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Factors Associated with Compliance in Iron Tablet Consumption among Adolescent Girls

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ABSTRAK

Background: Adolescent girls are a group that is vulnerable to anemia, while the level of compliance with iron tablet consumption is still low. Therefore, the purpose of this research is to identify factors that influence the level of compliance of adolescent girls in consuming iron tablets. **Method**: This research uses an analytical observational design using a cross-sectional method. A sample of 147 adolescent girls from four schools in the working area of the Kartasura Community Health Center was selected using a proportional random sampling technique. Data were collected using a questionnaire that had been tested for validity and reliability and then analyzed using a logistic regression test. **Results**: The results of this research revealed that the main factor related to compliance in iron tablet consumption is perceived susceptibility (p-value = 0.009; OR = 2.594; 95% CI: 1.264–5.323). This means that adolescent girls with a high perception of susceptibility are 2.594 times more likely to comply with consuming iron tablets (IBT) than adolescents with a low perception of susceptibility. **Conclusion**: This study reveals a statistically significant relationship between perceived susceptibility and perceived barriers, as well as the degree of compliance among female adolescents who take iron supplements, thereby underscoring the need for active involvement of both schools and families to improve adherence

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INTRODUCTION

Anemia occurs when hemoglobin levels in the body are below standard. In adolescent girls, if hemoglobin levels are below 12 g/dl, this indicates iron deficiency. While red blood cells play a role in distributing oxygen to all body tissues, so if levels decrease or are abnormal, the process of oxygen distribution to tissues is disrupted. The adolescence period is a developmental transition that bridges childhood and adulthood, which generally occurs between the ages of 12 and 21(WHO, 2025). Globally, the prevalence of anemia in the 15-49 age group was recorded at 29.9% (WHO, 2025). In Indonesia, 2018

data showed that 32% of adolescent girls aged 15-24 years experienced anemia, indicating that approximately 3-4 out of every 10 adolescent girls are affected by anemia in that age range (Kemenkes RI, 2022). Currently, there is no data on the prevalence of anemia in adolescent girls in Central Java. In the Kartasura region, anemia cases among adolescent girls rank second in Sukoharjo Regency (47.5%) (Dinas Kesehatan Kabupaten Sukoharjo., 2023).

Adolescent girls with anemia are at risk of continuing the condition as they enter their childbearing years. If left untreated, anemia that develops during adolescence can potentially persist into pregnancy and increase the risk of obstetric complications. This condition can cause various pregnancy complications, including an increased risk of giving birth to a baby with low birth weight (LBW), which can ultimately lead to stunting. As a preventative measure, the Indonesian government has issued a circular from the Director General of Public Health No. HK.03.03/V/0595/2016 concerning the provision of iron-fortified tablets (TTD) to adolescent girls and women of childbearing age. This intervention is implemented through the School Health Unit (*UKS*) within the school environment (Kementrian Kesehatan RI., 2020; Tonasih et al., 2019)

In Indonesia, approximately 76.2% of adolescent girls received iron-containing tablets (IB) within 12 months. However, only 1.4% of them took them correctly, taking one tablet per dose. The coverage of iron-containing tablets (IB) among adolescent girls in Indonesia was 78.9% in 2023). In 2021, the coverage of iron supplement (TTD) provision among adolescents in Indonesia reached 61,3% (Dinas Kesehatan Provinsi Jawa Tengah., 2023) . There are no reported data on iron-containing tablets (IB) compliance among adolescent girls in Central Java. Meanwhile, there are no reports on iron-containing tablets (IB) compliance among adolescent girls in Kartasura. Based on these data, adolescent girls in Indonesia and Central Java have not yet reached targets for iron-containing tablets at either the national or provincial levels.

Adherence of adolescent girls to iron supplement consumption is influenced by adolescent knowledge, adolescent attitudes, peer support, parental support, and adolescent girls' perceptions(Kustini & Purnamawati, 2023; Yanniarti et al., 2023). Referring to the results of previous literature reviews using the health belief model, it was found that there is an influence between perceived threat, perceived benefits, perceived barriers, and self-efficacy related to adherence to iron supplement consumption. However, perceived susceptibility and perceived seriousness have no relationship with iron supplement compliance. Then, perceived benefit is the perception of benefits felt by adolescent girls if they consume iron supplement. Next, perceived susceptibility or vulnerability is the perception of adolescent girls that they feel vulnerable to anemia if they do not consume iron supplement, then perceived barriers or obstacles that can affect the willingness of adolescent girls to consume iron supplement. The next aspect is self-efficacy, which is the ability of adolescent girls to be able to consume iron supplement, if they have a strong belief, it will influence the consumption of iron supplement by adolescent girls (Amir & Djokosujono, 2019). Research in Semarang showed a significant relationship between perceived vulnerability, perceived seriousness, perceived barriers, and perceived confidence in iron supplement intake among adolescent girls (p=0.00). Perception of vulnerability, among respondents, led to non-compliance with iron supplement consumption. Poor perception of seriousness was associated with iron supplement consumption (p=0.001). Furthermore, perceived barriers were associated with iron supplement compliance. Perception of confidence was associated with iron supplement compliance (p=0.023) (Lismiana & Indarjo, 2021).

In Kartasura, there are 12 adolescent posyandu (integrated health post) that distribute iron tablets once a month, and Kartasura Community Health Center (*Puskesmas*) officers provide iron tablets for adolescent girls every week and distribute them through school health centers (*UKS*). However, some girls still do not consume iron tablets, and some have consumed them but are not compliant. Each adolescent girl has a perception of threats, vulnerabilities, benefits, obstacles, and self-efficacy that influence their compliance in consuming iron tablets. However, in Kartasura, there has been no research examining various aspects that influence compliance in consuming iron tablets. Based on the literature review, the HBM theory was used to assess the extent of mothers' perceptions regarding understanding and awareness in implementing stunting care and prevention measures. In addition, the HBM theory was used to systematically examine the use of the HBM theory in understanding health behaviors related to chronic kidney disease, as well as the effectiveness of the HBM theory in facilitating behavioral changes. Furthermore, the HBM theory was used to analyze the influence of perceptions, motivations, and beliefs on behaviors to prevent hypertension complications. Studies using the HBM theory in Surabaya have already been conducted on high school students (Anuar et al., 2020; Hermanto & Katmini, 2021; Noor & Muniroh, 2023). Therefore, the novelty of this study lies in the use of a population of adolescent girls from four schools with a high prevalence of anemia in the Kartasura Community Health Center (*Puskesmas*) working area. This study aims to identify various factors influencing adherence, so that the results can be useful in designing appropriate and appropriate health promotion methods for adolescents.

LITERATURE REVIEW

Anemia occurs when hemoglobin (Hb) levels in the blood fall below normal limits. According to the World Health Organization (WHO) definition, anemia occurs when the body experiences low hemoglobin levels or the blood's oxygen-carrying capacity is insufficient to meet the body's physiological needs. Anemia is generally defined as a condition where the hemoglobin level is less than 12 g/dL in women and less than 13 g/dL in men, or when the red blood cell count is below 4.2 million/µL. Factors causing anemia include deficiencies in iron, folate, vitamin B12, and vitamin A, chronic inflammation, parasitic infections, and congenital abnormalities. Symptoms of anemia include fatigue, weakness, dizziness, and drowsiness (WHO, 2019).

Compliance is defined as an individual's behavior in taking medication, making lifestyle changes, and consistently visiting healthcare facilities (Pertiwi, 2019). Compliance with iron tablets is assessed by the appropriate amount, method of consumption, and frequency of tablet consumption (Suaib et al., 2024). Knowledge is a crucial factor influencing compliance, but it doesn't always guarantee behavioral change (Yanniarti et al., 2023). Furthermore, attitude is a form of supportive or unsupportive reaction to an object; knowledge can influence a person's attitude (Putri et al., 2024).

Social support from teachers, parents, and peers is crucial. Parents play a role in monitoring iron tablet consumption at home or reminding students to schedule iron tablet consumption. Meanwhile, peers provide moral and material support to motivate and encourage them to pursue a goal. Teachers play a key role in promoting health at school, thereby encouraging healthy behaviors (Darmayanti, 2019; Darmini, 2020; Nilawati, 2023).

Perception is a key variable used in preventing or treating individual illnesses, as well as motivating preventive measures. Research conducted by (Lestari et al., 2021) indicated a significant association between perception and iron tablet consumption, with a p-value of 0.0. Therefore, understanding perceptions is fundamental to designing interventions. One approach used to analyze perceptions is the Health Belief Model (HBM).

According to (Setiari & Sulistyowati, 2018) the HBM serves as a framework for understanding how individual motivation is formed in disease prevention efforts, including adherence to iron tablet consumption. The HBM consists of six components: first, perceived susceptibility, which refers to a person's likelihood of contracting a disease. Second, perceived severity is an individual's perception of the serious impact of a disease, both physically (death, disability, pain) and socially (interference with work, family, and social relationships). Third, perceived benefits is an individual's belief that preventive measures will bring benefits, thus encouraging them to take them. Fourth, perceived barriers are obstacles experienced by a person in taking preventive measures, such as shame, fear, lack of knowledge, minimal support, limited time, and costs. Fifth, self-efficacy is a feeling of confidence in oneself to successfully carry out an activity, and Cues to action are triggers that encourage a person to start taking preventive measures (Pramono, 2018).

METHOD

This study employs an observational analytical study design with a cross-sectional approach. The independent variables studied include perceived susceptibility, perceived barriers, perceived benefits, perceived severity, and self-efficacy, while the dependent variable is adherence to iron supplementation (TTD) consumption. The study was conducted in July 2024 within the Kartasura Community Health Center service area with a population of 758 female students from several schools, students from several schools, two public senior high schools and two public junior high schools. This study involved 147 female students. The sample size was determined using the Lemeshow formula as follows:

$$n = \frac{N\left(Z^2_{1-\alpha/2}\right).p.q}{d^2\,(N-1) + \left(Z^2_{1-\alpha/2}\right).p.q}$$

Where n is the required sample size, N is the population size, $Z_{1-\alpha/2}$ is the z-value for a 95% confidence level, p is the estimated proportion, q=1−p and d is the margin of error. In this study, N=758, $Z_{1-\alpha/2}$ =1.96, d=0.05, and the proportion was set at p=0.62 (Kamarullah, 2023), so q=0.38. Substituting these values into the formula yielded a minimum required sample size of 130 female students. To account for potential non-response, the sample size was increased to 147 female students, and the samples were selected using proportional random sampling techniques.

Data collection was carried out through a questionnaire that had been tested for validity and reliability at SMK Muhammadiyah Kartasura. The questionnaire was distributed directly to respondents at each school under the supervision of the researcher. Prior to completion, respondents were informed about the purpose of the study and provided their informed consent. Data collection was conducted in classrooms during school hours, with each session taking approximately 15–20 minutes per respondent.

The validity test was conducted on 30 respondents with an r-table value of 0.361, while the reliability test produced an Alpha coefficient value for each variable, namely perceived susceptibility (0.777), perceived benefits (0.861), perceived barriers (0.898), perceived severity (0.931), and self-efficacy (0.946). All statements were declared reliable because the Alpha coefficient value was > 0.6. Each variable was categorized into two based on the average value (mean). The perceived susceptibility variable is categorized as high if the value is ≥ 2.1156 and low if < 2.1156, perceived benefits are high if the value is ≥ 5.5170 and low if < 5.5170, perceived barriers are high if the value is ≥ 3.5102 and low if < 3.5102, perceived severity is high if the value is ≥ 7.1293 and low if < 7.1293, self-efficacy is high if the value is ≥ 5.9252 and low if < 5.9252. These cut-off values were determined based on the median score of each variable, as the median was deemed suitable for classifying

respondents into high and low categories. Iron tablet consumption compliance is categorized as compliant if consuming iron tablet at least once a week, and non-compliant if less than that. Data analysis was performed using multivariate logistic regression with a significance level of $\alpha = 0.05$ and a 95% confidence interval (CI) to determine the dominant factors influencing iron tablet consumption compliance. This research has been ethically approved with Number 343/KEPK-FIK/V/2024.

RESULT AND DISCUSSION

This study was conducted among female students within the working area of the Kartasura Community Health Center, involving two public senior high schools and two public junior high schools, with a total of 147 respondents. The characteristics of the respondents in this study are presented in the following table.

Table 1. Characteristics Of Repondents

Characteristics of Repondents	Frequency (N= 147)	Percentage (%)
Age		
12 -13 years	17	11.5
14 -15 years	58	39.5
16 – 17 years	72	49.0
School of Origin		
Public Junior High School 1	34	23.1
Public Junior High School 2	28	19.0
Public Senior High School 1	46	31.3
Public Senior High School 2	39	26.6
Grade Level		
Grade 8	17	11.6
Grade 9	45	30.6
Grade11	66	44.9
Grade 12	19	12.9

The majority of respondents were aged 16-17 years (72 people) (49.0%). The majority of respondents were also from Public Senior High School (46 people) (31.3%). Furthermore, the majority of respondents were in grade 11 (66 people) (44.9%) (Table 1).

The results of the study revealed that the majority of respondents had a low perceived susceptibility category, namely 62.6%. Then, the majority of perceived benefits regarding TTD consumption were in the high category, namely 55.8%. Next, the majority of respondents' perceived barriers to TTD consumption were in the low category, namely 53.8%, and the majority of respondents' perceived severity towards TTD consumption was in the high category, namely 56.5%. The next aspect of self-efficacy towards TTD consumption, most had high self-efficacy, namely 72.1%. Furthermore, compliance, some respondents were not compliant in consuming TTD, as much as 55.8% (Table 2).

Bivariate analysis revealed a significant correlation between perceived susceptibility and adherence to iron supplementation in adolescent girls, with a p value of 0.019 ($p < 0.05$). Meanwhile, perceived benefits, perceived barriers, perceived severity, and self-efficacy variables did not significantly influence iron supplementation adherence, as each had a p value > 0.05 (Table 3).

The multivariate analysis revealed that perceived susceptibility had an odds ratio (OR) of 2.594. This indicates that adolescent girls with high perceived susceptibility were 2.594 times more likely to be more compliant with iron supplement consumption compared to those with low perceived susceptibility. A p-value of 0.009 ($p < 0.05$) indicates that perceived susceptibility significantly influenced iron supplement compliance.

Meanwhile, perceived barriers had an OR of 0.470, indicating that the higher the perceived barriers, the less likely adolescent girls were to be compliant with iron supplement consumption. A p-value of 0.031 ($p < 0.05$) indicates that perceived barriers significantly influenced iron supplement compliance (Table 4).

Table 2. Perception and Compliance of Adolescent Girls Toward Iron Supplement Consumption in the Working Area of Kartasura Community Health Center

Types of Perception	Frequency (N=147)	Percentage (%)
Perceived Susceptibility		
High	55	37.4
Low	92	62.6
Perceived Benefits		
High	82	55.8
Low	65	44.2
Perceived Barriers		
High	79	53.8
Low	68	46.2
Perceived Severity		
High	83	56.5
Low	64	43.5
Self Efficacy		
High	106	72.1
Low	41	27.9
Compliance		
Compliant	65	44.2
Non - Compliant	82	55.8

Table 3. Relationsip Between Perception and Compliance of Adolescent Girls Toward Iron Supplement Consumption

Variable	Iron Tablet Compliance				Total		p-value
	Compliant		Non - Compliant		N	%	
	n	%	n	%			
Percived Susceptibility							
Low	48	52.2	44	47.5	92	100	0.019
High	17	30.9	38	69.1	55	100	
Perceived Benefits							
Low	29	44.6	36	55.4	65	100	1.000
High	36	43.9	46	56.1	82	100	
Perceived Barriers							
High	24	35.3	44	64.7	68	100	0.064
Low	41	51.9	38	48.1	79	100	
Perceived Severity							
High	31	37.3	52	62.7	83	100	0.082
Low	34	53.1	30	46.9	64	100	
Self Efficacy							
High	46	46,9	60	59,1	106	100	0.891
Low	19	46.3	22	53.7	41	100	

Table 4. Logistic Regression

Variable	OR	p-value	95% CI	
			Lower	Upper
Perceived Susceptibility	2.594	0.009	1.264	5.323
Perceived Barriers	0.470	0.031	0.237	0.934

The results of the logistic regression test in this study revealed that perceived susceptibility and perceived barriers had a significant relationship with adherence to iron tablet consumption (ITC). The perceived susceptibility variable obtained a p-value of 0.009 and a confidence interval (95% CI: 1.264–5.323). This study indicates that adolescent girls with high perceived susceptibility are 2.60 times more likely to adhere to iron tablet consumption than those with low perceived susceptibility. This finding is in line with previous research which stated that perceived susceptibility is related to adherence to iron tablet consumption. Individuals who feel at risk of contracting a disease tend to be more proactive in taking preventive measures (Narsih & Hikmawati, 2020). In contrast to the findings of research conducted (Ainaya et al., 2022)which showed that the perceived susceptibility variable was not statistically related to the intention to consume iron tablets, in this study, most respondents had a good perception of susceptibility to anemia. This indicates that respondents were aware of the high risk of developing anemia and viewed anemia as a serious health problem.

Meanwhile, research in Iran shows that perceived vulnerability is associated with anemia prevention behavior in adolescent girls. Increased perceived vulnerability after education impacted preventive behavior, including adherence to iron tablet consumption (Mirzaei et al., 2018).

Adolescent girls are considered a high-risk group, particularly due to monthly menstruation. Additionally, other factors such as stress, irregular eating patterns, and late meals also contribute to an increased risk of anemia in adolescent girls (Handayani & Budiman, 2022). Questionnaire analysis revealed awareness of their vulnerability to anemia due to not taking the recommended one iron tablet per week. Several factors contributing to this non-compliance include laziness and post-consumption side effects, including nausea and discomfort (Putra et al., 2020).

Several programs have been implemented by schools to improve adolescent girls' compliance. These programs include education about anemia using leaflets and posters, involving parents in monitoring compliance, coordinating with guardians through WhatsApp groups, and distributing iron tablets weekly on Fridays. In addition, schools require students to collect ITC packaging as proof of consumption. These efforts are expected to foster a higher perception of vulnerability among adolescents, thereby increasing compliance with ITC consumption.

The strategies implemented by each school showed variation. Two schools actively involved parents as supervisors of iron tablet consumption, while others relied on internal monitoring by teachers and homeroom teachers. Therefore, additional, innovative strategies are needed, such as digital technology-based monitoring through an app equipped with a weekly reminder feature. Peers can remind and encourage each other to take TTD regularly, adolescent girls generally spend more time with their peers than with their parents, so peer influence affects their habits in taking TTD (Mukharomah, U & Budiono, 2024).

A good understanding of the importance of iron tablet consumption is a supporting factor in fostering compliance. This aligns with Surah Al-Baqarah, verse 269, which explains

that Allah grants wisdom and knowledge to whom He wills. In this context, knowledge is crucial for adolescent girls to understand the risks of anemia and the importance of regular iron tablet consumption.

In addition to perceived susceptibility, another influential variable is perceived barriers. This study showed a p-value of 0.031, indicating a statistically significant effect between perceived barriers and adherence to iron supplement consumption (95% CI = 0.237–0.934). This means that adolescent girls with low perceived barriers were 0.47 times more likely to adhere to iron supplement consumption than those with high perceived barriers. This finding aligns with previous research, which found that when perceived barriers are minimal, individuals are more likely to take preventive health measures (Lismiana & Indarjo, 2021).

This is in line with research conducted by (Chusna et al., 2021), which also found that perceived barriers influence the intensity of iron supplement consumption. In that study, respondents with moderate perceived barriers tended to perceive greater barriers, resulting in lower adherence to iron supplement consumption. Research conducted in Northern Ethiopia, specifically in the Debub Achefer District, West Gojam Zone, Amhara Region, showed that adolescent girls who experienced side effects such as nausea and heartburn tended to have lower adherence to iron tablet (Haile et al., 2024).

Some barriers experienced by adolescent girls included poor taste and packaging of iron tablets (Ferina et al., 2025). Other barriers included nausea after taking iron tablets, dislike of the tablet's smell, laziness, the belief that iron tablets were unnecessary, and forgetfulness. Some adolescents even expressed fear that taking iron tablets could worsen menstrual bleeding (Hidayanty et al., 2025). Schools have attempted to address these barriers through various means, such as regular education, shared iron tablet consumption, provision of iron tablets in the health center (*UKS*), and coordination with parents through WhatsApp groups.

Based on questionnaire results, the most common barrier experienced by adolescents was forgetting to take their iron tablets. This occurs because adolescents often do not immediately take the tablets upon receipt, but instead store them in their bags, thus forgetting to take them as scheduled (Masfufah et al., 2022). Although perceived barriers in the school environment are generally low, interventions based on innovative approaches are still needed. These interventions can include developing an engaging and interactive shared consumption schedule, monitoring by teachers or peer educators, and emotional support from parents in the form of attention, reminders, and appreciation (Nurjanah & Azinar, 2023; Silitonga et al., 2023).

Implications for healthcare management include the role of health workers as motivators, facilitators, and counselors for adolescent girls who experience barriers to iron tablet consumption. This role includes providing education on the benefits of iron tablets, the dangers of anemia, how to manage the side effects of iron tablet consumption, explaining factors that influence iron tablet absorption, such as food and medication, and addressing myths and misconceptions related to iron tablet consumption (Ristanti et al., 2023).

This study has the advantage of providing a clear description of the factors influencing adherence to iron tablet consumption among adolescent girls. Furthermore, the study involved respondents from several schools, allowing the results to better represent the adherence behavior of adolescent girls within the working area of the Kartasura Community Health Center. However, the limitations of this study are that the results of this study were self-reported by the respondents, so there is a possibility of recall bias, as well

as a tendency for respondents to exaggerate answers regarding perceptions and compliance behavior.

CONCLUSION

The findings of this study revealed that perceived susceptibility and perceived barriers were significantly associated with adherence to iron supplement consumption in adolescent girls. Adolescent girls with high perceived susceptibility tended to be more compliant in iron supplement consumption compared to those with low perceived susceptibility. Furthermore, perceived barriers also influenced adherence, indicating that the higher the perceived barriers, the lower the adherence to iron supplement consumption. Barriers perceived by adolescent girls in iron supplement consumption included side effects such as nausea, laziness, and forgetfulness due to not consuming it immediately after being given. Several schools have implemented various efforts to improve iron supplement consumption compliance, such as providing education, distributing iron supplements weekly, and monitoring through the collection of iron supplement packs as evidence of consumption. Furthermore, some schools involve parents in monitoring iron supplement consumption compliance through regular meetings and coordination via WhatsApp groups. These efforts demonstrate that the active role of schools and families is crucial in improving adolescent girls' adherence to iron supplement consumption.

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