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(Research) Article

Increasing Junior High School Students' Awareness of the Importance of Routine Hemoglobin Level Health Examination

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Abstract: Anemia is a condition characterized by a lower-than-normal number of red blood cells or a reduced level of hemoglobin, which is essential for carrying oxygen and nutrients such as vitamins and minerals throughout the body. In healthy individuals, normal hemoglobin levels are approximately 13.5 grams per deciliter (g/dL) for males and 12 g/dL for females. Hemoglobin plays a vital role in maintaining the body's energy levels and supporting cognitive and physical functions. This community service activity was carried out at SMPN 05 Sungai Kakap and aimed to increase student awareness about the importance of monitoring hemoglobin levels to detect early signs of anemia. The program combined two approaches: educational counseling and hemoglobin testing using a digital device called Easy Touch GCHb. The students responded positively to the educational sessions, actively participating and expressing curiosity through various questions related to anemia. Hemoglobin testing was performed on 24 students, and the results showed that 4 female students had hemoglobin levels below 12 g/dL, indicating they were anemic. Additionally, the hemoglobin data were compared with each student's Body Mass Index (BMI), but no significant relationship was found between hemoglobin levels and BMI, suggesting that anemia is not solely influenced by body weight. The combined method of education and on-site testing proved to be effective in both engaging students and identifying potential cases of anemia. However, to further address this issue, continued health education and regular screening efforts are needed to help prevent and manage anemia among adolescents at an early stage, ensuring better long-term health outcomes.

Keywords: Anemia; Counseling; Hemoglobin.

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1. Introduction

Anemia is when someone has fewer red blood cells or less hemoglobin (Hb) in their blood than is normal for their age and gender. When people are healthy, their red blood cells have hemoglobin, which carries oxygen and nutrients like vitamins and minerals to the brain and body. Normal Hb levels are different for males and females (7). For males, the normal Hb level is 13.5 g/dl, and for females, it is 12 g/dl.

The most common type of anemia is iron deficiency anemia. Iron deficiency anemia happens when the body does not make enough red blood cells because it does not have enough iron Iron is a key nutrient that the body needs to make hemoglobin (6). Also, making hemoglobin needs a good diet, because teenagers often have problems like being overweight or not getting enough important nutrients. (9) BMI (Body Mass Index) can help find these problems. BMI is an easy way to check someone's nutrition by comparing their weight and height. (15)Thompson says that nutrition affects hemoglobin levels, so if someone's diet is poor, their hemoglobin is likely to be low. (1)

A study by Silvi in 2024 found that teenage girls are most likely to have iron deficiency anemia because they often focus on how they look and pick foods they think will help them

lose weight. Because of that study, the researcher wanted to test the hemoglobin levels of teenagers and teach them why it is important to get their hemoglobin checked at SMPN 05 Sungai Kakap

2. Preliminaries or Related Work or Literature Review

Anemia is when someone has fewer red blood cells or less hemoglobin (Hb) in their blood than is normal for their age and gender. When people are healthy, their red blood cells have hemoglobin, which carries oxygen and nutrients like vitamins and minerals to the brain and body. Normal Hb levels are different for males and females (7). For males, the normal Hb level is 13.5 g/dl, and for females, it is 12 g/dl.

2.1. Hemoglobin

Hemoglobin is a naturally colored substance because it contains iron. When it is attached to oxygen, it looks red, but when it doesn't have oxygen, it looks purplish. Because of this, blood that is fully filled with oxygen, like in arteries, looks red. However, blood that has given up some of its oxygen to the body's tissues, like in veins, looks bluish. Hemoglobin is made up of four protein parts that are connected together. In adults, the most common type of hemoglobin, called HbA, is made of two alpha-globulin proteins and two beta-globulin proteins. But in babies and fetuses, the type of hemoglobin is different. It has two alpha chains and two gamma chains, making it called fetal hemoglobin, or HbF.(12)

2.2 Factors that affect Hb

Hemoglobin levels can change based on different things like age, gender, living at high altitudes, how much someone exercises, if they smoke, and what they eat.(3) For women, especially during their periods, hemoglobin levels are often lower. This happens because of hormones, like androgen, which can affect how the body makes blood cells. Also, during menstruation, women lose blood each month, which can lower their hemoglobin. (4) Because of this, women need to get more iron in their diet. Iron is important because it helps the body make hemoglobin.(5)

2.3 Body Mass Index (BMI)

BMI is a helpful way to measure obesity, and it's recommended for checking obesity in children. (2) Body Mass Index (BMI) is an easy way to check your body condition and how close you are to being overweight or underweight. Being overweight can be called obesity. Obesity happens when your body has too much energy, and the extra energy is stored as fat. (8) Body Mass Index (BMI) is used to find out if someone is obese or at a healthy weight. A healthy body is one where weight matches height and is not too heavy or too light. (11) Body Mass Index (BMI) is calculated using a math formula: weight (in kilograms) divided by height (in meters) squared.BMI is the easiest way to guess obesity and is closely linked to body fat. It also helps find obese people who might have health problems. (10)

3. Proposed Method

This study used a method where data was collected at one point in time directly at SMPN 05 Sungai Kakap The survey data included gender, age, body mass index, and hemoglobin levels from lab tests. The collected data were shown as frequencies and percentages in tables.Then, statistical analysis was done using the Kolmogorov-Smirnov test to check if the data was normal, followed by Pearson correlation testing.(14)

To help people learn how to prevent anemia and why checking hemoglobin levels is a good way to screen for anemia, the first thing we did was provide education. Educational outreach is a type of informal learning that can happen within specific community groups. Using good educational methods is very important for successful learnig.(13) The educational session involved lecturers presenting information using easy-to-understand leaflets and presentation slides.The material explained what anemia is, what causes it, what the symptoms are, and how to prevent it, including eating healthy foods with iron and vitamin C. After the presentation, there was a Q&A session to make sure the students understood the material. The presenters also asked questions or used games to encourage students to share their

thoughts on the topic and check their understanding. If a student answered correctly or shared a good opinion, the community service team gave them a reward.

After the educational session, hemoglobin testing was done. This test was done to measure the amount of hemoglobin in the blood. Hemoglobin (Hb) is a protein in red blood cells and the most important part of human blood. It carries oxygen from the lungs to all parts of the body and takes CO_2 from the body back to the lungs.(16) The hemoglobin level test was done to find out if someone had anemia, as a way to screen for it. The screening was done using a device that measures hemoglobin. Blood samples were taken from the students, and their hemoglobin levels were checked and understood based on standard guidelines. Students who had mild or moderate anemia were told to eat more foods that are high in iron.The Easy Touch GCHb digital testing device was used for this test.

3.1. Algorithm/Pseudocode

Correlations

		HB	IMT
HB	Pearson Correlation	1	,077
	Sig. (2-tailed)		,715
	N	25	25
IMT	Pearson Correlation	,077	1
	Sig. (2-tailed)	,715	
	N	25	25

In this study, SPSS testing using the Pearson correlation test revealed no relationship between the two variables.

a. The correlation coefficient ($r = 0.077$) indicated a very weak and positive relationship between hemoglobin levels and BMI.
b. The significance value ($p = 0.715 > 0.05$) indicated that the relationship between hemoglobin levels and BMI was not statistically significant.

There was no significant relationship between hemoglobin levels and body mass index (BMI) in the respondents studied. This means that changes in hemoglobin levels were not significantly related to changes in BMI in this sample.

4. Results and Discussion

In this activity, two approaches were used. The first was educational counseling, where I explained information about hemoglobin to the students. The students showed a lot of interest and asked several questions, which helped them learn more about hemoglobin. The second method was a quick hemoglobin test called the Easy Touch GCHb digital test. This is a portable device used by healthcare workers to check hemoglobin levels. It's known to be accurate and is often used because it's easy to use and doesn't cost much.

The Easy Touch GCHb is a system used to measure hemoglobin in small blood samples. It works by detecting changes in electrical signals when hemoglobin reacts with chemicals on a test strip. When a blood sample is placed on the strip, it is drawn into the testing part automatically. The results come up in about 6 seconds. There were 30 students in the class, but only 24 were present for the test. Out of these 24, 4 girls had hemoglobin levels below 12 g/dl. Based on these results, these 4 students were diagnosed with anemia. They were given advice about eating healthy and encouraged to see a doctor for more tests, since this was just the first step in checking their hemoglobin levels. Then the results of the Hb examination were continued with a comparative test between Hb and BMI using SPPS 24 with the Pearson Partial test.

4.1. Figures and Tables

In this study, images and tables were obtained which were the results of the Hb examination that had been carried out.

Figure 1. Hb examination using the EasyTouch tool

Table 1. Results of Hb examination on students

NO	Name	Age		HB
		M	W	
1	Ahmad hiftahul faldani	15		15.6
2	Nur Cahaya		15	13
3	Riska		15	12.7
4	Mardiansyah	15		14.4
5	Sabarudin	15		14.6
6	Lia Anggraeni		15	12.9
7	Peni yati		16	11.0
8	Anggita Aisyah Azahra		15	14.5
9	Rihana		16	14.1
10	Ananda Dwi Sifa		14	.9.9
11	Mustika Sari		15	11.2
12	Chintia Marisca		15	13.0
13	Mardiyyah Zahra		15	12.3
14	Afnan Musyarullah	14		18.2
15	Gabriel Andrea F	15		13.9
16	Wulandary		15	13.9
17	Widia Islamy		15	12.9
18	Natalia		16	10.4
19	Larasati		14	13.8
20	Apriansyah	15		12.8
21	Fabliyanto	15		14.2
22	Riska fadilah	15		15.1
23	Nasrullah I.M	15		13.0
24	Saul	15		13.6
25	Julyansah	15		13.0

5. Comparison

The comparison of this research is the place where the examination was carried out, then in this examination a comparison of the Hb results obtained was used compared to the BMI results.

6. Conclusions

Based on the activities done, it seems the counseling method was well received by the students. In the hemoglobin test, four students had low hemoglobin levels, so they were given more education and advised to have further tests. The study also found that there is no link between students' hemoglobin levels and their Body Mass Index (BMI). As a suggestion, it's important to do more complete health checks and provide continuous support and watch over students who have hemoglobin levels below normal to help stop anemia from developing early.

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Data Availability Statement: The data obtained in this research was obtained directly through direct examinations. This can be seen in the table above

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Conflicts of Interest: There is no conflict of interest in this study because the Funders had a role in the study design; in the collection, analysis, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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