

## School-Based Balanced Nutrition Education as a Strategy to Improve Adolescents' Nutritional Knowledge and Attitudes

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### Abstract

Nutritional disorders among adolescents remain a major public health challenge in Indonesia, as indicated by the persistently high prevalence of anemia and obesity in this age group. Various factors contribute to adolescent nutritional problems, including low nutritional knowledge, the habit of skipping breakfast, and high consumption of fast food and low-nutrient foods. Many students at SMP Kartika IV-4 Jember still practice unhealthy eating patterns and have never received balanced nutrition education. The design of community service was pre-post school-based educational intervention aimed to improve adolescents' knowledge and attitudes toward balanced nutrition. The nutrition education was delivered to 25 tenth-grade students of SMP Kartika IV-4 Jember and covered the principles of balanced nutrition, examples of unhealthy foods and beverages, and various nutritional disorders among adolescents, using PowerPoint presentations and leaflets as educational media. The results showed that balanced nutrition education had a significant effect on students' levels of knowledge and attitudes ( $p$  value < 0.001). There was an increase in the mean knowledge score of 31 points and an increase of 34.3 points in the attitude score after the balanced nutrition education was implemented. School-based nutrition education is therefore essential as an effort to promote healthy eating behaviors by improving knowledge and attitudes toward balanced nutrition among adolescents, thereby contributing to the prevention of nutritional problems in this population.

**Keywords:** Balanced nutrition, school-based education, knowledge, attitude, adolescents

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### Introduction

Nutritional problems among adolescents remain a significant public health issue at both global and national levels. Adolescence is a period characterized by rapid physical growth, hormonal changes, and psychosocial development, which increases the need for adequate and balanced nutritional intake. Inadequate fulfillment of nutritional requirements during this stage may lead to various nutritional problems, including undernutrition, anemia, overweight, and obesity, which can adversely affect health status, learning capacity, and future productivity (Carducci et al., 2025; Parajuli & Prangthip, 2025).

Globally, the World Health Organization (WHO) reports that anemia remains a major nutritional problem among adolescents, particularly adolescent girls, with a higher prevalence observed in developing countries (WHO, 2025; Wiafe et al., 2023). In Indonesia, nutritional problems among adolescents reflect a *double burden of malnutrition*. Based on data from the 2018 Basic Health Research (Riskesdas), the prevalence of anemia among adolescents aged 15–24 years reached approximately 32%, with a higher proportion observed among adolescent girls. Meanwhile, the prevalence of overweight and obesity among adolescents aged 13–15 years was around 16%, indicating an increasing trend of overnutrition among school-aged

adolescents (Kementrian Kesehatan Republik Indonesia, 2019). This condition highlights that Indonesian adolescents simultaneously face the risks of undernutrition and overnutrition. In 2018, the number of obesity cases among senior high school-aged adolescents and equivalent groups in Jember Regency reached 163 individuals (Susindra et al., 2023). Anemia, one of the nutritional disorders, remains relatively high among adolescents in Jember Regency, affecting approximately 41% of the estimated 76,000 adolescents (Dinas Kesehatan Provinsi Jawa Timur, 2023).

Nutritional problems among adolescents are influenced by various factors, including low nutritional knowledge, unbalanced dietary patterns, the habit of skipping meals, high consumption of fast food and low-nutrient snacks, and insufficient physical activity. In addition, peer influence and the school environment play important roles in shaping adolescents' eating behaviors. Low nutrition literacy limits adolescents' ability to make healthy food choices that meet their nutritional needs (Purba et al., 2024; Sinaga & Habibi, 2025).

Nutrition education is one strategy that has been proven effective in improving knowledge, attitudes, and healthy behaviors related to balanced nutrition and food choices that support adolescent health. Structured and consistently delivered nutrition education interventions can enhance adolescents' nutrition literacy, promote positive dietary behavior changes, and increase awareness of the negative impacts of unhealthy eating patterns. Nutrition education also plays an important role in raising awareness of the importance of iron and other micronutrient intake as part of efforts to prevent anemia and other nutritional problems among adolescents (Harianti et al., 2024; Putri & Fitriani, 2024).

Schools play a strategic role as settings for nutrition education, as they serve as places where adolescents spend a substantial amount of time and have great potential to shape healthy lifestyle behaviors (Iqbal et al., 2025; Samad et al., 2024). School-based interventions are considered effective because they can directly reach adolescents in a continuous manner and be integrated into learning activities. Therefore, community service programs conducted in school settings represent a relevant approach to the prevention of nutritional problems among school-aged adolescents.

## **Identification of Problems**

Based on a preliminary study conducted at SMP Kartika IV-V Jember, interviews with 10 male and female students revealed that all students frequently consumed unhealthy snacks purchased around the school environment. These snacks were generally high in sugar and salt, including sugar-sweetened beverages, processed snacks, *seblak*, and *gorengan*. The sugar-sweetened beverages commonly consumed by students at SMP Kartika IV-4 included soda, packaged fruit juices, bottled tea, sweetened coffee, and bubble tea, which are characterized by high added sugar content and low nutritional value. The students reported consuming these sugar-sweetened beverages and unhealthy snacks on a daily basis. Furthermore, some students reported very low consumption of vegetables and fruits.

Regarding breakfast habits, 5 students reported regularly skipping breakfast due to lack of habit or experiencing gastrointestinal discomfort when eating in the morning. Skipping breakfast has the potential to adversely affect learning concentration and stamina during school activities (Pebriani et al., 2025). Limited understanding of the importance of breakfast and healthy food choices indicates that the students' nutrition literacy remains relatively low.

On the other hand, based on interviews with the school principal, no nutrition education program had previously been implemented at SMP Kartika IV-4. This condition has contributed to students' limited understanding of the long-term risks associated with unhealthy dietary patterns, including the risks of anemia, undernutrition, and overnutrition. Based on these issues, balanced nutrition education is therefore highly urgent to improve knowledge, foster positive attitudes, and promote healthier eating behaviors for students at SMP Kartika Jember.

## **Implementation Methodology**

The school-based balanced nutrition education at SMP Kartika IV-4 Jember was conducted among 25 Grade X students on December 11, 2025, through a single face-to-face session that included the delivery of educational materials and completion of questionnaires.

### ***Preparation Stage***

This community service activity began with obtaining official permission from the principal of SMP Kartika IV-4, followed by coordination with the Grade X homeroom teacher to determine the date and time of the activity. At this stage, questionnaires were prepared to assess students'

knowledge and attitudes toward balanced nutrition before and after the nutrition education intervention. Students' knowledge of balanced nutrition was measured using a Balanced Nutrition Knowledge Questionnaire developed by Nuryani (2019). The Balanced Nutrition Knowledge Questionnaire consisted of 31 items, while the Balanced Nutrition Attitude Questionnaire comprised 15 items. The validity of the questionnaires was tested using Pearson correlation analysis. The correlation coefficient for the balanced nutrition knowledge questionnaire was  $r = 0.564$  ( $r$  table = 0.333), while the balanced nutrition attitude questionnaire showed a correlation coefficient of  $r = 0.233$  ( $r$  table = 0.210). Since the calculated  $r$  values for both questionnaires were greater than the corresponding  $r$  table values, both instruments were considered valid. The reliability of the questionnaires was assessed using Cronbach's alpha. The balanced nutrition knowledge questionnaire had a Cronbach's  $\alpha$  value of 0.687, while the balanced nutrition attitude questionnaire had a Cronbach's  $\alpha$  value of 0.683. Both values fall within the range of 0.61–0.80, indicating that the questionnaires have good reliability. The nutrition education media used was a powerpoint presentation containing materials on the principles of balanced nutrition, examples of unhealthy foods and beverages, and various nutritional disorders among adolescents.

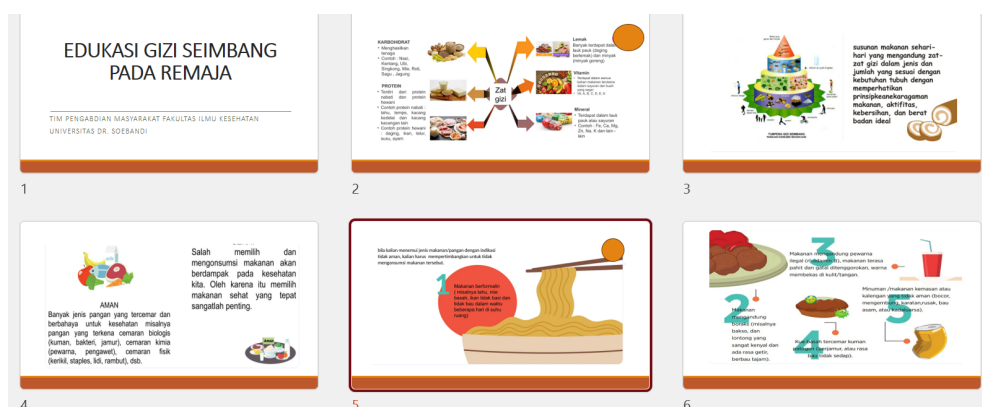


Figure 1. Community Service Material

### Implementation stage

This community service activity was conducted in several sessions as follows:

#### a. Pretest

The first session (pretest) was conducted prior to the nutrition education intervention. In this session, students were asked to complete a prepared questionnaire to assess their baseline knowledge and attitudes regarding balanced nutrition. The pretest aimed to identify students' initial understanding of the principles of balanced nutrition, healthy eating habits, and their perceptions of the importance of adequate nutritional intake during adolescence.

### b. Balanced Nutrition Education

The educational material was delivered face-to-face using an interactive PowerPoint presentation and leaflet. The content covered the definition and principles of balanced nutrition, examples of healthy and unhealthy foods and beverages, the importance of consuming vegetables, fruits, and protein sources, as well as common nutritional problems among adolescents, such as anemia, undernutrition, and overnutrition. The material was presented using simple language and examples relevant to students' daily lives to enhance understanding and engagement. In addition, this session included a question-and-answer discussion to encourage active student participation.

### c. Posttest

During this session, students were asked to complete the same questionnaire used in the pretest. The posttest aimed to evaluate changes in students' knowledge and attitudes following the balanced nutrition education. The posttest results were subsequently used as indicators of the effectiveness of the nutrition education activity in improving students' understanding and awareness of the importance of balanced nutrition.



Figure 2. Documentation of Community Service Activity

## Results and Discussion

**Table 1. Demographic Characteristics of Participants**

No.	Characteristics	Frequency (%)
<b>1</b>	<b>Age</b>	
	16	5 (20)
	17	12 (48)
	18	8 (32)
<b>2</b>	<b>Gender</b>	
	Female	16 (64)
	Male	9 (36)
<b>3</b>	<b>Mother's occupation</b>	
	Working	10 (32)
	Not working	15 (68)
<b>4</b>	<b>Father's Occupation</b>	
	Farmer	4 (16)
	Employee	8 (32)
	Merchant	6 (24)
	Others	7 (28)
<b>5</b>	<b>Family's income</b>	
	≥ UMR	21 (84)
	< UMR	4 (16)
<b>6</b>	<b>Number of Children</b>	
	≤2	14 (56)
	>2	11 (44)

Most students participating in this activity were 17 years old, female, had mothers who were not employed, fathers who worked as employees, family income at or above the regional minimum wage, and came from families with a maximum of two children

**Table 2. Pretest and Posttest of Knowledge and Attitude towards School-based Balanced Nutrition Education**

Variable	Pretest (Mean, ±SD)	Posttest (Mean, ±SD)	P value
Knowledge of balanced nutrition	61,8 ± 8,9	92,8 ± 7	<,001
Attitude of balanced nutrition	65,5 ± 14,3	89,8 ± 6,8	<,001

The results of the paired *t*-test indicated that balanced nutrition education had a significant effect on students' knowledge and attitudes. Table 2 shows that prior to the school-based balanced nutrition education intervention, the students' mean knowledge score was 61.8 and the mean balanced nutrition attitude score was 65.5. After the balanced nutrition education was conducted, the mean knowledge score increased to 92.8, while the mean balanced nutrition attitude score increased to 89.8. This represents an improvement of 31 points in knowledge scores and 34.3 points in attitude scores.

The improvement indicates that structured, school-based balanced nutrition education is effective in enhancing students' understanding and fostering positive attitudes toward the application of balanced nutrition. This finding is consistent with the concept that knowledge is a key factor influencing health-related attitudes and behaviors, particularly among adolescents (Contento & Street, 2016).

The increase in students' knowledge scores following the nutrition education intervention indicates that delivering educational materials using appropriate media and a contextual approach can effectively improve adolescents' nutrition literacy. The materials covered the principles of balanced nutrition, examples of healthy and unhealthy foods, and the impacts of nutritional disorders among adolescents, enabling students to gain a more comprehensive understanding of the importance of adequate nutritional intake. These findings are consistent with previous studies reporting that school-based nutrition education can significantly improve adolescents' nutrition knowledge, particularly when the content is tailored to the needs and characteristics of the students (Septiani et al., 2025; Sriwiyanti et al., 2025; Zakiah et al., 2023).

In addition to the improvement in knowledge, this nutrition education activity also successfully enhanced students' attitudes toward balanced nutrition. More positive attitudes reflect increased awareness and readiness among students to apply the principles of balanced nutrition in their daily lives. According to health behavior theory, changes in attitude represent an important stage preceding actual behavior change (Notoatmodjo, 2014). Nutrition education delivered through discussion and question-and-answer sessions allowed students to reflect on their own eating habits, thereby encouraging the development of attitudes that are more supportive of healthy eating behaviors.

This community service activity had several limitations. First, the number of adolescent respondents involved was relatively small, with only 25 participants, which limits the generalizability of the findings. Second, the intervention was conducted in only a single session, so the results may not reflect the long-term impact of balanced nutrition education. In addition, the outcomes assessed in this activity were limited to knowledge and attitudes, and behavioral changes related to dietary practices among adolescents were not evaluated

## Conclusion

School-based balanced nutrition education has been proven to improve adolescents' knowledge and attitudes toward balanced nutrition. Therefore, the school-based balanced nutrition education needs to be implemented continuously and integrated into school activities as part of a comprehensive effort to improve adolescents' overall health status.

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## References

- Carducci, B., Chen, Z. H., & Campisi, S. C. (2025). Adolescence as a key developmental window for nutrition promotion and cardiometabolic disease prevention. *Metabolic Health and Disease*, 3(40), 1–9. <https://doi.org/https://doi.org/10.1038/s44324-025-00082-1>
- Contento, I. R., & Street, W. (2016). *Nutrition Education Linking Research , Theory , and Practice* (Third). Jones and Bartlett Learning. [https://samples.jblearning.com/9781284078008/9781284083194\\_FMxx.pdf](https://samples.jblearning.com/9781284078008/9781284083194_FMxx.pdf)
- Dinas Kesehatan Provinsi Jawa Timur. (2023). *Profil Kesehatan Provinsi Jawa Timur 2022*. [https://dinkes.jatimprov.go.id/userfile/dokumen/PROFIL\\_KESEHATAN\\_JATIM\\_2022.pdf](https://dinkes.jatimprov.go.id/userfile/dokumen/PROFIL_KESEHATAN_JATIM_2022.pdf)
- Harianti, R., Putri, A. M., Ramadhani, N., & Nur, W. (2024). The Effect of Nutrition Education on Increasing Adolescents Knowledge about Diverse Food Consumption in an Effort to Implement the 4 Pillars of Balanced Nutrition Pengaruh Edukasi Gizi terhadap Peningkatan Pengetahuan Remaja tentang Konsumsi Makanan Berag. *Jurnal Kesehatan Masyarakat Mulawarman*, 6(1), 2017–2020.
- Iqbal, S., Zafar, S., Hassan, S., Usman, B., Momin, A., & Ahmad, R. (2025). Effectiveness of school-based nutrition education on obesity and nutritional status of adolescent girls : a scoping review. *International Journal of Public Health Science*, 14(3), 1243–1255. <https://doi.org/10.11591/ijphs.v14i3.26131>
- Kementrian Kesehatan Republik Indonesia. (2019). *Laporan Nasional Riset Kesehatan Dasar 2018*. <https://layanandata.kemkes.go.id/katalog-data/riskesdas/ketersediaan-data/riskesdas-2018>
- Notoatmodjo, S. (2014). *Ilmu Perilaku Kesehatan*. Rineka Cipta.

- Nuryani, N. (2019). Validity and Reliability Questionnaire of Knowledge, Attitude and Practice of Balanced Diet among Adolescent. *Ghidza: Jurnal Gizi Dan Kesehatan*, 3(2), 37–46. <https://doi.org/10.22487/j26227622.2019.v3.i2.13232>
- Parajuli, J., & Prangthip, P. (2025). Adolescent Nutrition and Health : a Critical Period for Nutritional Intervention to Prevent Long Term Health Consequences. *Current Nutrition Reports*, 14(116), 1–14. <https://doi.org/https://doi.org/10.1007/s13668-025-00706-4>
- Pebriani, Ekawaty, F., & Nasution, R. A. (2025). Hubungan Kebiasaan Sarapan Pagi dengan Konsentrasi Belajar pada Anak Usia Sekolah Dasar. *Jurnal Keperawatan Tropis Papua*, 08(2023), 4–11. <https://doi.org/https://doi.org/10.47539/jktp.v8i1.436>
- Purba, N. P., Kirani, N., Sabarita, A., Sitepu, B., & Risky, I. (2024). Faktor-faktor yang Mempengaruhi Status Gizi Remaja MTS Al-Washliyah Desa Celawan Kec. Pantai Cermin Kab. Serdang Bedagai. *Cendekia Utama*, 13(1), 72–81.
- Putri, E. R., & Fitriani, R. J. (2024). Hubungan Tingkat Pengetahuan dan Kepatuhan Konsumsi Tablet Tambah Darah Pada Remaja Putri Dengan Status Anemia. *Sehati*, 4(2), 98–103. <https://doi.org/https://doi.org/10.52364/sehati.v4i2.51>
- Samad, N., Bearne, L., Noor, F. M., Akter, F., & Parmar, D. (2024). School-based healthy eating interventions for adolescents aged 10 – 19 years : an umbrella review. *International Journal of Behavioral Nutrition and Physical Activity*, 21(117), 1–16. <https://doi.org/https://doi.org/10.1186/s12966-024-01668-6>
- Septiani, Hidayah, N., & Mahmudiono, T. (2025). Intervensi Pendidikan Gizi terhadap Pengetahuan, Sikap, dan Praktik Diet pada Remaja Usia Sekolah. *Journal of Telenursing*, 7(5), 654–662. <https://doi.org/https://doi.org/10.31539/3n2s0p95>
- Sinaga, M. D., & Habibi, J. (2025). *Faktor-Faktor Yang Mempengaruhi Status Gizi Pada Remaja Di SMPN 12 Kuala Lempuing Kota Bengkulu Factors Affecting Nutritional Status Of Adelescents A SMPN 12 Kuala Lempuing Bengkulu City*. 1(2), 83–90.
- Sriwiyanti, Hartati, S., & F, D. A. (2025). Effectiveness of Nutritional Education on Knowledge and Adolescent Attitudes About Stunting in High School. *Journal of Applied Nursing and Health*, 4(1), 16–22.
- Susindra, Y., Al, R., Permatasari, W., Studi, P., Kesehatan, P., Kesehatan, J., Jember, P. N., Studi, P., Klinik, G., Kesehatan, J., & Jember, P. N. (2023). Pengaruh Media Pembelajaran Infografis Berbasis Aplikasi Android Terhadap Tingkat Pengetahuan Mengenai Obesitas Pada Remaja Putri. *Arteri: Jurnal Ilmu Kesehatan*, 4(2), 81–86.
- WHO. (2025). *Anaemia*. WHO. <https://www.who.int/news-room/fact-sheets/detail/anaemia>
- Wiafe, M. A., Ayenu, J., & Eli-cophie, D. (2023). A Review of the Risk Factors for Iron

Deficiency Anaemia among Adolescents in Developing Countries. *Hindawi*, 2023, 1–11.  
<https://doi.org/10.1155/2023/6406286>

Zakiah, S., Toaha, A., Abri, N., & Wahyutri, E. (2023). The Effect of Nutrition Education on Knowledge , Attitudes , and Iron Intake in Adolescent Girls. *Journal of Health and Nutrition Research*, 2(3), 131–139.  
<https://doi.org/https://doi.org/10.56303/jhnresearch.v2i3.174>