

## Pengaruh Intervensi Apoteker terhadap Pengetahuan, Sikap dan Kadar Hb Remaja Putri dalam Mencegah Anemia

### *The Effect of Pharmacist Intervention on Knowledge, Attitudes, and Hemoglobin Levels Among Adolescent Girls in Preventing Anemia*

Mirna Risna Lovinanda Lubis<sup>1</sup>, Urip Harahap<sup>2\*</sup>, Putri Chairani Eyanoe<sup>3</sup>

<sup>1</sup>Master's Program in Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Sumatera Utara, Medan 20155, North Sumatra, Indonesia, Email : myrnalubis@gmail.com

<sup>2</sup>Faculty of Pharmacy, Universitas Sumatera Utara, Medan 20155, North Sumatra, Indonesia, [uripharahap@usu.ac.id](mailto:uripharahap@usu.ac.id)

<sup>3</sup>Faculty of Medicine, Universitas Sumatera Utara, Medan 20155, North Sumatra, Indonesia

#### Abstrak

**Latar belakang:** Anemia merupakan masalah kesehatan yang umum pada remaja putri dan dapat berdampak pada kesehatan fisik, konsentrasi belajar, serta kesehatan reproduksi di masa depan. **Tujuan:** Penelitian ini bertujuan untuk menganalisis pengaruh intervensi apoteker terhadap kadar hemoglobin, pengetahuan, dan sikap remaja putri dalam pencegahan anemia di Kecamatan Ujung Batu, Kabupaten Padang Lawas Utara. **Metode:** Penelitian ini merupakan eksperimen komparatif dengan desain one-group pretest-posttest yang dilaksanakan pada Oktober sampai November 2024. Sebanyak 80 remaja putri dengan anemia dipilih menggunakan teknik purposive sampling dari SMP dan pesantren di Kecamatan Ujung Batu. Intervensi meliputi edukasi, konseling, dan pemberian tablet tambah darah oleh apoteker. Kadar hemoglobin diukur menggunakan HemoCue Hb 301, sedangkan pengetahuan dan sikap dinilai menggunakan kuesioner terstruktur. Data dianalisis dengan uji Wilcoxon. **Hasil:** Hasil penelitian menunjukkan peningkatan yang bermakna setelah intervensi. Rata-rata kadar hemoglobin meningkat dari  $10,82 \pm 0,49$  g/dL menjadi  $13,35 \pm 0,63$  g/dL, skor pengetahuan meningkat dari  $44,75 \pm 7,95$  menjadi  $79,25 \pm 7,50$ , dan skor sikap meningkat dari  $67,23 \pm 6,56$  menjadi  $83,01 \pm 5,12$ , dengan seluruh variabel menunjukkan perbedaan yang signifikan ( $p < 0,001$ ). **Kesimpulan:** Intervensi apoteker efektif dalam meningkatkan kadar hemoglobin, pengetahuan, dan sikap remaja putri terkait pencegahan anemia.

**Kata kunci:** Anemia; Pengetahuan; Sikap; Remaja Putri

#### Abstract

**Background:** Anemia is a common health problem among adolescent girls and may negatively affect physical health, concentration, and future reproductive health. **Aim:** This study aimed to analyze the effect of pharmacist intervention on hemoglobin levels, knowledge, and attitudes of adolescent girls in preventing anemia in Ujung Batu District, North Padang Lawas Regency. **Methods:** A comparative experimental study with a one-group pretest-posttest design was conducted from October to November 2024. A total of 80 adolescent girls with anemia were selected using purposive sampling from junior high schools and Islamic boarding schools in Ujung Batu District. The intervention consisted of pharmacist-led education, counseling, and administration of iron supplementation tablets. Hemoglobin levels were measured using HemoCue Hb 301, while knowledge and attitudes were assessed using structured questionnaires. Data were analyzed using the Wilcoxon signed-rank test. **Result:** The results showed significant improvements after the intervention. Mean hemoglobin levels increased from  $10.82 \pm 0.49$  g/dL to  $13.35 \pm 0.63$  g/dL, knowledge scores increased from  $44.75 \pm 7.95$  to  $79.25 \pm 7.50$ , and attitude scores increased from  $67.23 \pm 6.56$  to  $83.01 \pm 5.12$ , with all variables showing statistical significance ( $p < 0.001$ ). **Conclusion:** Pharmacist intervention was effective in improving hemoglobin levels, knowledge, and attitudes of adolescent girls regarding anemia prevention.

**Keywords:** Anemia; Knowledge; Attitude; Adolescent girls

\*Corresponding author: Urip Harahap, Master's Program in Pharmaceutical Sciences, Faculty of Pharmacy, Universitas Sumatera Utara, Medan, Indonesia.

E-mail : [uripharahap@usu.ac.id](mailto:uripharahap@usu.ac.id)

Doi : 10.35451/w9gt8z66

Received : April 13, 2026, Accepted: April 20, 2026, Published: April 30, 2026

Copyright: © 2026 Urip Harahap(s). Creative Commons License This work is licensed under a Creative Commons Attribution 4.0 International License.

## **1. INTRODUCTION**

Anemia remains a significant global health issue, particularly among adolescent girls, and it has profound consequences on both physical and cognitive development [1,2]. It is defined as a condition where the hemoglobin levels in the blood fall below normal, thereby reducing the oxygen-carrying capacity of red blood cells. The primary cause of anemia, especially among adolescent girls, is iron deficiency, which is often exacerbated by menstrual blood loss. According to the World Health Organization (WHO), iron deficiency anemia remains one of the most common forms of anemia worldwide, particularly in low- and middle-income countries [1].

In Indonesia, the prevalence of anemia among adolescent girls is alarmingly high. Recent studies indicate a high burden of anemia among adolescent girls, making it one of the most pressing public health challenges in the country [3,4]. This high prevalence is concerning, as anemia can lead to various adverse health outcomes, including reduced physical performance, impaired cognitive function, and increased susceptibility to infections. Furthermore, anemia in adolescence may have long-term consequences and reflects broader vulnerabilities among adolescent girls entering reproductive age [2,10].

Although the issue of anemia among adolescent girls is well-documented, the strategies for prevention and treatment remain critical areas of research. Several interventions have been proposed to combat anemia, one of the most promising being pharmacist-led education and intervention. Pharmacists, as healthcare professionals, play a vital role in educating patients about anemia prevention, the importance of iron supplementation, and proper dietary changes [5]. Previous studies have highlighted the value of pharmacist counseling and adherence-related support in improving iron supplementation practices, increasing knowledge about anemia prevention, and ultimately improving hemoglobin levels [6,7].

This study aims to evaluate the impact of pharmacist-led interventions on improving knowledge, attitude, and hemoglobin levels in adolescent girls living in Ujung Batu, North Padang Lawas Regency, Indonesia. The research questions addressed in this study are: Pharmacist intervention is expected to improve knowledge about anemia and its prevention, enhance attitudes toward anemia prevention and iron supplementation, and result in a significant increase in hemoglobin levels in adolescent girls.

This research is significant as it provides valuable insights into the role of pharmacist-led education in addressing anemia among adolescent girls. By evaluating the effectiveness of these interventions, the study aims to inform public health strategies aimed at reducing the prevalence of anemia in adolescent girls and enhancing their overall well-being.

## **2. METODE**

### **Experimental Section**

#### **Study Design**

This study used a comparative experimental method with a pretest-posttest one-group design to evaluate the effect of pharmacist intervention on hemoglobin levels, knowledge, and attitudes of adolescent girls in preventing anemia. The study compared the participants' condition before and after the intervention to determine the effectiveness of the educational and counseling program.

#### **Study Setting and Participants**

This study was conducted from October to November 2024 in junior high schools and Islamic boarding schools in Ujung Batu District, North Padang Lawas Regency, Indonesia. A total of 80 adolescent girls aged 12 to 18 years with hemoglobin levels below 12 g/dL were included in the study. Participants were selected using purposive sampling based on the predefined inclusion criteria. The participants were female students from secondary schools and pesantren who were identified as having anemia before the intervention.

### **Materials and Apparatus**

The materials used in this study included iron supplement tablets containing 60 mg of elemental iron and 0.4 mg of folic acid, as well as educational materials in the form of an anemia booklet [5]. Hemoglobin levels were measured using the HemoCue Hb 301 device. Knowledge and attitudes were assessed using structured questionnaires developed for this study. The knowledge questionnaire consisted of 15 multiple-choice items, while the attitude questionnaire consisted of 15 statements measured using a Likert scale. Educational sessions were supported by presentation media during counseling and health education activities.

### **Intervention Procedure**

The intervention was carried out by pharmacists through educational and counseling sessions on anemia prevention, the importance of iron supplementation, and appropriate dietary practices to support hemoglobin improvement. Before the intervention, all participants underwent baseline hemoglobin measurement and completed pretest questionnaires on knowledge and attitudes. After that, the participants received pharmacist-led education and were given iron supplement tablets according to the study protocol. After a three-week intervention period, hemoglobin levels were re-measured and the participants completed the posttest questionnaires to assess changes in the study outcomes. The procedure was designed to evaluate the effect of pharmacist intervention on both clinical and behavioral outcomes.

### **Outcome Measures**

The primary outcome of this study was the change in hemoglobin level before and after the intervention. Secondary outcomes included changes in knowledge score and attitude score related to anemia prevention. Knowledge was assessed using a structured questionnaire and categorized into poor, moderate, and good levels based on the total score. Attitude was evaluated using an attitude questionnaire and categorized into poor and good levels according to the predefined scoring criteria. Hemoglobin levels were classified as normal if they ranged from 12 to 15 g/dL and as anemic if they were below 12 g/dL [11].

### **Statistical Analysis**

Data were analyzed both descriptively and inferentially. Descriptive analysis was used to summarize respondent characteristics and the mean values of hemoglobin, knowledge, and attitude scores before and after the intervention. Because the study compared paired measurements before and after intervention, the Wilcoxon Signed Ranks Test was used to determine statistical significance. A p-value of less than 0.05 was considered statistically significant.

### **Ethical Approval**

This study was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Sumatera Utara, under approval number 0504/KEPK/USU/2024. All participants were informed about the purpose of the study and provided informed consent before participation.

## **3. RESULT**

### **Characteristics of Respondents**

A total of 80 adolescent girls diagnosed with anemia were included in this study. All respondents were female students aged 12 to 18 years from secondary schools and Islamic boarding schools in Ujung Batu District, North Padang Lawas Regency. The largest age group was 14 years, consisting of 28 respondents (35.0%), followed by 13 years and 15 years, with 17 respondents each (21.25%). Respondents aged 16 years accounted for 12 participants (15.0%), while those aged 17 years and 18 years accounted for 5 (6.25%) and 1 respondent (1.25%), respectively. No respondents were aged 12 years. These findings indicate that most participants were in early to middle adolescence, a period in which the risk of anemia is relatively high due to menstrual blood loss, increased nutritional requirements, and inadequate iron intake.

### Knowledge Improvement

The mean knowledge score before the intervention was  $44.75 \pm 7.95$ , indicating that the knowledge of adolescent girls regarding anemia was classified as low. After the intervention, the mean knowledge score increased significantly to  $79.25 \pm 7.50$ , indicating a substantial improvement in knowledge ( $p < 0.05$ ). The Wilcoxon Signed Ranks Test showed a significant increase in knowledge, demonstrating that the pharmacist-led educational intervention effectively enhanced the participants' understanding of anemia and its prevention.

Table 1. Pre-test and Post-test Knowledge Scores of Adolescent Girls

Variable	Pre-test	Post-test	p-value
Knowledge	$44.75 \pm 7.95$	$79.25 \pm 7.50$	$< 0.001$

\* Wilcoxon signed-rank test

Classification :

- (  $< 56$  ) : Poor
- (  $56-75$  ) : Moderate
- (  $>76-100$  ) : Good

### Attitude Improvement

Attitudes toward anemia prevention improved from a baseline score of  $67.23 \pm 6.56$  (classified as poor) to  $83.01 \pm 5.12$  (classified as good) after the intervention. This significant improvement ( $p < 0.05$ ) highlights the effectiveness of the intervention in shaping the attitudes of adolescent girls toward anemia prevention and iron supplementation.

Table 2. Pre-test and Post-test Attitude Scores of Adolescent Girls

Variable	Pre-test	Post-test	p-value
Attitude	$67.23 \pm 6.56$	$83.01 \pm 5.12$	$< 0.001$

\* Wilcoxon signed-rank test

Classification :

- (  $< 76$  ) = Poor
- (  $>76$  ) = Good

### Hemoglobin Improvement

The average hemoglobin level before the intervention was  $10.82 \pm 0.49$ , indicating that the participants were suffering from anemia. After the intervention, the average hemoglobin level increased significantly to  $13.35 \pm 0.63$ , which falls within the normal range for hemoglobin (12–15 g/dL). The results from the Wilcoxon Signed Ranks Test ( $p < 0.05$ ) indicate that the intervention had a significant positive effect on the hemoglobin levels of adolescent girls, bringing them to a healthier level.

Table 3. Pre-test and Post-test Hemoglobin Levels of Adolescent Girls

Variable	Pre-test	Post-test	p-value
Hb	$10.82 \pm 0.49$	$13.35 \pm 0.63$	$< 0.001$

\* Wilcoxon signed-rank test

Classification :

- (  $12-15$  ) : Normal
- (  $< 12$  ) : Anemia

## 4. DISCUSSION

The findings from this study demonstrate that pharmacist-led interventions are highly effective in improving knowledge, attitude, and hemoglobin levels in adolescent girls who are at risk of anemia. The significant improvements in both knowledge and attitude after the intervention suggest that education and counseling about anemia prevention can enhance adolescents' understanding of the importance of iron supplementation and improve their attitudes toward preventive measures [6,7].

These results are consistent with previous studies that highlight the crucial role of pharmacists in educating patients about anemia and promoting adherence to iron supplementation programs [8,9]. The improvement in knowledge and attitude is directly linked to the effectiveness of pharmacist-led counseling, which helps address misconceptions and reinforces the importance of proper supplementation to prevent anemia [10,11].

The most notable finding from this study is the significant improvement in hemoglobin levels after the intervention [12,13]. The increase in hemoglobin levels from  $10.82 \pm 0.49$  to  $13.35 \pm 0.63$  suggests that the intervention not only improved knowledge and attitudes but also had a direct impact on the health of the participants. This improvement in hemoglobin levels indicates that iron supplementation, combined with education, plays a crucial role in preventing and treating anemia, especially in adolescent girls [14,15].

Previous studies have also shown that iron supplementation, when combined with education and dietary guidance, can significantly improve iron status and reduce the prevalence of anemia in adolescent populations [16,17]. This aligns with the current study, where pharmacist-led intervention proved to be an effective strategy in combating anemia among adolescent girls in Ujung Batu, North Padang Lawas.

In summary, this study provides strong evidence for the positive impact of pharmacist-led education on health outcomes in adolescent girls [17,18]. These findings suggest that incorporating pharmacists into public health strategies for anemia prevention can help improve the health of adolescents, particularly in rural areas with limited access to healthcare services [19,20].

## **5. CONCLUSION**

This study demonstrated that pharmacist-led intervention significantly improved hemoglobin levels, knowledge, and attitudes of adolescent girls in preventing anemia in Ujung Batu District, North Padang Lawas Regency. After the intervention, the mean hemoglobin level increased from  $10.82 \pm 0.49$  g/dL to  $13.35 \pm 0.63$  g/dL, indicating a change from anemic to normal status. The mean knowledge score increased from  $44.75 \pm 7.95$  to  $79.25 \pm 7.50$ , while the mean attitude score improved from  $67.23 \pm 6.56$  to  $83.01 \pm 5.12$ . These findings confirm that pharmacist-provided education, counseling, and monitoring, combined with iron supplementation, were effective in strengthening anemia prevention efforts among adolescent girls. The results suggest that pharmacist involvement can be integrated into school- and community-based anemia prevention programs and may contribute to broader strategies for improving adolescent health and reducing future maternal anemia risk.

## **CONFLICT OF INTEREST**

The authors declare no conflict of interest related to this study.

## **ACKNOWLEDGMENT**

The authors would like to express their sincere gratitude to the Faculty of Pharmacy, Universitas Sumatera Utara, for academic support and research facilitation. The authors also thank the schools and Islamic boarding schools in Ujung Batu District, North Padang Lawas Regency, for their cooperation during data collection, as well as all adolescent girls who participated in this study. Appreciation is also extended to the local health workers and all parties who supported the implementation of the educational intervention and hemoglobin examination.

## **SUPPLEMENTARY MATERIALS**

No supplementary materials are available for this article.

## REFERENCES

- [1]. World Health Organization. Anaemia [Internet]. Geneva: World Health Organization; 2025 [cited 2026 Apr 5]. Available from: <https://www.who.int/news-room/fact-sheets/detail/anaemia>.
- [2]. Kumar S, Anukiruthika T, Dutta S, Kashyap AV, Moses JA, Anandharamakrishnan C. Iron deficiency anemia: a comprehensive review on iron absorption, bioavailability and emerging food fortification approaches. *Trends Food Sci Technol*. 2020;99:58-75. <https://doi.org/10.1016/j.tifs.2020.02.021>.
- [3]. Kusuma TU. Peran edukasi gizi dalam pencegahan anemia pada remaja di Indonesia: literature review. *Jurnal Surya Muda*. 2022;4(1):61-78. <https://doi.org/10.38102/jsm.v4i1.162>.
- [4]. Situmeang AMN, Apriningsih A, Makkiyah FA, Wahyuningtyas W. Hubungan pengetahuan, sikap, dan sosioekonomi dengan perilaku pencegahan anemia pada remaja putri di Desa Sirnagalih, Bogor. *Jurnal Kesehatan Komunitas*. 2022;8(1):32-39. <https://doi.org/10.25311/keskom.vol8.iss1.1126>.
- [5]. Kementerian Kesehatan Republik Indonesia. Buku Pedoman Penatalaksanaan Pemberian Tablet Tambah Darah [Internet]. Jakarta: Kementerian Kesehatan Republik Indonesia; 2021 [cited 2026 Apr 5]. Available from: <https://ayosehat.kemkes.go.id/buku-pedoman-penatalaksanaan-pemberian-tablet-tambah-darah>.
- [6]. Novrita S, Puspitasari I, Yasin NM, Wardhani C. Pengaruh konseling apoteker terhadap outcome anemia pada siswi SMA yang menerima program suplementasi zat besi. *Majalah Farmasetik*. 2022;18(2):179-186. <https://doi.org/10.22146/farmasetik.v1i1.60555>.
- [7]. Lindawati R. Analisis faktor yang berhubungan dengan kepatuhan konsumsi tablet Fe pada remaja putri di SMA Negeri 3 Kota Serang Provinsi Banten Tahun 2022. *Detector: Jurnal Inovasi Riset Ilmu Kesehatan*. 2023;1(1):239-255. Available from: <https://ejurnal.politeknikpratama.ac.id/index.php/Detector/article/view/1519>.
- [8]. Oktavianis, Nurhayati, Yuniliza. Hubungan gaya hidup terhadap kejadian anemia pada remaja. *Human Care Journal*. 2023;8(1):227-233. <https://doi.org/10.32883/hcj.v8i1.2387>.
- [9]. Izzara WA, Yulastri A, Erianti Z, Putri MY, Yuliana Y. Penyebab, pencegahan dan penanggulangan anemia pada remaja putri: studi literatur. *Jurnal Multidisiplin West Science*. 2023;2(12):1051-1064. <https://doi.org/10.58812/jmws.v2i12.817>.
- [10]. Engidaw MT, Wassie MM, Teferra AS. Anemia and associated factors among adolescent girls living in Aw-Barre refugee camp, Somali regional state, Southeast Ethiopia. *PLoS One*. 2018;13(10):e0205381. <https://doi.org/10.1371/journal.pone.0205381>.
- [11]. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity [Internet]. Geneva: World Health Organization; 2011 [cited 2026 Apr 5]. Available from: <https://www.who.int/publications/i/item/WHO-NMH-NHD-MNM-11.1>.
- [12]. Indriasari R, Mansur MA, Srifitayani NR, Tasya A. Pengetahuan, sikap, dan tindakan terkait pencegahan anemia pada remaja berlatarbelakang sosial-ekonomi menengah ke bawah di Makassar. *Amerta Nutr*. 2022;6(3):256-261. <https://doi.org/10.20473/amnt.v6i3.2022.256-261>.
- [13]. Nguyen TH, Tran TT, Nguyen NK, Diep HG, Vo SD, Taxis K, Pham ST, Nguyen T. A randomized controlled trial of a pharmacist-led intervention to enhance knowledge of Vietnamese patients with type 2 diabetes mellitus. *International Journal of Pharmacy Practice*. 2022 Oct 1;30(5):449-56.
- [14]. Meiliani S, John C, Duggan C, O'campo L, Bates I. How can pharmacists contribute to anaemia management? A review of literature and exploratory study on pharmacists' role in anaemia. *Exploratory research in clinical and social pharmacy*. 2023 Mar 1;9:100231.
- [15]. Amaliah R, Nasution A. Analysis of Pharmacist Intervention in Anaemic Pregnant Women in Stunting Prevention. *International Journal of Science, Technology & Management*. 2023 Jun 4;4(3):674-80.
- [16]. Jannah M, Sari Y, Almasdy D. Study Of the Adverse Drug Reaction (ADR) On Geriatric Patients in Internal Medicine Inpatient at A Private Hospital in Bukittinggi City, West Sumatera. *Jurnal Farmasimed (JFM)*. 2024 Apr 30;6(2):178-85.
- [17]. Depari E, Malisie RF. A Review: Propolis As An Antiinflammatory Adjunct Therapy in Chronic Kidney Disease. *JURNAL FARMASIMED (JFM)*. 2025 Apr 30;7(2):293-301.
- [18]. Marbun RA. Testing the Activity of Chitosan Nanohydrogel from Belut Sawah (*Monopterus albus*) Extract as a Future Anti-Aging Candidate. *JURNAL FARMASIMED (JFM)*. 2025 Nov 13;8(1):331-8.
- [19]. Alfyan MT, Kasim F, Widyaningsih F. Effort to Reduce The Incidence of Anemia in Grade XII Students of SMAN 1 Sei Rampah Using The Action Research Approach. *JURNAL FARMASIMED (JFM)*. 2025 Apr 30;7(2):342-9.
- [20]. Idris V, Ahmad I. Peran apoteker dalam meningkatkan pelayanan kesehatan di Puskesmas. *Jurnal Riset Soshum*. 2024 Sep 25;1(1):05-13.