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[Healthy Hidayanty](#)^{*}, Nurzakiah Hasan, Irmayanti Irmayanti, Yuliana Yuliana, [Helmizar Helmizar](#)

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Article

Perceived Barriers and Enablers to Take Iron Supplementation Regularly among Adolescent Girls in Indonesia

Healthy Hidayanty ^{1,*}, Nurzakiah ¹, Irmayanti ¹, Yuliana ² and Helmizar ³

¹ Department of Nutrition, Faculty of Public Health, Hasanuddin University, Makassar 90245, Indonesia; fkm@unhas.ac.id

² Center for Food, Nutrition, Family, and Community Empowerment Research, Faculty of Tourism and Hospitality, Padang State University, Padang 25131, Indonesia

³ Nutrition Study Program, Faculty of Public Health, Andalas University, Padang 25175, Indonesia; humas@fkm.unand.ac.id

* Correspondence: healthy.hidayanty@unhas.ac.id

Abstract: Non-compliance with iron supplementation consumption contributes to the high rate of anemia among adolescent girls in Indonesia. This study explores the barriers and enablers perceived by adolescent girls regarding regular iron supplement consumption. Using a qualitative design, eight focus group discussions (FGD) were conducted in Makassar and Padang involving 32 girls grade 8 and 9 from four junior high schools. Data on perceived barriers and enablers were collected using a social cognitive theory framework and analyzed thematically. The average age of the informants was 13,65±0,60 years. Although all participants received supplement at school, most did not consume them regularly. Key barriers include dislike of the taste and smell, parental prohibition negative experience consuming iron supplement, and the belief that iron supplements increase menstrual blood flow and volume. Enablers include self-awareness of the supplement's benefits, trust in school-provided supplements, and positive support from parents and peers. Behavior change strategies are needed to address these barriers and strengthen supporting factors to improve iron supplementation consumption.

Keywords: keyword 1; Barrier 2; enabler 3; iron supplementation intake 4; adherence

1. Introduction

Iron deficiency anemia is one of the most prevalent nutritional deficiencies globally, especially affecting adolescent girls due to increased iron requirements during puberty. The World Health Organization (WHO) has identified anemia as a significant public health issue, with an estimated 30% of the world's population suffering from anemia, and 50% of these cases being attributed to iron deficiency [1]. To combat this issue, iron and folic acid supplementation programs, commonly referred to as iron tablet supplementation programs, have been widely implemented, especially targeting adolescent girls. Despite the availability and distribution of these supplements, adherence rates remain suboptimal in many regions, posing a challenge to improving adolescent health outcomes [2].

The regular consumption of iron tablets is critical for preventing and treating iron deficiency anemia. Iron supplementation during adolescence is crucial as this is a period of rapid growth, which increases the need for iron to support red blood cell production and prevent anemia [3]. Iron-deficiency anemia during adolescence can lead to fatigue, impaired cognitive function, reduced physical capacity, and can negatively affect academic performance and overall well-being [4]. Furthermore, anemia during this developmental stage can have long-term consequences, including complications during pregnancy and childbirth, further perpetuating the cycle of poor maternal and child health outcomes [5].

Despite the known benefits of iron supplementation, adolescent girls often face various barriers to regularly consuming iron tablets. These barriers may include lack of awareness, misconceptions about side effects, forgetfulness, and socio-cultural influences that affect adherence [6]. On the other hand, factors such as family support, proper counseling, and accessibility to supplements serve as enablers that can enhance adherence to iron tablet consumption [7]. Therefore, understanding these barriers and enablers is crucial for developing effective interventions that increase adherence rates and improve health outcomes among adolescent girls.

Although several studies have explored the effectiveness of iron supplementation programs, limited research has focused on understanding the specific barriers and enablers perceived by adolescent girls in different socio-cultural contexts. Previous studies have often focused on the clinical outcomes of iron deficiency without addressing the behavioral and psychosocial factors that affect adherence [8]. Moreover, research has primarily been conducted in adult women or pregnant populations, neglecting the unique needs and challenges faced by adolescent girls. The last five years have seen a growing recognition of the importance of tailoring health interventions to adolescent populations, but comprehensive studies addressing both barriers and enablers in diverse settings remain sparse [9].

Applying Social Cognitive Theory (SCT) to examine the barriers and enablers of iron tablet consumption among adolescent girls is crucial to designing more effective interventions. Barriers such as fear of side effects, misconceptions about iron tablets, forgetfulness, and cultural beliefs are common among adolescents [4]. In contrast, social support from family, schools, and health providers, along with self-regulation strategies, serve as significant enablers [6]. The SCT framework emphasizes that behavioral changes are not only determined by individual factors but also influenced by social and environmental contexts. Therefore, research focusing on these dimensions can help to tailor interventions that improve adherence rates among adolescent girls.

While previous studies have explored the clinical efficacy of iron supplementation, there remains a gap in understanding the psychosocial and environmental factors that influence adherence, particularly among adolescent girls. Much of the existing research has focused on adult populations, leaving a critical gap in the adolescent context [8]. Additionally, studies often fail to incorporate behavioral theories such as SCT to explain why some girls adhere to supplementation programs while others do not. A comprehensive exploration of these factors, including personal beliefs, social influences, and environmental barriers, is necessary to enhance program effectiveness.

2. Materials and Methods

This study employed a qualitative design using Focus Group Discussions (FGDs) to explore the perceived barriers and enablers to iron supplementation among adolescent girls in Indonesia. The study was conducted in Makassar City and Padang City, involving 32 participants from grades 8 and 9 across four Junior High Schools. Participants were selected using purposive sampling to ensure a diverse representation of experiences and perspectives [10].

This study employs a qualitative research design to explore the barriers and enablers perceived by adolescent girls regarding regular iron supplementation consumption. The research was conducted using Focus Group Discussions (FGD), an approach particularly suitable for understanding collective perceptions, beliefs, and experiences in a shared social context [11]. Eight FGDs were held in two cities in Indonesia—Makassar and Padang—allowing the researchers to gather rich, context-specific qualitative data on adolescent girls' perspectives about iron supplementation.

A total of thirty-two adolescent girls from grades 8 and 9 participated in the study. The participants were recruited from four junior high schools in urban and rural areas in Makassar City and Padang City, Indonesia. A purposive sampling technique was used to ensure that all participants had been part of iron supplementation programs at school, thus enabling them to provide meaningful insights into the barriers and enablers of consuming iron tablets [10]. The average age of the participants was 13.65 ± 0.60 years, and all informants were given access to iron supplements at their respective schools.

Data were collected through eight focus group discussions (FGDs), each consisting of 4-6 participants. The discussions were guided by semi-structured questions designed to explore the girls' experiences with and perceptions of iron supplementation. Key topics discussed included the taste and smell of the tablets, parental attitudes towards supplements, experiences with side effects, and the perceived benefits of regular iron supplementation. The discussions were conducted in the local language and lasted between 60 and 90 minutes. All FGDs were audio-recorded and later transcribed verbatim [12].

Data analysis followed the principles of thematic analysis as outlined by Braun and Clarke (2006) [13]. The transcripts were coded and categorized into themes that reflected both barriers and enablers of iron tablet consumption. Themes were identified inductively, allowing the data to guide the analysis without imposing pre-conceived categories. Thematic coding was guided by the Social Cognitive Theory framework, focusing on factors such as self-efficacy, outcome expectations, and social support. To enhance the trustworthiness of the data, peer debriefing and member checking were employed.

Ethical approval for this study was obtained from the relevant Institutional Review Boards (IRB) in both cities. Prior to data collection, informed consent was obtained from the participants and their parents. The participants were assured of confidentiality, and pseudonyms were used in the transcripts and reports. Participation in the study was voluntary, and the girls were informed that they could withdraw at any time without any consequences [11]. All recordings and transcripts were securely stored, and access was restricted to the research team.

3. Results

Average biological age of the informants was $13,65 \pm 0,60$ years and already have regular monthly menstruation. Majority father's occupation working in private sector and mother's occupation as a housewife (Table 1).

Table 1. Sociodemographic characteristic of the participants.

Characteristic	Mean \pm SD	n	%
Age	13.65 \pm 0,60		
13 years		13	40.6
14 years		18	56.3
15 years		1	3.1
Menarche			
10 years		3	9.4
11 years		14	43.8
12 years		11	34.4
13 years		2	6.3
14 years		2	6.3
Religion			
Islam		22	68.8
Christianity		10	31.3
Father occupation			
Civil servant		28	12.5
Private sector		4	87.5
Mother occupation			
Housewife		19	59.4
Civil servant		4	12.5

Private sector	9	28.1
Ethnic		
Bugis-Makassar	16	50.0
Minangkabau	16	50.0

The analysis of the focus group discussions (FGDs) revealed several key themes regarding the barriers and enablers to iron supplementation among adolescent girls in Indonesia. These themes were categorized into two main areas: perceived barriers and perceived enablers to iron tablet consumption.

Several barriers to regular iron tablet consumption were identified. The most prominent barriers included:

1. **Taste and Smell:** A significant number of participants reported that they disliked the taste and smell of the iron tablets, which made them reluctant to consume them regularly. This sensory aversion was a common theme across all FGDs.
2. **Parental Influence:** Some participants mentioned that their parents prohibited them from taking the tablets, often due to concerns about potential side effects or misconceptions regarding iron supplementation.
3. **Previous Negative Experiences:** Participants also shared those previous negative experiences with supplements, such as gastrointestinal discomfort or side effects, discouraged them from continuing with iron supplementation.
4. **Perception of Increased Menstrual Blood Flow:** There was a widespread belief among the participants that consuming iron supplements would lead to increased blood volume during menstruation, which further deterred them from taking the tablets regularly.

In contrast, several enablers were identified that encouraged the participants to take iron supplements:

1. **Self-awareness of Health Benefits:** Many participants expressed awareness of the health benefits they experienced after consuming the tablets, such as improved energy levels and general well-being, which motivated them to continue the supplementation.
2. **Trust in School-based Programs:** Participants had a positive perception of the iron supplementation programs administered through schools. They expressed trust in the information and guidance provided by the school health staff, which acted as a significant enabler.
3. **Parental and Peer Support:** The role of social support, particularly from parents and peers, was highlighted as a critical enabler in encouraging adherence to iron supplementation. Positive reinforcement and shared experiences among peers played an important role in adherence.

Table 2. Barriers and enablers to take iron supplements:

Topic	Statement
Barriers	
Taste and Smell	"Many people say the smell is just like real blood." (MU, 13)
Parental Influence	"Even though we know the benefits, if the parents say no, we won't take it. For example, I was supposed to get vaccinated at school, but I was prohibited from getting the vaccine." (S,13)
Previous negative experience	"Sometimes, after taking iron tablets, some people suddenly feel dizzy. But when asked, they said they hadn't eaten yet. However, there are also those who have eaten but still complain of dizziness, feeling like they want to sleep." (MU, 13) "I drank it once out of curiosity about the taste." (KI, 13)
Perception of Increased menstrual blood flow	"Because I was worried that a lot would come out due to the many school activities lasting until the afternoon, I was afraid of leaking" (UR, 12)
Enablers	

Self-awareness of Health Benefits	<p>"I usually feel dizzy when I first wake up. But after taking that medicine, I don't feel as dizzy." (PU, 14)</p> <p>"Yeah, same here. It's like it maybe gives more energy... increases blood too, right? Like, it decreases. So, taking the medicine helps increase our blood. That way, we don't lack it and don't get anemia." (Fa, 13)</p> <p>"To prevent anemia... to boost energy... so that we have the strength." (SI, 15)</p>
Trust in school-based programs	"Inviting the health center staff to provide it to all the students." (TA, 13)
Parental and peer support	<p>"It's like I was afraid to take just anything. But when they explained about the iron tablets, I thought, 'Oh, it's okay,' as long as it's clear what it is and its purpose." (AU, 13)</p> <p>"Uh.. My mom told me, 'Take the iron tablets so you don't get anemia.' Then she said, 'Fafa usually has low blood pressure, so try taking it.'" (FA, 13)</p>

4. Discussion

The findings of this study provide important insights into the barriers and enablers of iron tablet consumption among adolescent girls in Indonesia. Several of the barriers identified, such as the aversion to taste and smell and parental influence, have been well-documented in previous studies [8]. These barriers not only decrease the willingness of adolescents to adhere to iron supplementation programs but also reflect broader misconceptions and cultural beliefs about health and menstruation.

Previous studies, such as that by Rahman et al. (2020), also highlighted parental influence as a barrier, with concerns about side effects and misconceptions about iron tablets preventing adolescents from adhering to supplementation programs. In this study, participants echoed similar concerns, with some parents actively prohibiting their daughters from consuming iron supplements [4]. This emphasizes the importance of involving parents in educational interventions to correct misinformation and encourage support for iron supplementation intake.

Previous research, including the work of Das et al. (2019), has similarly noted that negative past experiences, particularly with gastrointestinal side effects, deter adolescents from adhering to iron supplementation [7]. Furthermore, the belief that iron tablets could increase menstrual blood flow was echoed in studies conducted in other Southeast Asian countries [4], indicating that this misconception may be widespread.

5. Conclusions

In conclusion, this study identified several key barriers and enablers to iron tablet consumption among adolescent girls in Indonesia. The most prominent barriers were related to the sensory properties of the supplements, parental influence, and misconceptions about the effects of iron supplementation on menstruation. On the other hand, enablers included self-awareness of health benefits, trust in school-based programs, and positive peer and parental support.

Based on the findings, the following recommendations are proposed:

1. Improved Supplement Formulation: Efforts should be made to improve the taste and smell of iron supplements to reduce sensory aversion among adolescents. Alternative formulations, such as chewable or flavored tablets, could be considered.
2. Parental Involvement: Educational programs targeting both adolescents and their parents should be developed to address misconceptions and enhance support for iron supplementation. Correcting misinformation is crucial to improving adherence.
3. School-based Interventions: Schools should continue to play a central role in iron supplementation programs, as trust in these institutions was identified as a significant enabler. Strengthening health education in schools could further reinforce positive attitudes toward supplementation.

- Peer Support Networks: Establishing peer support groups where adolescents can share their experiences and motivate each other to adhere to iron supplementation may increase adherence rates. These networks can provide a sense of community and shared responsibility.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data cannot be publicly available in repositories because they purport to personal information.

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