Original Research Article

# ANALYSIS OF FACTORS ASSOCIATED WITH THE INCIDENCE OF ANEMIA AMONG ADOLESCENT GIRLS IN WETLAND AREAS

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**ABSTRACT**

Adolescents are a vulnerable group to nutritional problems due to their rapid growth and development, which require increased nutrient intake. One of the most common nutritional problems among adolescents in South Kalimantan Province is anemia, with a prevalence of 21.60%, and 23.54% in Banjar Regency. This study aims to analyze the relationship between knowledge, attitudes, compliance with iron tablet supplementation, and eating habits, and the incidence of anemia among adolescent girls. This study employed an analytical observational design with a cross-sectional approach. The sample consisted of 47 adolescents selected using a total sampling technique. Data were collected using questionnaires to assess independent variables (knowledge, attitudes, compliance with iron supplementation, and eating habits), and a hemoglobinometer was used to measure hemoglobin (Hb) levels to determine anemia status. Data were analyzed using univariate analysis with frequency distribution tables and bivariate analysis using the Chi-square test. The results showed no significant relationship between knowledge (p = 0.246), attitudes (p = 1.000), compliance with iron supplementation (p = 1.000), and eating habits (p = 0.375) and the incidence of anemia among adolescent girls. However, descriptive findings indicate that poor eating habits tend to increase the risk of anemia.

.***Keywords*** *: Anemia, adolescent girls, iron supplementation, eating habits, knowledge*

## INTRODUCTION

According to the World Health Organization (WHO), adolescents are individuals aged 10–19 years, although some definitions extend this range to 24 years..[1] Adolescents are a group vulnerable to nutritional problems because they are in a phase of rapid growth and development that requires increased nutrient intake.. Adolescent girls experience rapid growth and physiological changes, particularly related to menstruation and reproductive development. . They are more likely to diet to maintain body image, which may reduce iron intake and increase the risk of anemia..[2] Adolescent girls who experienced lack nutrition will hinder development and intelligence brain as well as increase risk suffer disease infection. Because of reduced immune function, adolescent girls with nutritional problems are at increased risk of complications during pregnancy and adverse fetal outcomes..[3] Nutritional problems found in adolescents in South Kalimantan Province are the incidence of anemia with a prevalence of 21.60%. The incidence of anemia was 23.54% in Banjar Regency. This prevalence is still above the provincial prevalence and if the prevalence of anemia is >20% then it is said to be a Public Health problem.[4] The factor that greatly influences the incidence of anemia in adolescent girls is knowledge, which is caused by the lack of information obtained about anemia. In addition,

lack of nutritional intake such as iron is also an important causative factor. Health behavior can also cause anemia, especially those related to a person's food intake.[5] Research by Noor et. Al. (2023) states that if the knowledge of adolescent girls can affect their eating behavior, it will have an impact on nutritional status.[6] If anemia in young women is not immediately resolved and continues, it may impair cognitive function and learning capacity, especially an adolescentstill in its infancy and development.[7] In addition, it increases the risk of becoming an anemic mother in the future and have a 1.8 times greater risk of postpartum bleeding. Then the impact of anemia will be carried away until becoming a pregnant woman will increase the risk of Stunted Fetal Growth, premature childbirth, and Low Birth Weight and result in stunting in children. This study aims to analyze the relationship between knowledge, attitudes, compliance with iron tablet supplementation, and eating habits and the incidence of anemia among adolescents. This study's novelty provides new insights into anemia prevention strategies tailored to adolescent girls living in wetland environments, which have not been widely addressed in previous research.

## METHOD

This study employed an analytical observational design with a cross-sectional approach. This study was conducted in the East Martapura Public Health Center area. Sample size determined with Purposive Sampling, as many as 46 respondents.[8] The sampling technique used was purposive sampling with criteria inclusion willing to participate in the study; had experienced menstruation but were not menstruating during data collection, get additional tablet distribution program blood from Health Center. The instruments used in this study were questionnaires for identify independent variables (knowledge, attitude, compliance of iron tablet suplementation and eating habits), as well as a hemoglobinometer for measure Hb levels for identification anemia incident on adolescent girls. These questionnaires were already valid and reliable. Data were analyzed using univariate analysis with distribution frequency table and bivariate with the Chi Square test.

## RESULTS AND DISCUSSION

### A. Univariate Analysis

#### 1. Knowledge

Table 1. Distribution and Frequency of Knowledge

| Category | Frequency | Percentage |
|---|---|---|
| Less | 2 | 4.3 |
| Good | 44 | 93.6 |
| Total | 46 | 100 |

*source: Primary data, 2025*

Based on the table, out of 46 respondents, only 2 people (4.3%) had level lack of knowledge and as many as 44 people (93.6%) have level good knowledge. This indicates that group or population studied generally have an adequate understanding about current topic evaluated. Very high percentage for category good knowledge also can become indication that the education, counseling, or information received by the group was effective.

#### 2. Attitude

Table 2. Distribution and Frequency of Attitude

| Category | Frequency | Percentage |
|---|---|---|
| Negative | 1 | 2.1 |
| Positive | 45 | 95.7 |
| Total | 46 | 100 |

*source: Primary data, 2025*

Based on table known that as many as 1 respondent (2.1%) of the 46 respondents who had attitude negative meanwhile, 45 people (95.7%) of respondents own attitude positive.

#### 3. Compliance of Iron Tablet Suplementation

Table 3. Distribution and Frequency Compliance of Iron Talet Suplementation

| Category | Frequency | Percentage |
|---|---|---|
| Less obedient | 5 | 10.6 |
| Obedient | 41 | 87.2 |
| Total | 46 | 100 |

*source: Primary data, 2025*

Based on the table showed that as many as 5 people (10.6%) of the total 46 respondents considered not enough obedient, whereas as many as 41 people (87.2%), showed compliance, in overall, this data indicates that in group said, there is trend strong For obedient consume additional tablets blood, although There is A little respondents who need be noticed further explored related with compliance consumption of supplement tablets blood.

#### 4. Eating Habits

Table 4. Distribution and Frequency of Eating Habits

| Category | Frequency | Percentage |
|---|---|---|
| Poor eating habits | 15 | 31.9 |

| Category | Frequency | Percentage |
|---|---|---|
| Good eating habits | 31 | 66.1 |
| Total | 46 | 100 |

*source: Primary data, 2025*

Based on the table showed that 15 people (31.9%) had poor eating habits. Meanwhile, the majority of respondents, as many as 31 people (66.1%), had good eating habits. This shows that nearly one-third from respondent possible no own pattern healthy eating, which can become an area of concern for repair.

**5. Anemia Incidence**

Table 5. Distribution and Frequency of Anemia Incidence

| Category | Frequency | Percentage |
|---|---|---|
| Anemia | 6 | 12.9 |
| No anemia | 40 | 85.1 |
| Total | 46 | 100 |

*source: Primary data, 2025*

Based on table on known that as many as 40 respondents (85.1%) did not have anemia, while 6 respondents (12.9%) were anemic.. Overall, this data indicates that anemia is problem lots of health found in group research. The height number this anemia incident can leading to the need for medical intervention or change life style become a better life, like improvement the intake of essential nutrients for prevent or overcome anemia.

**B. Bivariate Analysis**

**1. Knowledge**

Table 6. Relationship Between Knowledge and the Incidence of Anemia

| Knowledge | Incodence of Anemia | | Total | P value |
|---|---|---|---|---|
| | Anemia | No Anemia | | |
| Less | 1 | 1 | 2 | |
| Good | 5 | 39 | 44 | 0.608 |
| Total | 6 | 40 | 46 | |

*source: Primary data, 2025*

Base on the table showed that of 2 people who have less knowledge less 1 person experience anemia, and 1 person was not experience anemia. As many as 44 people who had good knowledge, 5 people experienced anemia, while 39 people were not. The result of this research showed p-value = 0.608, indicating that there was no significant correlation between knowledge and incidence of anemia. This research in line with research conducted by Ridwan et al (2023) that there is no relationship between knowledge nutrition with incidence of anemia in adolescents girls. Knowledge is an important basis for changing attitudes and behaviors, one of which is eating habits Behaviors based on knowledge tend to be more sustainable, so getting nutritional information is important for adolescents that can be obtained not only through formal education at school but also from various sources such as family, environment, peers (peer group), print media, and electronic media.[9] Although most of those with good knowledge do not experience anemia, these results are insufficient to demonstrate that knowledge is the main factor influencing the incidence of anemia in this group. Thus, factors other than knowledge may play a greater role in determining whether or not someone experiences anemia.

These findings indicate that a high level of knowledge does not always correlate directly with behaviors aimed at preventing anemia in adolescent. Although the majority of respondents possessed good knowledge, there were still respondents who suffered from anemia. This may be due to various other factors that contribute to the development of anemia, such as inadequate nutritional intake, adherence to iron supplementation, health status, economic status, and sociocultural factors. Good knowledge does not necessarily lead to good health practices or behaviors, especially when there are barriers such as limited access to nutritious food, low family support, or side effects from taking iron supplements.[10]

In addition, the very small number of respondents with low knowledge may also affect the results of the statistical analysis. The imbalance in the number of respondents between the low-knowledge and high-knowledge groups can lead to low statistical power, meaning that the actual relationship may not be detected as statistically significant. Therefore, a more balanced sample size is needed in future studies to obtain more representative results.

The findings of this study are consistent with several previous studies indicating that knowledge alone is insufficient to prevent anemia; it must be accompanied by behavioral changes and adequate environmental support. More comprehensive interventions are needed ones that not only enhance knowledge but also reinforce education on balanced nutrition practices, improve adherence to iron supplement

intake, and strengthen the role of health workers in conducting regular monitoring.[11,12]

Thus, it can be concluded that although the respondents' knowledge levels were mostly in the "good" category, other factors beyond knowledge play a significant role in the incidence of anemia. Therefore, anemia prevention programs should be implemented in a multidimensional manner, taking into account factors such as knowledge, attitudes, behavior, and the socioeconomic conditions of the community.

**2. Attitude**

Table 7. Relationship Between Attitudes and The Incidence of Anemia

| Attitude | Incidence of Anemia | | Total | P value |
|---|---|---|---|---|
| | Anemia | No Anemia | | |
| Negative | 0 | 1 | 1 | 1,000 |
| Positive | 6 | 39 | 45 | |
| Total | 6 | 40 | 46 | |

*source: Primary data, 2025*

Based on the data above known that from 1 person who has negative atittude doesn't experience anemia. As amany as 45 people who had positive attitude, 6 people had anemia, and 39 people doesn't experiencing anemia. Statistical results showed p-value= 1.000 which shows that there is no significant correlation between attitudes and incidence of anemia. This finding is consistent with previous studies conducted by Saadah I et al (2021) which shows there is is no correlation between attitude with the incidence of anemia in adolescents girls. Attitude. Although individuals with positive attitudes positive not experiencing anemia, the results is not enough for conclude that attitude influence anemia condition. This result show that other factors that are more influential to anemia incidents need to be explored more carry on.[13]

These findings suggest that a positive attitude toward anemia prevention does not necessarily lead to the absence of anemia. Although the majority of respondents held a positive attitude, some still suffered from anemia. This indicates that attitude alone is insufficient to influence the incidence of anemia, as other factors also play a role, such as inadequate nutritional intake, adherence to iron supplements, health status, economic conditions, and sociocultural factors. Respondents with positive attitudes may understand the importance of preventing anemia, but they may not necessarily be able to consistently apply these behaviors in their daily lives.[14]

In addition, the very small number of respondents with negative attitudes may also affect the results of the statistical analysis. The imbalance in the number of respondents between the negative and positive attitude groups results in an uneven data distribution, thereby reducing the statistical power of the test. This situation may prevent the detection of a statistically significant relationship that actually exists. Therefore, future studies are advised to use a larger sample size and a more even distribution to ensure that the results obtained are more representative.

The findings of this study are also consistent with the concept of health behavior, which states that attitudes are one of the predisposing factors but do not directly determine the occurrence of a particular behavior or health status. Changes in health status, including the occurrence of anemia, are influenced by various other factors such as enabling factors and reinforcing factors, including family support, the role of health workers, and the availability of resources.[15]

Thus, it can be concluded that a positive attitude toward anemia prevention does not necessarily lead to a direct reduction in the incidence of anemia. Therefore, more comprehensive interventions are needed not only to improve attitudes but also to enhance health practices, ensure a balanced diet, and facilitate routine monitoring by healthcare professionals in order to effectively reduce the incidence of anemia.

**3. Compliance of Iron Tablet Suplementation**

Table 8. Relationship Between Compliance of Iron Tablet Suplementation and the Incidence of Anemia

| Compliance | Incidence of Anemia | | Total | P value |
|---|---|---|---|---|
| | Anemia | No Anemia | | |
| Less obedient | 0 | 5 | 5 | |
| Obedient | 6 | 35 | 41 | 0.831 |
| Total | 6 | 40 | 46 | |

*source: Primary data, 2025*

Based on the table known that from 5 people less obedient in taking additional tablets blood, There wern't those who experienced anemia (0 people were anemic, 5 people were not anemic). Of the 41 people who were

compliant consuming iron tablet, 6 people experienced anemia, and 35 people did not experience anemia. The results of the statistical test showed p-value = 0.831, indicating there is no significant correlation between Compliance of Iron Tablet Suplementation and incidence of anemia. In overall, this data show that compliance in taking additional tablets blood No in a way direct related with risk of anemia in group this, and maybe There is other factors that are more relevant that influences anemia condition in respondents.[16]

These findings suggest that adherence to iron supplement intake does not necessarily directly influence the incidence of anemia. Although the majority of respondents adhered to their iron supplement regimen, there were still respondents who experienced anemia. This may be due to several other factors that also influence a person's hemoglobin levels, such as a diet lacking in iron, low intake of vitamin C-rich foods that aid iron absorption, and the habit of consuming foods or beverages that inhibit iron absorption, such as tea and coffee.[17]

In addition, an individual's health status can also play a role in the development of anemia, even if the adolescents has been compliant with taking iron supplements. Factors such as chronic infections, bleeding, parasitic diseases, closely spaced pregnancies, and pre-pregnancy nutritional status can affect hemoglobin levels. Thus, compliance with taking iron supplements is not the only factor determining the development of anemia.[18]

On the other hand, the number of non-compliant respondents in this study is relatively small compared to the number of compliant respondents. This imbalance in the number of respondents may affect the statistical power of the test, meaning that the actual relationship may not be detected as statistically significant. The small sample size in the non-compliant group may also result in limited data variation and make the data less representative.

The findings of this study align with the concept that preventing anemia in adolescent requires a comprehensive approach not only through iron supplementation but also through dietary improvements, nutrition education, improved health status, and routine monitoring by healthcare professionals. Additionally, adherence to iron supplement intake must be accompanied by proper consumption practices, such as taking them regularly, avoiding consumption with tea or coffee, and pairing them with foods that enhance iron absorption.[19.]

Thus, it can be concluded that adherence to iron supplement intake is not necessarily directly linked to the incidence of anemia. Therefore, efforts to prevent anemia must be comprehensive and take into account various other risk factors in order to achieve an optimal reduction in the incidence of anemia.

**4. Eating Habits**

Table 9. Relationship Between Eating Habits and the Incidence of Anemia

| Eating Habits | Incidence of Anemia | | Total | P value |
|---|---|---|---|---|
| | Anemia | No Anemia | | |
| Poor eating habits | 3 | 12 | 15 | 0.612 |
| Good eating habits | 3 | 28 | 31 | |
| Total | 6 | 40 | 46 | |

*source: Primary data, 2025*

Based on table known that of the 15 people who have poor eating habits, 3 people had anemia, while 12 people did not have anemia. Of the 31 people who had good eating habits, 3 people had anemia, and 28 people did not have anemia. Statistical test show p-value = 0.612, which means there is no significant relationship between eating habits and the incidence of anemia. In Overall, this data show that eating habits no in a way direct influence risk of anemia in this group this. Other factors may more relevant in determine whether somebody experiencing anemia, and the eat pattern not the only one factor affecting anemia condition on adolescent and so on.[20-27]

These findings suggest that good eating habits do not necessarily guarantee that a person is free from anemia. Although most respondents had good eating habits, there were still some who suffered from anemia. This may be due to various other factors that influence the occurrence of anemia, such as the quality of the food consumed, the iron content in the food, and the body's ability to absorb iron. Eating habits that are considered good do not necessarily reflect adequate iron intake, especially if the diet lacks sources of heme iron such as red meat, liver, and fish.[28,29]

In addition, other factors such as the consumption of foods that inhibit iron absorption can also contribute to the development of anemia. The habit of consuming tea, coffee, or calcium-rich foods alongside iron-rich foods can hinder iron absorption in the body. Conversely, consuming foods rich in vitamin C, such as fresh fruits and vegetables, can enhance iron

absorption. Therefore, even if a person has good eating habits, the risk of anemia can still occur if they do not pay attention to proper food combinations.[30]

In addition to dietary factors, an individual's health status can also play a role in the occurrence of anemia, such as chronic infections, certain diseases, blood loss, and nutritional status prior to the study. These factors can affect hemoglobin levels even if respondents have good eating habits. Therefore, the occurrence of anemia is a multifactorial condition that is not influenced solely by eating habits.[31]

On the other hand, the results of this study may also be influenced by the relatively small sample size and the fact that the distribution of respondents did not differ significantly between the groups with good and poor eating habits. This may affect the power of the statistical tests, meaning that the true relationship may not have been detected as statistically significant.

Thus, it can be concluded that dietary habits do not have a significant association with the incidence of anemia in this study. Nevertheless, dietary habits remain an important factor in the prevention of anemia. Therefore, a more comprehensive approach to anemia prevention is needed, such as education on balanced nutrition, increased consumption of iron-rich foods, regular health monitoring, and improved adherence to other health interventions.

**5. The relationship between the research findings and wetland studies**

The findings of this study indicate that there was no statistically significant relationship between knowledge (p = 0.246), attitudes (p = 1.000), compliance with iron tablet supplementation (p = 1.000), and eating habits (p = 0.375) and the incidence of anemia among adolescent girls in wetland areas. However, descriptively, poor eating habits tended to increase the risk of anemia. These findings can be understood within the specific context of wetland environments, which present unique environmental, socioeconomic, and accessibility challenges.

Wetland areas are often characterized by limited access to diverse and nutritious food sources due to geographical constraints, seasonal flooding, and dependence on locally available food. Communities living in wetland areas may rely heavily on staple foods with limited intake of iron-rich foods such as red meat, poultry, and fortified products. Even when adolescents possess good knowledge and positive attitudes toward anemia prevention, environmental constraints in wetland areas may limit their ability to translate knowledge into appropriate dietary practices. Therefore, knowledge and attitudes alone may not significantly influence anemia incidence in this setting.[31]

Furthermore, environmental conditions in wetland areas may also affect compliance with iron tablet supplementation. Challenges such as limited access to health facilities, irregular distribution of iron tablets, transportation barriers during flooding seasons, and limited supervision from health workers may reduce the effectiveness of supplementation programs. Consequently, even adolescents who report compliance with iron tablet consumption may still experience anemia due to other underlying factors such as poor absorption, infections, or inadequate dietary intake.[31]

Additionally, wetland environments may increase exposure to health risks that contribute to anemia, such as parasitic infections, poor sanitation, and waterborne diseases. These environmental factors can influence hemoglobin levels independently of behavioral factors such as knowledge, attitudes, and compliance. This may explain why no significant association was found between these variables and anemia incidence in this study.

However, the descriptive findings showing that poor eating habits tend to increase anemia risk remain important. In wetland areas, dietary patterns may be influenced by food availability, cultural preferences, and economic limitations. Adolescents with poor eating habits may have lower intake of iron-rich foods and nutrients that enhance iron absorption, such as vitamin C, thereby increasing their risk of anemia.

Therefore, these findings suggest that anemia among adolescent girls in wetland areas is likely influenced by a complex interaction of environmental, socioeconomic, and behavioral factors. Interventions in wetland areas should not only focus on improving knowledge, attitudes, and compliance but also address structural barriers such as improving access to nutritious foods, strengthening iron supplementation programs, enhancing health service accessibility, and improving environmental sanitation. Such context-specific interventions are essential to effectively reduce anemia among adolescent girls living in wetland areas.

## CONCLUSION

There is no correlation between knowledge (p=0.246), attitude (p=1.000), compliance of iron tablet Suplementation (p=1,000) and eating habits (p=0.375) with the incident of anemia in adolescents girls in wetland area. The descriptive data from this study indicate that poor eating habits tend to increase the risk of anemia in adolescents.

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