

Analysis of *Aksi Bergizi* Activities and Anemia Incidence Among Adolescent Girls in Serang Regency

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Abstract. Anemia in adolescent girls is a public health concern that affects physical development, academic performance, and future quality of life. The government, through the *Aksi Bergizi* Program, has sought to prevent anemia by integrating nutrition education, iron tablet supplementation, and physical activity; however, its effectiveness still requires strengthening. This study aims to analyze the relationship between knowledge, attitudes, dietary patterns (food recall), iron tablet consumption compliance, and Body Mass Index (BMI) with the incidence of anemia in adolescent girls. The research used a cross-sectional analytic design involving 100 female students from SMPN 2 Ciruas, Serang Regency, selected through total sampling. Data were analyzed using the chi-square test. The results showed a significant relationship between knowledge, attitudes, food recall, iron supplement tablets consumption compliance, and BMI with the incidence of anemia ($p < 0.05$). These findings indicate that anemia prevention requires not only improved knowledge but also changes in attitudes, compliance with health behaviors, and comprehensive nutritional improvements.

Keywords: *Aksi Bergizi*, anemia, adolescent girls

1 Introduction

Anemia continues to pose a major global health challenge, exerting wide-ranging effects on the physical, social, and economic well-being of populations across the world. The condition disproportionately affects women in developing countries, including Indonesia, due to nutritional deficiencies and limited access to preventive healthcare [1]. Anemia in adolescent girls remains a public health issue that requires serious attention. Adolescent anemia has become a key focus of government initiatives, particularly within the implementation of targeted strategies aimed at accelerating stunting reduction, as outlined in Peraturan Presiden Nomor 72 Tahun 2021 [2]. Female adolescents face a heightened risk of anemia due to inadequate iron intake and absorption, menstrual blood loss, and increased iron requirements associated with rapid growth [1]. This condition may result in reduced productivity, impaired cognitive performance and development, as well as a greater susceptibility to various infections.

This condition is characterized by low hemoglobin levels in the blood, which reduce the body's capacity to transport oxygen [3]. Anemia is identified through the examination of hemoglobin (Hb) levels in the blood using the Cyanmethemoglobin method [4]. Adolescent girls and women of reproductive age are classified as anemic if their hemoglobin concentration is below 12 g/dL [5]. According to the Ministry of Health [6], the symptoms of anemia can be divided into three categories.

1. Mild Anemia: In the initial stage, anemia typically presents without noticeable symptoms. When the muscles receive less oxygen than required, individuals may experience fatigue, weakness, and sluggishness after engaging in physical activity. These symptoms are often overlooked or mistaken for normal tiredness. Additionally, insufficient oxygen supply to the brain can result in reduced concentration and forgetfulness—collectively referred to as the “5L” symptoms: *Lethargy*, *Listlessness*, *Lassitude*, *Lack of energy*, and *Lapses in memory*.
2. Moderate Anemia: At this stage, the signs become more evident, including heart palpitations, shortness of breath during mild activity, increased fatigue, and a noticeably paler complexion.
3. Severe Anemia: In the advanced stage, symptoms intensify and may include chronic exhaustion, rapid heartbeat, extreme pallor, shortness of breath, chest discomfort, and dysfunction of vital organs due to oxygen deprivation.

Adolescent girls are a vulnerable group because they are in a phase of rapid growth and also experience menstruation, leading to increased iron requirements that are often not met through daily dietary patterns [7], [8]. Adolescents with anemia may experience declines in learning ability, productivity, and endurance, and are also at risk of complications during future pregnancies. If left untreated, anemia during adolescence may continue into pregnancy, elevating the risk of delivering low birth weight infants and increasing the likelihood of both maternal and neonatal mortality [9]. Iron deficiency, inadequate dietary patterns, excessive blood loss, and hereditary factors are the main causes of anemia in adolescent girls [7]. As a global health issue, anemia is also an indicator of poor nutritional status, which has implications for a country's economic development.

A preliminary study conducted in September 2024 at SMPN 1 Ciruas, Serang Regency, revealed that out of 200 seventh-grade female students who were screened, 49 (24.5%) were diagnosed with anemia. During the program's implementation, it was found that most adolescent girls lacked an understanding of the importance of consuming Iron-Folic Acid Tablets (IFAT) and did not take them regularly. In addition, no structured monitoring and evaluation mechanism was in place to assess the program's effectiveness in reducing anemia rates. Based on the study conducted by Triana [10] on the relationship between risk factors and the incidence of anemia among students at MAS PP Nuruddin, the univariate analysis revealed that the majority of adolescent girls experienced anemia, accounting for 19 individuals (63.3%). Similarly, research by Indrawatiningsih et al. [11] identified 32 adolescents diagnosed with anemia. In the study of Yulianti et al. [12], 39 adolescent girls, representing 60% of participants, were found to suffer from anemia associated with nutritional status, menstrual irregularities, and limited knowledge. Furthermore, findings from Widyanthini

and Widyanthari [13] reported that 7.4% of adolescent girls were affected by anemia, while research by Muhayati and Ratnawati [14] indicated a higher prevalence, with 100 adolescents (53.2%) identified as anemic. Collectively, these findings demonstrate that anemia continues to pose a considerable public health concern among adolescent girls across different regions. This persistent issue underscores the urgent need to strengthen preventive efforts through comprehensive nutrition education, improved adherence to iron supplementation, and systematic monitoring and evaluation within school-based health programs.

The prevalence of anemia among adolescents in Indonesia shows an alarming trend. National data indicate an increase from 22.7% in 2013 to 32% in 2018 [15]. At the regional level, Banten Province reported a prevalence of 32% among adolescents aged 13–15 years, while in Serang District, 24.11% of 7th-grade junior high school students were identified as suffering from anemia. The coverage of Iron-Folic Acid Tablet (IFAT) consumption remains low, reaching only 46.47% compared to the national target of 70% [16]. This condition has long-term health implications, including risks of cognitive impairment, decreased academic performance, and complications during future pregnancies [17]. In adolescent girls, anemia is generally caused by increased iron requirements due to menstruation and rapid growth, which are often not matched by adequate iron intake [18].

Adolescent girls are particularly vulnerable to anemia due to increased nutritional demands associated with rapid growth, blood loss during menstruation, and an unbalanced diet deficient in iron [2]. Adolescence is a critical period marked by accelerated physical development, during which the body requires higher amounts of essential nutrients, including iron for hemoglobin synthesis in the blood and myoglobin in muscles. Menstrual blood loss further contributes to the depletion of iron stores, while dietary intake is often inadequate to compensate for this loss. This condition is aggravated by the tendency of adolescent girls to engage in restrictive dieting or limit the consumption of specific foods, leading to reduced energy and iron intake. Moreover, the frequent consumption of fast food that is high in calories but poor in micronutrient content increases the risk of iron deficiency and anemia [19]. Another contributing factor influencing hemoglobin levels in adolescent girls is Body Mass Index (BMI). Adolescents with low BMI are more likely to experience decreased hemoglobin levels due to insufficient nutritional intake, particularly iron, which is essential for red blood cell formation [20]. According to Triana [10], key risk factors associated with anemia among adolescent girls include limited knowledge, prolonged menstruation, and unhealthy dietary patterns. Similarly, Izzara [21], reported that poor eating habits and inadequate nutritional intake are significantly correlated with the prevalence of anemia. Adolescents with poor nutritional status are estimated to be approximately 11.7 times more likely to develop anemia compared to those with adequate nutritional status.

Limited knowledge about anemia among adolescents contributes to their inadequate understanding of the condition and its health implications. The cognitive domain of knowledge encompasses six hierarchical levels: knowing, understanding, applying, analyzing, synthesizing, and evaluating. However, most adolescent girls remain at the basic level of merely knowing, without the ability to apply this under-

standing in daily health practices [22]. According to Agustina [23], adolescents with a good level of knowledge are approximately 5.9 times more likely to adhere to the recommendation of consuming iron supplements compared to those whose knowledge remains moderate. Furthermore, findings by Masfufah et al. [20] demonstrated a significant association between knowledge level and the incidence of anemia, where adolescents with limited understanding were found to have a greater likelihood of developing anemia [24].

Attitude refers to an individual's predisposition or readiness to respond to a particular object or situation. It can manifest as either a positive or negative tendency. Individuals with a positive attitude generally express interest, enthusiasm, and optimism toward the object, whereas a negative attitude reflects feelings of aversion, disapproval, or indifference. A positive attitude plays a crucial role in enhancing awareness of the risks associated with anemia and the importance of preventive measures, such as regular iron supplementation and maintaining a balanced diet [25]. Findings from previous studies indicate that although 80% of respondents demonstrated a positive attitude toward anemia prevention, only 48% consistently practiced appropriate preventive behaviors [26].

The demanding routines of adolescent girl such as school activities, organizational involvement, and academic commitments often result in irregular eating habits. Moreover, their frequent consumption of foods that inhibit iron absorption can negatively affect hemoglobin levels in the body. Nutritional imbalance is another contributing factor to anemia among adolescents, particularly when they adopt restrictive diets or avoid certain types of food, leading to reduced nutrient intake. Such practices force the body to utilize its stored iron reserves, thereby accelerating the onset of anemia [27]. Previous studies have also indicated that insufficient iron intake and a monotonous diet significantly increase the risk of anemia among adolescent girls [28].

The issue of low hemoglobin levels in developing countries is often associated with unstable economic conditions that contribute to deficiencies in energy and protein intake. This situation is reflected in a low body mass index (BMI) and reduced upper arm circumference, as well as inadequate consumption of iron-rich foods [29]. Muchtar [30][30] reported that although most adolescent girls have a normal nutritional status, continuous education and awareness regarding self-monitoring of nutritional conditions remain essential to prevent nutrition-related health problems such as anemia.

Screening for anemia in adolescent girls is crucial because this group is undergoing rapid growth and requires higher iron intake [31]. Early detection enables preventive and corrective measures to be implemented to avoid further complications such as chronic fatigue, concentration disorders, and decreased academic performance [32]. One of the primary interventions to prevent anemia is the consumption of Iron Supplement Tablets, which contain iron and folic acid to support hemoglobin formation [33]. In addition to Iron Supplement Tablets, the intake of nutritious foods such as green vegetables, legumes, red meat, and vitamin C-rich fruits is important to enhance iron absorption. Regular physical activity and maintaining healthy breakfast habits also contribute to supporting adolescent health and preventing anemia [34]. To address this issue, the government introduced the Aksi Bergizi Program as an inte-

grated intervention aimed at reducing anemia rates among adolescent girls. This program includes nutrition education, physical activity, healthy breakfasts, and the provision of iron supplements in schools [33], [35]. However, its implementation still faces challenges, including low levels of adolescent knowledge, poor compliance with iron supplementation, and limited systematic monitoring and evaluation mechanisms [36]. Nurwijayanti [37] reported that the evaluation of iron supplement tablets consumption revealed an increase in positive attitudes toward regular intake, rising from 12.3% to 47.7%. Despite this improvement, sustained education and closer monitoring are still required to maintain and reinforce consistent adherence to iron supplementation.

Based on this background, this study was conducted to analyze the implementation of the Aksi Bergizi Program and to examine the relationship between knowledge, attitudes, food recall/dietary pattern, Iron Supplement Tablets consumption compliance, and Body Mass Index (BMI) with the incidence of anemia among adolescent girls in Serang District. A monitoring and evaluation-based approach is essential to ensure that program implementation is not only quantitative but also has a tangible impact on reducing anemia rates.

2 Method

This study used a quantitative approach with a cross-sectional design to collect preliminary data on the incidence of anemia in adolescent girls and the factors associated with it, including knowledge, attitudes, eating habits, compliance with iron tablet consumption, and nutritional status in Serang District. The design involved measuring independent and dependent variables simultaneously at a single point in time without any treatment or intervention [38]. According to Setiawan and Lestari [39], a cross-sectional design is an effective approach for examining the relationships among variables within a single period of observation, as it provides an initial yet comprehensive overview of the association between risk factors and specific health outcomes in an efficient manner. Therefore, this study used a cross-sectional design because it aligns with the research objective to analyze the relationship between knowledge, attitudes, dietary patterns, adherence to iron supplementation, and body mass index (BMI) with the incidence of anemia among adolescent girls at a single point in time. This approach enables researchers to obtain a clear understanding of the prevalence of anemia and its associated factors without requiring intervention or long-term observation. The primary objective is to identify the prevalence of anemia and to analyze the relationship between the Aksi Bergizi program and individual factors contributing to its occurrence.

The population in this study consisted of 102 female adolescents in grades 7 and 8 at SMPN 2 Ciruas. From this population, a total of 100 adolescent girls were selected using the total sampling method. According to Notoatmodjo [40], analytical studies using a cross-sectional design generally require a minimum sample size of 30 to 100 respondents to ensure adequate representation and analytical validity. The use of total sampling in this study aimed to include all individuals who met the inclusion criteria, thereby enabling a comprehensive analysis and a more representative depiction of the

factors influencing anemia among adolescent girls. The inclusion criteria comprised female students aged 12 to 15 years who were enrolled at SMPN 2 Ciruas, understood the objectives of the Aksi Bergizi program, expressed willingness to participate, and were present during data collection. Furthermore, only participants in good health and not undergoing treatment for chronic illnesses were included to ensure that the measurements of hemoglobin levels and nutritional status accurately reflected their physiological condition. Exclusion criteria consisted of adolescents currently receiving medical treatment or medication, as well as those absent during the data collection process, as these factors could compromise the validity and completeness of the collected data.

Based on these criteria, all eligible participants were included in the analysis using a total sampling technique to ensure that the study results provided a comprehensive and representative overview of the factors associated with anemia among adolescent girls. However, two respondents were excluded because they were undergoing medical treatment, resulting in a final sample of 100 participants. The selected sample is considered representative of the adolescent female population in Serang Regency, as all respondents were middle school students within the working area of the Ciruas Public Health Center, one of the active implementers of the Aksi Bergizi program. The selection of SMPN 2 Ciruas was conducted in coordination with the Serang Regency Health Office to ensure that the study accurately reflected the local conditions of adolescent girls. The respondents, aged 12–15 years, came from various socioeconomic backgrounds consistent with the general characteristics of adolescents in Serang Regency [16]. Although the study was conducted at a single school, the similarity between the sample profile and regional demographic data indicates that the findings remain relevant in representing the condition of adolescent girls in the study area.

The instruments used in this study were designed to collect complete, valid, and relevant data aligned with the research objectives. Respondent identity information was obtained using a structured form containing details such as name, age, grade level, and birth order within the family. This form was also used to document anthropometric measurements and anemia status, including body weight, height, hemoglobin levels (Hb), and body mass index (BMI), calculated using the standard formula based on weight and height. Knowledge and attitudes regarding anemia and iron supplementation were assessed through a researcher-developed questionnaire. The knowledge instrument consisted of multiple-choice questions, while the attitude instrument utilized a Likert scale. Prior to the main study, the questionnaire underwent validity and reliability testing at MTs Assalam with a sample of 30 respondents. The validity test results showed that the correlation coefficient (r -count) for the knowledge questionnaire ranged from 0.512 to 0.823, and for the attitude questionnaire from 0.478 to 0.802. Since all r -count values exceeded the r -table value of 0.361, both instruments were declared valid. Reliability testing produced Cronbach's Alpha values of 0.871 for knowledge and 0.854 for attitude, indicating high internal consistency and excellent reliability. Additionally, to record daily food consumption over the previous 24 hours, participants completed a dietary recall form documenting the type, portion, and frequency of food consumed. This data provided a detailed overview of eating patterns, supporting the assessment of adolescent girls' dietary habits.

The Aksi Bergizi Program, which involves nutrition education, iron tablet consumption, and physical activity, is expected to reduce the incidence of anemia commonly experienced by adolescent girls. Data were analyzed using the Chi-Square test to examine the relationship between factors such as knowledge, dietary patterns, iron supplement tablets compliance, and nutritional status with the incidence of anemia. The hypotheses in this study are presented as follows.

Ho : No significant relationship was found between knowledge, attitudes, food recall, compliance with iron and zinc supplement consumption, and body mass index (BMI) with hemoglobin levels among adolescent girls in Serang District

Ha : There is a significant relationship between knowledge, attitudes, food recall, compliance with iron supplement consumption, and body mass index (BMI) with hemoglobin (Hb) levels among adolescent girls in Serang Regency.

3 Results and Discussion

Iron Supplementation Tablets are one of the government's initiatives to reduce anemia in pregnant women and adolescent girls. Iron Supplementation Tablets is a nutritional supplement containing iron equivalent to 60 mg of elemental iron and 400 mcg of folic acid. The distribution of Iron Supplementation Tablets to adolescent girls aged 12–18 years is carried out through integrated nutrition programs in collaboration with UKS (Unit Kesehatan Sekolah) or healthy schools. Reporting and recording the number of Iron-Folic Acid Tablets received by adolescent girls can be conducted independently through several media, including nutritional supplementation cards, control cards, and the CERIA (Cegah Anemia Remaja Indonesia) application as a digital monitoring system.

One of the implementations of the *Gerakan Masyarakat Hidup Sehat* (GERMAS) is the *Aksi Bergizi* Program [35]. Nutrition is a key component and plays a central role in achieving 13 of the 17 Sustainable Development Goals (SDGs). Improving nutrition contributes to the achievement of many other goals that support national development. Adolescent nutrition is particularly crucial, as many nutrition-related habits formed during adolescence persist into adulthood. The main objective of intervention programs such as the *Aksi Bergizi* Program is to increase the knowledge and awareness of adolescent girls about the importance of nutrition and health, especially in preventing anemia. In addition, this program promotes the regular consumption of iron tablets, one of the most effective measures in preventing and addressing iron deficiency anemia. According to the Ministry of Health [35], the steps for implementing the *Aksi Bergizi* Program in schools include the formation of a school health team, program socialization, routine implementation, evaluation, and supervision.

Knowledge is the result of a learning process in which individuals absorb information through the five senses, such as sight and hearing [41]. In the context of anemia, knowledge plays a crucial role in understanding its causes, effects, and prevention, including the importance of iron supplement tablets consumption, which significantly influences the effectiveness of intervention programs [42]. Research by Masfufah et al. [43] demonstrates a significant relationship between knowledge levels

and the incidence of anemia. Adolescent girls with low levels of knowledge are at greater risk of developing anemia [24]. Therefore, increasing knowledge through education is an essential step in the management of anemia. Nutrition education has a significant influence on the balanced nutrition practices of adolescent girls, as their level of knowledge directly shapes their attitudes and behaviors toward food selection [44]. Therefore, a good level of knowledge not only enhances adolescents' understanding of anemia prevention but also fosters the development of sustainable healthy habits related to balanced nutritional intake and adherence to iron supplementation.

Attitude refers to an individual's predisposition to respond to an object, idea, or situation either positively or negatively. A positive attitude toward health serves as a key foundation for promoting preventive behaviors, including efforts to reduce the risk of anemia among adolescent girls. According to Pagiu [45], a favorable attitude facilitates the adoption of healthy practices, such as consistent consumption of iron supplement tablets. However, a study by Hevandari [26] found that although 80% of respondents exhibited positive attitudes toward anemia prevention, only 48% consistently implemented preventive measures. This discrepancy between attitudes and behaviors suggests the influence of external factors such as environmental support, dietary habits, and the availability of iron supplements in schools. Continuous nutrition education is therefore essential to reinforce positive attitudes and translate them into concrete behavioral changes. As emphasized by Magdalena and Hartoyo [46], attitude formation should be supported through comprehensive strategies involving participatory learning, regular monitoring of iron supplement tablets consumption, and motivational support from teachers and health professionals. Thus, fostering positive attitudes toward anemia prevention requires not only adequate education but also active collaboration among schools, families, and health institutions to build an enabling environment that promotes healthy behaviors among adolescent girls.

Food recall is a method used to obtain an overview of an individual's dietary patterns by asking them to recall and report all foods and beverages consumed within the past 24 hours [47]. This method plays an important role in managing anemia in adolescent girls, as it provides information on nutrient intake related to anemia risk, such as iron, vitamin C, folic acid, and protein [48]. Research indicates that low iron intake and limited dietary diversity can increase the risk of anemia in adolescent girls [28]. Moreover, adolescents' low awareness of the importance of iron-rich foods is often compounded by unhealthy eating habits, such as excessive sugar consumption and reliance on nutrient-poor processed foods [49]. Therefore, food recall data are used as the basis for providing more specific nutrition education, promoting nutrient-dense foods, and administering iron supplements as preventive or therapeutic measures against anemia.

One important strategy for reducing the prevalence of anemia in adolescent girls is the habit of regularly consuming iron supplement tablets or iron supplement tablets consumption compliance. The Indonesian Ministry of Health recommends consuming one iron supplement tablet per week for 52 weeks per year [7]. This practice is intended to increase hemoglobin levels and prevent anemia. Research by Nurwijayanti [37] reported that evaluations of iron supplement tablets consumption showed an increase in positive attitudes toward iron supplement tablets intake, from 12.3% to

47.7%. However, more intensive education and monitoring are required to ensure consistency of this practice. Rahmawati and Fauziah [50] emphasize that active school involvement in supervision and motivation plays a crucial role in improving adherence to iron supplement tablets consumption among adolescent girls. Furthermore, the effectiveness of the program is strongly influenced by continuous monitoring and consistent follow-up for students who have not yet developed regular consumption habits [46]. Consequently, the successful implementation of iron supplementation initiatives must be supported by behavioral reinforcement strategies, a conducive school environment, and a sustainable evaluation mechanism to effectively reduce the prevalence of anemia among adolescents [51], [52].

Nutritional status is a key indicator of an individual's health, determined by the balance between nutritional intake and the body's needs. In adolescent girls, nutritional status is assessed using the Body Mass Index (BMI) for age [30]. The Body Mass Index (BMI) is a calculation used to determine whether an individual's weight is proportional to their height. The BMI-for-age (BMI/U) categories, according to Meita et al. (2023), are as follows: (1) Very Thin: < -3 SD, (2) Thin: -3 SD to < -2 SD, (3) Normal: -2 SD to 1 SD, (4) Overweight: > 1 SD to 2 SD, and (5) Obese: > 2 SD. Nutritional status plays a vital role in determining overall health and the risk of various diseases, including anemia among adolescent girls. An imbalance between nutritional intake and the body's physiological needs can lead to metabolic disturbances that affect hemoglobin synthesis and oxygen transport in the bloodstream. Adolescents with poor nutritional status are more susceptible to deficiencies in iron, folic acid, and vitamin B12—micronutrients essential for red blood cell production—whereas excessive nutritional status can impair iron metabolism due to increased systemic inflammation [53]. Therefore, regular monitoring of nutritional status through BMI-for-age (BMI/U) measurements is an important strategy in preventing anemia and promoting the overall health and well-being of adolescents [18], [51].

The implementation of the Aksi Bergizi Program was conducted through several structured stages, encompassing preparation and core activities. During the preparation stage, coordination was established with school administrators, healthcare personnel, and parents to determine the activity schedule. Educational materials on balanced nutrition and anemia prevention were developed, accompanied by the provision of iron tablets for participants and the preparation of facilities to support physical activities, such as sports fields or gymnasiums. The core activities comprised three key components: nutrition education, iron supplement tablets administration, and physical exercise. Nutrition education was delivered by healthcare workers or trained teachers, focusing on the importance of balanced nutrition, the risks of anemia, and the benefits of iron supplementation. The educational content was presented interactively through lectures, discussions, and audiovisual media. The administration of iron supplement tablets was conducted routinely in accordance with the predetermined schedule under the supervision of teachers or healthcare staff, and adherence to supplementation was recorded in a monitoring logbook. The final component, physical activity, was carried out at least once a week and included exercises such as aerobics, light sports, or movement-based educational games. This activity aimed to enhance

physical fitness while simultaneously supporting efforts to prevent anemia among adolescent girls.

The results of the analysis of the relationship between knowledge, attitudes, food recall, iron supplement tablets compliance, and BMI are presented in the following table.

Table 1. The Relationship Between Knowledge and Anaemia

Knowle dge	Anemia						p- value
	Non-Anemia		Anemia		Total		
	F	%	F	%	F	%	
Less	21	29,6	50	70,4	71	100,0	0, 041
Good	3	10,3	26	89,7	29	100,0	
Total	24	24,0	76	76,0	100	100,0	

Based on Table 1, the proportion of anemia was higher among adolescent girls with good knowledge (89.7%) compared to those with poor knowledge (70.4%). Conversely, the proportion of non-anemia was higher in the group with poor knowledge (29.6%) than in those with good knowledge (10.3%). The statistical test results showed a p-value of 0.041 (< 0.05), indicating a significant relationship between knowledge level and the incidence of anemia. Interestingly, anemia was more prevalent among adolescents with good knowledge, which may be influenced by other factors such as an unbalanced diet, low compliance with iron supplementation, or underlying health conditions. These findings suggest that knowledge alone is not sufficient to prevent anemia without corresponding behavioral changes and appropriate nutritional practices.

Table 2. The Relationship Between Attitude and Anemia

Attitude	Anemia						p-value
	Non-Anemia		Anemia		Total		
	F	%	F	%	F	%	
Negative	23	31,5	50	68,5	73	100,0	0,04
Positive	1	3,7	26	96,3	27	100,0	
Total	24	24,0	76	76,0	100	100,0	

Based on Table 2, the proportion of anemia was higher among adolescent girls with a positive attitude (96.3%) compared to those with a negative attitude (68.5%). Conversely, the proportion of non-anemia was higher in the group with a negative attitude (31.5%) than in those with a positive attitude (3.7%). The statistical test results showed a p-value of 0.004 (< 0.05), indicating a significant relationship between attitude and the incidence of anemia. Interestingly, anemia was more prevalent among adolescents with positive attitudes, which may be attributed to other factors such as low compliance with iron supplementation, poor dietary patterns, or underlying health conditions. These findings suggest that a positive attitude alone is not sufficient to prevent anemia without consistent nutritional behavior.

Table 3. The Relationship Between Food Recall and Anemia

<i>Food recall</i>	Anemia						p-value
	Non-Anemia		Anemia		Total		
	F	%	F	%	F	%	
Unbalance	21	29,6	50	70,4	71	100,0	0,041
Balance	3	10,3	26	89,7	29	100,0	
Total	24	24.0	76	76.0	100	100.0	

Based on Table 3, the proportion of anemia was higher among adolescent girls with balanced food recall (89.7%) compared to those with unbalanced food recall (70.4%). Conversely, the proportion of non-anemia was higher in the group with unbalanced food recall (29.6%) than in those with balanced food recall (10.3%). The statistical test results showed a p-value of 0.041 (< 0.05), indicating a significant relationship between food recall and the incidence of anemia. Interestingly, anemia was more prevalent among adolescents with balanced food recall, which may be influenced by factors such as low consumption of animal-based iron sources, poor compliance with iron supplement intake, or nutrient malabsorption. These findings suggest that balanced food recall in terms of quantity does not necessarily fulfill micronutrient requirements if the quality of food sources is inadequate.

Table 4. The Relationship Between Iron Tablet Consumption Compliance with Anemia

Iron Tablet Consumption Compliance	Anemia						p-value
	Non- Anemia		Anemia		Total		
	F	%	F	%	F	%	
Non-Compliant	23	31,5	50	68,5	73	100,0	0,004
Compliant	1	3,7	26	96,3	27	100,0	
Total	24	24.0	76	76.0	100	100.0	

Based on Table 4, the proportion of anemia was higher among adolescent girls who compliant to iron supplement tablet consumption (96.3%) compared to those who did not compliant (68.5%). Conversely, the proportion of non-anemia was higher in the non-compliant group (31.5%) than in the compliant group (3.7%). The statistical test results showed a p-value of 0.004 (< 0.05), indicating a significant relationship between iron supplement tablet consumption compliance and the incidence of anemia. This finding is noteworthy, as anemia was more prevalent in the compliant group. Possible contributing factors include the suboptimal quality and bioavailability of iron in the tablets, insufficient duration of supplementation to improve hemoglobin levels, or the presence of inhibitors of iron absorption, such as consuming tea or coffee near the time of intake. These findings suggest that compliance to iron supplement tablet consumption should be accompanied by education on proper intake methods and dietary improvements to maximize its effectiveness.

Table 5. The Relationship Between Body Mass Index (BMI) and Anemia

BMI	Anemia						p-value
	Non-Anemia		Anemia		Total		
	F	%	F	%	F	%	
Less	18	30	42	70	60	100	0,024
Normal	1	4,3	22	95,7	23	100	
Overweight	0	0	5	100	5	100	
Obesity	2	28,6	5	71,4	7	100	
Total	24	24	76	76	100	100	

Based on Table 5, the highest proportion of anemia was found in the overweight group (100%), followed by the normal group (95.7%) and the obese group (71.4%). In contrast, the highest proportion of non-anemia was observed in the underweight group (30.0%). The chi-square test results showed a p-value of 0.024 (< 0.05), indicating a significant relationship between BMI and the incidence of anemia.

The results of the analysis support the alternative hypothesis (Ha), in which all variables show a significant relationship with the incidence of anemia (p < 0.05). Knowledge levels and positive attitudes do not always correlate directly with lower anemia prevalence. The data indicate that some adolescents with good knowledge and attitudes still experience anemia, possibly due to inconsistent consumption of iron supplement tablets, unbalanced dietary patterns, or other underlying health factors. This suggests that knowledge and attitudes alone are not sufficient to prevent anemia without being translated into actual nutritional behaviors. Dietary patterns, as assessed through food recall, also showed a significant relationship with anemia. However, cases of anemia were still found among adolescents with balanced food recall. This highlights that food quality—not just quantity—plays an important role, for instance, low consumption of animal protein or eating habits that inhibit iron absorption.

Compliance with iron supplement tablet consumption shows a similar pattern. Cases of anemia were still found among the compliant group, which may be influenced by improper consumption methods (e.g., taking the tablets too close to beverages that inhibit iron absorption) or insufficient duration of consumption to significantly increase hemoglobin levels. Therefore, technical education on the correct consumption of iron supplement tablets needs to be emphasized. Nutritional status factors measured by BMI were also found to be significant. Anemia was identified across different BMI categories, including both normal and overweight groups, indicating that proportional body weight does not automatically reflect adequate micronutrient status. This highlights the importance of assessing nutritional status comprehensively, not only from an anthropometric perspective but also in terms of dietary quality.

Based on the findings related to the implementation and impact of the Aksi Bergizi Program on the incidence of anemia among adolescent girls, further efforts are required to ensure the program’s sustainability and long-term effectiveness. Accordingly, systematic monitoring and evaluation activities were conducted as essential components to measure the program’s success and identify areas for improvement in future implementations. The monitoring and evaluation process was designed to assess

both the effectiveness of program delivery and its continuity over time. Monitoring of iron supplement tablets consumption was carried out by documenting student adherence in monitoring logbooks, which were reviewed monthly to evaluate progress and consistency of intake. In addition, adolescents' knowledge and behaviors related to nutrition and anemia prevention were assessed through structured questionnaires to determine changes in attitudes and understanding following participation in the program. Teachers and healthcare personnel were responsible for compiling periodic reports that summarized the implementation progress and outcomes. The results of these evaluations were subsequently discussed during school coordination meetings to serve as the basis for program improvement and follow-up actions, ensuring that the Aksi Bergizi Program operates more effectively and sustainably in the future.

Overall, these findings confirm the hypothesis that knowledge, attitudes, dietary patterns/food recall, iron tablet consumption compliance, and BMI are associated with the occurrence of anemia. However, this association is influenced by the interaction of multiple factors, indicating that preventing anemia requires a more comprehensive intervention. Such interventions should include nutrition education, improvements in dietary behavior, and continuous monitoring of compliance.

4 Conclusion

This study reveals that the occurrence of anemia among adolescent girls in Serang Regency is closely associated with their level of knowledge, attitudes, dietary patterns/food recall, iron tablet consumption compliance, and nutritional status as indicated by BMI. Although some adolescents demonstrate good knowledge and attitudes, these factors alone are not sufficient to prevent anemia without proper iron supplement tablet consumption behavior and a balanced diet. These findings highlight the importance of interventions that go beyond education and are supported by continuous monitoring, evaluation, and assistance to ensure that the Aksi Bergizi program becomes more effective in reducing the prevalence of anemia among adolescent girls.

References

1. A. F. Salsabilla, A. F. Klaudia, F. Zahroh, and I. Maulana, "Empowering Young Women Through the Healthy Without Anemia Movement in Taman Bondowoso Village Pemberdayaan Remaja Putri Melalui Gerakan Sehat Tanpa Anemia di Desa Taman Bondowoso," vol. 7, no. 1, pp. 8–10, 2023.
2. R. Ariana and N. Alam Fajar, "Analisis Faktor Risiko Kejadian Anemia pada Remaja Putri: Literatur Review," *J. Kesehat. komunitas (Journal community Heal.*, vol. 10, no. 1, pp. 133–140, 2024, [Online]. Available: <https://doi.org/10.25311/keskom.Vol10.Iss1>.
3. Z. Deivita, Y., Syafruddin, S., Andi Nilawati, U., Aminuddin, A., Burhanuddin, B., & Zahir, "Overview of Anemia; risk factors and solution offering," *Gac. Sanit.*, vol. 35, 2021.

4. W. H. O, *Iron deficiency anaemia: Assessment, prevention, and control — A guide for programme managers*. Geneva: World Health Organization, 2001.
5. Kementerian Kesehatan Republik Indonesia, *Pedoman Pencegahan dan Penanggulangan Anemia pada Remaja Putri dan Wanita Usia Subur*. Direktorat Gizi Masyarakat, Direktorat Jenderal Kesehatan Masyarakat, Kementerian Kesehatan RI, 2016.
6. Kementerian Kesehatan Republik Indonesia, *Direktorat Gizi Masyarakat, Direktorat Jenderal Kesehatan Masyarakat, Kementerian Kesehatan RI*. Direktorat Jenderal Kesehatan Masyarakat Direktorat Gizi dan Kesehatan Ibu dan Anak, 2023.
7. K. K. RI, *Pedoman Pelaksanaan Pemberian Tablet Tambah Darah pada Remaja Putri dan Wanita Usia Subur*. Kemenkes RI: Direktorat Gizi Masyarakat. 2022.
8. WHO, *Daily iron supplementation in adult women and adolescent girls*. 2024.
9. A. V. Chitekwe S, Torlesse H, “Nutrition in Nepal: Three Decades of Commitment to Children and Women,” *Matern Child Nutr.*, vol. 18, 2022.
10. Ani Triana, “Faktor Resiko Kejadian Anemia Pada Remaja Putri Di Mas Pp Nuruddin,” *Termom. J. Ilm. Ilmu Kesehat. dan Kedokt.*, vol. 1, no. 1, pp. 01–07, 2022, doi: 10.55606/termometer.v1i1.898.
11. Y. Indrawatiningsih, S. A. Hamid, E. P. Sari, and H. Listiono, “Faktor-Faktor yang Mempengaruhi Terjadinya Anemia pada Remaja Putri,” *J. Ilm. Univ. Batanghari Jambi*, vol. 21, no. 1, p. 331, 2021, doi: 10.33087/jiubj.v21i1.1116.
12. Anisa Yulianti, Siti Aisyah, and Sri Handayani, “Faktor-Faktor yang Berhubungan dengan Anemia pada Remaja Putri,” *Lentera Perawat*, vol. 5, no. 1, pp. 10–17, 2024, doi: 10.52235/lp.v5i1.276.
13. D. N. Widyantini and D. M. Widyantari, “Analisis Kejadian Anemia pada Remaja Putri di Kabupaten Bangli, Provinsi Bali, Tahun 2019,” *Bul. Penelit. Kesehat.*, vol. 49, no. 2, pp. 87–94, 2021, doi: 10.22435/bpk.v49i2.3929.
14. A. Muhayati and D. Ratnawati, “Hubungan Antara Status Gizi dan Pola Makan dengan Kejadian Anemia Pada Remaja Putri,” *J. Ilm. Ilmu Keperawatan Indones.*, vol. 9, no. 01, pp. 563–570, 2019, doi: 10.33221/jiiki.v9i01.183.
15. B. P. dan P. Kesehatan., *Laporan Nasional Riset Kesehatan Dasar (Riskesdas) 2018*. Jakarta: Kementerian Kesehatan Republik Indonesia, 2018.
16. D. K. K. Serang, *Profil Kesehatan Kabupaten Serang Tahun 2023*. Serang: Dinas Kesehatan Kabupaten Serang, 2023.
17. L. Andini, F. R., & Agestika, “The Effectiveness of Digital-Based Nutrition Education through Peer-group to Prevent Anemia among Adolescent,” *Amerta Nutr.*, vol. 6, pp. 220–225, 2022, doi: <https://doi.org/10.20473/amnt.v6i1SP.2022.220>.
18. A. R. Indriyani, S., Kusharisupeni, K., & Adawiyah, “Determinan Anemia pada Remaja Putri,” *J. Ilmu Kesehat. Masy.*, vol. 13, no. 02, 2024, doi: <https://doi.org/10.33221/jikm.v13i02.2709>.
19. G. D. Skolmowska D, “Analysis of heme and non-heme iron intake and iron dietary sources in adolescent menstruating females in a national Polish sample,” *Nutrients*, vol. 11, no. 5, 2019.
20. R. Febriayanti S, Masfufah Masfufah, and Ni Ketut Kariani, “Indeks Massa Tubuh (IMT) dengan Kadar Hemoglobin Remaja Putri,” *Vitam. J. ilmu Kesehat. Umum*, vol. 3, no. 1, pp. 10–17, 2024, doi: 10.61132/vitamin.v2i4.729.

21. W. A. Izzara, A. Yulastri, Z. Erianti, M. Y. Putri, and Y. Yuliana, "Penyebab, Pencegahan dan Penanggulangan Anemia pada Remaja Putri (Studi Literatur)," *J. Multidisiplin West Sci.*, vol. 2, no. 12, pp. 1051–1064, 2023, doi: 10.58812/jmws.v2i12.817.
22. A. S. Siyami, K. Achyar, and I. R. Kusuma, "Hubungan Pengetahuan terhadap Kepatuhan Konsumsi Tablet Tambah Darah dengan Kejadian Anemia pada Remaja Putri," *J. Ris. Kesehat. Masy.*, vol. 3, no. 2, pp. 80–86, 2023, doi: 10.14710/jrkm.2023.18844.
23. Agustina, "Analisis Pengetahuan Terhadap Kepatuhan Remaja Putri Dalam Mengonsumsi Tablet Tambah Darah Untuk Pencegahan Dan Penanggulangan Anemia Gizi Besi," *J. Ilmu Kesehat. Masy.*, vol. 11, no. 2, pp. 269–76, 2019.
24. N. S. I. Boli, E. B., Al-faida, N., & Ibrahim, "Konsumsi Tablet Tambah Darah, Kebiasaan Minum Teh, Dan Anemia Pada Remaja Putri Di Nabire," *Hum. Care J.*, vol. 7, no. 1, 2022, doi: <https://doi.org/10.32883/hcj.v7i1.1617>.
25. H. Al *et al.*, "Normalia et," vol. 1, no. 8, pp. 1387–1393, 2025.
26. D. Hevandari, "Pengaruh Intervensi Aksi Bergizi Terhadap Tingkat Kepatuhan Minum Tablet Tambah Darah (Fe) Pada Remaja Putri Kelas VIII Di SMPN 2 Sukodono Kecamatan Sukodono Kabupaten Lumajang," *J. Ilm. Ilmu Kebidanan*, vol. 14, no. 3, 2023.
27. B. A. Estri and D. K. Cahyaningtyas, "Hubungan Imt Dengan Kejadian Anemia Pada Remaja Putri Di Sman 2 Ngaglik Kabupaten Sleman," *JKM (Jurnal Kesehat. Masyarakat) Cendekia Utama*, vol. 8, no. 2, p. 192, 2021, doi: 10.31596/jkm.v8i2.683.
28. R. Ansari, M. R., Istiti Kandarina, B. J., Kusmayanti, N., Destriyani, D., Masfufah, M., & Fikrinnisa, "The acceptability of weekly iron-folic acid supplementation and its influencing factors among adolescent school girls in Yogyakarta city: a mixmethods study," *Malays. J. Nutr.*, vol. 27, no. 1, 2021, doi: <https://doi.org/10.31246/MJN-2020-0019>.
29. A. P. Harahap, C. E. Pamungkas, A. Amini, and N. Nopitasari, "Hubungan indeks massa tubuh dengan kejadian anemia pada remaja putri di SMP Negeri 14 Mataram," *J. Ris. Kebidanan Indones.*, vol. 3, no. 1, pp. 33–36, 2019, doi: 10.32536/jrki.v3i1.52.
30. R. Muchtar, "Analisis status gizi remaja berdasarkan Indeks Massa Tubuh (IMT) dan faktor yang memengaruhi," *J. Kesehat. Masy. Nusantara*, vol. 9, no. 3, pp. 121–129, 2022.
31. D. Alfianingsih, L., & Purwito, "Status Gizi Pola Makan, Pola Menstruasi dan Kejadian Anemia Pada Remaja Putri," *J. Ilm. Wahana Pendidik.*, vol. 6, pp. 550–563, 2024, doi: <https://doi.org/10.5281/zenodo.10646142>.
32. S. Fauziah, R., Adityatama, F., Palestin, B. T., & Nurhalifah, "Pengaruh Program Pendidikan Gizi terhadap Pola Makan dan Pencegahan Anemia Pada Remaja di SMPN Satap Rambatan," vol. 4, no. 4, pp. 3448–3454, 2023.
33. Kemenkes, *Profil Kesehatan Indonesia Tahun 2024*. Jakarta: Kementerian Kesehatan Republik Indonesia, 2024.
34. F. Novianty, A., "Pendidikan kesehatan tentang anemia dan pemenuhan kebutuhan gizi remaja dalam kaitannya dengan kesehatan reproduksi remaja di SMPN 10 Kota Tangerang," *J. Pengabd. Kpd. Masy. Ungu(ABDI KE UNGU)*, vol. 4, no. 1, 2022.

35. Kemenkes, *Buku Panduan untuk Fasilitator Aksi Bergizi , Hidup Sehat Sejak sekarang Untuk Remaja Kekinian*. Direktorat Kesehatan Masyarakat, 2019.
36. M. Nurjanah, A., & Azinar, "Kepatuhan Konsumsi Tablet Tambah Darah pada Sekolah Percontohan Kesehatan Reproduksi dan Seksualitas," *HIGEIA J. PUBLIC Heal. Res. Dev.*, 2023, doi: <https://doi.org/10.15294/higeia/v7i2/64227>.
37. D. Nurwijayanti, "Evaluasi Kepatuhan Konsumsi Tablet Tambah Darah pada Remaja Putri Melalui Program Aksi Bergizi di Sekolah Menengah Pertama," *J. Kesehat. Reproduksi Remaja Indones.*, vol. 5, no. 1, pp. 33–41, 2024.
38. H. Syapitri, *Buku Ajar Metodologi Penelitian Kesehatan*. Ahlimedia Press, 2021.
39. F. Setiawan, D., & Lestari, *Metodologi Penelitian Kesehatan: Pendekatan Kuantitatif dan Cross-Sectional Analysis*. Jakarta: Prenadamedia Group, 2023.
40. Notoatmodjo, *Metodologi Penelitian Kesehatan*. Jakarta: Rineka Cipta, 2018.
41. A. Syeptri, "Intervention Program Terhadap Pengetahuan Dan Sikap Remaja Putri Tentang Anemia Gizi Besi Di SMA N 1 Kecamatan Talamau Pasaman Barat Tahun 2020," *UNAND*, 2020, [Online]. Available: [http://scholar.unand.ac.id/62288/2/2.BAB 1.pdf](http://scholar.unand.ac.id/62288/2/2.BAB%201.pdf).
42. W. A. Farhan, K., Rahma Maulida, N., & Lestari, "Pengaruh Edukasi Anemia Melalui Media Video Terhadap Pengetahuan, Sikap, Serta Keberagaman Konsumsi Makanan Remaja Putri Di Smp Negeri 86 Jakarta," *J. Nutr. Coll.*, vol. 13, no. 2, pp. 127–138, 2024, [Online]. Available: <http://ejournal3.undip.ac.id/index.php/jnc/>.
43. R. S. Masfufah, M., Kandarina, I., & Padmawati, "Penerimaan remaja putri terhadap tablet tambah darah di Kota Yogyakarta," *J. Gizi Klin. Indones.*, vol. 18, no. 3, p. 145, 2022, doi: <https://doi.org/10.22146/ijcn.37031>.
44. E. R. Astuti, "Literature Review: Factors Causes Anemia in Adolescent Women," *Jambura J. Heal. Sci. Res.*, vol. 5, no. 2, pp. 550–61, 2023, [Online]. Available: <https://ejurnal.ung.ac.id/index.php/jjhsr/index>.
45. H. Windha Pagiu, "Hubungan Pengetahuan Dan Dukungan Guru Dengan Kepatuhan Mengonsumsi Tablet Tambah Darah (TTD) Pada Remaja Putri Di SMAN 4 Tana Toraja," *OBAT J. Ris. Ilmu Farm. Dan Kesehat.*, vol. 2, no. 1, 2024, doi: <https://doi.org/10.61132/obat.v2i1.262>.
46. R. Magdalena, L., & Hartoyo, "Peran Guru dan Tenaga Kesehatan dalam Meningkatkan Kepatuhan Remaja Mengonsumsi Tablet Tambah Darah," *J. Gizi dan Kesehat. Masy. Indones.*, vol. 13, no. 2, pp. 101–110, 2024.
47. R. Madanijah, S., Dwiriani, C. M., & Kolopaking, "Determinant of Highschool Girl Adolescent' Adherence to Consume Iron Folic Acid Supplementation in Kota Depok," *J Nutr Sci Vitaminol*, vol. 66, 2020.
48. M. L. Alfiah, E., Briawan, D., Khomsan, A., Dewi, M., Ekayanti, I., Mardewi, Raut, M. K., Zakaria, A., & Roche, "Coverage and adherence of weekly iron folic acid supplementation among school going adolescent girls in indonesia," *J. Nutr. Sci. Vitaminol. (Tokyo)*, vol. 66, 2020, doi: <https://doi.org/10.3177/jnsv.66.S118>.
49. G. Bhardwaj, A., Sreedevi, A., Vasudevan, S., & Vidyadharan, "Pattern of anaemia, determinants and weekly iron and folic acid supplementation programme among tribal adolescent girls attending a primary health centre in Wayanad, Kerala," *Int. J. Community Med. Public Heal.*, vol. 7, no. 7, 2020, doi: <https://doi.org/10.18203/2394-6040.ijcmph20203017>.

50. S. Rahmawati, N., & Fauziah, "Hubungan Status Gizi dan Kepatuhan Konsumsi Tablet Tambah Darah dengan Kejadian Anemia pada Remaja Putri," *Bunda Edu-Midwifery J.*, vol. 4, no. 1, pp. 22–30, 2024.
51. Y. Pratiwi, D., & Andriani, "Determinants of Iron Tablet Compliance among Adolescent Girls in Indonesia," *Open Public Health J.*, vol. 16, no. 2, pp. 145–152, 2023.
52. W. H. O. (WHO), *Guideline on Weekly Iron and Folic Acid Supplementation for Adolescent Girls and Women of Reproductive Age*. Geneva: WHO Press, 2023.
53. S. Yunita, "Anthropometric indices and body composition in adolescent girls with anemia: A literature review," *J. Manag. Dev. Heal.*, vol. 7, no. 2, pp. 55–64, 2024.
54. A. R. Indriyani, S., Kusharisupeni, K., & Adawiyah, "Determinan anemia pada remaja putri," *J. Ilmu Kesehat. Masy.*, vol. 13, no. 2, pp. 102–110, 2024, doi: <https://doi.org/10.33221/jikm.v13i02.2709>.
55. Y. Putri, F., & Andriani, "Nutritional status and iron metabolism among adolescent girls: Implications for anemia prevention," *Open Public Health J.*, vol. 18, no. 1, pp. 12–20, 2025.