Health Workers' Perspectives on Barriers to Adolescent Anemia Prevention Programs: Evidence from Bandung Regency, Indonesia

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Abstract. Adolescent anemia remains a major public health concern, particularly among adolescent girls in developing countries. Despite national efforts to reduce prevalence through iron supplementation programs, progress has been limited due to barriers that arise across multiple levels of implementation. This study explored the multilevel barriers to adolescent anemia prevention from the perspective of health workers in Bandung Regency, West Java, Indonesia. Using a qualitative descriptive design, data were collected through in-depth interviews with 12 informants, comprising 10 community health center staff members and 2 district health office representatives. **Thematic analysis identified four interrelated categories of barriers: (1) individual-level challenges, such as low awareness, weak perceived threat, disbelief in iron tablet benefits, and unhealthy body image, driven behaviors; (2) communication gaps between health workers, adolescents, parents, and schools; (3) fragmented social support, including negative peer influence and limited family engagement; and (4) structural barriers, such as inefficient logistics, inadequate human resources, and weak cross-sector coordination. These findings indicate that adolescent anemia prevention programs need to strengthen health communication strategies, enhance family and peer engagement, and improve coordination between health workers and schools, particularly in semi-urban settings where disparities in access, resources, and social support may influence program implementation**

Keywords: adolescent anemia, individual challenges, gap communication, social support.

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1 Introduction

Adolescents constitute a vital demographic segment in national development because of their large population size and future potential to drive productivity. Globally, there are approximately 1.3 billion adolescents [1], and in Indonesia, they comprise roughly 16% of the total population [2]. This demographic advantage underscores the importance of promoting adolescent health to ensure their full participation in social and economic development. Yet, adolescent girls remain vulnerable to various health problems that affect their well-being, one of the most concerning being anemia.

Anemia, defined as a hemoglobin concentration below 12 g/dl [3], persists as one of the most challenging nutritional deficiencies worldwide. In 2019, it affected nearly 30% of non-pregnant women and 37% of pregnant women of reproductive age [4]. The burden remains particularly high in Southeast Asia, with Indonesia ranked among the countries most affected. National data indicate that the prevalence of anemia among early adolescents reached 16.3%[5]. In West Java, approximately 40% of adolescent girls were reported anemic [6], the prevalence is estimated at 26%, exceeding that of several neighboring districts. These figures highlight anemia as a significant public health challenge at both national and subnational levels [7].

Anemia negatively impacts both the health and overall quality of life of adolescents [8,9]. It indirectly contributes to maternal mortality through postpartum hemorrhage. In West Java, anemia accounts for an estimated 61% of maternal deaths [10]. The economic implications are equally severe. Global productivity losses associated with anemia are estimated at US$761 billion annually, representing about 1% of the world's gross national income, primarily due to cognitive decline and premature mortality [11].

Recognizing the magnitude of these consequences, the WHO developed a comprehensive framework to accelerate anemia reduction [9]. Despite these efforts, progress has been modest; the global prevalence of anemia even rose from 29.9% in 2019 to 31.2% in 2024 [11]. In Indonesia, the government launched the Aksi Bergizi program in 2021, an integrated initiative combining iron supplementation, nutrition education, and behavior change communication [12]. However, the program's impact remains modest, with anemia among adolescent girls decreasing by only 4% [5].

Several factors contribute to the limited effectiveness of anemia prevention programs, including low adolescent knowledge about nutrition and anemia, inadequate micronutrient intake, ineffective health education, and poor compliance with iron tablet consumption [13]. National data show that only around 30% of adolescents regularly consume iron tablets, and few take the initiative to obtain supplements independently [5]. This mismatch between program design and behavioral response indicates a broader implementation gap.

Previous studies have identified several factors associated with low adherence to anemia prevention programs, including limited nutritional knowledge, misconceptions about iron supplementation, ineffective health education, and weak monitoring systems. However, much of the existing research has focused on individual determinants or has been conducted within narrowly defined settings, such as sin-

gle schools or subdistricts. As a result, less attention has been given to the perspectives of frontline health workers who are directly responsible for implementing anemia prevention programs across diverse contexts.

This gap is particularly relevant in semi-urban areas such as Bandung Regency, which exhibit a mix of urban and rural characteristics. Variations in infrastructure, human resources, access to health information, and social support systems create uneven conditions for program delivery. In such contexts, standardized national interventions may not fully address local implementation challenges.

Therefore, this study aims to explore barriers to adolescent anemia prevention programs from the perspectives of health workers in Bandung Regency. By examining barriers at individual, interpersonal, and institutional levels, this study seeks to provide context-sensitive insights that can inform the improvement of adolescent anemia prevention programs, particularly in semi-urban settings where implementation complexity is often underestimated.

2 Method

This study was conducted as a preliminary phase of a larger research project and employed a qualitative descriptive design to explore barriers to the implementation of adolescent anemia prevention programs. A qualitative approach was chosen to capture in-depth perspectives and contextual experiences of health workers as frontline implementers of the program.

The study took place in Bandung Regency, West Java, Indonesia, a semi-urban area characterized by a combination of urban and rural features. The regency covers an area of 1,767.96 km² and comprises 31 subdistricts with varying levels of urbanization, health infrastructure, and access to health services. Data collection was conducted between January and March 2025 in selected community health centers (*Puskesmas*) representing diverse geographic and service contexts.

Participants were selected using purposive sampling to ensure the inclusion of informants with direct experience in implementing adolescent anemia prevention programs. A total of 12 informants participated in the study, consisting of 10 primary informants (health workers responsible for adolescent or nutrition programs at community health centers) and 2 key informants (nutrition program coordinators from the Bandung Regency Health Office). The inclusion criteria were: (1) active involvement in adolescent anemia prevention activities, including iron supplementation or nutrition education programs; and (2) a minimum of one year of experience in program implementation. This sampling strategy allowed the study to capture diverse implementation perspectives across different service areas while maintaining relevance to the research objectives.

Data were collected through face to face, semi-structured interviews guided by an interview protocol designed to explore barriers at the individual, interpersonal, and institutional levels. Each interview lasted approximately 45–60 minutes and was audio-recorded with participants' consent. Field notes were taken during and after interviews

to document contextual information, nonverbal cues, and researchers' initial reflections. Interviews were conducted in Indonesian and transcribed verbatim for analysis.

Data analysis was performed using thematic analysis following an inductive approach. The analysis proceeded through several stages. First, data familiarization was conducted by repeatedly reading interview transcripts and field notes to gain an overall understanding of the content. Second, initial codes were generated by identifying meaningful units of text that reflected perceived barriers to program implementation. Third, related codes were grouped into categories, which were subsequently synthesized into broader themes representing key dimensions of the identified barriers. The coding and categorization process was iterative, with continuous comparison between codes, categories, and original transcripts to ensure analytical consistency. Themes were refined through repeated review to ensure that they accurately reflected the data and addressed the research objectives.

To enhance the trustworthiness of the findings, several strategies were applied. Credibility was supported through careful transcription, prolonged engagement with the data, and repeated cross-checking between codes and original interview excerpts. Dependability was addressed by maintaining a clear audit trail of the analytical process, including coding decisions and theme development. Reflexivity was applied throughout the analysis, with the researcher continuously reflecting on potential biases and assumptions to minimize subjective interpretation.

Ethical principles were upheld throughout the study. All participants received information about the study objectives and procedures and provided verbal informed consent prior to participation. Participation was voluntary, and informants were free to withdraw at any stage. To ensure confidentiality, no personal identifiers were recorded, and participants were assigned coded labels during transcription and analysis. All data were stored securely and used solely for research purposes.

3 Result

Thematic analysis of the in-depth interviews with 12 informants generated 73 meaning units, which were grouped into 85 codes, 12 categories, and ultimately four overarching themes. These themes represented multilevel barriers to adolescent anemia prevention programs in Bandung Regency: (1) Individual-level challenges, (2) Communication gaps, (3) Fragmented social support, and (4) Structural barriers.

3.1 Theme 1 Individual-Level Challenges

This theme reflected how adolescent girls' awareness, perceptions, and behaviors acted as barriers to program success.

Awareness. Many adolescent girls lacked awareness of the importance of regularly consuming iron tablets. Compliance occurred mainly during school-based activities (*Aksi Bergizi*) under supervision but declined afterward.

> *"Adolescent girls usually took the iron tablets only during the Aksi Bergizi events; outside of that, they didn't take them."*

This indicates that adherence was driven by external monitoring rather than internalized motivation.

Perceived Threat. Adolescent girls did not perceive anemia as a serious or immediate threat to their health. They tended to normalize anemia as a common condition among adolescents.

> *"They thought anemia was normal…just something that often happened to teenage girls. So, they didn't see it as something important to prevent."*

Some also viewed anemia as an issue relevant only later in life, particularly before marriage.

> *"When asked why they didn't want to take iron tablets, they said, 'I'll start later when I'm about to get married, not now."*

This present-oriented mindset made preventive measures less appealing to adolescents who had not yet experienced tangible symptoms.

Perceived Benefits. Some adolescents expressed skepticism about the benefits of iron tablets, focusing instead on perceived side effects.

> *"They said there's no difference even after taking the tablets. They still felt the same, so they wondered what's the point was."*

Even more concerning were misperceptions that iron tablets were unsafe or even dangerous.

> *"Some were afraid they would get high blood pressure or thought the tablets were illegal drugs."*

Such misbeliefs led to behaviors of active resistance, hiding or discarding the tablets.

> "Sometimes they hid the tablets or threw them away."

Body image & life style. Social pressure regarding body image influenced unhealthy dietary and lifestyle choices. Many adolescent girls practiced restrictive diets or avoided physical activity to maintain appearance.

> *"They didn't like doing physical activity because they were afraid their skin would get darker. There's also body shaming that made them go on unhealthy diets."*

Unhealthy food habits were widely reported, with a preference for low-nutrient "trendy" foods.

> *"Almost all of them said they often eat snacks like seblak, meatballs, or noodles, and rarely bring balanced meals from home."*

3.2 Theme 2 Communication Gaps

Communication barriers emerged between health workers, adolescents, and parents, resulting in misinformation and resistance.

Information Gaps. Miscommunication often occurred because adolescents failed to convey accurate information about the program to their parents, leading to confusion and stigma.

> *"Parents worry that iron tablets caused high blood pressure. They didn't understand that it's for iron supplementation, not blood pressure medicine. Medical explanations were difficult for them to grasp."*

This misunderstanding reflected a breakdown in the communication process, where health messages lose meaning as they passed from one actor to another.

Adolescent–Health Worker Communication. Health workers noted difficulties engaging adolescents during health education sessions. Many adolescents appeared inattentive or disinterested.

> *"Some paid attention, but many didn't—they talked among themselves or played with their phones, so the message didn't reach them properly."*

Adolescent–Parent Communication. Intergenerational communication gaps were evident. Adolescents struggled to explain program objectives to their parents, which often led to parental protests.

> *"Some parents complained to the school because their daughters couldn't explain what the tablets were for."*

This communication failure left parents misinformed and reduced family support for adolescent adherence.

3.3 Theme 3 Fragmented Social Support

Social support that should reinforced healthy behaviors was weak and fragmented across peer influence and family support

Peer Influence. Peer behavior strongly shaped adolescents' dietary and health choices. If peers rejected the program, others tended to follow.

> *"If a popular friend refused to take the tablets, others usually followed….If one student hid or threw away the tablets, her friends often imitated her."*

This shows the powerful role of peer norms and modeling in influencing compliance.

Family Support. Family involvement was minimal. Many parents were unaware of or indifferent toward their daughters' participation in the iron supplementation program.

> *"Many parents thought the tablets were only for pregnant women. When their daughters brought the tablets home, the family didn't care whether they took them or not."*

This lack of engagement created a disconnect between school-based interventions and home environments.

3.4 Theme 4 Structural Barriers

Systemic and institutional factors also constrained program implementation.

Suboptimal Distribution and Logistics. Distribution inefficiencies resulted in stockpiling and expiration of tablets.

> *"We once received a large supply, but it piled up at school and expired because it wasn't distributed."*

Limited Human Resources. Health workers reported difficulties monitoring and supervising schools due to limited staff and the wide geographic area of Bandung Regency.

> *"It's difficult….Bandung Regency was very large, and there were many schools. Teachers were also busy, so monitoring was hard."*

Weak Cross-Sector Collaboration. A lack of shared ownership among sectors weakened program coordination. Schools often viewed anemia prevention as solely a health sector responsibility.

> *"Schools still thought the Aksi Bergizi program belongs to the health sector, not education."*

This fragmented intersectoral collaboration limited program sustainability and consistency.

4 Discussion

4.1 Individual-Level Challenges

The findings indicate that low awareness and weak perceived threat of anemia are the core reasons for adolescents' low adherence to iron tablet consumption. Within the framework of the Protection Motivation Theory (PMT), preventive behavior occurs when individuals perceive themselves as vulnerable (perceived susceptibility), view the condition as serious (perceived severity), and believe that the recommended action is both effective and achievable (response efficacy and self-efficacy)[14]. However, this study revealed that many adolescents considered anemia a normal or temporary condition during adolescence, reflecting a low perception of threat.

The belief that anemia prevention is only relevant when approaching marriage illustrates a delay in preventive orientation, as adolescents view future health risks as distant and non-urgent [15]. Misperceptions regarding iron tablets such as fears of side effects like nausea, weight gain, or even hypertension; further reduce adherence. Similar misconceptions have been reported as primary causes of non-compliance in other contexts, where mild side effects (e.g., nausea, constipation) led adolescents to discontinue supplementation [16].

Social pressures concerning body image also shape unhealthy habits. The fear of gaining weight or having darker skin discourages physical activity, while restrictive eating patterns and frequent consumption of low-nutrient "modern" foods contribute to nutritional imbalances [17,18]. These individual-level challenges do not occur in isolation; rather, they are reinforced by communication and social environmental factors.

4.2 Communication Gaps

Communication breakdowns emerged as a critical barrier across all levels of interaction, between health workers, adolescents, parents, and schools. In the context of interpersonal communication theory, effective communication depends on mutual understanding and feedback between sender and receiver [19]. The anemia prevention program functions as a multistage communication chain: messages originate from health workers, are relayed to adolescents, and then to parents. When this chain is disrupted, health information becomes fragmented, distorted, or lost.

The study found that adolescents often failed to convey accurate information to parents, resulting in misunderstandings and resistance. Parents misinterpreted the purpose of iron tablets due to limited medical literacy. This type of misinformation cascade mirrors findings from broader health communication research, showing that inaccurate message relay can amplify mistrust and behavioral resistance [20].

Furthermore, weak communication skills and low empathy from some health workers contributed to adolescents' disengagement. In cross-cultural communication contexts, intercultural communication competence, the ability to understand and adapt to diverse values, perceptions, and social norms, is crucial [21]. Health workers need to tailor communication strategies to adolescents' language, cultural preferences, and digital behaviors. A one way, lecture style approach often fails to resonate with adolescents' interactive communication style.

This study underscores that communication is not a supplementary aspect of the anemia prevention program but rather its core operational component. Without an effective communication chain, even well-designed interventions will fail to achieve behavioral change.

4.3 Fragmented Social Support

Social support plays a pivotal role in shaping and sustaining preventive health behaviors. Based on the Social Ecological Model [22], social networks such as peers, family, and schools act as bridges connecting individual behavior with the broader social environment. The findings of this study highlight fragmented social support at multiple levels; peer influence that discourages adherence, weak family engagement, and schools' dependence on health workers.

The tendency for students to imitate peers who reject or discard iron tablets demonstrates the dominance of negative peer norms. Similar findings in adolescent nutrition research show that peer-led norms strongly influence diet and supplementation behavior [23]. In contexts where non-compliance is socially reinforced, positive health behaviors are unlikely to spread.

Weak family support further amplifies this issue. Many parents remain uninvolved due to misinformation or lack of understanding about the importance of anemia prevention during adolescence. Families act as primary agents in reinforcing daily habits such as diet and supplementation. However, in households where social fragmentation occurs (characterized by minimal communication, weak emotional ties, or low health literacy) because of messages delivered at school do not translate into sustained action at home [24,25]

Hence, social reinforcement mechanisms that connect school based programs with home environments must be strengthened. Integrating parents into communication campaigns and using peer led strategies could help counteract misinformation and build social norms that favor adherence.

4.4 Structural Barriers

Distribution problems were evident from the accumulation and expiration of iron tablet stock at schools, reflecting weaknesses in logistics management between community health centers (*Puskesmas*) and schools. This issue extends beyond a mere technical failure; it highlights deficiencies in the communication and coordination systems that underpin supply planning and consumption monitoring. Delays in distribution, uncertainty of stock availability, and poor coordination between health centers and schools have resulted in adolescents not receiving iron tablets consistently [26].

Similar findings have been reported in other countries, where most anemia control programs continue to face comparable challenges—namely, intersectoral fragmentation and weak logistics systems**.** These studies show that even when iron supplementation programs are widely implemented, their effectiveness remains limited due to inadequate coordination among the health, education, and community sectors [27].

In the context of this study, weak coordination among community health centers, schools, and related government agencies disrupts the continuity of program delivery. The situation is further exacerbated by limited human resources and insufficient training in logistics management, while schools lack standardized systems to record and report students' iron tablet consumption. These findings suggest that logistical problems are not purely technical but rather systemic and structural issues that reflect institutional fragmentation and weak interagency integration.

5 Conclusion

This study identified four interconnected categories of barriers to the implementation of adolescent anemia prevention programs in Bandung Regency: individual-level challenges, communication gaps, fragmented social support, and structural barriers. These barriers operate across individual, interpersonal, and institutional levels and interact in ways that reinforce low program adherence and limit effectiveness. The semi-urban context of Bandung Regency further amplifies these challenges, as disparities in access, resources, and social support create uneven conditions for program implementation.

From a programmatic perspective, the findings indicate that adolescent anemia prevention efforts should move beyond information delivery alone. Strengthening health communication strategies that are tailored to adolescents' social contexts, actively involving families, and leveraging peer influence are essential to improve adherence to iron supplementation. In addition, closer coordination between health workers and schools is needed to ensure consistent program delivery and monitoring.

At the institutional level, improved logistics management, clearer role distribution, and stronger cross-sector collaboration between the health and education sectors are critical to enhance program sustainability. Embedding shared responsibility for anemia prevention within schools and local health systems may help reduce fragmentation and improve accountability.

For future research, these findings highlight the need for intervention studies that integrate behavioral, communication, and structural components, particularly in semi-urban settings where implementation complexity is often overlooked. Further studies could also explore the perspectives of adolescents and parents to complement health workers' insights and inform the development of more comprehensive and context-sensitive anemia prevention strategies.

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