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Differences Serum Iron Levels in Pre-Menstrual and Post-Menstrual Women Who Consume Iron Tablets

Vinda Arifa Aprilia[1], Gilang Nugraha[1*]

*Correspondence:
gilang@unusa.ac.id

[1] Departement of Medical Laboratory Technology, Faculty of Health, University Nahdlatul Ulama Surabaya, Surabaya, Indonesia

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ABSTRACT

Iron deficiency anemia is a condition of insufficient nutrients needed to produce and statize erythrocytes. Adolescent girls are prone to iron deficiency anemia, one of the factors that affects menstruation. During menstruation, iron in the body will dissolve with menstrual blood so that it will affect iron levels. Iron deficiency anemia can be prevented by the consumption of iron tablets, but adolescent girls lack awareness for the consumption of iron tablets. This study aims to determine the difference serum iron levels in pre-menstrual and post-menstrual women consume iron tablets. This type of research is pre-experimental designs with simple random sampling techniques. The method used is colorimetry-ferozine. The sample of this study is a 3rd semester D-IV Health Analyst student at Nahdlatul Ulama University Surabaya which totals 31 respondents. The average serum iron level in pre-menstrual women was 74 µg/dL and post-menstrual women 71 µg/dL. Data were analyzed using *the Paired t-test* and obtained a p-value of 0.623 (p>0.05). The conclusion was that there was no significant difference in serum iron levels of pre-menstrual and post-menstrual women who consumed iron tablets. It is recommended that the next researcher use a sample of women with iron deficiency anemia. In addition, the researcher was further advised to measure serum iron levels in post-menstrual women did not consume iron tablets.

Keywords: Iron Deficiency Anemia, Adolescent Girls, Menstruation, Iron Tablets, *Serum Iron*

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INTRODUCTION

Anemia is a condition of not meeting physiological needs in the number of erythrocytes or oxygen carrying capacity so that the formation of erythrocytes will be disrupted [1]. Iron deficiency anemia is anemia that occurs due to iron deficiency such as insufficient iron intake, blood loss due to menstruation and decreased absorption due to age [2] Iron deficiency anemia is more risky for adolescent girls than adolescent boys, one of the influencing factors is menstruation so that iron in adolescent girls will be lost twice as much as adolescent boys [3]. Blood that comes out during menstruation plays a role in the incidence of anemia because there is insufficient iron supply in women and the loss of iron during menstruation cannot be replaced by iron *absorbs* in the body [3]. If there is enough menstrual blood, the iron in the body will be lost so much that women need more iron to replace the iron lost along with menstrual blood [4]. Lack of iron absorption in the body is due to the lack of iron needs in the body so that it will have an impact on decreasing hemoglobin levels, this can cause anemia in adolescents [5]. Impaired hemoglobin synthesis is caused by a decrease in iron levels in the blood, especially in the bone marrow [6]. This

occurrence, if not balanced with adequate iron intake, can cause anemia [1]. The way to anticipate anemia, especially iron deficiency anemia in women, can be done by giving iron tablets [4]. The prevalence of anemia aged 15-49 years in women of productive age in 2023 was 30.5% [7]. The prevalence of anemia in women of productive age in Indonesia is 20-39.9%. Anemia in adolescent girls aged 15-18 years in Jember Regency in 2018 was 648 cases with a proportion of 19.76%. Most of the symptoms of anemia were 76.9% in health students and 54.7% in non-health students [8]. The prevalence of anemia in adolescents in developing countries is much higher than in developed countries, in developing countries by 27% and in developed countries by 6% [9]. The purpose of this study was to determine the difference serum iron levels in pre-menstrual and post-menstrual women consumed iron tablets.

MATERIALS AND METHODS

The research uses a quantitative method with pre-experimental designs using One-Group Pretest-Posttest Designs. The research population is D-IV Health Analyst students at Nahdlatul Ulama University Surabaya. The sampling technique was carried out by simple random sampling. The research was conducted in February-March 2025 with a sample of 31 female students.

The tools used in this study are 3cc syringes, tourniquets, red vacutainer tubes without clot activators, semi auto chemistry analyzers (photometers), centrifuges, vortexes, microtubes, micropipettes, blue tips, yellow tips and label paper. The materials used are iron tablets, venous blood, irone ferene kits, plaster, handscoon, tissues and aquadest.

The method of collecting research data in the pre-menstrual group was blood collection 7 days before the follicular phase, measuring the menstrual phase using an application called flo while in the post-menstrual group before blood collection, female students were given iron tablets to consume. The intervention of giving iron tablets was carried out on female students for 5 days and post-menstrual blood collection was carried out on the 6 days. Serum iron levels were measured using a colorimetry-ferozine method photometer with an irone ferene kit. The normal value *of* serum iron levels in adult women is 50-170 µg/dL.

Blood sampling was carried out using a red tube that does not contain a clot activator. After blood collection, the sample is incubated in a red tube for 15-30 minutes for the blood clotting process. The blood clotting process is complete, the tube is centrifuged at a speed of 3000 rpm for 15 minutes. Separate the serum and transfer it to a microtube using 500 µl micropipettes. The sample was analyzed using a photometer and the reagent used, namely the glory reagent.

The duration of menstruation observed in the respondents was 5 days. Normally, the menstrual cycle occurs 21-35 days, the length of menstruation occurs for 2-8 days with the volume of menstrual blood coming out ranges from 20-60 ml per day [10]. The intervention of giving iron tablets was carried out for 5 days. The dose of blood supplement tablets in adolescent girls was a dose of 60 mg of ferro fumarate and folic acid 0.400 mg [11].

Data analysis was carried out to determine the difference serum iron levels in pre-menstrual and post-menstrual women consumed iron tablets, data analysis using a paired T-test.

RESULTS AND DISCUSSION

The respondents involved in the study were 31 people with women aged 19-20 years as the main respondents and had been declared ethical by the health research ethics committee of Nahdlatul Ulama University Surabaya with No. 0484/EC/KEPK/UNUSA/2024. The distribution of the sample based on the age criteria of the respondents is presented in Table 1.

Table 1. Sample Distribution by Age

Age	Frequency (People)	Presentase (%)
19 Years	16	52%
20 Years	15	48%
Total Amount	31	100%

Based on Table 1 of the total 31 respondents studied, the number of respondents aged 19 years was 16 people while respondents aged 20 years were 15 people. Thus, the most respondents were 19 years old.

Table 2. Sample Distribution Based on Menstrual Length

Length of Menstruation	Frequency (People)	Presentase (%)
5 Days	31	100%
Total Amount	31	100%

The distribution of samples based on the length of the respondents' menstruation is presented in Table 2. The length of menstruation was studied in 31 respondents for 5 days with 100% presentation.

Table 3. Average Results of Serum Iron Levels Examination

Treatment Groups	Mean (µg/dL)	SD (µg/dL)	Minimum (µg/dL)	Maximum (µg/dL)
Pre-menstruation	74	31	23	131
Post-Menstrual	71	30	22	130

The results of the examination of serum iron levels from 31 respondents, the pre-menstrual group of women who did not consume iron tablets obtained an average result of 74 µg/dL with a standard deviation of 31 µg/dL. The post-menstrual group that consumed iron tablets obtained an average result of 71 µg/dL with a standard deviation of 30 µg/dL.

Table 4. Serum Iron Level Examination Results Based on Normal Values

Treatment groups	Normal/Abnormal	Frequency (People)	Presentase (%)
Pre-menstruation	Normal	23	74%
	Abnormal	8	26%
Post-Menstruation	Normal	21	68%
	Abnormal	10	32%

The normal and abnormal treatment groups of pre-menstrual and post-menstrual serum iron levels, the normal value was 50-170 µg/dL obtained from the reagent insert kit. Based on Table 4 of the total 31 respondents studied, the number of respondents in the pre-menstrual female group obtained normal serum iron levels of 74% and abnormal levels of 26%. The post-menstrual group of women obtained normal serum iron levels of 68% and abnormal levels of 32%.

Table 5. Paired T-Test Test Results

Treatment groups	*P-Value*	Information
Pre and Post Menstruation	0,623	There is no difference

The interpretation of the paired T-test test, if the p-value < 0.05, H_0 is rejected and H_1 is accepted, namely there is a difference serum iron levels in pre-menstrual and post-menstrual women consume iron tablets. If the p-value > 0.05, H_0 is accepted and H_1 is rejected, i.e. there is no difference serum iron levels in pre-menstrual and post-menstrual women consume iron tablets. The results in table 5 showed a p-value of 0.623 (p>0.05) meaning that H_0 was accepted and H_1 was rejected so that there was no significant difference serum iron levels in pre-menstrual and post-menstrual women consumed iron tablets.

The findings obtained by the researcher are that iron tablets cannot increase serum iron levels in menstruating women and after statistical tests the results are insignificant. Factors that can affect are the nutritional status of the respondents where there is a lack of consumption of foods containing iron, vitamin C and animal protein [12]. Poor nutritional intake can affect a person's nutritional levels, if the body lacks protein needs it can result in a reduction in the process of iron transport in the blood so that the iron absorption and transport process will be disrupted. Iron has an important role in the formation of iron Hemoglobin in the blood. If the iron transport process is disrupted or not optimal, this will affect the formation of Hemoglobin and can lead to anemia [13].

Iron has an important role in the body, iron deficiency can cause the process of iron absorption in the body to be disrupted. Anemia can be prevented, one of which is by getting enough nutrients, namely iron. A normal human needs about 20 to 25 mg of iron daily to produce red blood cells. The body absorbs about 1 mg of iron, which is equivalent to 10-20 mg of iron in food [14]. Lack of iron in absorption can be caused by the content of foods consumed low in iron, which can lead to iron deficiency stored in the body for a long period of time so that it can be disrupted in the process of hemoglobin formation [15].

Iron absorption includes heme iron from animal foods and non-heme iron from plant foods and supplements. Heme iron found in meat, poultry, and seafood is more easily absorbed and has higher bioavailability compared to non-heme iron. The heme iron consumed will be released from proteins digested by stomach acid and small intestine [16]. Heme iron intake has high absorption and bioavailability, this is because heme iron is in the form of Fe^{2+} (ferro) iron so that it is directly absorbed and not affected by substances that inhibit absorption [17]. Non-heme iron, found in plant-based sources such as beans, chickpeas, dark chocolate, legumes, spinach, and fortified grains, has about two-thirds of the bioavailability of heme iron. When iron stores in the body decrease, the proportion of non-heme iron absorbed increases. Generally, heme iron is absorbed more efficiently than non-heme iron, but this is not affected by a person's iron status [16].

Another factor that can affect is menstrual volume. The length of menstruation cannot affect the incidence of anemia but is supported by the volume of blood that comes out, the volume of blood that is consumed during menstruation for each respondent is different. The length of menstruation can be said to be short and long, the length of short periods can be with a large volume of blood or long periods with a small volume of blood. The volume of blood excreted during menstruation ranges from 20-25ml which is equivalent to the loss of iron in the body that comes out along with menstrual blood ranging from 12.5-15 mg/month [18].

The shorter the menstrual cycle, the more often adolescent girls experience menstruation so that it can cause excessive menstrual bleeding. Blood that comes out plays an important role in the incidence of anemia because there is insufficient iron and iron absorption in the body cannot replace the iron lost during menstruation. The amount of iron lost during menstruation depends on the amount of blood that comes out during menstruation [19].

CONCLUSIONS

The results of the study on the difference serum iron levels in pre-menstrual and post-menstrual women showed that the results of the serum iron level examination in pre-menstrual women did not consume iron tablets showed an average value of 74 µg/dL and the results of the serum iron level examination in post-menstrual women consuming iron tablets obtained an average result of 71 µg/dL. Based on the results of the study, it can be concluded that there is no significant difference serum iron levels in pre-menstrual and post-menstrual women consume iron tablets.

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