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Effectiveness Of Supplementation With Fe And Vitamin C Tablets On Hemoglobin Values In Female Students With Anemia

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Abstract

Background:Anemia in adolescent girls remains a health problem that impacts decreased immunity, concentration in learning, productivity, and the risk of continuing into pregnancy. Iron tablets and vitamin C are known to increase hemoglobin formation by increasing iron absorption. Objective: To determine the effectiveness of administering iron tablets and vitamin C on hemoglobin levels in female students with anemia at STIKes RSPAD Gatot Soebroto. Method: Quantitative research with a pre-experimental one group pretest-posttest design. The sample consisted of 34 female students with anemia (Hb <12 g/dL) and were selected using consecutive sampling technique. The intervention was administration of iron tablets and vitamin C for two weeks. Data were analyzed using paired t-test. Results: Most respondents had good knowledge about anemia (59%), poor attitudes towards anemia prevention (64%), and good sleep quality (68%). The average hemoglobin level before the intervention was 10.8 g/dL (range 8.1–11.9 g/dL), while after the intervention it increased to 11.8 g/dL (range 11.5–14.5 g/dL). The results of the paired t-test showed a p value = 0.01 (<0.05), which indicated a significant increase in hemoglobin levels after administering Fe tablets and vitamin C. Conclusion: Administration of Fe tablets and vitamin C effectively increased hemoglobin levels in female students with anemia so that it can be one of the efforts to prevent and overcome anemia in adolescent girls.

***Keywords*:anemia, hemoglobin, Fe tablets, vitamin C, adolescent girls.**

INTRODUCTION

Anemia is a public health problem that remains a global challenge, particularly for adolescent girls and women of reproductive age. The World Health Organization (WHO) states that anemia is particularly prevalent among menstruating adolescent girls, women of childbearing age, pregnant women, and groups with inadequate nutritional intake. Globally, approximately 30% of women aged 15–49 years suffer from anemia, with iron deficiency being the leading cause

In Indonesia, the prevalence of anemia among adolescent girls remains high, showed that the prevalence of anemia in adolescent girls increased from 37.1% in 2013 to 48.9% in 2018, with the largest proportion found in the 15–24 age group. This condition indicates that anemia remains a health problem that requires serious attention because it can impact the quality of human resources in the future. [1].

According to WHO (2025), adolescent girls are a group vulnerable to anemia due to rapid growth, increased iron requirements, and monthly blood loss during

menstruation. Furthermore, an unbalanced diet, poor dietary habits, low consumption of iron-rich foods, and insufficient vitamin C intake contribute to the high incidence of anemia in this group. Vitamin C plays a crucial role in increasing the absorption of non-heme iron in the digestive tract, thus aiding optimal hemoglobin formation.

Anemia in adolescent girls can have various negative impacts, including fatigue, decreased concentration in learning, impaired academic performance, decreased productivity, and decreased resistance to infection. In the long term, anemia left untreated during adolescence can persist into pregnancy and increase the risk of maternal and neonatal complications.[2]

The Indonesian government has implemented a program to provide iron supplements (IBF) to prevent anemia in adolescent girls. However, the program's success is still influenced by various factors such as knowledge, attitudes, adherence to iron tablet consumption, diet, and nutritional status. Administering vitamin C along with iron tablets is known to increase iron bioavailability, potentially increasing hemoglobin levels more effectively than iron alone.[3]

Female students, as a group in their late teens, are at risk of developing anemia due to high academic activity, unhealthy lifestyles, and irregular eating habits. Therefore, research is needed to evaluate the effectiveness of administering iron and vitamin C tablets to increase hemoglobin levels in female students with anemia. The results of this study are expected to form the basis for developing promotive and preventive programs to prevent anemia in female adolescents in higher education settings.

RESEARCH METHODS

This study used a one-group pretest-posttest design to evaluate the effectiveness of administering iron tablets and vitamin C on hemoglobin levels in anemic female students. The study was conducted at STIKes RSPAD Gatot Soebroto in September–October 2024. The sample consisted of 34 female students with hemoglobin levels <12 g/dL selected using consecutive sampling technique. The intervention consisted of administering iron tablets and vitamin C for two weeks. Hemoglobin levels were measured before and after the intervention. Data were analyzed using descriptive analysis and paired t-test with a significance level of $p < 0.05$. The study was conducted in accordance with research ethics principles and all respondents had provided informed consent before participating.

RESEARCH RESULT

A total of 34 female students with anemia participated in this study. Respondent characteristics analyzed included knowledge about anemia, attitudes toward it, and sleep quality.

Table 1. Frequency Distribution of Characteristics of Female Students with Anemia Including Knowledge, Attitude and Sleep Quality (n = 34)

Variables	Category	n	%
Knowledge about Anemia	Good	20	59
	Not enough	14	41
Attitudes towards Anemia	Good	12	36
	Not enough	22	64
Sleep Quality	Good	23	68
	Not enough	11	32

Univariate analysis showed that most respondents had good knowledge about anemia (20 people) (59%), while 14 people (41%) had poor knowledge. Based on attitudes towards anemia, the majority of respondents had poor attitudes (22 people) (64%), while 12 people (36%) had good

attitudes. Based on sleep quality, most respondents had good sleep quality (23 people) (68%), while 11 people (32%) had poor sleep quality.

Hemoglobin Level Overview Before and After Intervention

Table 2. Distribution of Hemoglobin Values Before and After Administration of Fe Tablets and Vitamin C

Variables	n	Mean (g/dL)	Elementary School	Min–Max	95% CI
Before Intervention	34	10.8	1,319	8.1–11.9	9.3–11.3
After Intervention	34	11.8	1,626	11.5–14.5	11.7–12.5

The average hemoglobin level of respondents before the intervention was 10.8 g/dL, with a lowest value of 8.1 g/dL and a highest of 11.9 g/dL. After administering iron and vitamin C tablets for two weeks, the average hemoglobin level increased to 11.8 g/dL, with a lowest value of 11.5 g/dL and a highest value of 14.5 g/dL. These results indicate a 1.0 g/dL increase in hemoglobin levels after the intervention.

Effectiveness of Supplementation With Iron and Vitamin C Tablets

Table 3. Differences in Hemoglobin Values Before and After Intervention

Variables	n	Mean (g/dL)	Elementary School	p-value
Before Intervention	34	10.8	1.04	0.01
After Intervention	34	11.8	1.66	0.01

Bivariate analysis using a paired t-test showed a significant difference between hemoglobin levels before and after administration of iron tablets and vitamin C ($p = 0.01$; $p < 0.05$). The average hemoglobin level increased from 10.8 g/dL to 11.8 g/dL after the intervention. This increase indicates that the combination of iron tablets and vitamin C is effective in increasing hemoglobin levels in female students with anemia.

Clinically, the increase in hemoglobin levels indicates an improvement in the respondents' anemia status after consuming iron tablets and vitamin C for two weeks. Vitamin C plays a role in increasing iron absorption in the digestive tract, thus supporting optimal hemoglobin formation. Therefore, the research hypothesis that administering iron tablets and vitamin C can increase hemoglobin levels in female students with anemia is accepted.

DISCUSSION

This study demonstrated that administering iron tablets and vitamin C for two weeks effectively increased hemoglobin levels in female students with anemia. The analysis showed an average increase in hemoglobin levels from 10.8 g/dL before the intervention to 11.8 g/dL after the intervention, with a paired t-test showing a statistically significant difference ($p = 0.01$). These findings indicate that the combination of iron tablets and vitamin C can be an effective intervention in managing anemia in adolescent girls.

In the analysis of respondent characteristics, the majority of female students had good knowledge about anemia (59%), but the majority still showed a lack of attitude towards anemia prevention

(64%). These results indicate that good knowledge is not necessarily followed by changes in health attitudes and behaviors. According to Bloom's health behavior theory, knowledge is a cognitive domain that forms the basis for the formation of attitudes and behaviors, but behavioral changes are also influenced by supporting and reinforcing factors such as the environment, motivation, and individual habits. Therefore, health education needs to be accompanied by strategies that can increase adolescent compliance and motivation in preventing anemia.

Furthermore, the majority of respondents reported good sleep quality (68%). Sleep quality is a factor that can affect general health, including metabolism and recovery. However, anemia in adolescent girls is more influenced by iron intake, menstrual blood loss, and daily dietary patterns. Adolescent girls are a vulnerable group for anemia due to their increased iron needs during growth and monthly iron loss through menstruation. The WHO theory states that iron deficiency is the primary cause of anemia in adolescent girls and women of reproductive age.

The increase in hemoglobin levels found in this study can be explained by the mechanism of action of iron and vitamin C in the erythropoiesis process. Iron is a key component in the formation of hemoglobin, which functions to transport oxygen to all body tissues. Meanwhile, vitamin C acts as an enhancer, increasing the absorption of non-heme iron in the intestine by reducing ferric ions (Fe^{3+}) to ferrous ions (Fe^{2+}), which are more easily absorbed by the body. According to[4]Consuming vitamin C along with Fe tablets can increase iron absorption several times compared to consuming iron without vitamin C. Therefore, the combination of these two supplements can increase the availability of iron for hemoglobin synthesis so that hemoglobin levels increase after the intervention.

The results of this study are in line with research[5]who reported a significant increase in hemoglobin levels after administering iron tablets and vitamin C to adolescent girls. This study showed that the combination of the two interventions was able to improve hemoglobin status more effectively than before the intervention. Similar findings were also reported by[6]which states that regular consumption of iron tablets can prevent and treat anemia in adolescent girls, especially during menstruation when iron requirements increase.

However, several other studies have shown that the incidence of anemia is not solely influenced by iron sufficiency.[7]And[8]stated that other factors such as infectious diseases, nutritional status, diet, adherence to supplement consumption, and individual health conditions can also affect hemoglobin levels. Therefore, anemia management efforts are not limited to administering iron tablets alone; they need to be supported by improved diet, increased consumption of iron and vitamin C sources, and ongoing health education.

Overall, the results of this study strengthen the theory that iron supplementation combined with vitamin C is an effective strategy for increasing hemoglobin levels in anemic adolescent girls. This intervention can be used as a promotional and preventive program in higher education settings to reduce the prevalence of anemia and improve the health of adolescent girls.

CONCLUSION

The supplementation of iron tablets and vitamin C for two weeks has been proven effective in increasing hemoglobin levels in female students with anemia at the Gatot Soebroto Army Hospital (RSPAD) Health College. The average hemoglobin level increased from 10.8 g/dL before the intervention to 11.8 g/dL after the

intervention, with statistical test results showing a significant difference (p = 0.01). Most respondents had good knowledge about anemia, but still showed a lack of attitude towards anemia prevention efforts. The results of this study support the theory that the combination of iron and vitamin C supplementation can increase iron absorption and accelerate hemoglobin formation[9]. Therefore, the administration of iron tablets accompanied by vitamin C can be recommended as an effective strategy in the prevention and management of anemia in adolescent girls, especially in the tertiary environment.

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