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A NUTRITION AWARENESS INITIATIVE FOR ADOLESCENT GIRLS IN PREPARATION FOR THE FIRST 1,000 DAYS OF LIFE AT PERKAMPUNGAN MINANGKABAU ISLAMIC BOARDING SCHOOL

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ABSTRACT

Adolescent girls are a strategic population for improving maternal and child health, as their nutritional status before pregnancy may influence the health of future generations. However, inadequate nutritional knowledge, limited access to nutritious foods, and the risk of anemia remain important challenges, particularly in Islamic boarding school settings. This Community Service Program aimed to improve nutritional awareness among adolescent girls in preparation for the First 1,000 Days of Life. The program was conducted in September 2026 at MAS Al-Falah, Perkampungan Minangkabau Islamic Boarding School, Padang, West Sumatra, involving 40 female students. Activities included interactive nutrition education, group discussions, demonstrations, practical nutritional assessment, and the distribution of educational materials such as illustrated comics and posters. Educational topics covered balanced

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nutrition, anemia and chronic energy deficiency prevention, iron supplementation, and the importance of nutrition during the First 1,000 Days of Life. Nutritional assessment included body weight, height, body mass index, and mid-upper arm circumference measurements. Program outcomes were evaluated through pretests and posttests, participant engagement, and practical skill observation. The results indicated that most participants had a high level of nutritional knowledge at baseline, followed by a modest improvement in posttest results. Anthropometric activities also introduced participants to basic nutritional status monitoring. Overall, the program provided an accessible educational approach to strengthening nutritional awareness and supporting future maternal health preparedness among adolescent girls in the boarding school environment.

INTRODUCTION

Adolescence is a critical period of growth and development characterized by increased nutritional requirements to support physical maturation, cognitive development, and reproductive health. Adequate nutritional status during this period is important not only for adolescents' current health but also for their future reproductive outcomes and the health of the next generation. Nutritional problems experienced during adolescence may continue into adulthood and contribute to adverse maternal and child health outcomes. Therefore, improving nutritional awareness and promoting

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healthy dietary practices among adolescent girls are important components of a life-course approach to maternal and child nutrition (Victora et al., 2021; Rahfiludin et al., 2021).

In Indonesia, nutritional problems among adolescent girls remain a public health concern, particularly anemia and inadequate nutritional intake. According to the 2023 Indonesian Health Survey (Survei Kesehatan Indonesia/SKI), the prevalence of anemia among individuals aged 15–24 years was 15.5% (Badan Kebijakan Pembangunan Kesehatan [BKPK], 2024). Adolescent girls are particularly vulnerable to iron deficiency because of increased iron requirements during growth and menstrual blood loss. In addition, inadequate consumption of iron-rich foods, particularly animal-source foods, may contribute to insufficient iron intake and increase the risk of anemia. These concerns are also reflected in a study involving 176 adolescent girls from seven Islamic boarding schools in Tasikmalaya, which reported an iron deficiency anemia prevalence of 22.2% and a mean daily iron intake below the recommended level (Rahfiludin et al., 2021). These findings highlight the importance of improving nutritional knowledge and supporting access to diverse and nutritious foods among adolescent girls.

Nutritional status among adolescent girls is influenced by several interconnected factors, including dietary habits, nutritional knowledge, household socioeconomic conditions, and the food environment. Food insecurity may affect the quantity and quality of food consumed, particularly among adolescents from economically vulnerable households. A qualitative study in East Nusa Tenggara, Indonesia, reported that adolescent girls experiencing food insecurity adopted various coping strategies, including reducing meal portions, skipping meals, and consuming rice without vegetables or side dishes (Fatmaningrum et al., 2016). Furthermore, differences in nutritional knowledge and protein intake have been reported between adolescent girls attending Islamic boarding schools and those attending non-boarding schools, indicating that the school and residential environment may influence nutritional awareness and dietary practices (Alfanti et al., 2024).

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Similar concerns were identified at MAS Al-Falah, Perkampungan Minangkabau Islamic Boarding School, Padang, West Sumatra. The school has approximately 139 female students, with dormitory rooms measuring around 5 × 10 m² and accommodating approximately 30 students per room. Preliminary observations and discussions with the vice principal for student affairs indicated that limited dormitory space and household economic constraints may influence students' daily living conditions and access to nutritious foods. The school provides rice as a staple food, whereas students are generally responsible for purchasing side dishes. This arrangement may create challenges in accessing adequate sources of animal protein, vegetables, and fruits, particularly for students from lower-middle-income families and those with limited family support. These circumstances emphasize the need for nutrition education that considers not only individual knowledge but also the environmental and socioeconomic factors influencing food choices.

Despite the importance of adolescent nutrition, preliminary discussions with school representatives also indicated that structured and continuous nutrition education and routine nutritional assessment had not been systematically implemented. Strengthening nutrition literacy is therefore essential to help students understand balanced nutrition, recognize the risks of anemia and chronic energy deficiency (CED), understand the importance of iron supplementation, and become more aware of their own nutritional status. In addition, practical education on anthropometric assessment, including body weight, height, body mass index (BMI), and mid-upper arm circumference (MUAC), can introduce students to basic methods of nutritional self-monitoring. Previous research has demonstrated differences in anemia knowledge between adolescent girls in boarding and non-boarding school settings, supporting the need for educational approaches that are responsive to the characteristics of the school environment (Alfanti et al., 2024).

In response to these needs, a community service program entitled "A Nutrition Awareness Initiative for Adolescent Girls in Preparation for the First 1,000 Days of Life at Perkampungan Minangkabau Islamic Boarding School. The program aimed to strengthen adolescent girls' nutritional knowledge,

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improve their awareness of nutritional status monitoring, and provide accessible educational resources that could support the continuation of nutrition education within the school environment.

METHODS AND IMPLEMENTATION

The community service program was conducted in September 2026 at MAS Al-Falah, Perkampungan Minangkabau Islamic Boarding School, Padang, West Sumatra, Indonesia, involving 40 female students. The program was implemented through several integrated stages, including program socialization, nutrition education, educational media utilization, practical activities, mentoring, evaluation, and sustainability planning. The initial stage involved socialization and coordination with the boarding school management, dormitory administrators, and teachers to establish a shared understanding of the program objectives, implementation procedures, and adolescent nutritional health issues. This coordination also facilitated participant identification, activity scheduling, and preparation of the educational facilities and materials.

Nutrition education was delivered through interactive lectures, group discussions, demonstrations, simulations, and practical activities. The educational content covered balanced nutrition for adolescent girls, prevention of anemia and chronic energy deficiency (CED), the importance of nutrition during the First 1,000 Days of Life, iron supplementation, and nutritional status assessment. To facilitate understanding and improve the accessibility of nutritional information, the program utilized two main visual educational media: illustrated nutrition education comics and educational posters. The comics presented nutritional messages through illustrated stories and everyday situations relevant to adolescent girls, particularly regarding balanced dietary practices, anemia prevention, iron supplementation, and the importance of maintaining nutritional health before pregnancy. The posters presented key nutritional messages in a concise and visually accessible format, enabling participants to review important information during and after the educational sessions. Both media were used as complementary learning resources to reinforce the information delivered through interactive education and to support continued access to nutrition-related information within the boarding school.

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In addition to classroom-based education, practical sessions were conducted to introduce participants to basic nutritional status assessment. These activities included body weight and height measurements, body mass index (BMI) calculation, and mid-upper arm circumference (MUAC) measurement. Demonstrations and direct practice were provided to familiarize students with the measurement procedures and their relevance to nutritional status monitoring during adolescence.

Following the educational activities, mentoring and evaluation were conducted to assess participants' engagement, knowledge acquisition, and practical skills. Program outcomes were evaluated using pretests and posttests to assess changes in nutritional knowledge, observation of participants' skills in BMI calculation and MUAC measurement, and monitoring of their participation in educational and practical activities. The implementation team, comprising lecturers and students from relevant academic disciplines, was responsible for program coordination, educational material development, delivery of nutrition education, practical nutritional assessment, data collection, documentation, and evaluation. The boarding school management and staff supported the program by facilitating coordination, providing activity venues, identifying participants, and assisting with implementation.

Program sustainability was promoted through the provision of illustrated nutrition comics and educational posters to the boarding school for continued use as learning resources. Continued coordination with school management was also undertaken to encourage the integration of adolescent nutrition education and periodic nutritional status monitoring into routine school activities. These measures were intended to maintain students' access to nutrition information and support the continuation of nutrition promotion activities beyond the implementation period.

RESULTS AND DISCUSSION

The community service program was implemented through a combination of interactive nutrition education, group discussions, demonstrations, practical nutritional assessment, and the provision of educational materials. A total of 40 female students participated in activities addressing balanced

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nutrition, anemia and chronic energy deficiency (CED) prevention, iron supplementation, and the importance of maintaining adequate nutritional status before pregnancy. The educational sessions were designed to strengthen participants' understanding of adolescent nutritional health and its relevance to future maternal and child health. The following discussion presents the outcomes of the educational evaluation, practical anthropometric activities, and the implementation of educational media.

The implementation of this program is consistent with the broader recommendation to address adolescent nutrition through integrated school- and community-based approaches. Jaisamrarn et al. (2023) emphasized the importance of nutritional education, micronutrient intake, and self-care beginning during the preconception period and continuing throughout the First 1,000 Days of Life. Similarly, Ranisavljev et al. (2025), in a scoping review of community-based interventions in low- and middle-income countries, identified nutrition education, micronutrient supplementation, food supplementation, and multicomponent interventions as important strategies for addressing adolescent malnutrition. These findings support the relevance of implementing nutrition promotion activities in educational and residential settings, particularly among adolescent girls who may experience nutritional vulnerabilities before entering their reproductive years.

The evaluation of nutritional knowledge through pretests and posttests showed that most participants already had a high level of knowledge before the educational intervention. Following the educational sessions, a modest increase in knowledge was observed. However, no inferential statistical analysis was performed; therefore, the statistical significance of the observed difference could not be established. The relatively high baseline knowledge may have contributed to the limited increase in posttest scores, potentially reflecting a ceiling effect, in which participants with initially high scores have less room for further improvement. This finding suggests that the intervention primarily reinforced existing knowledge and provided additional understanding of adolescent nutritional health.

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The observed pattern should be interpreted in relation to evidence from previous nutrition education interventions. Silva de Medeiros et al. (2022), in a systematic review and meta-analysis, reported that school-based food and nutrition education interventions can influence food consumption among adolescents. Similarly, Flores-Vázquez et al. (2024) found that nutrition education interventions based on behavioral theories and implemented in school settings generally produced favorable changes in adolescents' consumption of food groups. These findings indicate that structured educational activities can contribute to nutritional awareness and dietary behavior, although the magnitude of improvement may depend on the intervention design, duration, educational methods, and participants' initial knowledge.

Evidence from Indonesia further supports the relevance of school-based nutrition interventions. Oddo et al. (2022) reported improvements in nutritional knowledge and selected dietary and physical activity behaviors following the implementation of a gender-responsive intervention package involving breakfast provision, weekly iron and folic acid supplementation, school-based nutrition education, and social and behavior change communication. Patimah et al. (2023) also reported improvements in nutrition-related knowledge and nutritional outcomes following school-integrated interventions among adolescent girls in Indonesia. In addition, Rimbawan et al. (2023) demonstrated that combining nutrition education with a school meal program in an Indonesian Islamic boarding school improved students' knowledge, attitudes, and practices related to nutrition and hygiene.

Nevertheless, the findings of these studies should not be directly equated with the present program because their intervention components, duration, and evaluation designs differed. For example, the intervention reported by Oddo et al. (2022) involved multiple components, while the present community service program primarily focused on educational activities, practical assessment, and educational materials. Similarly, longer-term interventions may provide more opportunities for participants to translate knowledge into dietary practices. Shinde et al. (2023) highlighted that the effectiveness of school-based health and nutrition interventions in low- and middle-income

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countries varies across intervention types and outcomes, with multicomponent approaches showing potential benefits but also considerable variation in effectiveness.

The relatively modest improvement in the present program may therefore reflect the short duration of educational exposure and the high initial knowledge level of participants. Capper et al. (2022) also emphasized that successful school-based dietary interventions require consideration of intervention components and the broader school environment rather than relying solely on information delivery. Accordingly, future activities may benefit from repeated educational sessions, practical food selection exercises, and opportunities for students to apply nutritional knowledge in their daily food choices.

In addition to classroom-based education, the program incorporated practical nutritional assessment activities, including body weight and height measurements, body mass index (BMI) calculation, and mid-upper arm circumference (MUAC) measurements. These activities introduced participants to basic anthropometric indicators for monitoring nutritional status and recognizing potential nutritional problems during adolescence. The practical sessions also provided an opportunity for students to understand the relationship between anthropometric measurements and nutritional health.

For adolescent participants, BMI should be interpreted according to age- and sex-specific growth references rather than adult BMI classifications. BMI-for-age is particularly important because adolescents are still undergoing physical growth and maturation. MUAC measurements also provided an opportunity to introduce anthropometric screening; however, their interpretation should follow appropriate adolescent reference standards and should not independently be considered a definitive diagnosis of CED. Therefore, the anthropometric activities in this program should be understood as educational and preliminary screening activities rather than comprehensive clinical assessments.

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The inclusion of anthropometric assessment was particularly relevant in the boarding school setting, where dietary patterns and nutritional conditions may be influenced by food availability, meal arrangements, and students' daily activities. Hidayanti et al. (2025) reported associations between predominant dietary intake patterns and nutritional problems among female adolescent students in Islamic boarding schools in Tasikmalaya. Their findings highlighted the importance of considering both meal composition and dietary patterns when addressing nutritional problems among adolescent girls in boarding school environments. Similarly, Suciyanti et al. (2025) demonstrated that a structured nutrition education intervention based on optimized food-based recommendations improved the consumption of nutrient-dense foods and selected nutrient intakes among adolescent girls in East Java. These findings suggest that nutritional awareness should be accompanied by practical guidance on food selection and dietary quality.

The importance of school-based nutritional assessment is also reflected in the study by Patimah et al. (2023), which incorporated nutritional assessment into an integrated intervention for adolescent girls. Such approaches may help connect nutritional knowledge with the recognition of individual nutritional needs. However, anthropometric assessment alone does not provide sufficient information to establish the presence of micronutrient deficiencies, including iron deficiency anemia. Additional clinical and biochemical assessments would be required to confirm such conditions.

In the present program, the anthropometric activities were intended to introduce students to basic nutritional monitoring and encourage greater awareness of their nutritional status. Since the numerical distribution of participants' anthropometric results and changes in nutritional status were not analyzed in this report, no conclusions can be drawn regarding the prevalence of nutritional problems or improvements in nutritional status following the intervention. This distinction is important to avoid interpreting an educational screening activity as evidence of a clinical or nutritional outcome.

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The provision of visual educational media, including illustrated nutrition comics, posters, leaflets, and educational modules, was another important component of the program. These materials were designed to communicate nutritional information in an accessible and engaging format for adolescent girls. The content addressed balanced nutrition, anemia prevention, iron supplementation, healthy dietary practices, and the importance of maintaining adequate nutritional status before pregnancy. The use of multiple educational formats was intended to support different learning preferences and provide students with opportunities to revisit nutritional information beyond the scheduled educational sessions.

The use of educational media is supported by research on school-based nutrition interventions. Magfirah et al. (2023) compared Android-based educational media with electronic posters for anemia prevention among adolescent girls and reported improvements in knowledge and selected dietary intake outcomes following the interventions. Their findings suggest that educational media can serve as useful tools for communicating nutrition-related information, although the effectiveness of particular formats may differ. Similarly, Dwijayanti et al. (2026), in a systematic review of video- and comic-based interventions, found that these approaches generally improved nutrition-related knowledge, attitudes, and self-efficacy among children and adolescents. However, their effects on dietary behavior and anthropometric outcomes were less consistent, indicating that educational media should be considered complementary tools rather than standalone solutions.

The implementation of illustrated comics in the present program was therefore intended to simplify nutritional messages and make them more accessible to students. Posters and leaflets provided concise information that could be displayed or revisited, while educational modules offered more structured learning materials. This approach is consistent with the findings of Silva de Medeiros et al. (2022), which emphasized the potential of school-based educational interventions to influence adolescent food consumption. Furthermore, Capper et al. (2022) highlighted the importance of combining educational content with supportive school environments to encourage dietary behavior changes.

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Nevertheless, the independent effectiveness of each educational medium was not evaluated in the present program. No separate assessment was conducted to compare the effects of comics, posters, leaflets, or modules on students' knowledge, attitudes, or dietary behaviors. Therefore, the contribution of each medium to the observed changes in knowledge cannot be determined separately. Their provision should instead be interpreted as a supporting strategy to reinforce the educational activities and provide accessible resources for continued nutrition learning within the boarding school.

The findings of this program also highlight the importance of considering the food environment when promoting nutritional awareness among adolescent girls. Nutritional knowledge does not necessarily translate into healthy dietary practices when access to diverse and nutritious foods is limited. In boarding school environments, food choices may be influenced by meal arrangements, food availability, students' financial resources, and institutional food policies. Shaw et al. (2023), in a systematic review, demonstrated that community and consumer nutrition environments can influence adolescents' food purchasing decisions and dietary behaviors. Although their review focused primarily on high-income settings, it reinforces the broader understanding that food choices are shaped by environmental factors as well as individual preferences and knowledge.

The importance of supportive food environments is also reflected in school-based nutrition interventions. Pramesthi et al. (2025), in their evaluation of Indonesia's national school feeding program, reported improvements in dietary diversity, meal frequency, and nutrition knowledge among schoolchildren. However, the study also identified challenges related to the nutritional quality of meals and the implementation of nutrition education. These findings indicate that educational activities should ideally be accompanied by supportive food provision and institutional arrangements. Similarly, Khizar et al. (2024) identified schools, health facilities, community-based programs, faith-based settings, and digital platforms as potential delivery mechanisms for adolescent nutrition interventions in low- and middle-income countries.

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Anemia prevention represents another important consideration in the nutritional preparation of adolescent girls. Although the present program included education on iron supplementation, it did not evaluate actual supplementation adherence or changes in hemoglobin levels. Therefore, the program's contribution to anemia prevention should be interpreted in terms of nutritional education and awareness rather than demonstrated clinical outcomes. Hidayanty et al. (2025) identified several barriers to regular iron and folic acid supplementation among adolescent girls in Padang and Makassar, including unpleasant taste and smell, concerns about side effects, misconceptions, and forgetfulness. Parental and peer support, awareness of health benefits, and trust in school-based supplementation programs were among the factors that could facilitate adherence.

More recent evidence from Indonesian school settings further emphasizes the importance of institutional support. Setiadi et al. (2026) reported that adherence to school-based iron supplementation among adolescent girls was associated with individual factors, including attitudes and peer support, as well as school-level factors such as the availability and administration of supplements. These findings suggest that nutrition education should be accompanied by consistent communication, access to supplements, and coordination among students, parents, teachers, and health professionals. In addition, the study by Magfirah et al. (2023) indicates that appropriate educational media may contribute to improving knowledge related to anemia prevention and dietary practices.

The sustainability of the present program was supported through the provision of educational materials to the boarding school and continued coordination with school management to encourage routine nutrition education and periodic nutritional status monitoring. These activities were intended to facilitate continued access to nutrition information after the completion of the community service program. The approach is consistent with the findings of Ranisavljev et al. (2025), who emphasized the importance of considering implementation, acceptability, feasibility, and sustainability when developing community-based adolescent nutrition interventions. Khizar et al. (2024) also

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highlighted the importance of using accessible and contextually appropriate delivery platforms to reach adolescents with nutrition services.

Overall, this community service program provided an integrated approach to adolescent nutrition promotion by combining health education, practical anthropometric assessment, and the provision of educational resources. Although the observed improvement in knowledge was modest, the activities provided an opportunity to reinforce existing nutritional knowledge and introduce practical skills for recognizing and monitoring nutritional status. The findings also suggest that improving nutritional awareness requires more than individual-level education. Food availability, dietary preferences, institutional meal arrangements, and support from teachers, parents, peers, and health professionals may influence the translation of nutritional knowledge into daily practices. Future community service initiatives should therefore consider longer-term, behavior-oriented interventions that integrate nutrition education with supportive school food environments and collaboration among schools, families, and health professionals. Such an approach may help strengthen healthy dietary practices and improve nutritional preparedness among adolescent girls before pregnancy.

CONCLUSION

The community service program enhanced nutritional awareness among adolescent girls through health education, practical nutritional assessment, and educational media, providing a foundation for improved nutritional preparedness for the First 1,000 Days of Life.

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