



Empowering Adolescent Girls to Prevent and Treat Anemia in Order to Prevent Stunting From an Early Age

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ABSTRACT

Anemia is a serious global health problem, especially among adolescents. Anemia can cause a decrease in immunity and productivity. Anemia in adolescent girls can pose risks during pregnancy, negatively impacting fetal growth and development, and potentially leading to complications during pregnancy and childbirth, even causing maternal and infant mortality. The purpose of community service activities is to prevent and treat anemia in adolescent girls at the Al-Luqmaniyyah Islamic Boarding School in Yogyakarta in order to prevent stunting from an early age. The target of the activity is 22 unmarried adolescent girls aged 10-24 years at the Al-Luqmaniyyah Islamic Boarding School in Yogyakarta. The method used was through lectures and question and answer sessions, providing material on anemia, processing and cultivating vegetables as a source of food, and practicing making food based on local wisdom that contains high nutritional value. The results of the activity showed an increase in participants' understanding, with a pre-test score of 75.22 and a post-test score of 87.27. Meanwhile, Spearman's rho correlation test showed a very strong and significant relationship between compliance in consuming moringa leaf capsules and an increase in hemoglobin levels ($r = 0.879$; $p = 0.000$). In addition to increased knowledge, participants also gained practical skills in preparing nutritious foods based on local wisdom and practicing vegetable cultivation using modern methods.



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INTRODUCTION

According to information from UNICEF in 2022, it is estimated that the number of adolescents aged 10-19 years worldwide will reach around 16% of the total population or around 1.3 billion individuals. The adolescent population in Indonesia in 2021 reached 45,844,000, with 23,524,000 male adolescents and 22,320,000 female adolescents. With this total population, adolescents make up 17% of the total population in Indonesia (UNICEF, 2022). There are several health problems commonly experienced by Indonesian adolescents. These four health problems are iron deficiency (anemia), stunting, chronic energy deficiency (thinness), and obesity (Dinas Kesehatan Provinsi Jambi, 2018).

Anemia is a serious global health problem, especially among adolescents. The WHO estimates that 40% of children aged 6-59 months, 37% of pregnant women, and 30% of women aged 15-49 years worldwide suffer from anemia (World Health

Organization, 2021). In Southeast Asia, the prevalence of anemia among women of childbearing age reached 46.6% in 2019, meaning that nearly half of them suffer from anemia (World Health Organization, 2022). The prevalence of anemia in Indonesia, based on 2018 Riskesdas data, reached 48.9%. Globally, the prevalence of anemia in adolescent girls is higher than in adolescent boys (F. Indriani & Rahayu, 2023). In Indonesia, the prevalence of anemia in adolescent girls reached 27.2%, which is 6.9% higher than the prevalence of anemia in adolescent boys. This is due to several factors, such as women's iron requirements being three times greater than men's, menstruation causing blood loss, as well as poor eating habits and lack of nutritional intake (Rizqi, 2024).

One of the causes of stunting is anemia in adolescent girls. Therefore, the health and nutritional status of adolescent girls must be prepared early on so that by 2030, they can produce a productive, creative, and competitive future generation. One solution to prevent stunting is to increase adolescent girls' knowledge about anemia prevention by implementing a balanced diet in their daily lives. This activity involves adolescent girls at the Al-Luqmaniyah Islamic Boarding School, one of the boarding schools in Yogyakarta with a large number of female students. Adolescent girls during puberty are at high risk of iron deficiency anemia. This is due to the large amount of iron lost during menstruation. This is further exacerbated by a lack of iron intake, as iron is essential for the body to accelerate growth and development. Iron supplementation is significantly associated with a reduced risk of anemia. However, iron supplementation cannot work optimally if it is not accompanied by daily intake of iron-rich foods. One alternative food to increase iron intake in order to prevent stunting is to use food ingredients sourced from local wisdom.

In this activity, young women were taught about the importance of consuming nutritious foods with a balanced diet in accordance with the Ministry of Health's recommended plate. It is hoped that young women will consume moringa capsules every day to prevent anemia so that when they become mothers, they will not give birth to babies with health problems.

METHOD

The community service activities will be carried out from April to July 2025. The community service activities will be implemented in stages, with the following details:

During the preparation stage, an inventory of problems and health data of adolescent girls at the Al-Luqmaniyyah Islamic Boarding School was conducted so that the activity design could provide solutions to the partners' problems. In addition, at this initial stage, a broader socialization of the program will also be carried out, as well as obtaining permits for community service activities and finding resource persons to support the running of community service activities. The team prepared educational materials in the form of leaflets, PPT presentations, pre-tests and post-tests consisting of 20 questions, which were declared valid after validity testing, as well as testing the food ingredients that will be demonstrated during the activity.

The activity was held on June 22, 2025, to empower young women on the prevention and treatment of anemia in the hall of the Al-Luqmaniyyah Islamic boarding school in Yogyakarta. The activity involved implementing partners, boarding school administrators, female students, resource persons from the Yogyakarta City Agriculture Office, and a team of lecturers and students from the Midwifery Department of the Yogyakarta Ministry of Health Polytechnic. The target respondents were all female students of the Al-Luqmaniyyah Islamic boarding school aged 10-24 years and unmarried, totaling 22 people. The community service activity began with a pretest to

determine the level of knowledge of young women about anemia. The questions consisted of 20 items and had been validated after a validity test. The questions were distributed to the young women, who were seated at a distance from each other so that they could not copy each other's answers. After completing the questions, the questionnaires were immediately collected by the community service team. This was followed by blood pressure, upper arm circumference, height, weight, and hemoglobin level checks by the health team. This was followed by a presentation on anemia, how to prevent and treat it, by a lecturer from the Midwifery Department of the Yogyakarta Ministry of Health Polytechnic. Information was also provided on how to grow vegetables using modern methods, demonstrated by a resource person from the Yogyakarta City Agriculture Office, and training was given on how to make nutrient-rich foods using local ingredients by the volunteer team.

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Monitoring activities are carried out periodically. Each female student is provided with a package of raw food ingredients and asked to prepare their own meals after the activity is completed. The students are also given moringa leaf capsules, which they must consume one capsule per day for one month, along with a monitoring card. Each adolescent girl reports her progress and any obstacles she faces to the female boarding school administrators, who then report to the service team. The activity evaluation is conducted on July 27, 2025. The evaluation was conducted comprehensively to determine the degree of success in improving the health of adolescent girls (no anemia), increasing adolescent girls' knowledge about anemia prevention and management, and improving skills in food processing using local wisdom. The final evaluation involved post-test completion, HB level measurement, and collection of monitoring cards on the accuracy of moringa leaf capsule consumption. The evaluation was conducted one month after the activity was carried out.



Figure. 1 PKM activity flowchart

RESULT AND DISCUSSION

Community service carried out on female students at Al-Luqmaniyyah Islamic Boarding School, produced the following results:

Table 1. Respondent Characteristics Based on Educational Status

Education Status	Amount	Percentage (%)
Student	20	90.9
Gabyear	2	9.1

This community service activity, in the form of outreach, involved 20 participants. They were female students at the Al-Luqmaniyyah Islamic Boarding School. The characteristics of the participants, as shown in Table 1, indicate that the majority of the participants were students, representing 20 respondents (90.9%).

Table 2. Respondent Characteristics Based on Chronic Energy Deficiency

Category	Amount	Percentage (%)
No Chronic Energy Deficiency (CED)	13	59.1
Chronic Energy Deficiency (CED)	9	40.9

Based on the table, it is known that the Chronic Energy Deficiency status of the female students who attended was mostly not experiencing chronic energy deficiency, namely 13 respondents (59.1%). This data was taken from a health examination in the form of measuring the upper arm circumference (MUAC) of the female students. If the MUAC is <23.5 cm, it is declared KEK. Adolescent girls are included in the group that is vulnerable to experiencing nutritional problems and is at high risk of suffering from nutrition-related diseases (Jaelani & Sitawati, 2024). Nutritional problems that are often encountered in adolescent girls today are mainly anemia and Chronic Energy Deficiency (CED) (Setyawati et al., 2023). Low energy and protein intake as sources of macronutrients can contribute to low availability and adequacy of micronutrients in the body (Telisa & Eliza, 2020). One of the factors causing ME among adolescents is a lack of knowledge and poor dietary patterns (Hatussaadah & Rosalina, 2025).

Table 3. Respondent Characteristics Based on Body Mass Index

Category	Amount	Percentage (%)
Normal	16	72.7
Thin	3	13.6
Fat	1	4.5
Obesity	2	9.1

Based on the table, it is known that the Body Mass Index (BMI) of the majority of female students present was normal, namely 16 respondents (72.7%). Body Mass Index (BMI) is a parameter used to assess whether a person is obese or not. BMI is a non-invasive, easy-to-use, widely applicable, safe, and simple anthropometric method. Body Mass Index (BMI) is the result of a calculation that compares body weight to height, using the formula BB/TB^2 (kg/m²). The measurement results are entered into the BMI formula to obtain various BMI values (Rodiana, 2024). Body Mass Index (BMI) can be used significantly to identify a person's risk of being overweight or underweight (Fajriani et al., 2019). Factors that can influence Body Mass Index (BMI) in adolescents include knowledge, attitudes, lifestyle, socio-economic conditions, behavior, nutritional status, eating patterns, and stress levels (Gantariadha, 2021).

1. Extension Process and Materials

The activity's partner, the Al-Luqmaniyah Islamic Boarding School, actively supports the implementation of the anemia prevention program for adolescent girls as a strategic effort to prevent stunting from an early age. Partner support is demonstrated by providing the necessary facilities and infrastructure, including the use of a hall as a venue for the activity.

The event began with an opening by the MC, followed by remarks from the management of the Al-Luqmaniyah Islamic Boarding School. This was followed by a health check, presentation on anemia prevention in adolescent girls, and training in the preparation of nutritious food using local wisdom by the community service team from the Midwifery Department of the Yogyakarta Ministry of Health Polytechnic. Participants were also given training in the practice of growing vegetables using modern methods by a facilitator from the Department of Agriculture.

This activity was carried out face-to-face and went well and smoothly. The outreach methods used were lectures, Q&A sessions, and leaflet distribution as supporting media. A total of 22 female students from the Al-Luqmaniyah Islamic Boarding School were directly involved in the activity. The implementation of the activity was supported by seven lecturers and four students from the Midwifery Department of the Yogyakarta Ministry of Health Polytechnic, as well as two field facilitators.

2. Evaluation of Extension Success

Group evaluations were conducted through practical demonstrations of making processed products presented in previous training sessions, including ice cream, meatballs, and sticks. This activity aimed to assess participants' understanding and mastery of the skills taught. The results of this evaluation serve as a benchmark for participants' success in applying their knowledge and demonstrating the effectiveness of the training method. Furthermore, the practical demonstrations also provided an overview of participants' readiness to independently develop processed products in their respective environments.

Furthermore, to assess the success of the counseling regarding the importance of consuming Moringa leaf capsules, an evaluation was carried out

through pre-tests and post-tests of participants' knowledge as well as monitoring compliance with capsule consumption.

Table 4. Paired Sample T-Test Results

Knowledge	Mean	N	Std. Deviation
Pre Test	75.2273	22	11.49299
Post Test	87.2727	22	12.50974

Based on the analysis results of the Paired Sample T-Test on respondents' knowledge about anemia before and after the intervention, the average pre-test score was 75.22 with a standard deviation of 11.49. Meanwhile, the average post-test score increased to 87.27 with a standard deviation of 12.50 for the same number of respondents, namely 22 people. This indicates an increase in the average value of respondents' knowledge after the intervention was given.

Table 5. Results of the Paired Correlation Test

Knowledge	N	Correlation	Sig.
Pre Test & Post Test	22	0,534	0,010

The results of the paired correlation test showed a correlation value of 0.534 with a significance level of 0.010 (<0.05), indicating a significant relationship between the pre-test and post-test scores. In other words, the knowledge outcomes before the intervention were quite correlated with the outcomes after the intervention.

Table 6. Paired Sample T-Test Results

Knowledge	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pre Test - Post Test	-12.05	11.61	2.47	-17.2	-6.9	-4.864	21	0.000

Furthermore, the results of the Paired Sample T-Test showed a mean difference of -12.05, meaning the post-test score was approximately 12 points higher than the pre-test score. The t-test value obtained was -4.864 with 21 degrees of freedom (df) and a p-value of 0.000 (<0.05). This indicates a statistically significant difference between the pre-test and post-test scores.

In addition, Hb level checks before and after the intervention were also used as an indicator of success. It is known that Hb level checks before the intervention had an average of 13, and after the intervention, it became 14. Adolescents are prone to anemia due to increased nutritional needs for growth, where iron requirements also increase for the formation of myoglobin in muscles and hemoglobin in the blood (Rahman & Fajar, 2024). A comparison of the correlation between adherence to taking moringa leaf capsules and the pre-post Hb difference can be seen in the table.

Table 7. Correlation Test Results with Spearman's rho

Variable	r (Spearman's rho)	Sig. (p-value)	N
Compliance in taking Moringa leaf capsules with pre-post Hb difference	0,879	0,000	22

Based on the results of the Spearman's rho correlation test, there was a very strong and significant relationship between compliance with consuming moringa leaf capsules and increased Hb levels ($r = 0.879$; $p = 0.000$). This indicates that the higher the compliance of participants after attending the counseling, the greater the increase in Hb levels obtained. Supported by the results of research by Indriani et al. (2019) which showed that administering moringa leaf capsules at a dose of 700 mg three times daily for 30 days was able to increase Hb levels in adolescent girls (L. Indriani et al., 2019). This finding is in line with research by Hastuty & Nitia (2022) which reported an increase in respondents' Hb levels, namely from an average of 10.83 g/dl before the intervention to 12.72 g/dl after the intervention, resulting in an increase of 1.89 g/dl (Hastuty & Nitia, 2022).

This is supported by research by Fitriyaa & Wijayanti (2020), which demonstrated that administering moringa leaf flour supplements increased hemoglobin levels in adolescent girls. The average Hb level before the intervention was recorded at 10.8033%, while after the intervention it increased to 11.8167%. Thus, there was an average increase in Hb levels of 1.0134% (Hastuty & Nitia, 2022). The composition of moringa leaves using the blanching method yielded 28.66% protein, 2.32% zinc, and 715.32% phosphorus. Meanwhile, the composition of moringa leaves using the drying method yielded 11.41% iron and 1014.81% calcium (Irwan, 2020). Moringa leaves contain 17.2 mg of iron per 100 grams, this amount is higher than most other vegetables (Syahrial & Handayani, 2020). Therefore, Moringa leaves have the potential to be an effective alternative in preventing anemia and improving nutritional status in adolescent girls (Widayati et al., 2024). The treatment of anemia in adolescents is not the responsibility of just one party. Education about nutrition and lifestyle to prevent anemia must continue to be carried out using various effective media to increase knowledge (Danarsih et al., 2024). Thus, the counseling provided can be declared effective because it not only increases participants' knowledge, but also contributes to behavioral changes that have a positive impact on health status.

CONCLUSION

The community service activities carried out at the Al-Luqmaniyyah Islamic Boarding School successfully increased the knowledge of young women about anemia and its prevention. In addition to increasing their knowledge, participants also gained practical skills in preparing nutritious meals using local ingredients and practicing modern vegetable cultivation methods. This activity not only contributed to the prevention of anemia, but also served as a strategic step in preventing stunting from an early age. Overall, the objectives of the activity were successfully achieved, supported by the enthusiasm of the participants, the active involvement of partners, and results that were in line with the planned targets.

It is hoped that similar activities can be carried out continuously with a wider range of participants, so that the positive impact on the prevention of anemia and stunting can be felt by more adolescent girls. Islamic boarding schools are also expected to continue to support efforts to improve the nutrition of female students through regular health education programs, the provision of nutritious food, and regular monitoring of nutritional status. In addition, closer collaboration is needed between health education institutions, community health centers, and related institutions to

develop youth empowerment programs based on local wisdom. With adequate policy support and facilitation, simple interventions such as consuming moringa leaf capsules, training in nutritious food processing, and plant cultivation can be real solutions to reduce anemia rates among adolescent girls and support the achievement of a stunting-free generation in the future.

REFERENCES

- Danarsih, D. E., Kusumawardani, A. M., & Ariningtyas, R. E. (2024). Deteksi Dini Anemia dan Edukasi Pola Hidup Sehat pada Remaja. *GEMAKES: Jurnal Pengabdian Kepada Masyarakat*, 4(3), 317–323. <https://doi.org/10.36082/gemakes.v4i3.1700>
- Dinas Kesehatan Provinsi Jambi. (2018). 4 Masalah Kesehatan Remaja Indonesia. https://dinkes.jambiprov.go.id/read/artikel_kesehatan/4_Masalah_Kesehatan_Remaja_Indonesia
- Fajriani, E. P., Nurfiati, A., & Budiharto, I. (2019). Hubungan Indeks Massa Tubuh (IMT) dengan Perilaku Makan pada Remaja di SMK Negeri 5 Pontianak. *Jurnal ProNers*, 4(1), 1–11.
- Gantarialdha, N. (2021). Hubungan Indeks Massa Tubuh terhadap Ketahanan Kardiorespirasi Dinyatakan dalam VO2MAX. *Jurnal Medika Utama*, 2(4), 1162–1167.
- Hastuty, Y. D., & Nitia, S. (2022). Ekstrak Daun Kelor dan Efeknya pada Kadar Hemoglobin Remaja Putri. *JPP (Jurnal Kesehatan Poltekkes Palembang)*, 17(1), 115–121. <https://doi.org/10.36086/jpp.v17i1.1176>
- Hatussaadah, S. F., & Rosalina, E. (2025). Upaya Pencegahan Kekurangan Energi Kronik (KEK) pada Remaja Putri di Smart Fast Global Education Jambi. *Jurnal Abdimas Kesehatan (JAK)*, 7(1), 169–174. <https://doi.org/10.36565/jak.v7i1.552>
- Indriani, F., & Rahayu, R. (2023). Factors Related to Incidence of Anemia in Adolescent Girl. *INCH: Journal of Infant and Child Healthcare*, 2(1), 33–39. <https://doi.org/10.36929/inch.v2i1.693>
- Indriani, L., Zaddana, C., Nurdin, N. M., & Sitinjak, J. S. M. (2019). Pengaruh Pemberian Edukasi Gizi dan Kapsul Serbuk Daun Kelor (*Moringa oleifera* L.) terhadap Kenaikan Kadar Hemoglobin Remaja Putri di Universitas Pakuan. *MPI (Media Pharmaceutica Indonesiana)*, 2(4), 200–207. <https://doi.org/10.24123/mpi.v2i4.2109>
- Irwan, Z. (2020). Kandungan Zat Gizi Daun Kelor (*Moringa oleifera*) Berdasarkan Metode Pengeringan. *Jurnal Kesehatan Manarang*, 6(1), 69–77.
- Jaelani, S., & Sitawati, S. (2024). Edukasi Pencegahan Kekurangan Energi Kronik pada Remaja dalam Upaya Penurunan Stunting. *Jurnal Pengabdian Kepada Masyarakat Citra Delima*, 1(2), 58–63. <https://doi.org/10.33862/jp.v1i2.438>
- Rahman, R. A., & Fajar, N. A. (2024). Analisis Faktor Risiko Kejadian Anemia pada Remaja Putri: Literatur Review. *Jurnal Kesehatan Komunitas (Journal of Community Health)*, 10(1), 133–140. <https://doi.org/10.25311/keskom.Vol10.Iss1.1403>
- Rizqi, N. 'Aisyah. (2024). Pengaruh Pemberian Tablet Tambah Darah dan Vitamin C terhadap Kadar Hemoglobin pada Remaja Putri di Asrama SMA IT Abu Bakar Yogyakarta. Poltekkes Kemenkes Yogyakarta.
- Rodiana, A. A. (2024). Faktor-faktor yang Mempengaruhi Indeks Massa Tubuh pada Remaja. *Journal of Midwifery Care*, 5(1), 78–86. <https://doi.org/10.34305/jmc.v5i1.1315>
- Setyawati, V. A. V., Yuniastuti, A., Handayani, O. W. K., & Farida, E. (2023). Faktor Risiko Kekurangan Energi Kronik pada Remaja Putri di Kota Semarang. 6(1), 875–882. <https://proceeding.unnes.ac.id/index.php/snpasca/article/view/2233>
- Syahrial, S., & Handayani, M. (2020). Pengaruh Waktu Milling dengan Ukuran Nano Serbuk Daun Kelor (*Moringa oleifera*) dan Hubungannya dengan Bioavailabilitas secara In-vitro dan In-vivo. *Action: Aceh Nutrition Journal*, 5(2), 121. <https://doi.org/10.30867/action.v5i2.213>
- Telisa, I., & Eliza, E. (2020). Asupan Zat Gizi Makro, Asupan Zat Besi, Kadar Haemoglobin dan Risiko Kurang Energi Kronis pada Remaja Putri. *Action: Aceh Nutrition Journal*, 5(1), 80–86. <https://doi.org/10.30867/action.v5i1.241>

- UNICEF. (2022). *Investing in a Safe, Healthy and Productive Transition from Childhood to Adulthood Is Critical*. <https://data.unicef.org/topic/adolescents/overview/>
- Widayati, R. S., Wulandari, R., Fatmawati, S., Sari, D. K., & Khotimah, N. (2024). Daun Kelor (*Moringa oleifera*) Membantu Mengatasi dan Mencegah Anemia pada Remaja. *Indonesian Journal on Medical Science*, 11(1), 58–63. <https://doi.org/10.55181/ijms.v11i1.461>
- World Health Organization. (2021). *Anaemia*. <https://www.who.int/data/nutrition/nlis/info/anaemia>
- World Health Organization. (2022). *Women of Reproductive Age Estimates*. <https://www.who.int/data/gho/data/indicators/indicator-details/GHO/prevalence-of-anaemia-in-women-of-reproductive-age-%28-%29>