



Effectiveness of Anemia Counseling and Screening Programs in Improving Health Knowledge of High School Students

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Abstract. Anemia is a common health problem among adolescent, particularly high school students, and it has a severe impact on both health and academic performance. Purpose of this study is to evaluate the effectiveness of anemia education and health screening programs in increasing students' knowledge and awareness of anemia. This study used a pre-post test design without a control group, with 45 students aged 16 to 18 as respondents. The interventions included health education through lectures and the distribution of booklet. In addition, students received an anthropometric evaluation and hemoglobin levels were measured. According to the screening results, 15 students out of 45 had anemia, with 14 being female students. The results of data analysis showed a significant increase in students' knowledge about anemia after the intervention ($p < 0.000$). However, there was no correlation between nutrition status and anemia, nor physical activity and anemia. According to this study, female students are more likely to suffer from anemia, and health education may contribute to increasing awareness of anemia and enhance the quality of life.

Keywords: anemia, health education, students, nutritional status, physical activity

1. Introduction

Anemia is a condition characterized by a decrease in the number of red blood cells, marked by hemoglobin levels below normal. The World Health Organization (WHO) states that the threshold for anemia in male adolescents over the age of 15 is < 13 g/dl and for female adolescents < 12 g/dl [1]. Anemia affects a large portion of the global population, with approximately 25% of people worldwide experiencing this condition, particularly impacting adolescents, pregnant women, children under the age of 5, and individuals over the age of 50 [2]. The prevalence of anemia among adolescents in Indonesia increased from 18.4% to 32% between 2013 and 2018. This has become one of the causes of decreased productivity and academic performance [3]. A meta-analysis study reported that adolescents are a target for anemia prevention interventions due to a prevalence of 65.7% [4].

Anemia can cause various health problems, such as stunted growth, increased susceptibility to infectious diseases, and decreased immunity [5]. In addition, during adolescent pregnancy, anemia increases the risk of postpartum hemorrhage, low birth weight, and premature birth [6]. Anemia in adolescents, particularly in school students, can occur due to various factors such as nutritional deficiencies, infectious diseases, and lack of awareness. Nutritional deficiency, especially iron deficiency, plays a significant role in the incidence of anemia [7]. Moreover, the lack of vitamin B12 and vitamin A also contributes to the occurrence of anemia [8]. Nutritional status and the prevalence of anemia among school students have a significant relationship. Studies show that there is an influence between nutritional status and anemia that exacerbates the severity of anemia [9]. Additionally, inadequate nutritional intake, low hemoglobin levels, and unhealthy habits can contribute to the prevalence of anemia among school students, making it important to provide educational interventions for students [8]. Educating students about the concept of balanced nutrition, iron-rich foods, and healthy eating habits is crucial in preventing anemia and improving health status among adolescents. Providing iron supplements and promoting awareness about anemia in adolescents are also essential actions [10].

Several factors, such as lack of physical activity, parental education, and low knowledge about anemia, also influence the prevalence of anemia [8]. Anemia significantly impacts the academic performance and overall well-being of high school students. Research shows that anemia in adolescents can lead to decreased concentration, reduced motivation to learn, and lower academic achievement [11]. Therefore, educational interventions, nutritional improvements, and increased awareness are needed to prevent the occurrence of anemia, especially among high school students.

2. Method

This study used a quantitative research design with a pre-post test design without control. The population considered in this study included adolescents aged 16-18 years, who had never received counseling about anemia, and were willing to participate in the counseling sessions. The activities were conducted at SMAN 7 Kota Malang in June, attended by approximately 45 students. The intervention in this study involved counseling using a lecture method and the distribution of booklets to the respondents. Before the counseling, respondents filled out a pre-test questionnaire, and a post-test questionnaire was completed after the counseling. Following that, anthropometric

measurements and anemia screening were performed on respondents by testing hemoglobin levels with Easy touch GCHb. The Malang State University Research Ethics Commission (KEP UM) approved this study ethical clearance with letter No.22.5.5/UN32.14.2.8/LT/2024. The analysis was conducted out utilizing descriptive analysis and statistical testing with SPSS 24.

3. Result and Discussion

This study was conducted on 45 respondents (Table I) consisting of 13 male students (29%) and 32 female students (71%). The age distribution of the respondents was 16 years (54%), 17 years (33%), and 18 years (13%). The respondents in this study were between the ages of 10 and 19 [12].

Table 1. Characteristics of Respondents

Characteristic	Frequency (%)
Gender	
Male	13 (29)
Female	32 (71)
Age	
16 years old	24 (54)
17 years old	15 (33)
18 yeats old	6 (13)

Anemia is the most prevalent hematological condition in children and adolescents. This disorder is defined by a lack of erythrocytes or hemoglobin, which can result in inadequate oxygen transport to the body's tissues [13]. Anemia is defined as having a hemoglobin level of less than 13 g/dL in men and less than 12 g/dL in women. Table II displays the anemic status of respondents according to gender. The Fisher's Exact Test ($\alpha=0.05$) demonstrates a significant relationship between gender and anemia incidence ($p\text{-value} = 0.038$). Table II shows that 14 of the 19 female students suffered anemia. This indicates that young girls are more susceptible to anemia.

Table II. Distribution of Anemia by Gender

Gender	Anemia (%)	Normal (%)	Total (%)
Male	1 (8)	11 (92)	12 (100)
Female	14 (42)	19 (58)	33 (100)
Total	15	30	45

The nutritional status of the respondents was assessed by calculating the Body Mass Index (BMI) using the formula weight divided by height squared ($BMI = BW/H^2$). The BMI results (Table III) were then adjusted by referring to the median value in the Z-Score table according to the respondent's age. The median value determines the formula used to calculate BMI-for-age (BMI/A). Based on the BMI/A calculation, the nutritional status categories were classified according to the Z-Score categories. The nutritional status categories are as follows: severe malnutrition if the Z-Score is < -3

SD, undernutrition from -3 SD to < -2 SD, normal from -2 SD to 1 SD, overweight from 1 SD to 2 SD, and obesity > 2 SD [14].

Table III. Nutritional Status of Respondents

Nutritional Status Category (IMT/U)	Frequency (%)	Anemia (%)
Gizi buruk (< -3 SD)	0	0
Gizi kurang (-3 SD sd < -2 SD)	3 (7)	0
Normal (-2 SD sd +1 SD)	36 (80)	13 (36)
Gizi lebih (+1 SD sd +2 SD)	5 (11)	2 (40)
Obesitas (> +2 SD)	1 (2)	0

The study found that 80% of respondents (36 persons) had normal nutritional status. There were five people with an overnutrition status (11%), one with obesity (2%), and three with undernutrition (7%). The chisquare statistical test demonstrated no relationship between nutritional status and anemia. This contrasts with the findings of a study which showed an association between nutritional status and hemoglobin levels in adolescents [15]. Anemia can be influenced by various factors other than nutritional knowledge, such as socioeconomic status, access to health services, and genetic predisposition. These factors might obscure the role of nutritional status, reducing its relevance for determining the incidence of anemia. Food intake, nutrient absorption, and overall health have each had an effect on a person's nutritional status [16]. In this study, 13 respondents with anemia had normal nutritional status. This suggests that even if adolescents have a certain nutritional status, it may not be adequate to prevent anemia caused by other health problem or other nutritional deficiencies that are not directly related to their dietary habits [16].

Anemia among adolescents in Indonesia highlights the importance of having a thorough understanding of the causes and risk factors for anemia in order to develop effective prevention and treatment strategies. Ignorance of the importance of nutritional intake, particularly iron, may compromise efforts to improve adolescent health. As therefore, effective education about healthy eating habits, anemia symptoms, and the need of regular health checks is essential [17]. The educational intervention significantly increased respondents' understanding about anemia ($P<0.000$). By improving teenagers' awareness of anemia, it is hoped that they would be able to make better nutritional choices and take proactive efforts to improve their health, thus lowering the prevalence of anemia in this demographics.

Table IV. Respondents' Knowledge About Anemia

	Frequency	Mean±SD	P-value
Pre-Test	45	8.40±1.05	0.000*
Post-Test	45	9.87±0.34	

* $p=0.000$, $\alpha=0.05$

According to the findings of the study, 25 respondents (55.5%) engaged in light physical activity in the previous month, 18 (40%) engaged in moderate physical activity, and 2 (4.5%) engaged in vigorous physical activity. Ten of the responders who engaged in light physical activity developed anemia.

Table V. Physical Activities of Respondents

Physical Activities Category	Frequency (%)	Anemia (%)
Light	25 (55.5)	10 (40%)
Moderate	18 (40)	4 (22%)
Intense	2 (4.5)	1 (50%)

The chisquare statistical test found no association between physical activity and anemia status. This is consistent with the findings of a study that demonstrated no relationship between physical activity in students and the development of anemia [18]. Other research, however, has established a correlation between high levels of physical exercise and anemia. Increased physical activity increased the risk of anemia due to higher dietary and iron requirements [19]. In this study, two individuals engaged in intense exercises, and one developed anemia. This could happen due to an increase in iron needs.

4. Conclusion

This study demonstrates that there is a relationship between gender and anemia, with female students experiencing anemia more frequently. The results showed a significant increase in students' knowledge about anemia after the intervention. Although there was no clear correlation between nutritional status and anemia incidence, nor physical activity and anemia, this study's findings indicate that nutritional education and health promotion are critical for reducing anemia prevalence. This study did not investigate social, economic, or parental knowledge aspects that may influence nutritional status and anemia in students. Improving understanding of anemia may increase self-awareness, enabling students to prevent anemia and enhance the quality of life.

5. Conflict of Interest

The author(s) declared no conflict of interest.

6. Acknowledgment

Gratitude is extended to the Rector of Universitas Negeri Malang (UM), the Institute for Research and Community Service (LPPM), the Faculty of Medicine, and SMAN 7 Kota Malang for their involvement in this research.

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