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Combination of Iron Tablets With Yoga in Teenage Girls Experiencing Anemia With Dysmenorrhea

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ABSTRACT

Anemia and dysmenorrhea are common reproductive health problems among adolescent girls that reduce quality of life and daily activity, yet research combining iron (Fe) supplementation with non-pharmacological therapy such as yoga remains limited. This study aimed to compare the effect of Fe tablets alone with a combination of Fe tablets and yoga on hemoglobin level and dysmenorrhea intensity among adolescent girls. A quasi-experimental study with a pretest-posttest control group design involved 62 female students of SMA Negeri 03 Rejang Lebong, divided into two groups of 31: one receiving Fe tablets only and the other receiving Fe tablets combined with yoga twice a week for four weeks. Data were analyzed using the Wilcoxon and Mann-Whitney tests. The mean hemoglobin level was higher in the combination group (12.40 ± 0.72 g/dL) than in the Fe-only group (11.85 ± 0.75 g/dL), and the mean dysmenorrhea score was lower in the combination group (1.13 ± 1.18) than in the Fe-only group (2.65 ± 1.38), both with p = 0.000. The combination of Fe supplementation and yoga is significantly more effective than Fe supplementation alone in raising hemoglobin levels and reducing dysmenorrhea intensity in adolescent girls

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INTRODUCTION

Reproductive health is super important for teenage girls' development. They often face challenges in taking care of their reproductive health because of lack of knowledge, tough access to health services, and social or cultural factors. That's why in Indonesia, this issue sometimes doesn't get much attention, even though it has a huge impact on teens' quality of life and future (Saputra et al., 2021). There have been lots of policies to support teen reproductive health, but social stigma and limited access are still the main obstacles (Kemenkes RI, 2022). During puberty, teenage girls go through physical and hormonal changes that increase the risk of reproductive issues, especially dysmenorrhea and anemia (Hanifah et al., 2021). Data from the Indonesian Ministry of Health shows that both issues are commonly found in the 15–18 age group, which is when menstrual cycles start to become regular but teenagers' nutrition and lifestyle are still not stable (Khamidah et al., 2022).

Dysmenorrhea is menstrual pain caused by an increase in body chemicals during ovulation or conditions like endometriosis and fibroids (Hamidah & Rizal, 2022). Primary dysmenorrhea is caused by uterine muscle contractions due to increased prostaglandins, with symptoms appearing one to two days before menstruation, while secondary dysmenorrhea is caused by certain medical conditions and the pain can last longer (Oktavianto et al., 2023).

The impact of dysmenorrhea includes physical pain and abdominal cramps, as well as psychological issues like difficulty concentrating, depression, and anxiety. Studies on teenage girls report that around 60–70% of students experiencing dysmenorrhea say it interferes with their learning activities, and some even miss school on the first day of their period (Saalino et al., 2023). Pharmacological treatment of dysmenorrhea with regularly taken painkillers can potentially reduce organ function, such as in the liver and kidneys, so a non-pharmacological approach is more recommended (Nurmaliza et al., 2022).

Besides dysmenorrhea, iron deficiency anemia is also a reproductive health issue often experienced by teenage girls due to blood loss during menstruation, inadequate nutrient intake, and an unbalanced diet. The World Health Organization reported in 2023 that around 500 million women aged 15–49 worldwide suffer from anemia, with a global prevalence among non-pregnant women of 29.9%. In Indonesia, the Ministry of Health's 2020 data showed that the prevalence of anemia among teenage girls was 26.5% (Ministry of Health, 2023). On the other hand, the 2018 Basic Health Research (Riskesdas) recorded an anemia prevalence of 32% among youth aged 15–24 (Pratiwi et al., 2024).

Low hemoglobin levels reduce the distribution of oxygen to reproductive organs and trigger tissue hypoxia, which can make dysmenorrhea pain worse. A study on medical students even found that respondents with anemia had about twice the risk of experiencing moderate to severe dysmenorrhea compared to respondents with normal hemoglobin levels (Pratiwi et al., 2024).

Iron tablets are the standard pharmacological intervention to tackle anemia in teenage girls, with a program that gives one tablet per week running nationwide, although the adherence rates vary across regions, ranging from 40–76% (Ministry of Health RI, 2023). On the other hand, yoga as a non-pharmacological complementary therapy is reported to reduce menstrual pain intensity through muscle relaxation, improved blood circulation, and lowered stress hormone levels (Lestari et al., 2019; Cahyati et al., 2022).

The initial screening at SMA Negeri 03 Rejang Lebong of 115 female students showed that 84 students (73%) had mild to moderate anemia and 71 students (61.7%) of them also experienced mild to moderate dysmenorrhea, making this location seem relevant for research. Based on these high numbers and the limited studies on the combination of Fe tablets and yoga, this study aims to analyze the combination of Fe tablets and yoga on hemoglobin levels and dysmenorrhea intensity in teenage girls at SMA Negeri 03 Rejang Lebong.

LITERATURE REVIEW

Some previous studies show that consistently practicing yoga can lower menstrual pain levels in teenage girls, with pain scores dropping by about 1–3 points on the pain scale after four to eight sessions of practice (Jangam & Pawar, 2022; Hashemi et al., 2022). Yoga is also pretty easy to do since it doesn't require any special equipment and can be done in groups at school (Andaeni et al., 2021). Even though iron tablets and yoga have each been widely studied on their own, research that combines both interventions at the same time for teenage girls dealing with anemia and dysmenorrhea is still rare, especially in areas with limited access to reproductive health services (Sari KIP et al., 2022). In fact, a combined approach that targets both nutritional and non-pharmacological aspects could potentially offer more comprehensive benefits compared to a single approach (Guimaraes & Povoa, 2020).

METHODOLOGY

This study used a quantitative method with a quasi-experimental design through a pretest-posttest control group approach to test the combination of iron tablets and yoga in adolescent girls experiencing dysmenorrhea and anemia. The research was conducted at SMA Negeri 03 Rejang Lebong from May to June 2025. Samples were taken using purposive sampling with inclusion criteria: adolescent girls who have already menstruated with a normal cycle (21–35 days), experiencing mild to moderate dysmenorrhea, having low hemoglobin levels (9.0–11.9 g/dL), and willing to participate with parental consent, while exclusion criteria included dropping out during the study, using other drug or alternative therapies, and having serious medical conditions such as heart, kidney, or endocrine diseases. The sample size was calculated using the analytical formula for unpaired categorical comparison ($\alpha = 0.05$; $\beta = 0.20$), resulting in an estimate of 28 samples per group, plus a 10% anticipation of dropouts, making it 31 samples per group (a total of 62 respondents). Out of the 115 students initially examined, 84 were identified with mild–moderate anemia, 71 of them also experienced mild–moderate dysmenorrhea, and 62 students eventually met the

inclusion criteria and were willing to participate as respondents after the informed consent process.

The respondents were randomly divided into two groups: the Fe tablet group (n=31) and the combination group of Fe tablets with yoga (n=31), using the notation G1 O1 X1 O2 for the Fe tablet group and G2 O1 X2 O2 for the combination group. The combination group attended yoga sessions twice a week for four weeks (eight meetings in total) lasting 60 minutes each session (5 minutes warm-up, 50 minutes main exercise, 5 minutes cool-down) and took Fe tablets every night, while the control group only took Fe tablets every night without doing yoga. The independent variable of the study is the administration of iron tablets and a combination of iron tablets with yoga, while the dependent variables are hemoglobin levels (measured using a digital hemoglobinometer, in g/dL, categorized as not anemic/mild/moderate) and dysmenorrhea intensity (measured using a numeric pain scale instrument that has been validated for reliability, categorized as no pain/mild/moderate). Pretest measurements were taken before the intervention and posttest measurements were taken after four weeks of intervention.

Data analysis was done both univariately and bivariately using the Wilcoxon test to compare pretest-posttest results within each group, and the Mann-Whitney test to compare posttest results between the two groups, with a significance level of $p < 0.05$. Compliance with taking Fe tablets and attendance at yoga sessions was monitored through online communication groups during the study, and all respondents followed the research procedures completely without anyone dropping out. This study also observed ethical guidelines, including the principles of autonomy, beneficence and non-maleficence, justice, and confidentiality.

RESULTS AND DISCUSSION

The study involved 62 respondents divided into an iron tablet group (n=31) and a combination group of iron tablets with yoga (n=31). The basic characteristics of the respondents in both groups are shown in Table 1.

Table 1. Respondent Characteristics Based on Intervention Group

Variable	Category	Combination n	Combination %	Fe n	Fe %
Age	15years	3	9,7	6	19,4
	16 tyears	15	48,4	16	51,6
	17 years	12	38,7	7	22,6
	18 years	1	3,2	2	6,5
Class	X	16	51,6	14	45,2
	XI	15	48,6	17	54,8
Age of menarche	11 Year	2	6,5	1	3,2
	12 Year	9	29,0	8	25,8
	13 tahun	17	54,8	15	48,4
	14 tahun	3	9,7	7	22,6

Table 1 shows that most respondents in both groups are 16 years old (48.4% in the combination group; 51.6% in the Fe tablet group), with a fairly even distribution between grade X and XI. The most common age of menarche in both groups is 13 years. The relatively balanced distribution of basic characteristics between the two groups indicates that the comparison of treatment effects can be done objectively without major bias from differences in basic characteristics. This similarity in characteristics also strengthens the assumption that the different outcomes between groups in hemoglobin levels and dysmenorrhea are more likely caused by differences in the types of interventions received, rather than by factors like age, grade level, or the respondents' age at menarche.

Table 2. Distribution of Anemia Status and Dysmenorrhea Levels Before and After Treatment

Variable	**Category**	**Combination Pre** %	**Kombinasi Post** %	**Fe Pre** %	**Fe Post** %
Anemia Status	Not anemic	-	77,4	-	45,2
	Light	87,1	22,6	83,9	54,8
	Busy	12,9	-	16,1	-
Level of Dysmenorrhea	No pain	-	41,9	-	6,5
	Light	22,6	58,1	51,6	61,3
	Busy	77,4	-	48,4	32,3

Table 2 shows improvements in anemia status in both groups after treatment, but the improvements were greater in the combination group, where 77.4% of respondents were no longer anemic compared to 45.2% in the iron tablet-only group. A similar pattern was seen in dysmenorrhea: in the combination group, 41.9% of respondents no longer experienced menstrual pain and none had moderate dysmenorrhea, whereas in the iron tablet-only group, 32.3% of respondents still had moderate dysmenorrhea after treatment. These differences in proportions suggest that although iron tablets alone can improve most mild anemia cases, adding yoga seems to provide an extra effect that helps more respondents reach a condition free from anemia and menstrual pain within the same intervention period.

Table 3. Comparison of Average Hemoglobin Levels Before and After Treatment

Group	Time	Mean ± SD	Difference	p
Iron Tablets (n=31)	Pre-test	10,78 ± 0,65	1,068	0,000*
	Post-test	11,85 ± 0,72		
Combination of Fe + Yoga (n=31)	Pre-test	10,90 ± 0,68	1,503	0,000*
	Post-test	12,40 ± 0,75		

Note: Wilcoxon Test; *significant at p < 0.05

Table 3 shows a significant increase in hemoglobin levels in both groups (p = 0.000). The mean difference in the combination group (1.503 g/dL) was higher than in the Fe tablet-only group (1.068 g/dL), indicating that adding yoga exercises to Fe supplementation provides an extra effect on boosting hemoglobin levels.

Table 4. Comparison of Average Dysmenorrhea Scale Before and After Treatment

Groups	Time	Red ± SD	Differences	p
Fe Tablet (n=31)	Pre-test	3.52 ± 1.29	0,87	0,000*
	Post-test	2.65 ± 1.38		
Fe + Yoga Combination (n=31)	Pre-test	4.29 ± 1.22	3,16	0,000*
	Post-test	1.13 ± 1.18		

Table 4 shows a significant decrease in dysmenorrhea scores in both groups (p = 0.000). The decrease in scores in the combination group (3.16 points) was much greater than in the Fe tablet group alone (0.87 points), suggesting that the addition of yoga amplified the effect of Fe tablets in reducing dysmenorrhea complaints.

Table 5. Comparison of Hemoglobin Levels and Dysmenorrhea Scores Between Groups After Treatment

Variable	Groups	Red ± SD	Min–Max	p
Hemoglobin	Fe Tablet (n=31)	11.85 ± 0.75	10,0–13,0	0,000*
	Fe+Yoga Combination (n=31)	12.40 ± 0.72	10,5–13,7	
Dysmenorrhea	Fe Tablet (n=31)	2.65 ± 1.38	0–5	0,000*
	Fe+Yoga Combination (n=31)	1.13 ± 1.18	0–3	

Description: Mann-Whitney U Test; *significant at p < 0.05

Table 5 confirms that in the posttest results, the combination group of Fe and yoga tablets had higher average hemoglobin levels (12.40 ± 0.72 g/dL) and lower average dysmenorrhea scores (1.13 ± 1.18) compared to the Fe tablet group alone, with statistically significant differences in both variables (p = 0.000).

These findings are in line with several previous experimental studies that also compared the effects of yoga on dysmenorrhea pain in adolescent girls, including studies of adolescent girls that showed a consistent decrease in pain scale after a series of structured yoga sessions (Lestari et al., 2019), as well as studies in young adult populations that reported a decrease in the duration and intensity of menstrual pain after water yoga practice over several menstrual cycles (Hashemi et al., 2022). This consistency of the cross-study and cross-population findings reinforces the biological plausibility that yoga does have a pronounced analgesic effect on dysmenorrhea, rather than merely a placebo effect from the additional attention the intervention group received.

From a public health perspective, the consistent difference in effects between the combination group and the Fe tablet group alone in this study is also relevant to be considered in the formulation of iron supplementation policies for adolescent girls in Indonesia, which has generally only focused on the distribution of Fe tablets without a physical activity component (Ministry of Health of the Republic of Indonesia, 2023). Weekly iron supplementation programs for adolescent girls that have been running in various regions have the potential to provide more optimal results when enriched with simple physical exercise components such as yoga, especially considering the low cost of implementation and ease of replication of the program in schools with limited resources (Mardliyana & Puspita, 2022).

The results of hypothesis testing showed that regular administration of Fe tablets for four weeks significantly increased hemoglobin levels and lowered dysmenorrhea scores in adolescent girls ($p < 0.05$), so the first hypothesis was accepted. Similarly, the combination of Fe tablets and yoga was shown to have a positive effect on the improvement of hemoglobin levels and the reduction of dysmenorrhea pain ($p < 0.05$), so the second hypothesis was also accepted. The comparison between groups in Table 5 further proves that the combination of Fe tablets and yoga gives statistically better results than Fe tablets alone.

The process of implementing the intervention took place without significant obstacles. Compliance with Fe tablet consumption was monitored through daily reporting on online communication groups, while attendance at yoga sessions was recorded by facilitators at each meeting. The compliance rate of Fe tablet consumption in both groups was relatively high, as was the attendance rate for the combination group yoga sessions which reached almost all of the scheduled sessions. No significant side effects were found during the implementation of the intervention in both groups, both related to the consumption of Fe tablets and the implementation of yoga exercises, so that both forms of intervention could be declared well accepted by the respondents.

The increase in hemoglobin levels in both groups is in line with the pharmacological mechanism of Fe tablets which plays a role in hemoglobin synthesis and erythropoiesis (Wahyuni, 2021). The additional increase in the combination group is thought to be related to the effect of yoga on improving blood circulation and tissue oxygenation through breathing techniques and stretching movements that increase blood flow to the organs of the body (Kinasih, 2010), so that the absorption and distribution of iron can take place more optimally. These findings are in line with research showing that regular physical exercise can support the effectiveness of iron supplementation in adolescent girls (Sari P et al., 2022).

The greater decrease in dysmenorrhea scores in the combination group is in line with the theory that yoga can reduce the intensity of menstrual pain through relaxation of uterine muscles, decreased prostaglandin levels, and increased release of endorphins that are naturally analgesic (Lestari et al., 2019; Jangam & Pawar, 2022). Research conducted by Lestari et al (2019) also reported that yoga practice, including movements such as paschimottanasana and adho mukha padmasana, was effective in reducing the intensity of primary dysmenorrhea in adolescent girls. Studies in young adult women that showed a similar effect on a decrease in menstrual pain after regular yoga practice (Cahyati et al., 2022; Jangam & Pawar, 2022). In addition to physiological effects, yoga also provides psychological benefits in the form of emotional control and reduced stress levels, which also contribute to lower pain perception in adolescent girls (Mardliyana & Puspita, 2022).

The relationship between anemia and dysmenorrhea also explains the results of this study, where low hemoglobin levels can aggravate dysmenorrhea pain due to decreased oxygen supply to reproductive tissues, so that greater improvement in hemoglobin levels in the combination group also contributes to a more significant decrease in dysmenorrhea scores (Pratiwi et al., 2024). These findings reinforce the importance of a combination of nutritional and non-pharmacological approaches in treating anemia and dysmenorrhea simultaneously, as recommended in several studies of complementary obstetric therapies (Mardliyana & Puspita, 2022).

From the perspective of community midwifery, the findings of this study are relevant to school-based adolescent reproductive health promotion efforts, considering that anemia and dysmenorrhea are widely found in the high school-age population (Nurmaliza et al., 2022). Education on the importance of regular consumption of Fe tablets remains a key component in the prevention of anemia, but the addition of simple physical activities such as yoga can be a complementary strategy that is relatively easy to integrate into the school activity schedule without the need for large costs (Rachmat et al., 2023). This is in line with the research recommendations of Rahayu et al., (2023) and Saalino et al., (2023) which emphasize the importance of a multicomponent approach in handling menstrual disorders in adolescents, rather than relying on only one type of intervention.

The findings of the distribution of respondent characteristics in Table 1 show that the majority of respondents are in the age range of 16–17 years, which is the middle adolescent age range with relatively regular menstrual patterns but still susceptible to reproductive disorders due to suboptimal diet and physical activity that tends to decrease as academic load increases (Ilham et al., 2022). The maximum menarche age at 13 years in this study is also in line with the average age of menarche of Indonesian adolescents in general, which ranges from 12 to 14 years old (Villasari, 2021). This similarity in demographic characteristics reinforces the internal validity of the study, as differences in outcomes between groups are more attributable to differences in intervention types than differences in basic respondent characteristics.

The pattern of improvement in anaemia and dysmenorrhea status in Table 2 shows a trend consistent with the results of statistical tests in Table 3 and Table 4, where the combination group showed a greater proportion of category improvement than the Fe tablet group alone. This pattern is in line with research on adolescent girls in Bali that showed that the combination of nutritional therapy and physical activity provided a more categorically consistent effect than single therapy (Saalino et al., 2023). The decrease in the category of moderate dysmenorrhea to mild or no pain in the combination group also indicates that the effect of yoga on pain is progressive as the frequency of exercise increases, as reported in a study of the dose-response effect of yoga practice on menstrual pain (Hashemi et al., 2022; Kulkarni, 2023).

The results of the Mann-Whitney test in Table 5 showing significant differences between groups in posttest results reinforce the conclusion that the additional effects of yoga are not caused by differences in initial conditions, but by the effects of the intervention itself. The range of minimum and maximum hemoglobin levels and a narrower dysmenorrhea score in the combination group also showed a more homogeneous response to the intervention, indicating the consistency of the yoga effect in almost all respondents in the group (Lestari et al., 2019).

Biomolecularly, the synergistic mechanism between Fe tablets and yoga can be explained through several pathways. First, iron supplementation provides the main substrate for hemoglobin synthesis in the bone marrow, while yoga practice through deep breathing techniques (pranayama) increases lung ventilation capacity and oxygen exchange efficiency, so that the oxygen bound by newly formed hemoglobin can be distributed more optimally to body tissues (Kinasih, 2010; Wahyuni, 2021). Second, yoga movements that involve rhythmic stretching and contraction of muscles stimulate peripheral blood flow including to the pelvic organs, which also supports the absorption of iron in the gastrointestinal tract through increased intestinal motility and improved splannic circulation (Mardliyana & Puspita, 2022). Third, in the pain aspect, pelvic muscle tension during yoga decreases myometrium tension which is the main source of dysmenorrhea pain, while activation of the parasympathetic nervous system during yoga relaxation decreases the release of pain-causing prostaglandins (Oktavianto et al., 2023; Kinasih, 2010). These three pathways work complementarily, explaining why the combination group showed

improved hemoglobin levels and a greater decrease in dysmenorrhea scores compared to the group that received only Fe tablets.

When compared to national epidemiological data, the prevalence of anemia in this study group before intervention (87.1–83.9% mild anemia and 12.9–16.1% moderate anemia) was in a higher range than the national average prevalence of anemia among adolescent girls of 26.5% according to data from the Indonesian Ministry of Health (Kemenkes RI, 2023), considering that the research population had indeed been specifically screened in female students with low hemoglobin levels. These findings reinforce the urgency of routine anemia screening programs in schools, considering that many cases of mild anemia do not cause obvious symptoms so they are often not detected without laboratory examination (Sari P et al., 2022). Similarly, the high proportion of moderate dysmenorrhea in the initial condition of both groups (77.4% and 48.4%) indicates that complaints of menstrual pain are still often considered normal by adolescent girls so that they are rarely reported or actively handled (Nurmaliza et al., 2022; Hezekiah et al., 2024).

The practical implications of these findings are the need to integrate anemia and dysmenorrhea screening programs with combined Fe tablets and yoga interventions into School Health Business (UKS) activities, so that adolescent girls can receive more comprehensive treatment without having to rely on referral health services (Rachmat et al., 2023). Training of school health cadres or sports teachers as basic yoga instructors can also be a solution to the sustainability of this program considering the limitations of health professionals in many areas, including in Rejang Lebong (Hamidah & Rizal, 2022).

This study has a number of limitations, including the relatively short duration of the intervention (four weeks) so that it cannot describe the long-term effects, as well as the presence of sports lessons in schools that have the potential to be a confounding variable in the level of physical activity of respondents in both groups. In addition, this study also did not strictly control the variables of respondents' daily food intake that also affected hemoglobin levels, so the results of the study need to be interpreted taking into account these limitations. Follow-up studies with longer duration, larger sample sizes, and control of nutritional intake variables and physical activity levels outside of the intervention are suggested to strengthen the evidence for the effectiveness of the combination of Fe tablets and yoga in adolescent girls.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study and discussion, it can be concluded that the administration of Fe tablets regularly for four weeks has a significant effect on the reduction of anemia and dysmenorrhea pain in adolescent girls, and the combination of Fe tablets with yoga regularly for four weeks also has a significant effect on the reduction of anemia and dysmenorrhea pain, with the results of the combination of Fe tablets and yoga being statistically better than the administration of Fe tablets alone in increasing levels of hemoglobin and lowers dysmenorrhea pain. It is recommended that adolescent girls regularly take Fe tablets and engage in light physical activities such as yoga, and that schools and health centers integrate nutrition education programs and simple yoga training as part of adolescent reproductive health activities, while further research is suggested to explore the most optimal duration and type of yoga with a larger sample size

FURTHER STUDY

This research still has limitations, so further studies are needed on the topic of Combining Iron Tablets With Yoga in Teenage Girls Experiencing Anemia With Dysmenorrhea

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