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# Anemia Knowledge, Perception, and Teacher Support Related to Iron Supplement Adherence among Female Students at SMA Muhammadiyah 15 Jakarta

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**Abstract:** Anemia remains a public health problem in Indonesia, with a prevalence of 23.7%. The government has implemented a prevention program by providing Iron–Folic Acid (IFA) supplements to adolescent girls and women of reproductive age, with coverage in DKI Jakarta reaching 63.5%. This study aimed to analyze the relationships among anemia knowledge, anemia perception, and teacher support with adherence to IFA consumption among adolescent girls. A cross-sectional design was employed, involving 55 students aged 16–18 years from SMA Muhammadiyah 15 Jakarta who were selected through purposive sampling. Data were collected using questionnaires that assessed knowledge, perceptions, teacher support, and adherence to IFA. Adherence was measured using the Morisky Medication Adherence Scale (MMAS-8). Chi-square analysis showed that anemia perception was significantly associated with IFA adherence ($p = 0.003$; OR = 9.394), whereas anemia knowledge ($p = 0.272$) and teacher support ($p = 1.000$) were not. These findings indicate that anemia perception plays a key role in determining adherence to IFA, whereas knowledge and teacher support do not. Programs that enhance adolescents' perception of anemia risk and consequences are needed to improve adherence. School-based education should be more engaging and relevant, and although teacher support was not significant, schools still play an important role in providing a supportive environment for implementing the IFA consumption program.

**Keywords:** anemia, consumption adherence, iron-folic acid (IFA), knowledge, perception, teacher support

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## INTRODUCTION

Anemia is a major health concern in Indonesia (Indar et al., 2022). It is defined as hemoglobin or red blood cell levels below the normal range of 12–16 g/dL. Based on the World Health Organization 2019, the global prevalence among women was 29.9%. In Indonesia, the rate was 23.7% in 2018, and among those aged 15–24, it reached 32.0% (Demitri et al., 2023). In DKI Jakarta province, the prevalence of anemia among adolescents was 23% (Mahardika et al., 2022). Symptoms include fatigue, difficulty concentrating, reduced productivity, and weakened immune function (Aulya et al., 2025).

World Health Organization recommends iron and folic acid supplementation to prevent anemia in adolescents (Kusuma, 2022). The Ministry of Health's 2016 Circular Letter reinforces this recommendation. It encourages school health units to provide Iron-Folic Acid (IFA) supplements to adolescent girls and women of reproductive age. In 2022, adolescent girls in Indonesia achieved 50% coverage. Bali Province reached 95.1%, DKI Jakarta 63.5%, and Papua 2.5% (Kementerian Kesehatan Republik Indonesia, 2023).

Knowledge shapes adolescent behavior and thus supports efforts to prevent anemia (Runiari & Hartati, 2020). Adolescent girls can prevent anemia most effectively by adhering to the correct iron supplementation regimen. When adolescents do not adhere to IFA, its effectiveness decreases, resulting in persistent high anemia rates in their group(Yulianti et al., 2023). Multiple factors can cause this non-adherence, such as boredom, laziness, the tablets' unpleasant taste and smell, and side effects like nausea, vomiting, stomach discomfort, or dark-colored stools (Ningtyias et al., 2020; Pemayun et al., 2023).

Adherence to IFA consumption is influenced by many factors. Teacher support is guidance and encouragement from educators about IFA. Individual attitudes are personal beliefs or feelings toward IFA. Culture shapes behaviors through shared norms and values. The family environment is the familial context that influences consumption. perceived threat, perceived benefits, and perceived barriers relate to beliefs about IFA's risks, advantages, and obstacles. Self-efficacy is confidence in consuming IFA. Some factors not associated with adherence include knowledge, economic ability, IFA availability, parental support, family income, perceived susceptibility, and seriousness (Amir & Djokosujono, 2019). Low perception of threat or benefit may also contribute to non-adherence (Lismiana & Indarjo, 2021).

This study aims to determine the relationships between anemia knowledge, anemia perception, and teacher support with adherence to IFA consumption among female students at SMA Muhammadiyah 15 Jakarta. Specifically, anemia knowledge includes understanding its causes, symptoms, prevention, and management. Anemia perception encompasses beliefs according to the six components of the Health Belief Model: perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy. Teacher support refers to the extent of teacher involvement in encouraging and facilitating supplement intake, while IFA consumption is defined as consistently and correctly taking iron tablets. Although existing studies have addressed some of these variables individually or in pairs, there is a lack of comprehensive research analyzing all four—knowledge, perception using all six Health Belief Model components, teacher support, and adherence—in a single study. As a result,

the most influential factors for adherence among adolescent girls remain unclear. Additionally, research using all components of the Health Belief Model to assess perceptions of anemia is scarce, resulting in an incomplete understanding of how each element may affect adherence. Preliminary observations show low IFA adherence among female students at SMA Muhammadiyah 15. Teachers also have not routinely monitored or recorded supplement intake. Therefore, this study aims to address these gaps by examining the interplay among the four key factors.

## METHODS

*Design, Time, and Place*

This study employed a quantitative, cross-sectional study design. The research was conducted from March to June 2025 at SMA Muhammadiyah 15 Jakarta. The research process received ethical approval from the Research Ethics Committee of Universitas Esa Unggul (Reference No. 0925-06.009/DPKE-KEP/FINAL-EA/UEU/VI/2025).

*Population and Sample*

The study population consisted of all 88 female 11th-grade students at SMA Muhammadiyah 15 Jakarta. The sample included 55 female 11th-grade students, determined using a hypothesis test formula for differences between two proportions. The sampling technique used was purposive sampling, coordinated with the school and adjusted to meet the inclusion and exclusion criteria. The inclusion criteria were 11th-grade female students at SMA Muhammadiyah 15, aged 16–18 years, who had consumed an IFA supplement for at least the past 4 weeks and were willing to participate as respondents. The exclusion criteria were respondents never having consumed IFA, not receiving IFA, and not obtaining parental consent to consume IFA.

*Research Procedure and Instrument*

Adherence to IFA consumption was measured using the Morisky Medication Adherence Scale (MMAS-8). Validity and reliability tests were conducted for the anemia knowledge, anemia perception, and teacher support questionnaires. Instrument validity was determined based on an r-value ≥ r-table (0.444 at n = 20, $\alpha = 0.05$). The anemia knowledge variable was reduced from 30 to 11 questions, anemia perception from 27 to 16, and teacher support from 14 to 7. Reliability test results showed values of 0.848 for anemia knowledge, 0.793 for anemia perception, and 0.833 for teacher support, indicating that all three questionnaires were reliable.

Respondents' knowledge of anemia (knowing facts about anemia) was measured using true-or-false questions. Scores were grouped as good (76–100%), sufficient (56–75%), or poor (<56%) knowledge (Nursalam, 2016). Anemia perception (beliefs about anemia risk and prevention based on six Health Belief Model parts) was measured with a Likert scale: strongly agree, agree, disagree, and strongly disagree. Scores were classified as good (80–100%) or fair to poor (60–79%) (Swarjana, 2022).

Teacher support, as assessed by motivation, information, attention, and advice, plays an important role in helping female students regularly consume IFA. In the questionnaire, participants

answered true/false items regarding these aspects. Teacher support scores were calculated by summing true responses, with a possible score of 0 to 4. Scores greater than or equal to the mean (3.33) were categorized as good support, while scores below the mean were categorized as poor support (Aryanti et al., 2023). Adherence to the IFA schedule, meaning how closely female students took iron supplements as recommended, was measured using a simple checklist For questions 1–7, answers were yes or no; for question 8, answers ranged from never to always. Adherence was scored as high (score 8), moderate (6–7), or low (5 or less) (Morisky & Dimatteo, 2011).

*Data Processing and Analysis*

Data were analyzed using SPSS version 25. The independent variables included anemia knowledge, anemia perception, and teacher support, while the dependent variable was adherence to TTD consumption. Data were collected through questionnaires distributed via Google Forms.

## RESULTS AND DISCUSSION

*Analysis of Respondent Characteristics*

The characteristics of the respondents (Table 1) indicate that most female adolescents were 17 years old (89.1%). The majority of respondents demonstrated good knowledge of anemia (87.3%). However, more than half of the respondents showed fair to poor perceptions of anemia (61.8%). In terms of teacher support, approximately half of the respondents reported receiving good support (50.9%). Despite this, most respondents exhibited low adherence to iron–folic acid (TTD) consumption (76.4%).

**Table 1**

*Characteristics of Respondents*

| Respondent Characteristics | n (%) |
|---|---|
| Respondent Age | |
| 16 Years | 3 (5.5) |
| 17 Years | 49 (89.1) |
| 18 Years | 3 (5.5) |
| Anemia Knowledge | |
| Poor Knowledge | 0 (0.0) |
| Fair Knowledge | 7 (12.7) |
| Good Knowledge | 48 (87.3) |
| Anemia Perception | |
| Fair-to-Poor Perception | 34 (61.8) |
| Good Perception | 21 (38.2) |
| Teacher Support | |
| Poor | 27 (49.1) |
| Good | 28 (50.9) |
| Iron Tablet (TTD) Consumption Adherence | |
| Low Adherence | 42 (76.4) |
| Moderate Adherence | 13 (23.6) |
| High Adherence | 0 (0.0) |
| Total | 55(100) |

Source: Personal Document.

Based on the statistical test results in Table 2, the anemia knowledge variable showed that most female adolescents had good knowledge but low adherence (72.9%), with a p-value of 0.272 (p > 0.05). For the anemia perception variable, most female adolescents had fair-to-poor perceptions along with low adherence (91.2%), yielding a p-value of 0.003 (p ≤ 0.05). For the teacher support variable, most female adolescents reported poor support and low adherence (77.8%), with a p-value of 1.000 (p > 0.05). These results indicate that anemia knowledge and teacher support are not significantly associated with IFA adherence, whereas anemia perception is significantly associated with IFA adherence among female adolescents.

**Table 2**

*Bivariate Analysis*

| Variabel | Iron-Folic Acid Consumption (%) | | | n (%) | p-value | OR | CI 95% |
|---|---|---|---|---|---|---|---|
| | Low Adherence | Moderate Adherence | High Adherence | | | | |
| Anemia Knowledge | | | | | | | |
| Poor knowledge | 0(0.0) | 0(0,0) | 0(0,0) | 0(0,0) | 0,272 | - | |
| Moderate knowledge | 7(100.0) | 0(0,0) | 0(0,0) | 7(100,0) | | | |
| Good knowledge | 35(72.9) | 13(27,1) | 0(0,0) | 48(100,0) | | | |
| Anemia Perception | | | | | | | |
| Poor-to-fair perception | 31(91.2) | 3(8,8) | 0(0,0) | 34(100,0) | 0,003* | 9.394 | 2.18 to 40.54 |
| Good Perception | 11(52.4) | 10(47,6) | 0(0,0) | 21(100,0) | | | |
| Teacher Support | | | | | | | |
| Poor support | 21(77.8) | 6(22,2) | 0(0,0) | 27(100,0) | 1,000 | - | |
| Good support | 21(75.0) | 7(25,0) | 0(0,0) | 28(100,0) | | | |

*) Statistically significant results (p-value ≤ 0.05

*Anemia Knowledge and Adherence to Iron-Folic Acid Consumption*

Results from the Chi-Square test revealed no statistically significant relationship between anemia knowledge and adherence to Iron–Folic Acid (IFA) consumption among adolescent girls, with a p-value of 0.272. The Odds Ratio (OR) for the anemia knowledge variable could not be calculated because of zero-frequency cells, reflecting a lack of respondents with moderate to high compliance in specific knowledge groups. These results indicate that the null hypothesis (Ho) is accepted and the alternative hypothesis (Ha) is rejected, suggesting that there is no significant relationship between the level of anemia knowledge and IFA consumption adherence. This finding aligns with a previous study conducted among students at SMAN 5 Tuban, which similarly reported that knowledge did not significantly influence adherence to IFA consumption (Harlisa et al., 2023).

A large proportion of adolescent girls at SMA Muhammadiyah 15 demonstrated good knowledge, yet adherence was low (72.9%). Even though they understood the consequences of anemia and their higher iron requirements compared to boys, low adherence was mainly attributed to dislike of the tablets' odor and side effects, including nausea and vomiting after consuming IFA. Other contributing factors to low adherence include physical discomfort following IFA consumption (Fatimah & Wulandari, 2020). This is consistent with a study at SMK Kesehatan Bina Karya Medika Ponorogo, which found that non-adherence commonly occurred because students experienced excessive

dizziness, disliked the smell of TTD, frequently forgot, or received the tablets late from the school health unit (UKS) teachers (Pibriyanti et al., 2024). Research conducted in Ghana also showed that adolescent girls' knowledge of the meaning, causes, consequences, signs and symptoms, and prevention of anemia remains low due to limited education or counseling on anemia (Dubik et al., 2019).

Several adolescent girls at SMA Muhammadiyah 15 Jakarta reported consuming IFA; however, their consumption patterns did not follow the recommended guidelines, such as taking only one tablet every two weeks or only during menstruation. This condition illustrates that good knowledge does not necessarily translate into adherence to IFA consumption. Many adolescent girls do not perceive themselves as ill or experiencing anemia symptoms, leading them to view IFA consumption as unnecessary. Moreover, the benefits of IFA are not immediately felt, and perceptions that anemia is not dangerous—combined with barriers such as forgetfulness, low motivation, and limited supervision—further decrease adherence. This is consistent with previous research indicating that, even when adolescents have high knowledge of the benefits of IFA in preventing anemia, such knowledge does not necessarily motivate appropriate consumption behavior (Amir & Djokosujono, 2019). Similarly, previous studies note that knowledge level does not always influence behavior, as the information adolescents receive about anemia may not be sufficient to encourage them to consume IFA as a preventive measure(Lismiana & Indarjo, 2021).

*Anemia Perception and Adherence to Iron-Folic Acid Consumption*

The bivariate analysis using the Chi-Square test showed a significant association between anemia perception and adherence to iron–folic acid (IFA) supplementation among adolescent girls ($p = 0.003$). Adolescents with inadequate perception showed a significantly higher risk of low compliance (OR = 9.394) than those with good perception. These findings indicate that the alternative hypothesis (Ha) is accepted while the null hypothesis (Ho) is rejected, demonstrating a significant relationship between anemia perception and IFA consumption adherence among adolescent girls. This is consistent with findings from a study at MTS Nurul Jadid in Mojokerto, which reported an association between the Health Belief Model and IFA consumption behavior among adolescent girls (Widiyawati & Virgia, 2024).

Most adolescent girls at SMA Muhammadiyah 15 Jakarta had fair-to-poor perceptions with low adherence (91.2%). Regarding perceived susceptibility, the findings show that although the girls were aware of beverages that inhibit iron absorption, they continued consuming tea and coffee in daily life. This aligns with Onoruoiza's theory, which explains that perceived susceptibility reflects an individual's subjective judgment about their likelihood of facing a health problem. Individuals who perceive themselves as low risk tend to engage in less healthy behaviors, whereas those who believe they are at high risk are more likely to take preventive actions to reduce the risk of illness (Lismiana & Indarjo, 2021).

Regarding perceived severity, the results indicate that adolescent girls understood the serious consequences of anemia, including decreased immunity that increases susceptibility to infections. This aligns with the theory that perceived severity reflects how individuals assess the level of danger associated with a health condition. Those with high perceived severity tend to be more motivated to

take preventive measures or mitigate the impact of the condition, based on information from the media or prior knowledge (Lismiana & Indarjo, 2021).

For perceived benefits, the girls agreed that preventing anemia early through regular IFA consumption would provide long-term health benefits, including during pregnancy and childbirth. This is consistent with Pemayun's findings, which state that perceived benefits represent an individual's beliefs about the advantages or positive outcomes expected from following recommended actions to prevent or manage disease (Pemayun et al., 2023).

In terms of perceived barriers, the results indicate that the girls did not consider consuming IFA once a week to be troublesome; however, they still struggled to remember to take the supplement. This aligns with Kurniawati's study, which notes that perceived barriers involve how individuals evaluate the difficulties encountered when adopting new behaviors (Kurniawati et al., 2020). Even with minimal obstacles, forgetfulness disrupts consistent health behavior.

Self-efficacy among the adolescent girls was reflected in their confidence to routinely consume IFA as recommended. However, this confidence had not been fully translated into actual behavior, as adherence remained low, primarily due to forgetfulness. Self-efficacy refers to an individual's belief in their capability to independently perform the recommended behavior (Ainaya et al., 2022).

Regarding cues to action, the findings show that the girls agreed that teachers' reminders positively influenced adherence. Distributing IFA for all 10 weeks at once may lead to negligence if not accompanied by support or reminders from the environment. This is consistent with previous research, which states that cues to action are internal or external triggers that motivate individuals to engage in healthy behaviors. Support from teachers and surrounding environments serves as external cues that strengthen IFA consumption behavior (Nasichah & Sulistyowati, 2023).

The results also indicate that adolescent girls with good perceptions of anemia risk, IFA benefits, and self-efficacy are more likely to adhere to IFA consumption. However, some girls still chose not to adhere, despite having positive perceptions. While good perceptions can facilitate adherence, in reality, some adolescents remain inconsistent in consuming IFA even when they possess positive perceptions (Ningtyias et al., 2020). Positive perceptions of health conditions and their preventive actions encourage positive behaviors such as medication adherence, whereas low perceptions tend to lead to non-adherence (Lismiana & Indarjo, 2021).

*Teacher Support and Adherence to Iron-Folic Acid Consumption*

The bivariate analysis assessing the association between teacher support and adherence to IFA consumption among adolescent girls, using the Chi-Square test, yielded a p-value of 1.000. For the teacher support variable, the Odds Ratio (OR) could not be estimated due to the presence of zero-frequency cells linking teacher support with high adherence. In addition, the data showed homogeneity across both categories of teacher support. These findings indicate acceptance of the null hypothesis ($H_0$) and rejection of the alternative hypothesis ($H_1$), suggesting that no significant association exists between teacher support and adherence to IFA consumption among adolescent girls.. This result is consistent with a previous study conducted among students at SMAN Tanjungsari,

which also found that teacher support did not significantly influence adherence to IFA consumption (Metallisa et al., 2024).

At SMA Muhammadiyah 15 Jakarta, a considerable proportion of adolescent girls faced poor teacher support and low adherence (77.8%). The lack of teacher support—such as failing to remind students when they forget to take their tablets or to record and monitor adherence—led many students to perceive IFA consumption as unimportant. During IFA distribution, teachers distributed one strip covering 10 weeks without monitoring, which prevented them from identifying or addressing non-adherence. Teachers play an important role in improving IFA adherence, considering that adolescents spend most of their time at school. Adolescents tend to receive information more readily and model the behaviors of teachers, who are viewed as influential figures in the school environment (Fatimah & Wulandari, 2020).

Ideally, all teachers in the school should actively support adherence to IFA consumption among adolescent girls, for instance, by providing brief education during distribution on the importance of IFA and the negative consequences of iron deficiency. However, the findings of this study indicate that teacher support did not significantly influence adherence. This may be due to limited teacher–student interaction regarding the IFA program, where tablet distribution was treated merely as a procedural task, with no follow-up communication or regular supervision. Several students also mentioned that teachers rarely.

IFA distribution should not be conducted all at once over 10 weeks, as this approach reduces supervision when tablets are consumed at home and increases reliance on individual factors rather than teacher support. School-based consumption is considered more effective because it allows direct monitoring by teachers, such as adherence reporting. In addition, recognizing compliant students and providing motivation and attention to those who are not yet adherent may strengthen teacher involvement while encouraging better adherence to IFA consumption. This is supported by a previous study in Kallur, India, where the IFA program was implemented strictly, adolescent girls were required to swallow the tablets in front of teachers, and teachers provided encouragement and guidance to support regular consumption (Y et al., 2024)

## CONCLUSION

The results of the study show that anemia perception is significantly associated with TTD consumption adherence (p-value = 0.003; OR = 9.394). School health programs need to emphasize strengthening students' perceptions of risk and benefits, for example, through more structured and consistent education. Future studies are encouraged to include additional variables related to TTD consumption adherence or to measure hemoglobin levels among respondents to determine whether there is a relationship between physiological conditions and adherence to TTD consumption. A limitation of this study is the change in sampling technique from stratified random sampling to purposive sampling, which was necessitated by the school's refusal to permit sampling from each class due to concerns about disrupting instructional time. Consequently, only three classes were included in the study, and sampling was conducted among adolescent girls who met the inclusion and exclusion criteria.

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*Author Contribution Statement*

**Tsabitah Hazadina**: Investigation, Writing original draft. **Vitria Melani**: Conceptualization, Methodology, Project administration, Supervision (Correspondence). **Erry Yudhya Mulyani**: Data curation, Translation. **Putri Ronitawati**: Data curation, Writing – review & editing**. Rachmanida Nuzrina**: Translation, Writing – review & editing. **Anugrah Novianti**: Review & editing discussion. **Nazhif Gifari**: Review & editing discussion

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