Journal of Nutrition Explorations
Vol. 3, No.4, November 2025, pp. 282~291

Descriptive Study: Nutrition Knowledge, Physical Activity, and Nutritional Status of 11th-Grade Students at SMA Muhammadiyah 2 Surabaya

Amira Salsabil[1], Nuning Marina Pengge[2], Juliana Christyaningsih[3], Riezky Faisal Nugroho[4]
[1,2,3,4]Department of Nutrition, Politeknik Kesehatan Kemenkes Surabaya, Surabaya, Indonesia
Email : nuning.marina@gmail.com

ARTICLE INFO

Article History:
Received August 5th, 2022
Revised form July 5th, 2024
Accepted July 19th, 2025
Published online July 29th, 2025

Keywords:
Balanced nutrition
Physical activity
Nutritional status

ABSTRACT

Adolescence is a critical period of rapid growth and behavioral change that influences nutritional needs and lifestyle choices. This study aims to describe the nutrition knowledge, physical activity levels, and nutritional status of 11th-grade students at SMA Muhammadiyah 2 Surabaya. A descriptive study was conducted involving 58 students selected through proportional random sampling. Data were collected using validated questionnaires on nutrition knowledge and physical activity, as well as anthropometric measurements. Nutritional status was assessed using BMI-for-age and categorized based on WHO z-score standards. Data were analyzed using SPSS with univariate and bivariate methods. The majority of respondents were female (67.2%) and aged 16 (65.5%). Most had high nutrition knowledge (70.7%), engaged in light physical activity (74.1%), and had normal nutritional status (60.3%). It is recommended that schools enhance regular nutrition education, promote physical activity, and monitor students' nutritional status to support healthy adolescent development.

INTRODUCTION

Adolescence is a critical transitional period from childhood to adulthood and is considered the second fastest phase of growth. During this stage, physical development begins to decline, while psychological and behavioral changes emerge[1–3]. Inadequate knowledge of balanced nutrition may lead to an imbalance between nutrient intake and recommended dietary needs, increasing the risk of malnutrition and reduced functional capacity in adolescents[4]. In addition to knowledge, physical activity is another factor that significantly affects adolescent nutritional status[5].

According to the 2018 Basic Health Research (Riskesdas), the prevalence of undernutrition among adolescents aged 16–18 years in East Java Province was 7.9%, consisting of 1.1% categorized as severely thin and 6.8% as thin. Meanwhile, the prevalence of overnutrition was 16.4%, with 11.3% categorized as overweight and 5.1% as obese[6]. These data reflect the nutritional challenges faced by adolescents in the region and highlight the need for better health education and lifestyle interventions.

An imbalance among nutrition knowledge, physical activity, and nutritional status in adolescents may result in significant health, cognitive, and psychological consequences[7]. Inadequate

understanding of balanced nutrition can lead to unhealthy dietary behaviors, such as skipping meals, excessive consumption of processed foods, and a lack of dietary diversity. Insufficient physical activity may contribute to excessive energy storage, increasing the likelihood of becoming overweight or obese. On the other hand, high physical exertion without adequate nutritional intake can cause undernutrition, fatigue, and delayed physical development[8]. Suboptimal nutritional status, whether due to being underweight or overweight, may compromise immune function, disrupt hormonal balance, hinder academic performance, and elevate the risk of chronic diseases such as diabetes and heart conditions in the future[9–11]. Furthermore, poor nutritional status can negatively affect self-esteem and social well-being.

Preliminary observations conducted on 20 students of grade XI at SMA Muhammadiyah 2 Surabaya revealed that 15% were underweight, 30% were overweight, and 55% had normal nutritional status. Additionally, approximately 90% of the students were found to engage in only light physical activities, such as playing video games or sitting and relaxing at home. Most of them reported that they only performed physical activity during physical education classes or extracurricular sessions.

Although adolescence is a crucial period for establishing healthy lifestyle habits, there is still a lack of integrated data describing the relationship between nutrition knowledge, physical activity, and nutritional status, particularly among high school students in Surabaya. Existing studies often examine these factors separately, without showing how they may interact in shaping adolescent health. Therefore, this study aims to provide a comprehensive description of nutrition knowledge, physical activity levels, and nutritional status among 11th-grade students at SMA Muhammadiyah 2 Surabaya.

MATERIALS AND METHODS

This research was a descriptive study conducted from October 2021 to April 2022 at SMA Muhammadiyah 2 Surabaya. The study obtained ethical approval and research permission from the Health Polytechnic of the Ministry of Health Surabaya (Poltekkes Kemenkes Surabaya). The population consisted of all students from grade XI MIPA and XI IBB, totaling 391 students. A total of 58 students were selected as respondents using a proportional random sampling technique. The inclusion criteria were students who were willing to participate, present during data collection, and able to complete the questionnaire independently. The exclusion criteria included students who were ill or absent during the data collection process.

Data collection was carried out through questionnaire administration and anthropometric measurements. The instruments used included a standardized and previously validated nutrition knowledge questionnaire and a physical activity questionnaire, both of which had been tested for

validity and reliability in prior studies. Height was measured using a GEA microtoise, and weight was measured using a Camry digital standing scale. Nutritional status was assessed using the Body Mass Index-for-Age (BMI-for-Age) and categorized based on WHO z-score standards for adolescents. Data analysis was performed using SPSS, with univariate analysis used to describe the frequency distribution of each variable, and bivariate analysis using cross-tabulation to explore the relationships between variables.

RESULT

Table 1 Distribution of Respondent Frequencies by Gender at SMA Muhammadiyah 2 Surabaya in 2022

Gender	n	%
Man	19	32,8
Woman	39	67,2
Total	**58**	**100**

Source : Primary Data, 2022

Based on Table 1, the majority of respondents were female, totaling 39 students or 67.2%, while the remaining 19 respondents, equivalent to 32.8%, were male. This indicates that female students were more dominant in the study sample at SMA Muhammadiyah 2 Surabaya in 2022.

Table 2 Frequency Distribution of Respondents by Age at SMA Muhammadiyah 2 Surabaya in 2022

Age	n	%
16 years	38	65,5
17 years	19	32,8
18 years	1	1,7
Total	**58**	**100**

Source : Primary Data, 2022

Table 2 shows that the majority of respondents were 16 years old, accounting for 38 students or 65.5%. A total of 19 students (32.8%) were 17 years old, while only 1 student (1.7%) was 18 years old. This indicates that most of the participants in the study were in the early phase of late adolescence.

Table 3 Distribution of Respondent Frequencies Based on Knowledge Level Related to Balanced Nutrition at SMA Muhammadiyah 2 Surabaya in 2022

Related Knowledge Level Balanced Nutrition	n	%
Low	0	0
Moderate	17	29,3
High	41	70,7
Total	**58**	**100**

Source : Primary Data, 2022

Table 3 illustrates that the majority of respondents had a high level of knowledge regarding balanced nutrition, with 41 students (70.7%). Meanwhile, 17 students (29.3%) had a moderate level

of knowledge, and none of the respondents were categorized as having low knowledge. These findings indicate that most students at SMA Muhammadiyah 2 Surabaya possess a strong understanding of balanced nutrition.

Table 4 Distribution of Respondent Frequencies Based on Physical Activity at SMA Muhammadiyah 2 Surabaya in 2022

Physical Activity	n	%
Very Light	1	1,8
Light	43	74,1
Moderate	14	24,1
Heavy	0	0
Very Heavy	0	0
Total	**58**	**100**

Source : Primary Data, 2022

Table 4 shows that the majority of respondents engaged in light physical activity, with 43 students (74.1%). Additionally, 14 students (24.1%) reported performing moderate physical activity, and only 1 student (1.8%) reported very light activity. There were no respondents who reported engaging in heavy or very heavy physical activity. These results suggest that most students at SMA Muhammadiyah 2 Surabaya had relatively low levels of physical activity.

Table 5 Distribution of Respondent Frequencies Based on Nutritional Status at SMA Muhammadiyah 2 Surabaya in 2022

Nutritional Status	n	%
Underweight	8	13,9
Normal	35	60,3
Overweight	6	10,3
Obese	9	15,5
Total	**58**	**100**

Source : Primary Data, 2022

Table 5 indicates that most respondents had normal nutritional status, with 35 students (60.3%). A total of 8 students (13.9%) were categorized as underweight, 6 students (10.3%) as overweight, and 9 students (15.5%) as obese. These findings suggest that while the majority of students at SMA Muhammadiyah 2 Surabaya maintained a normal nutritional status, a notable proportion were affected by both underweight and overnutrition.

Table 6 Cross-tabulation of Balanced Nutrition Knowledge and Nutritional Status at SMA Muhammadiyah 2 Surabaya

Knowledge Level Nutrient Balanced	Nutritional Status								Total	
	Underweight		Normal		Overweight		Obese			
	n	%	n	%	n	%	n	%	n	%
Low	0	0	0	0	0	0	0	0	0	0
Moderate	1	5,9	11	64,7	1	5,9	4	23,5	17	100
High	7	17,1	24	58,5	5	12,2	5	12,2	41	100
Total	**8**	**13,9**	**35**	**60,3**	**6**	**10,3**	**9**	**15,5**	**58**	**100**

Source : Primary Data, 2022

Table 6 presents the cross-tabulation between nutrition knowledge and nutritional status. Among respondents with high nutrition knowledge, the majority had normal nutritional status (58.5%),

while 17.1% were underweight, 12.2% overweight, and 12.2% obese. For those with moderate knowledge, 64.7% had normal nutritional status, 5.9% were underweight, 5.9% overweight, and 23.5% obese. No respondents were categorized as having low nutrition knowledge. These findings suggest that while a high level of nutrition knowledge is generally associated with normal nutritional status, it does not guarantee optimal nutritional outcomes, indicating that other factors may also influence students' nutritional status.

Table 7 Cross-Tabulation of Physical Activity and Nutritional Status at SMA Muhammadiyah 2 Surabaya

Physical Activity	Nutritional Status								Total	
	Underweight		Normal		Overweight		Obese			
	n	%	n	%	n	%	n	%	n	%
Very Light	0	0	0	0	0	0	1	100	1	100
Light	7	16,3	27	62,8	2	4,7	7	16,3	43	100
Moderate	1	7,1	8	57,1	8	28,6	1	7,1	14	100
Heavy	0	0	0	0	0	0	0	0	0	0
Very Heavy	0	0	0	0	0	0	0	0	0	0
Total	8	13,9	35	60,3	6	10,3	9	15,5	58	100

Source : Primary Data, 2022

Table 7 displays the cross-tabulation between physical activity and nutritional status. Among respondents who engaged in light physical activity, the majority had normal nutritional status (62.8%), while 16.3% were underweight, 4.7% overweight, and 16.3% obese. Of those with moderate physical activity, 57.1% had normal nutritional status, 7.1% were underweight, 28.6% overweight, and 7.1% obese. One respondent (100%) who reported very light physical activity was classified as obese. No respondents reported engaging in heavy or very heavy physical activity. These results indicate that most students who performed light or moderate physical activity had normal nutritional status; however, cases of overweight and obesity were also present, suggesting that physical activity alone may not fully determine nutritional outcomes.

DISCUSSION

Respondent Characteristics

Most of the respondents in the study were female (67.2%) and 16-year-old (65.5%). These findings are not surprising, given that women's participation rates in school survey activities tend to be higher than men's. However, the dominance of female respondents can be a source of gender bias in the interpretation of results, mainly due to physiological and psychosocial differences that affect nutritional status and physical activity between men and women[12].

Balanced Nutrition Knowledge

Most of the respondents had a high level of knowledge related to balanced nutrition (70.7%). This high level of knowledge can be attributed to the availability of information sources such as libraries,

biology lessons, and internet access. However, these results need to be analyzed more critically. Although knowledge is an important factor in shaping nutritional behaviors, some studies show that knowledge is not always directly proportional to healthy eating practices[8,13,14]. For example, in this study, it was found that some respondents with high knowledge actually experienced overweight or obesity nutritional status, which indicates that there are other factors such as eating habits, family influences, and social environment that also determine nutritional practices.

Nutritional knowledge without changes in attitudes and behaviors tends to be ineffective in preventing nutritional status disorders. In line with the findings in the study of Wang *et al*. (2021), Maternal knowledge during pregnancy does not automatically reduce the risk of premature birth, unless it is supported by consistent healthy behaviors[8]. Therefore, nutrition education provided in schools needs to place more emphasis on the formation of positive attitudes and behaviors, not just the improvement of cognitive knowledge.

Physical Activity

Most respondents did light physical activity (74.1%), such as playing on their phones, watching TV, and light household activities. This reflects a sedentary lifestyle that is starting to take root in urban adolescents. In fact, physical activity plays an important role in maintaining energy balance and preventing being overweight. Study by Serra-Payá *et al*. (2021) emphasized that low physical activity leads to decreased ventilation efficiency and an increased risk of obesity in adolescents, especially if not balanced with a healthy diet[7].

Interestingly, although there was a group of respondents who reported moderate physical activity, some of them still had overweight nutritional status. This reinforces the hypothesis that physical activity alone is not enough to guarantee normal nutritional status[15,16]. Effective nutrition interventions should be multisectoral and take into account food consumption patterns, sleep duration, stress, and the influence of digital media[17].

Nutritional Status and Its Determinants

As many as 60.3% of respondents had normal nutritional status. However, the percentage of respondents who were underweight (13.9%), overweight (10.3%), and obese (15.5%) still indicated a dual nutritional problem. Suboptimal nutritional status can be caused by a variety of factors, including unbalanced food intake, lack of physical activity, social pressure, and genetic factors[18–20].

The study found that nutritional status is not always aligned with knowledge level or physical activity level. For example, some respondents with high knowledge are still obese. These findings are in line with the results of research by Arruda *et al*. (2022) which showed that even children with disabilities or mobility barriers can have normal nutritional status if the environment and interventions provided are appropriate[21].

The Relationship between Nutritional Knowledge and Nutritional Status

From the results of the cross-tabulation, respondents with high nutritional knowledge mostly had normal nutritional status (58.5%), but there were also those who were underweight, overweight, and obese. This suggests that nutritional knowledge is not the only determinant of nutritional status. Global nutrition studies also show that while nutrition education can improve knowledge, sustainable changes in eating behavior only occur when individuals have supportive environmental support, such as the availability of healthy foods and eating habits at home[22].

In this context, behavioral theory models such as the Health Belief Model or the Theory of Planned Behavior should be used to design more effective nutrition education, taking into account risk perceptions, subjective norms, and behavioral control that adolescents feel towards healthy food consumption[23–25].

The Relationship of Physical Activity and Nutritional Status

Cross-tabulation showed that most of the respondents who engaged in light activities had normal nutritional status. However, there is still a proportion who are obese, even in respondents who report moderate physical activity. This suggests that other variables such as calorie intake, meal time, and sleep patterns are very likely to be additional determinants of nutritional status.

Research by Saputro & Dewi (2024) shows that students in dormitories with structured physical activity are more likely to have normal nutritional status than those who stay at home without supervision of daily activities[5]. Therefore, school and family have an important role in shaping students' daily physical habits.

This study may be subject to response bias, as the data on nutrition knowledge and physical activity were collected through self-reported questionnaires. Respondents might have overestimated or underestimated their behaviors or knowledge due to social desirability or misunderstanding of the questions. In addition, the use of a cross-sectional design limits the ability to establish causal relationships between variables.

This research was conducted at a single school with a relatively small sample size, which may limit the generalizability of the findings to a broader adolescent population. Furthermore, the study did not include other influencing factors such as dietary intake, socioeconomic status, or parental education, which could have provided a more comprehensive understanding of the students' nutritional status.

CONCLUSION

In conclusion, most 11th-grade students at SMA Muhammadiyah 2 Surabaya had a high level of knowledge about balanced nutrition, performed light physical activity, and were classified with normal nutritional status. However, the presence of underweight, overweight, and obese students indicates that knowledge alone is not sufficient to ensure optimal nutritional outcomes. Some students with high knowledge levels still had poor nutritional status, suggesting the influence of other factors such as lifestyle, eating habits, and family environment. Therefore, it is recommended that schools implement regular nutrition education, promote active lifestyles, and conduct periodic monitoring of students' nutritional status to support healthier adolescent development.

BIBLIOGRAPHY

1. Matiti M, Waningsih NA, Paputungan F. Intelligence Development and Physical Development in Adolescents. J Educ Cult [Internet]. 2023;3(1):2986–1012. Available from: https://journals.ubmg.ac.id/index.php/JEaC/article/view/1265

2. Maheux AJ. Early Adolescents' Attitudes Towards and Interest in Care-Oriented HEED Professions: Gender Differences and Associations With Academic Achievement. J Adolesc [Internet]. 2025 Jul 21; Available from: https://onlinelibrary.wiley.com/doi/10.1002/jad.70017

3. Sunita Almatsier Soetardjo, Susirah Soekatri M. Gizi Seimbang dalam Daur Kehidupan. In Jakarta: Kompas Gramedia; 2011. Available from: https://lib.fkm.ui.ac.id/detail?id=75080&lokasi=lokal

4. Dwi Jayanti Y, Elsa Novananda N. Hubungan Pengetahuan Tentang Gizi Seimbang dengan Status Gizi Pada Remaja Putri Kelas XI Akuntansi 2 (di SMK PGRI 2 Kota Kediri). J KEBIDANAN [Internet]. 2019 Mar 25;6(2):100–8. Available from: https://akbid-dharmahusada-kediri.e-journal.id/JKDH/article/view/38

5. Saputro H, Dewi ASSADA. Aktivitas Fisik Berhubungan Dengan Status Gizi Lebih Pada Siswa di Asrama Putri. Pontianak Nutr J. 2024;7(September):538–43.

6. Badan Penelitian Dan Pengembangan Kesehatan Republik Indonesia. Laporan Riskesdas 2018 Nasional. Lembaga Penerbit Balitbangkes. 2018. p. hal 156.

7. Serra-Payá N, Garnacho-Castaño MV, Sánchez-Nuño S, Albesa-Albiol L, Girabent-Farrés M, Moizé Arcone L, et al. The Relationship between Resistance Exercise Performance and Ventilatory Efficiency after Beetroot Juice Intake in Well-Trained Athletes. Nutrients [Internet]. 2021 Mar 27;13(4):1094. Available from: https://www.mdpi.com/2072-6643/13/4/1094

8. Wang Z, Zhao S, Cui X, Song Q, Shi Z, Su J, et al. Effects of Dietary Patterns during Pregnancy on Preterm Birth: A Birth Cohort Study in Shanghai. Nutrients [Internet]. 2021 Jul 10;13(7):2367. Available from: https://www.mdpi.com/2072-6643/13/7/2367

9. Febriane Balafif F, Rafisa A, Kuswandani F, Najmi N. The Role of Nutrition on the Immune Response under a Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC4.0). J eduhealth [Internet]. 2023;14(02):2023. Available from: http://ejournal.seaninstitute.or.id/index.php/healt

10. Calder P, Carr A, Gombart A, Eggersdorfer M. Optimal Nutritional Status for a Well-Functioning Immune System Is an Important Factor to Protect against Viral Infections. Nutrients [Internet]. 2020 Apr 23;12(4):1181. Available from: https://www.mdpi.com/2072-6643/12/4/1181

11. Arruda RCBF de, Tassitano RM, da Silva Brito AL, de Sousa Martins OS, Cabral PC, de Castro Antunes MM. Physical Activity, Sedentary Time and Nutritional Status in Brazilian Children with Cerebral Palsy. J Pediatr (Rio J) [Internet]. 2022 May;98(3):303–9. Available from: https://linkinghub.elsevier.com/retrieve/pii/S002175572100098X

12. Alamoudi NA, Algabbani MF, Al-Heizan MO, Alhusaini AA. Physical Activity and Sedentary Behavior among Ambulatory Children with Cerebral Palsy using Accelerometer: A Cross-Sectional Study. Front Pediatr [Internet]. 2024 Sep 19;12. Available from: https://www.frontiersin.org/articles/10.3389/fped.2024.1463288/full

13. Alodia Y, Depytha ES, Nugrahaini YAM, Apriliandani GP, Putri ZA, Mufateha AS, et al. Hubungan Pengetahuan Gizi dengan Pola Makan Mahasiswa Prodi Farmasi Angkatan 2023 Fakultas Kedokteran Universitas Negeri Semarang. J Angka [Internet]. 2024;1(2):356–70. Available from: http://jurnalilmiah.org/journal/index.php/angka

14. Natsir Djide NA, Pebriani R. Hubungan Pengetahuan Gizi terhadap Praktik Pemilihan Makanan Mahasiswa STIKES Nani Hasanuddin Makassar. J Ilm Kesehat Masy Media Komun Komunitas Kesehat Masy. 2023;15(1):18–22.

15. Dini Lubna Alyani. Hubungan Asupan Energi, Aktivitas Fisik, dan Tingkat Stres dengan Status Gizi Santri di Asrama Sunan Ampel Putri Pondok Pesantren Mamba'ul Ma'arif Denanyar Jombang. J Ilmu Kesehat dan Gizi. 2024;2(3):20–31.

16. Azis A, Agisna F, Kartika I, Aulia R, Maulana R, Anggisna S, et al. Aktivitas Fisik Dapat Menentukan Status Gizi Mahasiswa. Contag Sci Period J Public Heal Coast Heal. 2022;4(1):26.

17. Ramadoan S. Model Intervensi Terpadu dalam Mengatasi Prevalensi Stunting di Kota Bima. J Gov Local Polit. 2024;6(2):229–39.

18. Hafsah T, Sudaryo LSQ, Yoanita Y. Factors Affecting Nutritional Status among Children Aged 12–23 Months. Althea Med J. 2019;6(4):205–10.

19. Ibrahim I, Saputra B. Analysis Of Factors Related to Malnutrition Status Among Children Under The Age of Five in the Binanga Health Center ' s Service Area in Mamuju District.

20. Manongga SP, Yutomo L. Determinant Factors of Malnutrition in Papuan Children Under Five Years: Structural Equation Model Analysis. Indones J Multidiscip Sci [Internet]. 2023 Feb 6;2(5):2379–94. Available from: https://ijoms.internationaljournallabs.com/index.php/ijoms/article/view/355

21. Arruda RCBF de, Tassitano RM, da Silva Brito AL, de Sousa Martins OS, Cabral PC, de Castro Antunes MM. Physical Activity, Sedentary Time and Nutritional Status in Brazilian Children with Cerebral Palsy. J Pediatr (Rio J) [Internet]. 2022 May;98(3):303–9. Available from: https://linkinghub.elsevier.com/retrieve/pii/S0021755721001194

22. UNICEF. Building a Better Future with and For Adolescents : UNICEF Indonesia Adolescent Strategy 2024-2030. 2024;1–44.

23. Diddana TZ, Kelkay GN, Dola AN, Sadore AA. Effect of Nutrition Education Based on Health

Belief Model on Nutritional Knowledge and Dietary Practice of Pregnant Women in Dessie Town, Northeast Ethiopia: A Cluster Randomized Control Trial. J Nutr Metab [Internet]. 2018 Jun 21;2018:1–10. Available from: https://www.hindawi.com/journals/jnme/2018/6731815/

24. Afniratri A, Tamtomo DG, Murti B. Meta-Analysis: Effectiveness of Health Education Based on Health Belief Model in Type 2 Diabetes Mellitus Patients. J Heal Promot Behav [Internet]. 2024;9(2):132–44. Available from: https://thejhpb.com/index.php/thejhpb/article/view/463

25. Riazi S, Ghavami V, Sobhani SR, Shoorab NJ, Mirzakhani K. The Effect of Nutrition Education Based on the Health Belief Model (HBM) on Food Intake in Pregnant Afghan Immigrant Women: A Semi-experimental Study. BMC Pregnancy Childbirth [Internet]. 2024 Oct 25;24(1):700. Available from: https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-024-06728-0