



# Empowering Adolescent Girls in Anemia Prevention through Monitoring Book Media: A Qualitative Health Promotion Study

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**Abstract. Background:** Anemia among adolescent girls remains a major public health problem linked to growth, menstruation, and poor nutrition. Current prevention efforts, including promoting healthy lifestyles, providing iron supplements, and encouraging school-parent collaboration, have not yielded optimal results. Challenges include dependence on primary health centers (Puskesmas), low health literacy, and educational media that are less accessible or engaging. Lampung Province has the highest anemia prevalence in Sumatra (63%), with 24.3% among adolescent girls. Lampung Tengah Regency also shows low program coverage at 39.22% of the 75% target. **Objective:** This study aimed to explore an effective empowerment model for adolescent girls in preventing anemia in Lampung Tengah Regency. **Methods:** This study employed a qualitative phenomenological design, collecting data through in-depth interviews and focus group discussions (FGDs) with 8 participants they are students, parents, teachers, healthcare staff, and health officials, selected via purposive sampling. The data were analyzed thematically with N-VIVO through open, axial, and selective coding, with triangulation applied for validity. **Results:** Existing media such as smartphones and oral counseling were ineffective due to school phone restrictions, poor connectivity, and low engagement. Most participants preferred a personal monitoring book as an alternative. The book met eight criteria: practicality, reminders, standard monitoring, self-assessment, visual appeal, daily iron targets, nutrition calculator, and shared access. This tool enhanced adolescents' awareness and self-reliance in anemia prevention while promoting stronger cross-sectoral collaboration in health promotion.

**Keywords:** adolescent girls, anemia prevention, empowerment, health promotion, monitoring book

# 1 Introduction

## 1.1 Global Overview of Anemia

Anemia remains a global public health problem and a serious challenge, particularly in low- and middle-income countries. This condition is characterized by hemoglobin levels below the normal range, which reduces the blood's capacity to transport oxygen to body tissues [1]. Its adverse impacts include decreased quality of life, impaired growth and cognitive development, and increased susceptibility to infectious diseases. Among adolescent girls, anemia can reduce concentration and academic performance, and increase the risk of pregnancy complications such as preterm birth, low birth weight, and stunting [1].

## 1.2 Adolescent Girls as a High-Risk Group

Adolescents, particularly girls aged 10–19 years, are a high-risk group due to increased iron requirements during growth and iron loss during menstruation. The causes of anemia include inadequate iron intake, blood loss, infections, and socioeconomic factors such as low education, low income, and unbalanced dietary patterns [1]. WHO (2023) data show that around 30% of women of reproductive age worldwide suffer from anemia, with the highest prevalence found in Africa and Southeast Asia.

## 1.3 Anemia Situation in Indonesia and Lampung Province

In Indonesia, despite the implementation of various policies such as Law No. 36 of 2009 and the National Nutrition Action Movement (Gerakan Nasional Aksi Bergizi), the prevalence of anemia among adolescents remains high. According to the Indonesia Health Survey (2023), the prevalence of anemia among adolescents aged 15–24 years reached 15.5%, and 18% among adolescent girls. In Lampung Province, the rate is even higher, at 63%, with 24.3% of cases occurring among adolescent girls. The coverage of iron supplement tablet (TTD) consumption also remains suboptimal, with Lampung Tengah Regency recording the lowest achievement at only 39.22% [2].

## 1.4 Challenges in Anemia Prevention Programs

Studies have shown that low adherence to iron tablet consumption is affected by a lack of knowledge, perceived side effects, as well as weak distribution and monitoring systems [3](Ministry of Health of the Republic of Indonesia, 2023). Therefore, anemia prevention interventions cannot rely solely on supplementation but must be complemented by nutrition education, food fortification, and youth empowerment [4], [5].

## 1.5 Empowerment Approach in Health Promotion

An empowerment-based approach is an effective strategy for enhancing adolescent awareness and promoting healthy behaviors. Empowerment enables individuals and

groups to gain control over resources and actively participate in behavioral change processes found that empowerment through anemia education significantly improved adolescents' knowledge, adherence to iron tablet consumption, and hemoglobin levels.

## **1.6 Research Gap and Study Objective**

In Lampung Tengah Regency, the Aksi Bergizi program has been implemented, focusing on supplementation and nutrition education. However, it still lacks a proper recording and reporting system and has not yet included comprehensive monitoring. This condition highlights the need to develop an empowerment model for adolescent girls, based on a monitoring book system that integrates nutrition education, family involvement, and innovation in iron-rich foods. This model is expected to increase adolescents' active participation in anemia prevention and serve as an effective, sustainable solution to reduce anemia prevalence in Lampung Tengah.

# **2 Materials and Methods**

## **2.1 Research Design**

This study employed a qualitative approach with a phenomenological design, aiming to gain an in-depth understanding of the experiences, perceptions, and meanings expressed by adolescent girls and related stakeholders in anemia prevention efforts in Lampung Tengah Regency. The phenomenological approach was selected because it allowed researchers to explore the subjective meaning of informants' experiences regarding the phenomenon of anemia and its prevention within their social, cultural, and environmental contexts [6].

## **2.2 Study Setting and Duration**

The study was conducted in Lampung Tengah Regency, Lampung Province. This location was selected because it had a relatively high prevalence of anemia among adolescent girls and the lowest coverage of iron tablet consumption in the province. Research activities were conducted in several senior high schools, Puskesmas, and the Lampung Tengah District Health Office, which served as the coordinating body for adolescent health programs. The study was conducted over a six-month period, encompassing the stages of preparation, data collection, analysis, and report writing.

## **2.3 Participants and Sampling Technique**

Informants in this study 8 participants included various stakeholders directly involved in adolescent anemia prevention: four adolescent girls, one parent, one school teacher, one health worker from a primary health center, and one official from the Lampung Tengah District Health Office. Informants were selected using purposive sampling, that is, the intentional selection of participants based on specific criteria deemed capable of

providing relevant and in-depth information related to the studied phenomenon [7]. The selection criteria included involvement in anemia prevention activities, experience in iron tablet supplementation programs, nutrition education, or cross-sectoral coordination related to adolescent health.

## **2.4 Data Collection Procedures**

Data collection employed two primary techniques: (1) In-depth interviews, to explore personal experiences, perceptions, and meanings of each informant; and (2) Focus Group Discussions (FGDs), to obtain collective views, compare perceptions, and explore empowerment ideas in adolescent anemia prevention. The interview and FGD guides were developed based on the study's objectives to analyze adolescent girls' needs in anemia prevention. All interviews and discussions were conducted face-to-face, recorded with participants' consent, and transcribed verbatim to maintain data accuracy.

## **2.5 Data Analysis**

Data were analyzed using a systematic thematic approach with N-VIVO consisting of several stages: rereading transcripts to understand data context; open coding to identify key statements from informants until reaching the final selective codes; grouping codes into categories based on similar meanings; and thematic development through reflection and identification of correlations among categories. Thematic interpretation was then conducted to derive deeper meanings from emerging patterns that explained informants' perceptions and experiences in the context of adolescent anemia prevention. Data validity was ensured through source and method triangulation and researcher reflexivity to maintain the credibility and reliability of the findings .

## **2.6 Trustworthiness and Limitations**

Although this methodology provides significant insight into the empowerment needs of adolescent girls in anemia prevention, certain limitations should be acknowledged. The findings of qualitative research were context-specific and might not be generalizable to other regions or populations. Moreover, reliance on self-reported data introduces potential recall bias. These limitations highlighted the importance of interpreting the findings within their cultural and regional contexts.

## **2.7 Ethical Considerations**

This study obtained ethical approval from the Health Research Ethics Committee of Dr. Moewardi General Hospital (No: 1.426/VII/HREC/2025). Before interviews and FGDs were conducted, each informant received an information sheet and signed informed consent to ensure voluntary participation. The researcher ensured the confidentiality of

participants' identities and that all data were used solely for academic research purposes. The principles of anonymity, confidentiality, and non-maleficence were upheld throughout the research process.

### 3 Results

#### 3.1 Participant Characteristics

This study involved eight informants, comprising four adolescent girls aged 15–16 years, one teacher, one midwife, one private sector employee, and one representative from the District Health Office. The informants' educational backgrounds ranged from secondary school to postgraduate level. This diversity provided a broad perspective in understanding the social and institutional contexts of anemia prevention among adolescent girls.

**Table 1.** Informant Characteristics.

No	Name	Age	Occupation	Last Education
1	Zakiyatus Sholiha	15	Student	Grade 10
2	Dea Febriana	15	Student	Grade 10
3	Nur Amalah	16	Student	Grade 11
4	Celsia Monika	15	Student	Grade 11
5	Nur Halimah, Spd.I	24	Teacher	Bachelor of Islamic Education
6	Fitri Hermeni, Bdn, S.Keb	42	Midwife	Bachelor of Midwifery
7	Evilia, S.Si	40	Private Employee	Bachelor of Chemistry
8	Ardiyansah Sofyan, S.Si, MPH, Apt	44	Head of Pharmaceutical, Food, and Beverage Division, District Health Office	Master's Degree

#### **Theme 1: Support in Anemia Prevention**

Thematic analysis revealed that anemia prevention among adolescent girls was supported by two main factors: institutional support and social support. Institutional support came from the health office, Puskesmas, and schools, while social support originates from families and peer circles. These findings align with [8], emphasizing the importance of multisectoral collaboration in anemia prevention among Indonesian adolescents.

##### *Subtheme 1: Institutional Support.*

Institutional support involved the Health Office, Puskesmas, and schools. The Health Office acted as a policymaker and program supervisor, while Puskesmas served as technical implementers responsible for distributing iron tablets, providing health education, and monitoring adolescent health data. Schools contributed by integrating anemia education into learning activities. Informants stated:

- “The iron supplement comes from the Puskesmas.” (Adolescent girl 1)
- “The government and schools should not only provide iron tablets but also a medium to record them.” (Adolescent girl 2)
- “Schools and the government should distribute anemia monitoring books, not just give counseling or supplements.” (Adolescent girl 3)
- “It’s easier to remember when recorded, and teachers or parents can help.” (Adolescent girl 4)
- “Hopefully, there will be a standardized monitoring book distributed by schools, Puskesmas, or the government.” (Parent)
- “Innovation should include mandatory use of monitoring books in all schools and integration with Puskesmas reports for data-based evaluation and decision-making.” (Health Office)

### *Subtheme 2: Social Support*

Social support primarily came from families, ensuring that adolescents maintained a sufficient nutritional intake, particularly of iron-rich foods. This support fostered a conducive environment for anemia prevention. Informants expressed:

- “Hopefully, there’s a guidebook and parental involvement to monitor children’s health.” (Teacher)
- “Ideally, schools assist with distribution while parents accompany their children in filling out the monitoring book.” (*Puskesmas*)

### **Theme 2: Knowledge and Awareness in Anemia Prevention**

All adolescent participants demonstrated basic knowledge and sufficient awareness about anemia, including its causes, effects, and prevention methods. They understood that anemia is closely related to diet, iron intake, and reproductive health. This finding confirms [9], who reported adequate knowledge of anemia-related issues among Indonesian adolescents. Informants explained:

- “I think anemia means lack of blood, usually because of iron deficiency.” (Adolescent girl 2)
- “The result is feeling weak, pale, and tired easily.” (Adolescent girl 3)
- “Foods high in iron include spinach, chicken liver, fish, eggs... and fortified foods. I also take iron tablets weekly.” (Adolescent girl 4)

Adult informants, such as teachers and parents, shared similar views, emphasizing that while knowledge of anemia is widespread, practical approaches and supportive media are still needed to transform knowledge into action.

### **Theme 3: Strategies and Barriers in Anemia Prevention**

Three main strategies were identified in anemia prevention: (a) Healthy lifestyle behaviors, including diet and meal planning, (b) Collaborative synergy among parents, schools, and health services for adolescent health monitoring, and

(c) Routine iron supplementation. This multi-strategy approach aligns with WHO recommendations for adolescent anemia interventions [10].

*Subtheme 1: Healthy Lifestyle Behaviors*

- “We should eat foods rich in iron, like green vegetables, chicken liver, and fish.” (Adolescent girl 2)
- “To prevent anemia, we should eat nutritious foods high in iron, like vegetables, liver, and meat.” (Adolescent girl 3)

*Subtheme 2: Collaborative Synergy*

- “The strategy should strengthen coordination between *Puskesmas* and schools, provide educational tools, conduct routine monitoring and evaluation, and use a monitoring book.” (Health Office)

*Subtheme 3: Iron Supplementation*

- “The iron supplement comes from the *Puskesmas*.” (Adolescent girl 1)
- “And also take iron tablets regularly.” (Adolescent girl 4)
- “No, only from the *Puskesmas*.” (Teacher, regarding external supplementation)

However, implementation challenges remain, including dependency on *Puskesmas*, irregular implementation, limited educational media, and low adolescent health awareness. Digital barriers such as mobile phone restrictions and poor internet connectivity further limited access. Informants stated:

- “Adolescents prefer books... apps aren’t possible due to phone rules and weak signals.” (*Puskesmas*)
- “Network access is limited... standardized monitoring books would make coordination easier among *Puskesmas*, schools, and parents.” (Health Office)

**Theme 4: The Need for New Empowerment Media**

All informants emphasized the need for a relevant, engaging, and effective medium to support anemia prevention. Most participants recommended a personal monitoring book as the main tool, while a few suggested complementary educational videos. Informants stated:

- “It would be better to have a notebook, it helps us be more aware and clear about anemia prevention.” (Adolescent girl 1)
- “A special notebook to record meals and iron tablet intake would be very helpful.” (Adolescent girl 2)
- “With a monitoring book, I can easily check if I’ve had enough iron.” (Adolescent girl 3)
- “It helps me maintain my diet, take tablets regularly, and record them for self-monitoring.” (Adolescent girl 4)

- “Books are fine, but sometimes students get bored... they prefer group movie sessions.” (Teacher)
- “We need a practical guidebook, menus rich in iron, fortified food ideas, and space to record daily intake.” (Parent)
- “A standardized anemia monitoring book is needed; it functions both as an educational and supervisory tool.” (Health Office)
- “A monitoring book is needed; it shouldn’t be monotonous; it should have appealing visuals.” (*Puskesmas*)

The monitoring book was considered relevant because it enabled adolescents to independently track their health status while involving teachers, parents, and healthcare professionals.

### **Theme 5: Specifications for the Anemia Prevention Monitoring Book**

Participants proposed eight ideal criteria for the monitoring book:

#### *Subtheme 1: Practicality – Portable and durable.*

The book should be small, portable, and made from sturdy materials for daily use, consistent with user-centered design principles in health monitoring systems [11].

“The best way to receive information is through a small book we can carry anywhere.” (Adolescent girl 1)

#### *Subtheme 2: Schedule Reminder – Records Meals and Supplement Timing.*

The reminder section should note times for consuming vegetables, meat, and other iron sources, applying Implementation Intention techniques proven effective in behavior change (Bailey, 2019).

“Sometimes I forget whether I’ve taken it or not.” (Adolescent girl 2)

#### *Subtheme 3: Standardized Monitoring and Evaluation – Provides Healthy Menu Guidelines and Restrictions.*

“What’s really needed is a standardized monitoring tool, a record book that functions as both an educational and supervisory medium.” (Health Office)

#### *Subtheme 4: Fast Self-Screening – Daily Checklist for Self-Assessment.*

This feature enables adolescents to assess their anemia risk without requiring medical visits, incorporating Bandura’s (1986) concept of self-efficacy.

“We need a practical guidebook, with iron-rich food lists, fortified meal ideas, and space for daily records.” (Parent)

#### *Subtheme 5: Attractive and Realistic Design – Visually Engaging for Adolescents.*

The layout should incorporate relevant colors, fonts, and illustrations that reflect the aesthetic preferences of adolescents, thereby enhancing engagement (Thornton et al., 2021).

“The monitoring book should not be monotonous; it needs interesting visuals.” (*Puskesmas*)

“Yes, it should be varied and suitable for adolescents, more appealing.” (Adolescent girl 3)

*Subtheme 6: Daily Target – Specifies Iron Intake Goals.*

The book should include specific targets for daily iron consumption, applying Goal-Setting theory, which has been proven effective in adolescent behavior change [12].

“With a monitoring book, I can easily see if I’ve met my daily iron target.” (Teacher)

*Subtheme 7: Nutritional Calculation – Lists Foods with Nutritional Values.*

The book should present food categories (vegetables, meats, and fruits) and their nutritional content, supporting informed dietary choices [13].

“The book should help record what we eat, how often we take supplements, and set weekly targets; it makes us more disciplined.” (Adolescent girl 1)

*Subtheme 8: Multi-User Access – Shared by Students, Teachers, Parents, and Health Officers.*

This feature facilitates collaborative health monitoring, consistent with evidence-based approaches in adolescent health promotion [11].

“If teachers or health workers also check the book, I’ll feel more motivated because I know someone’s accompanying me.”

These criteria demonstrated that the desired empowerment model was not only informative but also interactive, participatory, and cross-sectoral, aligning with the principles of community empowerment and participatory health education.

Overall, the analysis concluded that an empowerment model for adolescent girls in anemia prevention should involve collaboration among individuals, families, educational institutions, and health agencies, facilitated by a monitoring book that integrated educational, practical, and participatory elements. This medium was expected to serve as an innovative tool for sustainable anemia prevention.

## **4 Discussion**

The findings of this study emphasized that anemia prevention among adolescent girls required a comprehensive approach that extended beyond medical interventions to include social, educational, and participatory dimensions. This aligned with the empowerment model of health promotion, which positioned individuals and communities as the primary agents of behavioral change.

### **4.1 The Support Ecosystem for Anemia Prevention**

The results indicated that anemia prevention among adolescent girls depended on a comprehensive support ecosystem involving health institutions, educational settings, and the social environment. This multi-stakeholder role aligned with the health systems

approach, which emphasizes the importance of cross-sectoral collaboration in addressing public health challenges [8].

However, the persistent dependency of parents and schools on Puskesmas suggested the need to strengthen capacity at both the family and educational institution levels to ensure sustainable interventions, as recommended in the Collaborative Care in Schools model [11].

The local health office had established structured short-term and long-term objectives. Nevertheless, the implementation remained sporadic, revealing a gap between policy and practice. Irregular program execution could have reduced program effectiveness and lowered compliance with iron supplementation, consistent with the findings of [14] in Indonesia.

## **4.2 The Knowledge–Behavior Paradox in Health Practices**

An interesting phenomenon emerged wherein participants demonstrated adequate knowledge about anemia but displayed low adherence to preventive behaviors. This Knowledge–Behavior Gap was commonly observed in adolescent health research [15]. [16] similarly found that good health knowledge did not always predict favorable health behaviors among adolescents.

Knowledge alone was insufficient to change behavior without internal motivation, environmental support, and effective reminder systems [13]. The developmental characteristics of adolescents, such as a limited concern for long-term health, a present-oriented focus, and strong peer influence, necessitate a different intervention approach compared to adults. Interventions needed to account for adolescent psychological factors, as explained by the Health Belief Model (Rosenstock, 1974).

## **4.3 Strategies and Barriers in Anemia Prevention**

The three main prevention strategies, healthy lifestyle practices, cross-sectoral collaboration, and regular iron tablet supplementation, demonstrated an integrative effort between the education and health sectors. However, barriers such as dependency on Puskesmas, limited access to relevant educational media, and restricted digital connectivity challenged effective implementation.

These findings supported [17], who noted that the success of adolescent health interventions in Indonesia largely depended on the sustainability of education and the use of contextual, easily accessible communication media.

## **4.4 The Irrelevance of Conventional Media**

The identification of barriers related to media revealed that conventional approaches, such as using smartphones and oral counseling, were no longer effective in this context. School regulations that prohibited smartphone use and limited telecommunication infrastructure posed significant technological barriers. This underscored the importance of contextualizing health interventions to local conditions and institutional policies, as also highlighted in [18] regarding anemia programs in remote Bengkulu.

The ineffectiveness of oral media in changing adolescent behavior highlighted the need for media that were more interactive, personalized, and consistently accessible. Such media needed to bridge the gap between knowledge and behavior by providing mechanisms for continuous self-monitoring and feedback [19].

#### **4.5 The Monitoring Book as an Alternative Solution**

The strong preference for the monitoring book across all participant categories demonstrated that low-tech solutions could serve as effective alternatives in settings with limited access to digital technology. The monitoring book offered several advantages: high accessibility, independence from technological infrastructure, and unrestricted use under school regulations.

The eight identified criteria represented a comprehensive need that integrated educational, self-monitoring, goal-setting, and multi-stakeholder collaboration aspects. The fast self-screening feature enabled adolescents to detect early signs of anemia independently, thereby enhancing self-efficacy and empowerment, consistent with Bandura's (1986) social cognitive theory. The multiuser criterion fulfilled the collaborative synergy mentioned by health officers, enabling parents, teachers, and healthcare professionals to participate in monitoring without total reliance on Puskesmas [11] (Flores & Sarkadi, 2024).

The daily target and nutritional calculation components integrated the principles of goal-setting and personalization, which had proven effective in modifying health behaviors. [12], [13] demonstrated that establishing specific and measurable goals improved adolescent compliance with health recommendations. By providing clear daily targets and flexible menu options, the monitoring book fostered intrinsic motivation among adolescents to maintain adequate nutrition, consistent with Self-Determination Theory [20].

#### **4.6 Limitations and Implementation Challenges**

Despite its promise, the monitoring book faced several potential implementation challenges. Consistent use required commitment from adolescents, who generally exhibited low health awareness. Therefore, early mentoring strategies and incentive systems were needed to build a habit of using the book, in line with Michie et al. (2018), who emphasized the importance of behavior change techniques in adolescent interventions.

The multiuser criterion also necessitated effective coordination among various stakeholders, which might be difficult without clear communication systems and protocols. There was a risk that the book could have become merely an administrative tool without contributing to behavioral change. Thus, the design needed to ensure that completing the book felt natural and was integrated into adolescents' daily routines, consistent with user-centered design principles [15].

## 5 Conclusion

This study confirms that efforts to prevent anemia among adolescent girls require a comprehensive approach based on the empowerment model. The qualitative analysis indicates that the success of anemia prevention is strongly influenced by three dimensions of empowerment, as follows:

- **Individual empowerment**, demonstrated through the knowledge, awareness, and ability of adolescent girls to recognize and monitor their own health conditions.
- **Social empowerment**, reflected in the support from parents, teachers, and peers in creating a social environment that promotes healthy behavior.
- **Structural empowerment**, manifested through institutional support from schools, community health centers, and health offices in providing programs, policies, and supporting media.

The key finding of this study is that the personal monitoring book serves as the most ideal medium to support the empowerment model for adolescents. This book functions not only as a recording tool but also as a means of self-reflection and cross-role communication among students, teachers, and health professionals.

The needs analysis for the anemia prevention model among adolescent girls yielded important findings regarding the support ecosystem, the knowledge–behavior paradox, and media intervention preferences. Although institutional and social support are available, and knowledge about anemia is adequate, implementation gaps still occur due to irregular program execution, high dependence on health centers, and the limited relevance of existing media.

The personal monitoring book emerged as a solution agreed upon by all participant categories, characterized by eight specific criteria: practicality, reminder function, standardized supervision and evaluation, fast self-screening, realistic visuals and colors, daily target, menu, and nutrition calculation, and multi-user access. These criteria integrate principles of empowerment self-monitoring, personalization [13], and multi-party collaboration [11], which are essential for the success of anemia prevention interventions.

This study recommends the development of the personal monitoring book as a primary medium for anemia prevention among adolescent girls, considering local contexts, adolescent characteristics, and technological infrastructure limitations [8] [18]. Successful implementation requires mentoring strategies, habit formation, and clear coordination protocols among stakeholders [14]. Further studies should consider applying the development model to design, validate, and test the effectiveness of the monitoring book in reducing anemia prevalence among adolescent girls.

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