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Factors Associated with the Incidence of Anemia among Adolescent Girls at SMK Bina Sriwijaya Indonesia, Palembang City, 2026

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Abstract

Anemia among adolescent girls remains an important public health concern because it may impair learning concentration and productivity and adversely affect future reproductive health. Dietary practices, adherence to iron–folic acid (IFA) supplementation, and menstrual cycle patterns are among the factors potentially associated with anemia in this population. This study aims to examine the relationships between fast food consumption, adherence to IFA supplementation, menstrual cycle patterns, and anemia among adolescent girls at SMK Bina Sriwijaya Indonesia, Palembang, in 2026. An analytical survey with a cross-sectional design was conducted among a population of 108 adolescent girls, from whom 52 respondents were selected using stratified random sampling. Data were analyzed using the chi-square test at a significance level of $\alpha = .05$. The findings showed that 28 respondents (53.8%) had anemia, 26 (50.0%) frequently consumed fast food, 31 (59.6%) were non-adherent to IFA supplementation, and 27 (51.9%) had abnormal menstrual cycles. Bivariate analysis demonstrated significant associations between fast food consumption

and anemia ($p < .001$), adherence to IFA supplementation and anemia ($p < .001$), and menstrual cycle patterns and anemia ($p < .001$). These findings indicate that dietary behavior, adherence to IFA supplementation, and menstrual health are significantly associated with anemia among adolescent girls. The study contributes empirical evidence supporting integrated anemia-prevention strategies that emphasize balanced dietary practices, reduced fast food consumption, adherence to IFA supplementation, and appropriate monitoring of menstrual health among adolescent girls.

Keywords: Adolescent Girls; Anemia; Fast Food Consumption; Iron–Folic Acid Supplementation; Menstrual Cycle

INTRODUCTION

Adolescence is a developmental stage that bridges childhood and adulthood, generally occurring between the ages of 9 and 16 years. This period is crucial because it involves various physical and psychological changes (Dewina et al., 2025). Adolescents often face several health problems, including anemia due to iron deficiency, as well as nutritional issues such as underweight or overweight conditions (Anggraini, 2025). Anemia itself is a condition in which the blood hemoglobin level falls below the normal threshold, namely less than 12 g/dL in adolescent girls, thereby reducing the blood's capacity to transport oxygen throughout the body (Mawardika et al., 2025).

In 2023, based on 2025 World Health Organization data, the prevalence of anemia among women was 30.7%, and in 2025 around 30% of women aged 15–49 years experienced anemia. Other factors causing anemia include nutritional deficiencies; anemia can also be influenced by various infectious diseases commonly found in certain regions, such as malaria, tuberculosis, HIV, and parasitic infections (WHO, 2025). Based on this data, anemia remains a fairly serious health problem among women of reproductive age worldwide (Utami & Sudaryanto, 2025).

Anemia affects 32% of Indonesian adolescent girls aged between 15 and 24 years, according to statistical data collected nationally (Kemenkes RI, 2023). Among adolescent girls, the incidence of anemia in 2023 was 15.5% for those aged 15–24 years (Kemenkes RI, 2026).

According to data from the South Sumatra Provincial Health Office, the proportion of adolescent girls with anemia reached 57.1% in 2021, around 60% in 2022, and around

68.8% in 2023 (Dinkes Provinsi Sumatera Selatan, 2023) (Dinkes Provinsi Sumatera Selatan, 2025). Data from 2024 showed that 15.73% of 7th- and 10th-grade adolescent girls were identified as anemic, decreasing to 8.49% in 2025. This indicates a decline in the prevalence of anemia among adolescent girls, although the percentage remains high (dinas kesehatan provinsi sumatera selatan, 2025).

According to data from the Palembang City Health Office, in 2024 the number of adolescents with anemia was recorded at 36.6% among 7th-grade students and 37.3% among 10th-grade students. In 2025, these figures decreased to 15.27% for 7th-grade students and 16.77% for 10th-grade students. Despite this decline, anemia remains a health problem with a relatively high prevalence among adolescents (Dinkes Kota Palembang, 2026).

According to school data from SMK Sriwijaya Palembang, the number of female students in 2026 was recorded at 118, consisting of students in grades X and XI. This data indicates that the number of adolescent girls at the school is fairly large, requiring attention to their health conditions, particularly regarding the prevention and management of anemia among adolescent girls.

A factor that influences anemia in adolescent girls is inadequate iron intake (Angeline & Rangnga, 2023; Visco, 2024). Other factors include family income, the monthly menstrual cycle, nutritional status or fast food consumption, and adolescent lifestyles involving dieting to appear slimmer (Anggraini & Ernawati, 2026; Armah et al., 2021). In conclusion, these conditions show that anemia in adolescent girls is influenced by various interrelated factors, so early attention and preventive efforts are needed through improved dietary patterns, healthy lifestyle practices, and increased awareness of the importance of maintaining nutritional status and taking iron supplementation tablets to minimize the incidence of anemia (Anggraini et al., 2020).

The government's program is set out in Regulation of the Minister of Health of the Republic of Indonesia No. 88 of 2014 concerning the criteria for Iron-Folic Acid (IFA) tablets for women of reproductive age and pregnant women. The government has taken action to prevent anemia among adolescent girls through the IFA tablet distribution program, requiring every school to hold weekly IFA tablet consumption activities (Permenkes, 2014).

Numerous previous studies have examined the factors associated with the incidence of anemia among adolescent girls. For example, a study by Nur'aisah (2025) found a

significant relationship between high fast food consumption and the incidence of anemia. In addition, research by Lasmawanti & Ardilla Siregar (2024) demonstrated that abnormal menstrual cycles significantly increase the risk of anemia, while findings by Mardhotillah & Sumarni (2024) and Nurhayati (2023) showed that adherence to iron-folic acid (IFA) tablet consumption is highly effective in reducing that risk. However, a research gap exists among these studies, as each focused only on individual factors in different locations and with different respondent characteristics, without providing a complete picture. This inadequately addressed gap forms the logical basis for conducting the present study, which aims to examine the most relevant factors comprehensively.

Based on this research gap, the novelty offered by this study lies in its analytical approach, which simultaneously examines three independent variables the frequency of fast food consumption, adherence to IFA tablet consumption, and menstrual cycle patterns in relation to the incidence of anemia among adolescent girls. The scientific contribution of this study is to present a comprehensive picture of the extent to which the integration of these three factors dominates or influences a single target population. Specifically, the context and population of this study also offer novelty, as it was applied directly to a group of female students at a vocational high school, namely SMK Bina Sriwijaya Indonesia, Palembang City, in 2026.

This study is grounded in several interrelated core concepts and theoretical foundations, forming a modified framework based on the concepts of Padondan & Restiana (2020), Febriana (2021), and Saputra (2023). Conceptually, the definition of anemia among adolescent girls follows the WHO (2024) and Kemenkes RI (2025) standards, namely a condition in which the hemoglobin level falls below 12 g/dL due to insufficient nutrient intake relative to the high demand for iron. This variable is then linked to the theoretical basis of fast food consumption, which is low in micronutrients (iron, folic acid) and whose processing methods (high temperatures) degrade protein quality; government supplementation guidelines (Permenkes RI No. 88 Tahun 2014) concerning the importance of weekly adherence to IFA tablet consumption; and the theory of abnormal menstrual cycles as a pathway for blood loss and iron depletion from the body.

Based on the results of a preliminary survey conducted at SMK Bina Sriwijaya Palembang in April 2026, grade 10 consisted of 28 female students and grade 11 consisted of 26 female students. Among the students in grades 10 and 11, 10 adolescent girls were

examined, with data obtained through hemoglobin level testing. The examination results showed that 7 students had mild anemia, while 3 students were not anemic. In addition, based on interview results, it was found that several students had abnormal menstrual patterns, frequently consumed fast food, and were non-adherent to IFA tablet consumption, showing symptoms indicative of anemia, such as difficulty concentrating while studying, frequent drowsiness, quick fatigue, and a lethargic appearance (Anggraini et al., 2019).

Based on this background, the present study was motivated by the persistently high incidence of anemia among adolescent girls, which can reduce concentration, academic achievement, and long-term health. Adolescent girls are considered an at-risk group because their iron requirements increase during growth and menstruation. Therefore, this study aims to analyze the factors associated with the incidence of anemia among adolescent girls at SMK Bina Sriwijaya Palembang. The variables studied include fast food consumption, adherence to Iron-Folic Acid (IFA) tablet consumption, and menstrual cycle patterns in 2026.

METHODS

This study used an analytical survey design with a cross-sectional approach, in which the dependent variable (anemia among adolescent girls) and the independent variables (fast food consumption, adherence to IFA tablet consumption, menstrual cycle patterns) were observed and collected simultaneously within the same time period (Sinambela, 2015).

This study was conducted at SMK Bina Sriwijaya Palembang in 2026, with the research carried out in May–June 2026, using students of SMK Bina Sriwijaya as the research subjects.

The population of this study consisted of adolescent girls in grade 10 (5 classes) and grade 11 (5 classes) at SMK Bina Sriwijaya Palembang in 2026, totaling 108 individuals. The sampling technique used in this study was stratified random sampling, in which the population is divided into several groups or strata with certain characteristics. This technique was used to ensure that the resulting sample proportionally and representatively reflects the study population. Using this technique, a sample of 52 adolescent girls with anemia at SMK Bina Sriwijaya Palembang was obtained.

The data used in this study were primary data, obtained directly from respondents through questionnaires. The data collected included fast food consumption, adherence to

Iron-Folic Acid (IFA) tablet consumption, and menstrual cycle patterns among adolescent girls at SMK Bina Sriwijaya Palembang in 2026.

The data processing technique involved data collected on both the independent and dependent variables. Data completed by either the researcher or the respondents were then processed through the following steps: editing, coding, data entry, cleaning, and tabulating (Endra, 2017).

Data analysis in this study used univariate and bivariate analysis (Sugiono, 2024). Univariate analysis was conducted to determine the description or frequency distribution of each variable studied. The variables analyzed included the dependent variable, namely anemia among adolescent girls, and the independent variables, namely fast food consumption, adherence to IFA tablet consumption, and menstrual cycle patterns. Bivariate analysis, meanwhile, was used to determine the relationship between the independent variables fast food consumption, adherence to IFA tablet consumption, and menstrual cycle patterns and the dependent variable, namely anemia among adolescent girls. This analysis was performed using the Chi-Square statistical test with the aid of a computerized system.

The Chi-Square test was used to determine whether or not a relationship exists between two categorical variables. The significance level used in this study was $\alpha = 0.05$. The statistical test results were determined by comparing the p value with the α value: if the p value ≤ 0.05, it can be concluded that there is a significant relationship between the independent and dependent variables, whereas if the p value > 0.05, it can be concluded that there is no significant relationship between the independent and dependent variables (Sugiono, 2024).

RESULTS

Univariate Analysis

This analysis aims to determine the frequency distribution and percentage of the independent variables (frequency of fast food consumption, adherence to IFA tablet consumption, and menstrual cycle patterns) and the dependent variable (anemia among adolescent girls). This analysis is presented in table form and further explained narratively, as follows:

Dependent Variable (Incidence of Anemia)

The variable in this study is anemia among adolescent girls at SMK Bina Sriwijaya Indonesia, Palembang, in 2026, grouped into two categories: anemic, with Hb levels < 12 g/dL, and non-anemic, with Hb levels ≥ 12 g/dL. For further detail, see Table 1 below:

Table 1. Frequency and Percentage Distribution Based on the Incidence of Anemia

Anemia Status	Frequency (f)	Percentage (%)
Anemia	28	53.8
Non-anemic	24	46.2
Total	52	100

Based on Table 1, it can be seen that of the 52 respondents, 28 respondents (53.8%) had anemia and 24 respondents (46.2%) did not have anemia.

Independent Variable (Fast Food Consumption)

The variable in this study is the frequency of fast food consumption among adolescent girls at SMK Bina Sriwijaya Indonesia, Palembang, in 2026, grouped into two categories: rarely and frequently. For further detail, see Table 2 below:

Table 2. Frequency and Percentage Distribution Based on Fast Food Consumption

Fast Food Consumption	Frequency (f)	Percentage (%)
Rarely	26	50
Frequently	26	50
Total	52	100

Based on Table 2, it can be seen that of the 52 respondents, 26 adolescent girls (50.0%) rarely consumed fast food and 26 (50.0%) frequently consumed fast food.

Independent Variable (Adherence to Iron-Folic Acid (IFA) Tablet Consumption)

The variable in this study is adherence to IFA tablet consumption among adolescent girls at SMK Bina Sriwijaya Indonesia, Palembang, in 2026, grouped into two categories: non-adherent and adherent. For further detail, see Table 3 below:

Table 3. Frequency and Percentage Distribution Based on Adherence to Iron-Folic Acid (IFA) Tablet Consumption

Adherence to IFA Consumption	Frequency (f)	Percentage (%)
Non-adherent	31	59.4
Adherent	21	40.4
Total	52	100

Based on Table 3, it can be seen that of the 52 respondents, 31 adolescent girls (59.6%) were recorded as non-adherent to IFA tablet consumption, while the remaining 21 (40.4%) were classified as adherent to taking the supplement.

Independent Variable (Menstrual Cycle)

The variable in this study is menstruation, grouped into two categories: abnormal and normal. For further detail, see Table 4 below:

Table 4. Frequency and Percentage Distribution Based on Menstrual Cycle

Menstrual Cycle	Frequency (f)	Percentage (%)
Abnormal	27	51.9
Normal	25	48.1
Total	52	100

Based on Table 4, it can be seen that of the 52 respondents, 27 adolescent girls (51.9%) had an abnormal menstrual cycle and 25 (48.1%) had a normal menstrual cycle.

Bivariate Analysis

Data analysis to determine the relationship between the independent variables (sleep quality, frequency of junk food consumption, adherence to IFA tablet consumption) and the dependent variable (anemia among adolescent girls) was conducted using the Chi-Square statistical test with the aid of a computerized system. The "Chi-Square" statistical test used follows (Narimawati, 2020). The significance level set in this study was 0.05, which served as the basis for determining whether the relationship between variables was statistically significant. The statistical results were determined by comparing the p value with the α value.

Relationship between Fast Food Consumption Frequency and the Incidence of Anemia among Adolescent Girls

The variables in this study are the independent variable (fast food consumption), categorized as rarely and frequently, and the dependent variable (anemia among adolescent girls), categorized as anemic and normal. For further detail, see Table 5 below:

Table 5. Relationship between Fast Food Consumption Frequency and the Incidence of Anemia

Fast food consumption	Normal		Anemia		Total		P value	OR
	n	%	n	%	N	%		
Rarely	22	84.6	4	15.4	26	100	0,000	10.286
Frequently	2	7.7	24	92.3	26	100		
Total	24		28		52	100		

The results in Table 5.5 show that of the 52 respondents, among the 26 respondents who rarely consumed fast food, 22 (84.6%) were not anemic (normal) and 4 (15.4%) were anemic, while among the 26 respondents who frequently consumed fast food, 2 (7.7%) were not anemic (normal) and 24 (92.3%) were anemic.

Based on the chi-square test results, with a significance level of α = 0.05, a p value of 0.000 was obtained, which is smaller than 0.05. This indicates a statistically significant relationship between the frequency of fast food consumption and the incidence of anemia among adolescent girls. Thus, the hypothesis stating that there is a relationship between fast food consumption and the incidence of anemia is accepted.

The Odds Ratio (OR) value obtained was 10.286, indicating that adolescent girls who frequently consumed fast food had a 10.286 times greater risk of developing anemia compared to those who rarely consumed it.

Relationship between Adherence to Iron-Folic Acid (IFA) Tablet Consumption and the Incidence of Anemia among Adolescent Girls

This study was conducted on 52 respondents, with the independent variable (adherence to IFA tablet consumption) grouped into two categories: non-adherent and adherent. The dependent variable was the incidence of anemia. For further detail, see Table 6 below:

Table 6. Relationship between Adherence to IFA Tablet Consumption and the Incidence of Anemia

IFA Adherence	Normal		Anemia		Total		P value	OR
	n	%	n	%	N	%		
Non-adherent	3	9.4	28	90.3	31	100	0,000	8.000
Adherent	21	100	0	0	21	100		
Total	24		28		52	100		

The results in Table 6 show that of the 52 respondents, among the 31 respondents who were non-adherent to IFA tablet consumption, 3 (9.7%) were not anemic (normal) and 28 (90.3%) were anemic, while among the 21 respondents who were adherent to IFA tablet consumption, all 21 (100%) were not anemic (normal) and none were anemic (0.0%).

Based on the chi-square test results, with a significance level of α = 0.05, a p value of 0.000 was obtained, which is smaller than 0.05. This indicates a statistically significant relationship between adherence to IFA tablet consumption and the incidence of anemia among adolescent girls. Therefore, the hypothesis stating that there is a relationship between adherence to IFA tablet consumption and the incidence of anemia is accepted.

The Odds Ratio (OR) value for the non-adherent cohort was 8.000, indicating that adolescent girls who were non-adherent to IFA tablet consumption had an 8 times greater risk of developing anemia compared to respondents who were adherent.

Relationship between Menstrual Cycle and the Incidence of Anemia among Adolescent Girls

This study was conducted on 52 respondents, with the independent variable (menstruation) grouped into two categories: abnormal and normal. The dependent variable was the incidence of anemia. For further detail, see Table 7 below:

Table 7. Relationship between Menstrual Cycle and the Incidence of Anemia

Menstrual cycle	Normal		Anemia		Total		P value	OR
	n	%	n	%	N	%		
Abnormal	2	7.4	25	92.6	27	100	0,000	91.667
Normal	22	88	3	12	25	100		
Total	24		28		52	100		

The results in Table 7 show that of the 52 respondents, among the 27 respondents with an abnormal menstrual cycle, 2 (7.4%) were not anemic (normal) and 25 (92.6%) were anemic, while among the 25 respondents with a normal menstrual cycle, 22 (88.0%) were not anemic (normal) and 3 (12.0%) were anemic.

Based on the chi-square test results, with a significance level of $\alpha = 0.05$, a p value of 0.000 was obtained, which is smaller than 0.05. This indicates a statistically significant relationship between menstrual cycle and the incidence of anemia among adolescent girls. Therefore, the hypothesis stating that there is a relationship between menstruation and the incidence of anemia is accepted.

The Odds Ratio (OR) value of 91.667 indicates that respondents with an abnormal menstrual cycle had a 91.667 times greater likelihood of developing anemia compared to those with a normal menstrual cycle

The results section should be presented factually, systematically, and in a data-based manner. Authors should report the research findings from the main results to relevant supporting data in accordance with the research objectives, research questions, or hypotheses. This section should not include theoretical interpretation, comparison with previous studies, or in-depth discussion, as these elements should be presented in the Discussion section.

DISCUSSION

Based on the assumptions of this study, the high incidence of anemia among adolescent girls indicates that meeting iron requirements remains a challenge that requires attention. Therefore, preventive efforts are needed through improved dietary patterns, increased consumption of iron-rich foods, and adherence to Iron-Folic Acid (IFA) tablet consumption in order to reduce the risk of anemia among adolescent girls.

The researchers assume that a high frequency of fast food consumption contributes to an increased risk of anemia among adolescent girls. The questionnaire results showed that most respondents in the frequent-consumption category consumed fast food approximately 5–6 times per week to once daily. This relatively high consumption frequency indicates that fast food has become part of the respondents' daily diet. This habit has the potential to cause nutrient intake imbalances, as fast food generally contains more fat, sugar, and sodium than nutrients involved in hemoglobin formation, such as iron, folic acid, and vitamin C. In addition, the fast food processing methods, which use high temperatures, excessive oil, and repeated heating, can reduce the quality of several important nutrients. This condition can prevent micronutrient requirements from being optimally met, even though daily energy requirements are relatively fulfilled. Most respondents who frequently consumed fast food were found to be in the group with anemia. There is a tendency for increased fast food consumption frequency to be followed by an increased risk of anemia. Therefore, controlling fast food consumption and increasing the intake of balanced, iron-rich nutritious foods need to be a focus of anemia prevention efforts among adolescent girls.

The researchers assume that the prevention of anemia among adolescent girls is one of the government's priority programs, implemented through the distribution of Iron-Folic Acid (IFA) tablets at schools, supported by the Puskesmas (Community Health Center) 7 Ulu. Puskesmas 7 Ulu provides 13 IFA tablets every three months (quarterly) for each adolescent girl, to be consumed at a rate of 1 tablet per week, in accordance with the recommendation of the Ministry of Health of the Republic of Indonesia to consume 1 tablet per week containing 60 mg of elemental iron and 400 mcg of folic acid. The success of this program depends not only on the availability and distribution of IFA tablets but also on adolescents' adherence to consuming them. Low adherence among students/adolescents is often caused by the unpleasant taste of the tablets and side effects such as nausea, or incorrect consumption methods, such as taking them together with milk/tea/coffee, which inhibits

iron absorption and can lead to anemia. Adolescents should take IFA tablets once a week with plain water or citrus juice, which can accelerate the iron absorption process.

The researchers assume that most respondents with an abnormal menstrual cycle experienced anemia, specifically 25 respondents (92.6%). Although most respondents had a menstrual cycle of 28–32 days, the majority experienced menorrhagia, a menstrual condition characterized by excessive bleeding volume, marked by pad changes up to approximately six times per day. In addition, 6 respondents experienced metrorrhagia, namely bleeding occurring outside the normal menstrual cycle or between two menstrual periods. Both menorrhagia and metrorrhagia can cause greater blood loss, thereby increasing iron loss and the risk of anemia. Therefore, anemia prevention efforts need to be carried out through adequate balanced nutrition, particularly iron-rich foods, accompanied by IFA tablet consumption as recommended, to help meet iron requirements during menstruation.

The results of this study are consistent with several previous studies that examined the determinants of anemia separately. The finding of a significant relationship between fast food consumption and the incidence of anemia (p-value = 0.000) supports the study of Nur'aisah, (2025); scientifically, this occurs because fast food is generally calorie-dense but low in micronutrients, thereby displacing the intake of iron-rich foods that adolescents greatly need. In addition, the findings regarding adherence to IFA tablet consumption are consistent with Mardhotillah & Sumarni (2024), confirming that this supplement is a crucial intervention for addressing iron deficits during the growth period. From a physiological perspective, this study also reinforces the findings of Lasmawanti & Ardilla Siregar (2024), which demonstrated that an abnormal menstrual cycle, whether in duration or excessive blood volume, triggers blood loss (iron loss) that exceeds the body's compensatory capacity to produce red blood cells.

Although these findings partially confirm previous research, this study provides a new contribution by demonstrating the simultaneous impact of all three factors. Whereas previous studies, such as those conducted by (Lasmawanti & Ardilla Siregar, 2024; Mardhotillah & Sumarni, 2024; Nur'aisah, 2025), focused on analyzing single variables, the results of this study confirm that the incidence of anemia among adolescent girls is a multifactorial problem with strongly cumulative effects (p-value = 0.000). The combined interaction between lifestyle (fast food consumption), health discipline (IFA tablet adherence), and physiological condition (menstrual cycle) demonstrates that anemia

prevention interventions in schools can no longer be conducted partially, but must be integrated to simultaneously encompass dietary improvement, supplement consumption monitoring, and reproductive health education.

This study has several limitations, including the use of a cross-sectional design that observes only a single point in time, so it cannot definitively confirm long-term cause-and-effect relationships. In addition, the study's geographic scope was limited to a single institution, namely SMK Bina Sriwijaya Indonesia, Palembang City, with a relatively small sample size of 52 respondents, so generalizing the results to a broader population of adolescent girls should be done with caution. Due to limitations in time, resources, and cost, the scope of this study was also focused on only three determining variables (frequency of fast food consumption, adherence to IFA tablet consumption, and menstrual cycle patterns).

As a direction for future research, it is recommended to involve a larger sample size with a broader geographic scope or a wider range of school institutions. Future studies are also expected to use a longitudinal design to observe the development of variables over time, as well as to examine other risk factors not covered in this study but theoretically closely related. Several additional variables recommended for investigation include nutritional status (BMI-for-age), adolescents' level of knowledge about anemia, and socio-demographic factors such as parental income and education level.

CONCLUSION

Based on the results of the study at SMK Bina Sriwijaya Indonesia, Palembang City, in 2026, it can be concluded that, simultaneously (jointly), there is a meaningful relationship between the frequency of fast food consumption, the level of adherence to IFA tablet consumption, and menstrual cycle patterns with the incidence of anemia among adolescent girls. This means that these three main factors are collectively interrelated and have a substantial influence on the risk of anemia among female students at that school.

Furthermore, partial (individual) analysis demonstrated that each of the three factors has a highly significant direct relationship with the incidence of anemia. The frequency of fast food consumption, the level of adherence to IFA tablet consumption, and menstrual cycle patterns each independently showed a statistical significance value (p-value) of 0.000. This confirms that each of these variables is a strong and genuine determining factor influencing adolescent girls' vulnerability to anemia.

This study makes a proportional contribution to the development of midwifery science and public health by empirically reinforcing the etiological and pathophysiological theory of anemia, specifically demonstrating that the frequency of fast food consumption, non-adherence to IFA tablet consumption, and abnormal menstrual cycles are significantly associated with decreased hemoglobin levels among adolescent girls. Methodologically, this study presents a more comprehensive analytical model by integrating three variables from different dimensions dietary behavior, supplementation adherence, and physiological condition within a single cross-sectional analytical design, whereas previous literature tended to measure these risk factors separately. Practically, these comprehensive findings provide an evidence-based foundation for SMK Bina Sriwijaya Indonesia, Palembang City, in formulating targeted preventive school health policies, such as restricting fast food consumption and collectively monitoring IFA tablet consumption programs, while also serving as a relevant academic reference for Universitas Kader Bangsa and future researchers.

As a direction for future research, it is recommended to involve a larger sample size with a broader geographic scope or a wider range of school institutions. Future studies are also expected to use a longitudinal design to observe the development of variables over time, as well as to examine other risk factors not covered in this study but theoretically closely related. Several additional variables recommended for investigation include nutritional status (BMI-for-age), adolescents' level of knowledge about anemia, and socio-demographic factors such as parental income and education level.

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