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Screening for Anemia Through Hemoglobin (Hb) Tests in Female Students at STIKes Muhammadiyah Ciamis

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ABSTRACT

Background & Objectives: Indonesia ranked 5th in the world (22.331%) in terms of anemia incidence in 2019, after Pakistan (22.409%), Nigeria (25.475%), China (54.041%), and India (187.325%). The prevalence of anemia in Indonesia based on data from the 2018 Basic Health Research was 48.9%. Globally, the prevalence of anemia is higher in adolescent girls than in adolescent boys. Anemia is a disease caused by a lack of red blood cells. This study aims to determine anemia screening through hemoglobin testing in female students at STIKes Muhammadiyah Ciamis.
Method: The method used in this study was descriptive, with the respondents being female students at STIKes Muhammadiyah Ciamis. Hemoglobin levels were measured using a spectrophotometer with the synehemoglobin method. This study was conducted at the Hematology Laboratory of STIKes Muhammadiyah Ciamis in May 2024.
Results: Based on the examination results of 42 samples, 1 person (2%) was found to have moderate anemia, 4 people (10%) had mild anemia, and 37 people (88%) had normal results.
Conclusion: The average hemoglobin level of female students at STIKes Muhammadiyah Ciamis is normal.

Keywords: Female Student, Anemia, Hemoglobin.

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INTRODUCTION

Anemia is a nutritional problem that affects millions of people in developing countries and remains a major challenge to human health (Sudikno & Sandjaja, 2016). In relation to anemia incidence in 2019, Indonesia ranked fifth in the world (22.331%) after Pakistan (22.409%), Nigeria (25.475%), China (54.041%), and India (187.325%). This indicates that Indonesia ranks fourth in Asia for anemia prevalence (Dineti et al., 2022). According to the World Health Organization (WHO), anemia affects 1.62 billion people, equivalent to 24.8% of the world's population. In Southeast Asia (excluding Thailand), more than 25% of adolescents suffer from anemia, with prevalence reaching up to 50% in some countries (Lodia Tuturop et al., 2023).

The prevalence of anemia in Indonesia based on the 2018 Basic Health Research (Riskesdas) data was 48.9%. The prevalence of anemia among adolescents aged 15–24 years has continued to increase over the past 11 years—from 6.9% in 2007 to 32.0% in 2018. Globally, the prevalence of anemia among adolescent females is higher than among adolescent males (Lodia Tuturop et al., 2023). According to the West Java Health Office, in 2018, the prevalence of anemia among adolescents in West Java reached 41.5% (Idaningsih & Mustikasari, 2020).

Anemia is a condition caused by a deficiency of erythrocytes. Erythrocytes are formed from hemoglobin, which plays a vital role in transporting oxygen and carbon dioxide throughout the body. A decrease in hemoglobin levels leads to early symptoms such as fatigue, loss of appetite, decreased concentration, dizziness, weakened immune system, reduced stamina, and blurred vision, especially when standing up. In addition, the face, mucous membranes of the eyelids, lips, and nails appear pale (Mersil, 2021).

One of the examinations used to diagnose anemia is hemoglobin testing using the cyanmethemoglobin method, which is considered the gold standard for hemoglobin measurement. The advantage of this method is its simplicity and stable standard, while its drawbacks lie in instrument limitations, reagent quality, and analytical techniques—such as pipetting, homogenization, and incubation—that may result in falsely high or normal results (Dan et al., 2015).

Women are ten times more likely to develop anemia than men. One of the groups particularly vulnerable to anemia is female college students, due to their busy academic schedules. Their lifestyle often changes from being regular to irregular—for example, delaying meals and lacking rest. In addition, many female students pay close attention to their body shape, which leads them to reduce food intake or go on diets. Such diets often exclude certain food groups, such as carbohydrates. Another factor influencing the occurrence of anemia among female students is the menstrual pattern. Menstrual pattern refers to the series of menstrual processes, including the menstrual cycle and duration of bleeding. The menstrual cycle is the interval between the first day of menstruation and the start of the next menstruation (Sari, 2020). Normally, a woman's menstrual cycle ranges from 21 to 35 days. The length of the menstrual cycle may be affected by age, body weight, physical activity, stress levels, genetics, and nutrition (Suryadinata et al., 2022).

Female students at STIKes Muhammadiyah Ciamis have busy schedules, such as numerous academic assignments, organizational activities, and clinical practice. Those undergoing clinical practice often have shifts—morning, afternoon, and night—which limits their rest time. In addition to insufficient rest, poor dietary habits—such as skipping breakfast and consuming fast food for convenience—can lead to malnutrition.

Lack of adequate rest and poor dietary habits can cause anemia among students of STIKes Muhammadiyah Ciamis, which may in turn weaken their immune system and impair their concentration in learning. The occurrence of anemia among adolescent girls or female students should not be ignored, as it has long-term and serious implications for their reproductive health. Women, as future mothers, may experience complications during pregnancy, childbirth, and postpartum periods if they are anemic. Pregnant women with anemia are at greater risk of postpartum hemorrhage, premature birth, low birth weight, and stunting (Angraeni, 2022).

Anemia is generally easy to treat with a healthy diet and supplements, but it is important to identify the underlying causes. Anemia has a significant impact on human resource quality; therefore, it must be addressed early through screenings such as hemoglobin testing, which aims to measure hemoglobin levels in the blood. Hemoglobin plays a crucial role in binding and distributing oxygen throughout the body. Hence, maintaining adequate hemoglobin levels is essential to prevent anemia.

Based on a previous study by Mardiyansyah et al. (2022) titled Screening for Anemia in the Elderly through Hemoglobin Examination in the Working Area of Sukasari Village Health Center, 17 respondents (56.7%) had decreased or abnormal hemoglobin levels, 12 respondents (40%) were normal, and 1 respondent (3.3%) had elevated hemoglobin levels. Another study by Nasriyah et al. (2019) titled Screening for Anemia through Hemoglobin Examination Using the Cyanmethemoglobin Method among Adolescent Girls in the Working Area of UPT Mayong II Health Center found that out of 209 respondents, 52.63% were normal (non-anemic), while 47.37% were anemic—comprising 25.36% mild anemia, 18.18% moderate anemia, and 3.83% severe anemia.

OBJECTIVE

To determine anemia screening through hemoglobin examination among female students of STIKes Muhammadiyah Ciamis.

METHOD

This study is a descriptive study aimed at describing the results of blood hemoglobin level examinations among female students of STIKes Muhammadiyah Ciamis using the cyanmethemoglobin method. The sampling technique used in this study was purposive sampling with a total of 42 samples. The study utilized both primary and secondary data. The research was conducted in May 2024 at the Laboratory of STIKes Muhammadiyah Ciamis.

RESULTS

The respondents in this study were 42 female students of STIKes Muhammadiyah Ciamis. The results of the study are presented in the following table:

TABLE 1. Characteristics of Research Samples

No	Sample Characteristics	(n)	Percentage (%)
1.	**Education Level**		
	Year 1	9	21%
	Year 2	12	29%
	Year 3	21	50%
2.	**Age (Years)**		
	18 Years	1	2%
	19 Years	4	10%
	20 Years	16	38%
	21 Years	17	40%
	22 Years	4	10%
3.	**Understanding of Anemia**		
	Yes	42	100%
	No	0	0%
4.	**Anemia Symptoms**		
	Yes	42	100%
	No	0	0%
5.	**Difficulty Concentrating While Studying**		
	Yes	31	74%
	No	11	26%
6.	**Regular Eating Pattern**		
	Yes	14	33%
	No	28	67%
7.	**Diet**		
	Yes	2	5%
	No	40	95%
8.	**Normal Menstrual Cycle**		
	Yes	28	67%
	No	14	33%
9.	**Excessive Menstruation**		
	Yes	14	33%
	No	28	67%
10.	**History of Disease**		
	Yes	5	12%

No	Sample Characteristics	(n)	Percentage (%)
	No	37	88%
11.	**History of Blood Transfusion**		
	Yes	2	5%
	No	40	95%

Based on Table 1, the ages of the respondents in this study were 18 years old (1, 2%), 19 years old (4, 10%), 20 years old (16, 38%), 21 years old (17, 40%), and 22 years old (4, 10%). According to the questionnaire results provided by the researcher to the respondents, 9 (21%) respondents were at level 1, 12 (29%) respondents were at level 2, and 21 (50%) respondents were at level 3. Of the 42 respondents, 42 (100%) understood anemia, 42 (100%) respondents experienced symptoms of anemia, 31 (74%) respondents had difficulty concentrating while studying, 11 (26%) respondents were able to concentrate while studying, 14 (33%) respondents had regular eating patterns, 28 (67%) respondents did not have regular eating patterns, 2 (5%) respondents were on a diet, 40 (90%) respondents were not on a diet, 28 (67%) respondents had a normal menstrual cycle, 14 (33%) respondents did not have a normal menstrual cycle, 14 (33%) respondents experienced excessive bleeding during menstruation, 28 (67%) respondents had normal bleeding during menstruation, 5 (12%) respondents had a history of illness while 37 (88%) did not have a previous history of illness, and 2 (5%) respondents had undergone a transfusion, while 40 (95%) respondents had never undergone a transfusion

TABLE 2. Frequency of Hemoglobin Test Results

Hemoglobin Examination Results	Frequency (n)	Percentage (%)
Normal	37	88%
Mild Anemia	4	10%
Moderate Anemia	1	2%
Severe Anemia	0	0%
Total	**42**	**100%**

Based on Table 2, the results of the hemoglobin examination among female students of STIKes Muhammadiyah Ciamis showed that 1 student (2%) had moderate anemia, 4 students (10%) had mild anemia, and 37 students (88%) had normal hemoglobin levels.

DISCUSSION

This study aimed to describe the hemoglobin levels among female students of STIKes Muhammadiyah Ciamis. Based on Table 1, the study included 42 female students. This research focused specifically on female students because women are ten times more likely to develop anemia than men. This is primarily due to iron (Fe) deficiency during menstruation. Women tend to consume more plant-based foods, which often provide insufficient iron to meet daily requirements (Budiarti, Anik & Wirani, 2021).

The analysis results presented in Table 2 show that 5 respondents (12%) fell into the anemia category, with the lowest hemoglobin level recorded at 8.8 g/dL. According to Ellym Asiffa & Ruliati (2020), low hemoglobin levels in respondents are influenced by irregular eating patterns and menstrual factors, such as excessive bleeding during menstruation.

Dietary intake plays a crucial role in determining hemoglobin levels. Inadequate nutrient intake, particularly of iron-rich foods, leads to decreased hemoglobin synthesis. Iron is a vital element in the formation of the heme component of hemoglobin. The amount of iron absorbed by the body depends on dietary iron sources and intestinal mucosal absorption. Iron deficiency can lead to impaired growth of brain cells and body tissues (Hikmah, 2023).

Excessive menstrual bleeding also contributes to low hemoglobin levels. Menstruation is a cyclic and periodic bleeding from the uterus involving the shedding of the endometrial lining. A typical menstrual period lasts 3–5 days, although it can vary between 1–2 days (light bleeding) to 7–8 days (heavy bleeding). Loss of iron due to abnormal menstrual patterns can lead to anemia (Djunaid & Hilamuhu, 2021).

Iron loss reduces the body's iron stores, a condition known as iron deficiency status. If this condition persists, iron reserves become depleted, reducing the iron supply for erythropoiesis (red blood cell production). This disruption hinders red blood cell formation even before clinical anemia appears, known as iron-deficient erythropoiesis. Continued iron depletion further inhibits erythropoiesis, causing hemoglobin levels to decline and resulting in microcytic hypochromic anemia, commonly known as iron deficiency anemia (Kristin, Jutomo & Boeky, 2022).

Low hemoglobin levels can impair body metabolism and nerve cell function. Decreased hemoglobin also affects blood viscosity, which can drop to about 1.5 times the viscosity of water. Blood viscosity depends on red blood cell count and plasma composition. When blood is less viscous (thinner), it generally indicates low hemoglobin, whereas thicker (more viscous) blood often corresponds with elevated hemoglobin levels (Hadijah, Hasnawati & Hafid, 2019).

A reduction in hemoglobin levels within erythrocytes is the main cause of anemia. Low hemoglobin leads to reduced oxygen levels in the blood, causing shortness of breath. Inadequate oxygen supply forces the heart to work harder, resulting in symptoms such as chest pain and palpitations. When oxygen cannot circulate properly throughout the body, organ function becomes impaired, and cells do not receive sufficient oxygen to perform their activities. Fatigue is the most common symptom experienced by individuals with anemia (Sari, Orno & Hasan, 2023).

Erythrocyte index and peripheral blood smear examinations are important to determine the type of anemia—whether it is due to deficiency, disease, or other causes associated with low hemoglobin levels. The purpose of peripheral blood smear examination is to observe erythrocyte morphology, including size, color, shape, and structure, which can help identify specific types of anemia (Novila, Herawati & Ifan, 2020).

Morphologically, peripheral blood smear results classify anemia into microcytic hypochromic, macrocytic normochromic, and normocytic normochromic types.

- Microcytic hypochromic anemia is characterized by decreased MCV, MCH, and MCHC values.
- Macrocytic normochromic anemia shows increased MCV and MCH, while MCHC remains normal.
- Normocytic normochromic anemia presents with normal MCV, MCH, and MCHC values (Setiawan, Merta & Sudarmanto, 2019).

This study found that some female students still experience anemia. Anemia can be prevented or managed by improving dietary habits to enhance iron bioavailability in the body—for example, increasing the intake of protein, vegetables, and vitamin C-rich foods to boost iron absorption. Conversely, consumption of foods and drinks that inhibit iron absorption, such as tea and coffee, should be reduced (Novila, Herawati & Ifan, 2020).

CONCLUSION

Based on the results of anemia screening through hemoglobin (Hb) examination using the cyanmethemoglobin method among female students of STIKes Muhammadiyah Ciamis, the average hemoglobin level was found to be normal. However, 12% of students were detected with anemia, indicating the importance of early screening and follow-up actions regarding anemia among female students.

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CONFLICT OF INTEREST

There is no conflict of interest in the preparation of this research and article.

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