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Nutritional Knowledge, Food Consumption, and Physical Activity in Relation to Nutritional Status among Students in Junior High School Muhammadiyah 9 Surabaya: A Descriptive Study

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ABSTRACT

Adolescence is a critical period marked by rapid growth and development, requiring optimal nutrition to support physical and cognitive functions. This descriptive quantitative study aimed to assess the relationship between nutritional knowledge, food intake, physical activity, and nutritional status among eighth-grade female students at SMP Muhammadiyah 9 Surabaya. Using total sampling, 48 students participated by completing structured questionnaires, 2×24-hour dietary recalls, and anthropometric measurements. Results showed that 97.9% of students had good nutritional knowledge. However, 56.3% had very low protein intake, 64.6% had very low fat intake, and 89.6% had very low carbohydrate intake, with no participants reaching normal carbohydrate consumption. Most students (52.1%) engaged in light physical activity. Despite poor dietary intake and low activity levels, 66.7% had normal nutritional status, while 26.0% were underweight, and 8.4% were overweight or obese. The findings reveal a disconnect between knowledge and behavior, suggesting that nutritional awareness alone does not ensure healthy practices. Environmental, economic, and behavioral factors likely influence this gap. The study highlights the importance of integrated interventions that address not only knowledge but also food access, habits, and lifestyle to improve adolescent health. A holistic, school-based approach is recommended to support adequate nutrition, physical activity, and growth during adolescence..

INTRODUCTION

Adolescence is a crucial transitional phase in human development characterized by rapid physical growth, psychological changes, and evolving social roles (Best and Ban, 2021). Optimal nutritional status plays a vital role in supporting the physical and cognitive development of adolescents (Roberts et al. 2022; Soliman et al, 2022). However, nutritional challenges among adolescents in Indonesia remain significant. According to the 2018 Basic Health Research (Riskesdas), the prevalence of undernutrition among adolescents reached 26.8%, while cases of overnutrition are also increasing, particularly in urban areas (Kemenkes RI, 2019).

Nutritional status is influenced by multiple factors, including nutritional knowledge, dietary habits, and physical activity. Adequate knowledge about nutrition can help shape positive attitudes and behaviors toward healthy eating, which ultimately impacts overall nutritional status. Unfortunately, low levels of nutrition literacy among adolescents often lead to poor food choices and unhealthy eating behaviors (Silva et al. 2023).

In addition to knowledge, food consumption patterns significantly affect nutritional outcomes. Many adolescents tend to consume high-calorie, low-nutrient foods such as fast food, sugary snacks, and processed beverages (Li et al, 2020; Almoraie et al. 2021). These habits are often compounded by a sedentary lifestyle, including excessive screen time and limited participation in physical exercise (Kracht et al, 2021; Stierlin, 2015).

Environmental factors, including the school setting, also contribute to shaping students' dietary behaviors and lifestyle. Therefore, it is important to conduct a descriptive study to explore the relationship between nutritional knowledge, food consumption, and physical activity with the nutritional status of students.

MATERIALS AND METHODS

This study employs a descriptive quantitative design, which aims to numerically describe phenomena occurring within a defined population (Sugiyono, 2016). The purpose of this research is to assess the nutritional intake—including energy, protein, fat, and carbohydrate consumption among eighth-grade female students at SMP Muhammadiyah 9 Surabaya.

The study population includes all 48 eighth-grade female students, and the sampling technique used is total sampling (also known as saturated sampling), where all members of the population are included due to the relatively small population size. It should be noted that while total sampling is a type of non-probability sampling, it was selected to ensure full population coverage. Prior to data collection, participants were informed about the study objectives and procedures, and written informed consent was obtained from each respondent.

Data collected in this study includes students' demographic characteristics, body weight, height, and two-day 24-hour dietary recall. Data collection took place over two consecutive days-Thursday and Friday. Nutritional status was assessed using Body Mass Index-for-Age (BMI/Age) based on WHO Growth Standards, ensuring standardized evaluation of nutritional status.

The research instrument consisted of structured questionnaires and recall forms. Prior to implementation, the questionnaire underwent validity and reliability testing to ensure its appropriateness and accuracy for the study population.

Although this study uses a descriptive approach, it also explores potential patterns and relationships among variables such as nutritional knowledge, dietary intake, physical activity, and nutritional status. Therefore, the design could be further developed or combined with analytical methods in future research to explore causality or correlations more thoroughly.

RESULTS

Table 1. Distribution of Respondents by Age

Variable	Frequency (n)	Percent (%)
Age		
13	8	16.7
14	33	68.8
15	7	14.6
Amount	48	100

Source: Primer Data 2024

Based on Table 1, it shows that out of 48 students, the majority of the eighth-grade female students at SMP Muhammadiyah 9 Surabaya who participated in this study are 14 years old, totaling 33 students (68.8%).

Table 2. Distribution of Respondents by Nutritional Knowledge, Nutrient Intake, Physical Activity, and Nutritional Status

Variable	Frequency (n)	Percent (%)
Nutritional Knowledge		
Good	47	97.9
Adequate	1	2.1
Poor	0	0.0
Protein Intake		
Very Low	27	56.3
Low	8	16.7
Normal	9	18.8
High	4	8.3
Fat Intake		
Very Low	31	64.6
Low	11	22.9
Normal	4	8.3
High	2	4.2
Carbohydrate Intake		
Very Low	43	89.6
Low	5	10.4
Normal	0	0.0
High	0	0.0
Physical Activity		
Light	25	52.1
Moderate	21	43.8

Heavy	2	4.2
Nutritional Status		
Underweight	12	26.0
Normal	32	67.7
Overweight	3	6.3
Obese	1	2.1

Source: Primer Data 2024

Based on the results, the majority of respondents demonstrated a good level of nutritional knowledge, with 97.9% (47 out of 48 students) falling into this category. Only one respondent (2.1%) had adequate knowledge, and none were categorized as having poor nutritional knowledge.

In terms of protein intake, more than half of the students (56.3%) had very low intake, while 16.7% had low intake. A smaller proportion had normal (18.8%) or high (8.3%) protein intake. This indicates that most students consumed protein below the recommended levels.

Fat intake showed a similar trend, with 64.6% of respondents having very low fat intake, and 22.9% categorized as low. Only 8.3% had normal intake, and 4.2% had high fat consumption, suggesting an overall insufficient fat intake among the students.

For carbohydrate intake, the results were even more concerning: 89.6% of respondents had very low carbohydrate intake, and the remaining 10.4% had low intake. No respondents were found to have normal or high carbohydrate consumption. This indicates a significant energy intake deficiency, especially considering carbohydrates are the primary source of energy.

Regarding physical activity, more than half of the students (52.1%) engaged in light activity, while 43.8% were classified under moderate activity. Only 4.2% performed heavy physical activity, suggesting a relatively sedentary lifestyle among the respondents.

In terms of nutritional status, most students (67.7%) had a normal Body Mass Index-for-Age (BMI/Age). However, 26.0% were underweight, 6.3% were overweight, and 2.1% were obese. This shows that while the majority have a healthy weight status, a notable portion still faces issues of undernutrition and overnutrition.

DISCUSSION

Nutritional Knowledge

Based on the results, 47 students (97.9%) were found to have good nutritional knowledge. However, this good level of knowledge does not appear to align with actual dietary practices, as most students had very low intake of protein, fat, and carbohydrates. This indicates a paradox between knowledge and behavior a phenomenon frequently observed in adolescent nutrition.

While nutritional knowledge is a key factor influencing food choices, it does not automatically translate into healthy dietary practices. Knowledge alone is not sufficient. Several factors may contribute to this gap. Economic limitations can restrict access to diverse and nutrient-rich foods, especially for students from lower-income households. Cultural preferences or taste inclinations may also lead adolescents to choose less nutritious, highly processed foods. Furthermore, the school or home environment might not support the application of nutritional knowledge—such as the absence of healthy food options in the school canteen or lack of parental modeling (Islam et al, 2024).

This discrepancy highlights the need for interventions that go beyond information dissemination. Nutrition education should be integrated with strategies that address behavioral, environmental, and economic barriers to ensure that knowledge is effectively translated into practice, ultimately supporting optimal nutritional status during adolescence a critical period for growth and development.

Protein Intake

As shown in the results, 56.3% of students had very low protein intake. This low intake is attributed to a lack of variety in protein sources; most students reported consuming only small amounts of chicken or eggs, while many meals consisted solely of carbohydrate-rich foods with minimal inclusion of either plant-based or animal-based proteins. The 2x24-hour dietary recall revealed that a significant number of students regularly consumed small portions of instant noodles, which are low in protein and essential micronutrients.

This condition is concerning, especially considering that 97.9% of the students demonstrated good nutritional knowledge. The disconnect between knowledge and practice suggests that external factors such as economic limitations, food preferences, or lack of access to protein-rich foods may hinder students from applying their knowledge in daily food

choices. This aligns with findings from Iyassu et al. (2024), who reported that adolescents with adequate nutrition knowledge may still exhibit poor dietary habits due to environmental and socioeconomic constraints.

Low protein intake in adolescence poses a significant risk to nutritional status and long-term health. Protein is essential for linear growth, tissue repair, immune function, and hormonal development during puberty. Inadequate protein consumption during this critical developmental stage can increase the risk of underweight, delayed growth, weakened immune response, and in severe cases, protein-energy malnutrition (Endrinikapoulos et al, 2023; Dipasquale et al, 2020).

Fat Intake

The results show that fat intake is severely deficient in 31 students (64.6%). This indicates that the majority of respondents are not meeting their daily fat requirements. The foods consumed during the 2x24-hour recall period were largely low in fat content and lacked diversity in fat sources. For instance, none of the students reported consuming dishes rich in fats, whether from coconut milk, oils, nuts, seeds, or animal fats. Additionally, irregular meal patterns and unbalanced eating habits further contributed to this deficiency.

Fat is an essential macronutrient, particularly important during adolescence, as it supports brain development, hormone production, and the absorption of fat-soluble vitamins (A, D, E, and K) (Espinosa-Salas and Gonzalez-Arias, 2023). Chronic fat deficiency can impair reproductive health, weaken immune function, and reduce the bioavailability of critical nutrients (Morales et al, 2024). Adolescents should obtain approximately 25–35% of their total energy intake from fats, ideally from healthy sources such as avocados, nuts, seeds, fish, and plant-based oils.

The findings suggest a gap between nutritional knowledge and practice. Despite most students having good knowledge of nutrition, it appears they may lack awareness of the importance of incorporating healthy fat sources into their diets, or they may face economic or cultural barriers that limit their access to a balanced variety of foods. This highlights the need for comprehensive interventions that address both knowledge and food accessibility, while also promoting the inclusion of diverse fat sources in adolescents' daily meals.

Carbohydrate Intake

The results show that 89.6% of students (43 out of 48) have a very low carbohydrate intake, which is an unexpected finding given that carbohydrates typically dominate the diet of Indonesian adolescents. Common staple foods such as rice, noodles, and bread are usually consumed in large quantities. However, data from the 2x24-hour dietary recall suggest that students often skipped meals, consumed snacks instead of full meals, or ate in small portions, possibly due to irregular eating habits, time constraints, or food preferences.

Carbohydrates are a critical energy source, particularly during adolescence, a phase characterized by rapid physical growth and increased energy demands (Rollo et al, 2020; Lewis, 2022). Insufficient carbohydrate intake can result in reduced stamina, difficulty concentrating, and muscle fatigue, especially among adolescents who engage in moderate to high levels of physical activity (Heslin and McNulty, 2023). Furthermore, chronic energy deficiency can contribute to underweight status, which was observed in 26% of the students in this study.

The discrepancy between good nutritional knowledge (97.9% of students) and poor carbohydrate intake highlights a potential gap between awareness and actual behavior. Factors such as body image concerns, dieting trends, or misconceptions about carbohydrate consumption and weight gain could contribute to intentional restriction. This underscores the need for nutrition education programs that not only improve knowledge but also correct misconceptions, support behavior change, and consider the social and psychological factors influencing adolescents' food choices.

Physical Activity

The results show that 52.1% of students (25 out of 48) engage in light physical activity, while 43.8% (21 students) engage in moderate activity, and only 4.2% (2 students) participate in heavy physical activity. These findings suggest that the majority of students have relatively low levels of physical exertion, which may be influenced by several factors such as a sedentary lifestyle, lack of physical education emphasis in the school curriculum, urban living environments with limited open space, and the widespread use of digital devices that promote prolonged screen time (van Sluijs et al, 2021).

When linked to dietary intake, particularly the very low carbohydrate intake reported in 89.6% of students, the imbalance between energy intake and expenditure becomes evident. While a portion of students are moderately active, their energy intake especially from

carbohydrates, the body's primary energy source is insufficient to meet physiological demands. This mismatch can lead to fatigue, reduced academic performance, and delayed growth, particularly in adolescents undergoing rapid physical and cognitive development (Most and Redman, 2020; Tardy et al, 2020; O'Leary et al, 2025).

Moreover, when physical activity is compared with nutritional status, it is notable that 26% of students were underweight, which may be influenced by both inadequate energy intake and insufficient physical engagement in muscle-building or weight-maintaining activities. Conversely, the small percentage of overweight or obese students may reflect poor dietary quality rather than physical inactivity alone.

These findings highlight the complex interplay between lifestyle, diet, and health outcomes in adolescents. Interventions should not only promote increased physical activity through structured school programs and active commuting, but also ensure that students consume sufficient, balanced nutrients to support their activity levels and growth during this critical stage of development.

Nutritional Status

In this study, 32 students (66.7%) were classified as having a normal nutritional status, while the rest were categorized as underweight (26.0%), overweight (6.3%), and obese (2.1%). Nutritional status is commonly used as an index to assess the adequacy of nutrient intake; however, it is influenced by a variety of interrelated factors beyond diet alone. While underweight status may suggest inadequate intake, other factors such as chronic infections, high metabolic rates, hormonal imbalances, poor absorption, or psychosocial stress can also contribute to suboptimal nutritional status in adolescents (Godha et al, 2022; Moehlecke et al, 2016) .

Interestingly, despite the generally very low intake of carbohydrates, proteins, and fats reported in this study, a small percentage of students were still categorized as overweight or obese. This paradox may be explained by dietary quality rather than quantity, such as frequent consumption of energy-dense but nutrient-poor foods (e.g., sugary snacks, fried foods, sweetened beverages), low physical activity, or even genetic predisposition. Inactive lifestyles, as indicated by the 52.1% of students with light physical activity, may also contribute to the accumulation of body fat even when overall caloric intake appears low.

These findings are consistent with research by Marinkovic et al. (2024), which found that adolescent nutritional status is shaped by a combination of intake, physical activity and psychological stress. Therefore, a holistic approach is necessary when interpreting nutritional status, emphasizing not only food intake but also behavioral, environmental, and physiological factors.

Understanding these complex interactions highlights the importance of integrated school-based health programs that promote balanced diets, physical activity, stress management, and regular monitoring of growth and development among adolescents.

CONCLUSION

Based on the research results and discussion, it can be concluded that although most students at SMP Muhammadiyah 9 Surabaya are 14 years old and possess good nutritional knowledge (97.9%), this knowledge has not been effectively translated into healthy eating behaviors. The majority of students had very low intakes of carbohydrates, proteins, and fats, with no respondents reaching normal carbohydrate intake levels. Physical activity among students also tended to be low, with over half (52.1%) engaging only in light activity. Despite these findings, 66.7% of students were found to have normal nutritional status, although a significant proportion (26.0%) were underweight. These results suggest a gap between nutritional knowledge and actual practice, likely influenced by lifestyle habits, dietary patterns, and environmental or socioeconomic factors.

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