Investigating Factors Influencing The Incidence of Anemia Among Adolescent Girls at Senior High School In Samarinda City

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Abstrak

Anemia merupakan suatu kondisi tidak cukupnya jumlah sel darah merah atau hemoglobin untuk membawa oksigen guna memenuhi kebutuhan fisiologis tubuh. Terjadinya anemia pada remaja putri dapat dipengaruhi oleh berbagai faktor. Penelitian ini bertujuan untuk mengetahui faktor-faktor yang mempengaruhi kejadian anemia pada remaja putri di SMA kota Samarinda. Desain penelitian ini adalah analitik observasional dengan pendekatan *cross-sectional*. Data primer diperoleh dengan menggunakan wawancara dengan Kuesioner *Knowledge, Attitudes, and Practice* (KAP) dan Kuesioner SAMANTA, serta pemeriksaan kadar hemoglobin menggunakan hemometer digital. Teknik pengambilan sampel yang digunakan adalah *total sampling* dengan jumlah responden sebanyak 98 orang yang diwakili oleh siswa kelas X SMA Negeri 6 Kecamatan Palaran. Analisis bivariat yang digunakan adalah uji *chi-square*. Hasil analisis hubungan status anemia dengan tingkat pengetahuan tentang anemia, status gizi, pola menstruasi, pendapatan orang tua, dan pendidikan ibu secara berurutan diperoleh *p-value* sebesar 0,645; 0,279; 0,654; 0,551; 0,776. Berdasarkan hasil penelitian, disimpulkan bahwa tidak terdapat hubungan yang signifikan antara faktor-faktor tersebut dengan kejadian anemia pada remaja putri di SMA Negeri 6 Kecamatan Palaran.

Kata Kunci: Anemia, Remaja Putri, Hemoglobin, Faktor Risiko

Abstract

Anemia is a condition of not having enough number of red blood cells or hemoglobin to carry oxygen to supply the body's physiological needs. The occurrence of anemia in adolescent girls can be influenced by various factors. This study aimed to determine the factors that influence the incidence of anemia in adolescent girls at Senior High School in Samarinda city. The design of this research was analytical observational with the cross-sectional approach. Primary data was obtained using the interview with Knowledge, Attitudes, and Practice (KAP) Questionnaire and SAMANTA Questionnaire, and hemoglobin levels were examined using haemometer digital. The sampling technique used was purposive sampling with 98 respondents represented by a 10th grade student in Senior High School 6 Palaran District. The bivariate analysis used was the chi-square test. The results of the analysis between anemia status and the level of knowledge about anemia, nutritional status, menstrual patterns, parental income, and maternal education sequentially obtained showed p-values of 0.645; 0.279; 0.654; 0.551; 0.776. Based on the results of the study, it is concluded that there is no significant relationship between the factors and the incidence of anemia in adolescent girls at Senior High School 6 Palaran District.

Keywords: Anemia, Adolescent Girls, Hemoglobin, Risk Factors

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INTRODUCTION

Anemia is a condition in which the number of red blood cells, and their capacity to transport oxygen, is insufficient to meet the body's physiological needs. According to the World Health Organization (WHO), anemia in children under 5 years of age and pregnant women is defined as a hemoglobin concentration of <11.0 g/dL, while in non-pregnant women, anemia is characterized by a hemoglobin concentration of <12.0 g/dL. Anemia can be diagnosed through a count of red blood cells, blood smear analysis, or hemoglobin level checks. Among these methods, hemoglobin level checks are the most commonly used as indicators to determine anemia. Hemoglobin plays an important role in transporting oxygen to tissues, which explains the frequent clinical symptoms of anemia, such as fatigue, shortness of breath, rapid pulse or palpitations, as well as pallor in the conjunctiva and palms (Chaparro, 2019; World Health Organization, 2017).

Anemia is a global health problem. In 2021, the global prevalence of anemia was recorded at 24.3%, with details of 0.9% for severe anemia, 9.3% for moderate anemia, and 14.1% for mild anemia. By gender, women are more likely to experience anemia than men, with a prevalence of 31.2% in women and 17.5% in men. This difference is more noticeable in the productive age, namely 15–49 years, where the prevalence of anemia in women reaches 33.7%, while in men it is only 11.3%. The condition of anemia in Indonesia is not much different. Based on Basic Health Research (Riskesdas) 2018, the prevalence of anemia nationally reached 23.7%, with a higher rate in women at 27.2%. In particular, the prevalence of anemia in the age group of 5-14 years was recorded at 26.8%, while at the age of 15-24 years it reached 32% (Ministry of Health of the Republic of Indonesia, 2018; Gardner, 2023).

Anemia in adolescents is a significant public health problem. Adolescent girls in particular are more susceptible to anemia due to their higher nutritional needs to support growth, sexual maturation, and preparation for future pregnancies. If anemia in adolescent girls is not treated immediately and continues, it can affect their intelligence and learning ability, especially in adolescent girls who are still in the period of growth and development. In addition, anemia in adolescent girls can increase the risk of becoming a mother with anemia, who is 1.8 times more likely to experience postpartum bleeding. The impact of this anemia can continue into pregnancy, increasing the risk of fetal growth disorders, premature birth, and low birth weight, as well as inhibiting the growth of children (Agustina, 2021; Deivita, 2021). The occurrence of anemia in adolescent girls can be influenced by various factors. Influencing factors include menstrual duration, history of parasite infestation, low socioeconomic status, number of family members, insufficient iron intake and the habit of drinking tea immediately after meals. In addition, parental education levels, low body mass index (BMI), stunted growth, and

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underweight also contribute to the risk of anemia (Fentie, 2020).

The importance of research on anemia in adolescent girls cannot be ignored, given the serious impact that this condition can have if it is not treated properly. Although there have been many studies that have discussed anemia, research on this topic has never been conducted before in Palaran District, so a deeper understanding of the factors that affect the incidence of anemia among adolescent girls in this region is needed. In addition, researchers have conducted a preliminary study on class X students at SMKN 19 Palaran District and found that as many as 48 out of 77 (62.33%) female students suffer from anemia. Therefore, researchers are interested in conducting this study.

METHOD

This study is an observational analytical research with a cross sectional approach. This research was carried out at SMA Negeri 6, Palaran District, Samarinda City on November 1, 2024. The population in this study is all students of class X of Senior High School 6 Samarinda. The sample in this study is class X students of Senior High School 6 Palaran District who take part in hemoglobin level checks who are willing to be the subject of the research, fill out the questionnaire completely, have experienced menstruation, are not being diagnosed with blood disorders, such as thalassaemia, hemophilia, autoimmune, blood malignancy, and so on. Sampling in this study was carried out using a total sampling technique. The data used in this study is sourced from primary data obtained from the results of hemoglobin examinations, questionnaire filling, and interviews. Knowledge data about anemia in female students was obtained from the results of the Knowledge, Attitudes, and Practice Questionnaire (KAP) questionnaire and menstrual patterns were obtained from the results of the SAMANTA questionnaire which had been translated into Indonesian. Hemoglobin (Hb) value data of female students was obtained from an examination using a digital hemometer. The data was then analyzed with the Chi Square test. Data processing was carried out using a Microsoft Word 2019, Microsoft Excel 2019, and IBM SPSS Statistics 26.

RESULT AND DISCUSSION

The total number of respondents participating in this study was 98 people. The distribution of respondents based on age, anemia status, nutritional status, level of knowledge about anemia, menstrual patterns, parental income, and maternal education can be seen in table 1. From the table, it is known that the most respondents are 15 years old (74.5%) with the average age of respondents being 15.20 years old. Based on anemia status, the majority of respondents suffered from anemia, namely 62 respondents (63.3%). Based on parental income, the majority of respondent's parents have a high income, namely 70 respondents (71.4%). Meanwhile, most of the respondents have mothers with low education levels, namely 83 respondents (84.7%).

The level of knowledge about anemia in this study was defined as the

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result of the interpretation of structured interviews using the Knowledge, Attitudes, and Practice Questionnaire. The results of the interpretation were divided into two groups, namely low and high. The level of knowledge about anemia in respondents can be seen in table 1. From the table, it is known that the majority of the 98 respondents have a low level of knowledge about anemia, namely 76 people (77.6%).

The nutritional status in this study was defined as the result of weight and height measurements and interpreted using the CDC's growth curve. The results of the interpretation were divided into three groups, namely underweight, normal and overweight. The nutritional status of the respondents can be seen in table 1. From the table, it is known that the majority of the 98 respondents have normal nutritional status, namely 68 people (69.4%).

The menstrual pattern in this study is defined as the characteristics of the menstrual cycle which are grouped into excessive menstrual bleeding and no excessive menstrual bleeding based on the interpretation of the SAMANTA questionnaire. Menstrual patterns in respondents can be seen in table 1. From the table, it is known that the majority of 98 respondents have a menstrual pattern with excessive bleeding, namely 60 people (61.2%).

Table 1. Characteristics of Respondents

Characteristic		Frequency (n)	Percentage (%)
Age	14 years	3	3,1
	15 years	73	74,5
	16 years	21	21,4
	17 years	1	1,0
Status Anemia	Anemia	62	63,3
	No Anemia	36	36,6
Parents Income	Low	28	28,6
	High	70	71,4
Mother's Education Level	Low	83	84,7
	High	15	15,3
Level of Knowledge About Anemia	Low	76	77,6
	High	22	22,4
Nutritional Status	Underweight	11	11,2
	Normal	68	69,4
	Overweight	19	19,4
Menstrual Patterns	Excessive Bleeding	60	61,2
	No Excess	38	38,8

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The results of the bivariate analysis in this study with the Chi-square test were obtained greater than 0.05 (p>0.05) so that statistically it can be concluded that there is no relationship between the level of knowledge of female students about anemia, nutritional status, menstrual patterns, parental income, and maternal education with anemia status in class X students of Senior High School, Palaran District, Samarinda City. The results of the Chi-square test can be seen in table 2.

Table 2. Bivariate Analysis of Factors Affecting Anemia

Factors	Anemia Status		*P-value*
	Anemia (n)	Not Anemia (n)	
Level of knowledge about anemia			
Low	49	27	0,645
High	13	9	
Nutritional status			
Underweight	9	2	
Normal	43	25	0,776
Overweight	10	19	
Menstrual pattern			
Heavy bleeding	39	21	0,654
Not heavy	23	15	
Parental income			
Low	19	9	0,551
High	43	27	
Mother's education level			
Low	53	30	0,776
High	9	6	

In this study, a statistically insignificant relationship was obtained between knowledge about anemia and the incidence of anemia in 10th grade students of Senior High School 6 Palaran (p-value = 0.645). The results of this study are in line with the research conducted by Agustina (2021), showing that individual and overall KAP scores are not associated with anemia. Having a high KAP score compared to low against anemia is not associated with a lower likelihood of anemia in adolescent girls. In contrast, in the study of Novelia (2022), the results showed a correlation between knowledge and anemia in adolescent girls. There is no direct relationship between the level of knowledge and the occurrence of anemia, as knowledge serves more as a fundamental factor rather than a direct cause, such as adequate nutritional intake, the presence of diseases like worm infections, malaria, and iron deficiency. Knowledge is not the only factor influencing anemia, nor is it a direct cause of anemia in women of reproductive age. Even women with high knowledge about anemia and who regularly consume iron-rich foods may still experience anemia. Conversely, women with only moderate knowledge about anemia but who rarely apply it or consume iron-rich foods may not necessarily develop anemia (Ardianto,

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2022). The knowledge of adolescent girls about anemia in this study was measured using an interview method with a KAP (Knowledge, Attitude, and Practice) questionnaire. This method allows for the possibility of interviewer bias and respondent bias in answering questions. The interviewer might misinterpret the questionnaire during the interview or assist the respondent in various ways (even with cues), emphasize different questions, and so on (Kumar, 2014). Interviewer bias can also occur when the interviewer unconsciously imposes their own beliefs in the way questions are presented. When interview questions are biased, they influence the respondents' answers. Additionally, bias may arise in the way the researcher interprets the responses. Respondent bias can also pose a problem in research, such as when respondents intentionally mislead the researcher by providing false answers to conceal their lack of knowledge or to avoid embarrassment (Mouselli, 2018).

In this study, a statistically insignificant relationship was obtained between nutritional status and anemia status (p-value = 0.279). The results of this study are in line with the research conducted by Mustika Sari & Amelia (2024) which also found that there was no significant relationship between nutritional status and anemia status. On the contrary, research conducted by Fauziah (2024) found a relationship between the two. The Body Mass Index (BMI)/age indicator in assessing nutritional status is more influenced by macronutrients, which are the largest source of energy for the body, such as carbohydrates, fats, and proteins, but does not represent the intake of micronutrients such as vitamins and minerals, which play a role in the formation of hemoglobin levels (Sari, 2023). Moreover, BMI does not account for the quality of food consumed. A person may have a normal BMI despite a diet low in essential vitamins and minerals. On the other hand, individuals with higher BMI may consume nutrient-dense foods that meet or exceed their micronutrient requirements. Research indicates that dietary patterns and food choices play a more significant role in determining micronutrient intake than BMI (Kamiliyah, 2024; Kamruzzaman, 2021).

In this study, a statistically insignificant relationship was obtained between menstrual patterns and the incidence of anemia (p-value = 0.654). The results of this study are in line with research conducted by Wahyurin & Rahmah (2021) which also found that there was no significant relationship between menstrual patterns and the incidence of anemia. In contrast, research conducted by Hadriani (2023) found a relationship between the two. The results of the insignificant analysis between menstrual patterns and anemia are suspected because the characteristics of menstrual patterns are not divided more specifically into short or long cycles, as well as fast or long duration. Blood production in the body is affected by the menstrual cycle, which has an impact on hemoglobin levels. In the event of disruption of the menstrual cycle, especially those at risk (cycles of less than 24 days), the amount of blood that comes out will increase, causing the loss of iron, the main component of hemoglobin formation. As a result, hemoglobin levels decrease, increasing the

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risk of anemia. Conversely, if the menstrual cycle is not at risk, blood loss will be minimal. Less iron is lost with the blood, allowing hemoglobin levels to remain normal (Hafiz Ansari, 2020). The researchers categorized menstrual patterns into heavy menstrual bleeding (HMB) and non-heavy menstrual bleeding. The findings related to heavy menstrual bleeding may have been influenced by limitations in the study, such as the use of different types of menstrual pads among respondents, varying in size, absorbency, and brand. These differences could affect the calculation of menstrual blood volume. Iron loss during menstruation depends on the volume of blood lost in each menstrual cycle. The loss of iron leads to a reduction in iron stores. If this continues, iron reserves decrease, creating an iron-depleting state. If the iron deficiency persists, iron stores are further depleted, reducing the availability of iron for erythropoiesis (red blood cell production). This condition is known as iron-deficient erythropoiesis, where red blood cell formation is impaired, although clinical anemia has not yet occurred. As erythropoiesis becomes increasingly disrupted, hemoglobin levels start to decline, leading to the development of hypochromic microcytic anemia, commonly referred to as iron deficiency anemia (Minarfah, 2021).

This study found no significant relationship between parental income and anemia status among adolescent girls (p-value = 0.551). These results are consistent with studies by Hasan (2023) and Efendi (2022), which also found no significant association between parental income and anemia status among adolescent girls.

Conversely, studies by Oktavia (2024) and Situmeang (2022) reported a significant relationship between the two. These findings can be attributed to factors such as income and socioeconomic conditions that are difficult to quantitatively measure. Often, people also tend not to be open about the actual income earned by their families. Not a few young women do not know exactly how much their parents actually earn (Hasan, 2023; Sari, 2019). In this study, it was found that the majority of adolescent girls who experience anemia come from high-income families. This can be seen as an illustration that many families do not focus their expenses on meeting the needs of high-quality food, but focus on meeting other household needs. A high level of income, if not balanced with high knowledge, will certainly affect the determination of the type of food or needs needed by a family (Efendi, 2022).

This study found no statistically significant relationship between maternal education level and anemia status. (p-value = 0.776). The results of this study are in line with the research conducted by Dwihestie (2018); Hadju (2019); Kurniawati (2022) also found that there was no significant relationship between the mother's education level and anemia status. In contrast, the research conducted by Oktavia (2024) and Sugiharti (2020) found a relationship between the two. The results of the bivariate analysis showed that there was no association between maternal education and the incidence of anemia. A high level of maternal education if not followed by behavior that cares about the nutrition of their family cannot change the nutritional status of respondents which leads to the

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incidence of anemia (Permata, 2016). Additionally, mothers with higher education levels are more likely to be employed, spending more time outside the home and sometimes lacking the opportunity to cook or consider the types of meals prepared. However, the nutritional balance of the food consumed plays a crucial role in optimizing the child's health (Dwihestie, 2018). This research is not in line with Oktavia (2024), which stated that most mothers are homemakers, allowing them to spend more time at home. This provides mothers with the opportunity to educate, care for, and maintain the health of their family members, particularly in terms of nutrition for their children. Additionally, mothers with higher education levels are better equipped to receive and understand information related to health, enabling them to meet their family's nutritional needs appropriately (Sugiharti, 2020).

The limitations of this study include the potential for bias arising from both the interviewers and the respondents. This study used a questionnaire as an instrument, requiring an interview technique to collect responses. In this study, multiple interviewers were involved, which could lead to differences in question interpretation among individual interviewers. Respondent bias could occur due to a lack of knowledge or unwillingness to disclose certain information.

CONCLUSION

The conclusion of this study is that there is no relationship between the level of knowledge of female students about anemia, nutritional status, menstrual patterns, parental income, and maternal education with anemia status in 10th grade students of Senior High School 6 Palaran District, Samarinda City. Based on the findings that none of the studied factors (knowledge about anemia, nutritional status, menstrual patterns, parental income, and maternal education) were significantly associated with the incidence of anemia, it is recommended that future research explore other potential determinants of anemia. These could include factors such as dietary diversity, adherence to iron supplementation programs, access to healthcare services, and the presence of underlying medical conditions like chronic infections or genetic disorders. Additionally, employing a larger sample size and using more precise measurement tools, such as biochemical markers for assessing iron status and dietary intake analysis, could provide more comprehensive insights. Further, qualitative studies could help uncover cultural and behavioral aspects influencing anemia, particularly in adolescent girls.

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