that align with recommended macronutrient distribution (55% carbohydrates, 15% protein, 30% fat) and consider students' taste preferences to enhance acceptability. **Nutrition Education Programs:** Schools can conduct nutrition education sessions to increase students' awareness of the importance of balanced diets and the impact of excessive consumption of sweet or fatty foods. **Canteen Regulation:** Implementing stricter regulations for school canteens, such as limiting the sale of sugary or fried foods and promoting healthier alternatives, can help bridge the gap between taste preferences and nutritional quality. **Collaboration with Stakeholders:** Schools can collaborate with parents, food vendors, and government agencies to ensure the provision of affordable, nutritious, and palatable food options.

Future studies should address the following areas to build on the findings of this research: **Longitudinal Studies:** Conduct longitudinal studies to explore the causal relationships between taste perception, dietary intake, and nutritional status. **Broader Samples:** Include diverse samples from urban and rural schools to improve the generalizability of findings. **Micronutrient Analysis:** Expand the analysis to include micronutrients (e.g., vitamins and minerals) to better understand the overall nutritional quality of school canteen food. **Intervention Studies:** Test the effectiveness of tailored interventions, such as improving menu variety, nutrition education, and taste adaptation strategies, in enhancing students' nutritional outcomes. **Psychosocial Influences:** Investigate

the role of psychosocial factors, such as peer influence, parental guidance, and media exposure, on adolescents' food choices and taste perceptions.

CONCLUSION

The results of this study highlight significant findings regarding the nutritional status, perceptions of food taste, and macronutrient content of canteen food among students at SMAN 104 East Jakarta. The statistical analysis revealed key relationships between students' nutritional status, their perceptions of taste, and the nutritional quality of the food served at the school canteen. Students with better perceptions of taste were more likely to consume canteen food regularly, yet the macronutrient content analysis indicates imbalances, with higher fat and carbohydrate proportions and insufficient protein content in the menu items. These imbalances could potentially contribute to multiple nutritional problems, including overweight and underweight statuses, observed in the student population. Despite the importance of taste in influencing food choices, the findings show that the nutritional quality of canteen food does not consistently meet recommended dietary guidelines, raising concerns about the adequacy of school-provided meals in supporting students' growth and development. These results emphasize the need for a more structured approach to improving the quality and acceptability of canteen food, balancing students' taste preferences with nutritional requirements.

To address these issues, school administrators and policymakers must work together to optimize canteen menus by conducting regular evaluations to ensure alignment with recommended macronutrient compositions of 55% carbohydrates, 15% protein, and 30% fat. School canteens should also offer varied, affordable, and culturally appropriate food options to improve both the nutritional quality and appeal of their meals. Furthermore, schools can implement taste adaptation strategies, such as gradually reducing added sugar and fat in their food items, to meet healthier dietary standards without compromising students' taste preferences. Nutrition education should also be integrated into the school curriculum to improve students' awareness of healthy eating habits and encourage better food choices. Stricter regulations on the types of food and beverages sold in school

canteens should also be enforced, limiting energy-dense, nutrient-poor options and promoting healthier alternatives to improve the dietary intake of adolescents. The future of the nation is determined by children who are assets and successors of the ideals of the nation's struggle. Therefore, it is crucial for them to receive great attention and hope from their closest people, namely family, teachers, peers, and others (22).

Future research can build on this study by incorporating and displaying statistical test results in tables and narratives to strengthen the validity of conclusions and enhance transparency. Mechanistic studies are needed to explore the relationships between taste perceptions, macronutrient intake, and nutritional status, providing actionable insights for interventions. Expanding the scope of research to include a broader sample of schools in urban and rural areas could provide a more comprehensive understanding of adolescent nutrition across diverse settings. Moreover, intervention studies that assess the impact of optimized canteen menus, taste adaptation strategies, and nutrition education on students' dietary behaviors and nutritional outcomes would offer valuable insights for shaping effective school nutrition policies. Including micronutrient analysis alongside macronutrient assessments could provide a more holistic understanding of the nutritional quality of canteen food. Finally, a mixed-methods approach combining quantitative assessments with qualitative interviews could deepen insights into students' food preferences and the sociocultural factors influencing their choices. By addressing these recommendations, future studies could contribute to evidence-based policies and programs aimed at improving adolescent nutritional status in Indonesia.

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