



Original Article

Differences in Pre- and Post-Menstruation Hemoglobin Levels in Students of the Medical Laboratory Technology Study Program at Poltekkes Kemenkes Kupang

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ABSTRACT

Anemia is a common health problem experienced by adolescent girls, especially due to blood loss during menstruation which causes a decrease in hemoglobin (Hb) levels. Hemoglobin is an important protein in red blood cells that functions to transport oxygen from the lungs to all body tissues. Lack of hemoglobin can disrupt body function and potentially cause the risk of ongoing mental complications. This study aims to identify differences in hemoglobin (Hb) levels before (pre) and after (post) menstruation among female students of the Medical Laboratory Technology Study Program at Poltekkes Kemenkes Kupang. The research method used is quantitative with a cross-sectional approach. The sample in this study consisted of 30 female students who were taken using random sampling techniques. Hemoglobin levels were measured twice, namely on the first day of menstruation and after the last day of menstruation, using a POCT (Point of Care Testing) tool that provides fast and practical results. Data analysis was carried out using the Wilcoxon test because the data obtained were not normally distributed. The results of the study showed a significant decrease in hemoglobin levels after menstruation. Before menstruation, the average Hb level was recorded at 12,847 g/dL, while after menstruation it decreased to 11,273 g/dL. The Wilcoxon test results showed a significance value of 0,000 ($p < 0,05$), which indicated a significant difference between hemoglobin levels before and after menstruation.

Introduction

Adolescents play a crucial role in the development and growth of a nation, as a healthy young generation is an investment for the future. According to Diorarta & Mustikasari (2020), the adolescent age range is divided into three phases: early adolescence (11-14 years), middle adolescence (15-17 years), and late adolescence (18-20 years). One of the health problems frequently faced by adolescents, especially young women, is anemia. Anemia is a condition in which the number of red blood cells is below normal, or can be called a blood deficiency disease, which is partly caused by a lack of iron intake. The presence of anemia can also occur due to red blood cells that do not have enough hemoglobin (Handayani, Nurbaya, & Yusra, 2019). Anemia in

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adolescent girls needs to be studied, because adolescent girls who suffer from anemia and then become pregnant will face many risks, including abortion, giving birth to a baby with low birth weight, experiencing difficulties during labor due to the uterus being unable to contract properly, or bleeding after delivery which often results in death (Mursiti, 2016). Furthermore, for adolescents with a history of anemia during pregnancy, it can affect fetal development, potentially leading to stunting (Sarman & Darmin, 2021).

Adolescence is often marked by significant changes, both physiological and psychological. One striking physiological change is the onset of reproductive organ function, one of which is indicated by the onset of menstruation (Asfaraini, Zaetun, & Rohmi, 2017). Menstruation is a physiological process involving the monthly shedding of the endometrium, a tissue rich in blood vessels (Hadijah, Hasnawati, & Hafid, 2019). During the reproductive years, adolescent girls lose significant amounts of blood, resulting in iron loss. This iron deficiency can lead to decreased hemoglobin levels in the body. Hemoglobin (Hb) is a protein found in red blood cells (erythrocytes) and gives blood its red color. This protein plays a crucial role in transporting oxygen and carbon dioxide throughout the body (Nurhayati et al., 2022). Hemoglobin level examinations are carried out on female students because the menstrual cycle in female students is usually more regular compared to junior high or high school students, who may experience menstrual irregularities because their bodies are still in the development stage (Hatmanti, 2015).

Methods

This study was quantitative with a cross-sectional approach. The sample consisted of 30 female students randomly selected from the TLM study program. Hemoglobin levels were measured twice: on the first day of menstruation (pre-) and after the last day of menstruation (post-) using a POCT (Point of Care Testing) device. Data analysis was performed using the Wilcoxon test because the data were not normally distributed.

Results

This study, titled "Differences in Pre- and Post-Menstrual Hemoglobin Levels in Female Students in the Medical Laboratory Technology Study Program at Poltekkes Kemenkes Kupang," was conducted at the Medical Laboratory Technology Study Program at Poltekkes Kemenkes Kupang. Thirty female students, whose menstrual cycles lasted 3 to 4 days and who did not consume iron supplements (TTD), participated in the study. The following data presents the results of hemoglobin level tests on the respondents before and after menstruation.

Table 1. Pre- and post-menstrual hemoglobin level results

Group	Normal	Low	Mean	Max	Min
Pre-test	27	3	12,847	16,0	10,9
Post-test	4	26	11,273	14,0	8,0

Table 1 shows that during the pre-test (before menstruation), the majority of respondents, 90%, had normal hemoglobin levels, while only 10% showed low hemoglobin levels. However, after menstruation (post-test), there was a change in the number of respondents with normal hemoglobin levels, dropping drastically to 13,3%, while the number of respondents with low hemoglobin levels jumped to 86,7%. Physiologically, this condition can be caused by blood loss that occurs during menstruation. According to Minarfah, Kartika, & Puspasari (2021), adolescent girls who experience menstruation tend to experience iron deficiency, which can directly impact the amount of hemoglobin in the body. Data obtained in the pre-test data, the minimum and maximum values have a range of values of 5,1 g/dL. On the other hand, the post-test data has a wider range of 0,6 g/dL. This indicates an increase in value variation after menstruation, which is characterized by a wider range and a decrease in the minimum value. This means that some respondents had lower hemoglobin levels in the post-test compared to the pre-test. To evaluate whether the data is normally distributed or not, a normality test is performed. According to Ningsih, Nurhasanah, & Fadillah (2019), the Shapiro-Wilk test is more recommended for use in small sample sizes. The Shapiro-Wilk test produces a Sig. of 0,008, indicating a non-normal distribution. Therefore, the most appropriate difference test for this study is the Wilcoxon test.

Table 2. Wilcoxon Test Results

Description	Value
Number of samples	30
Negative ranks (post<pre)	26
Positive ranks (post>pre)	4
Ties (post=pre)	0
Asymp. Sig. (2-tailed)	0,000

The Wilcoxon test results showed a significance value of 0,000 ($p < 0,05$), indicating a significant difference between pre- and postmenstrual hemoglobin levels. Table 2 shows that 26 respondents (86,7%) experienced a decrease in postmenstrual hemoglobin levels compared to premenstrual levels, while only 4

respondents (13,3%) experienced an increase in hemoglobin levels, and no respondents had stable hemoglobin levels (ties=0).

Discussion

These results indicate that overall, there is a significant decrease in hemoglobin levels postmenstrually. Based on research conducted by Karamo et al. (2024), with a sample size of 74, statistical analysis results showed a p-value of 0,042 ($p > 0,05$), indicating a relationship between menstrual duration and hemoglobin levels. Furthermore, research conducted by Patonah & Azizah (2019) with a sample size of 47 found a relationship between menstrual duration and hemoglobin levels. Furthermore, research conducted by Puspitasari, Purnama, & Winarsih (2023) with a sample size of 29 found a relationship between menstrual duration and hemoglobin levels, as seen from statistical tests with a p-value of 0,000.

Iron tablet consumption habits are also a factor that can affect hemoglobin levels. Research conducted by Abby et al. (2023) showed that 37 respondents (92,5%) who were compliant with iron tablet consumption did not experience anemia. Meanwhile, 9 respondents (42,9%) who were non-compliant with iron tablet consumption experienced anemia. Another study conducted by Meitasari & Sarbini (2022) with a sample size of 47 samples obtained statistical test results ($p < 0,05$), namely a p-value $< 0,001$, indicating a relationship between adherence to iron supplement consumption and hemoglobin levels. These two studies are in line with the study conducted by Putra, Munir, & Siam (2020) with a sample size of 33 samples and the results obtained based on statistical tests, namely a p-value of 0,007 ($p < 0,05$), indicating a significant relationship between adherence to iron supplement consumption and hemoglobin levels, which can cause anemia.

Physical activity is also a factor that can affect hemoglobin levels. When a woman is menstruating and engages in excessive physical activity, it can affect hemoglobin levels. Excessive exercise can disrupt the function of the hypothalamus gland, which in turn affects menstrual hormones. This condition can cause menstrual disorders and cycle irregularities. When physical activity is excessive, hypothalamic dysfunction can occur, which impacts the secretion of Gonadotropin Releasing Hormone (GnRH). As a result, menarche can be delayed and menstrual cycles become irregular (Ilmi & Selasmi, 2019). Based on research conducted by Pratiwi (2018) with a sample of 48 samples using the Fisher's Exact Test, it shows that there is a relationship between menstrual duration and hemoglobin levels as seen from the p-value obtained, namely 0,000 ($p < 0,05$). There is also research conducted by Claudia, Arif, & Anggraini (2023) with a sample of 40 samples using a statistical test obtained a p-value=0,011 (0,05) indicating that there is a relationship between physical activity and hemoglobin levels.

Conclusions

Based on research conducted on female students in the Medical Laboratory Technology study program at Poltekkes Kemenkes Kupang, it can be concluded that there is a difference in pre- and post-menstrual hemoglobin levels. The average hemoglobin level in pre-menstrual respondents was 12,847 g/dL, while the post-menstrual hemoglobin level was 11,273 g/dL. It is recommended that female students pay attention to their intake of foods containing iron and adhere to the consumption of iron-fortified tablets to prevent anemia.

Author contributions

FL, NAY, and AA contributed to the study's concept and design. FL assisted with experimental studies and data acquisition. AA managed the literature search, data analysis, and statistical analysis. All authors participated in manuscript preparation, with FL and NAY responsible for editing and review. All authors have read and agreed to the published version of the manuscript.

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Ethical approval statement

The study received ethical approval from the Ethics Committee of Poltekkes Kemenkes Kupang with certificate number No.LB.02.03/1/0012/2025.

Conflicts of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Supplementary materials

No supplementary material available.

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