

The Relationship between Iron Intake with the Incidence of Primary Dysmenorrhea among Female High School Students at SMAIT Al-Kahfi, 2025

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Abstract. Adolescence represents a critical stage of physiological and hormonal development, characterized by the onset of menstruation. Primary dysmenorrhea is one of the most common complaints among adolescent girls. Nutritional factors, particularly iron intake, may influence menstrual pain through their role in hemoglobin synthesis and uterine oxygenation. This study aimed to determine the association between dietary iron intake and the incidence of primary dysmenorrhea among adolescent girls at SMAIT Al-Kahfi, Indonesia. A quantitative analytical observational design with a cross-sectional approach was applied. Ninety female students aged 15–17 years were recruited using stratified random sampling based on inclusion and exclusion criteria. Primary data were collected using a structured dysmenorrhea questionnaire and 3x24-hour food records. Data were analyzed using univariate and bivariate analyses with Chi-square tests ($p < 0.05$). The results showed Of the total respondents, 77 (85.6%) experienced primary dysmenorrhea, while 13 (14.4%) did not. Seventy-three participants (81.1%) had inadequate iron intake (<15 mg/day), and 94.8% of those reported dysmenorrhea. The Chi-square analysis revealed a statistically significant relationship between iron intake and the incidence of primary dysmenorrhea ($p < 0.001$). Low iron intake is significantly associated with a higher incidence of primary dysmenorrhea among adolescent girls. Adequate dietary iron consumption may play a protective role in reducing menstrual pain. Future studies incorporating laboratory assessments of iron status are recommended to confirm these findings.

Keywords: *Adolescence, iron intake, primary dysmenorrhea*

A. Introduction

Adolescence is a critical developmental stage marked by profound physical, hormonal, and psychological changes. In females entering adolescence, the most prominent change is the onset of menstruation.¹ Most females experience menstrual cycle disorders that can affect daily activities and cause medical complaints.² Menstrual disorders in females who should have regular cycles generally result from changes in sex hormones. These abnormalities can manifest as irregular menstrual cycles, dysmenorrhea, or premenstrual syndrome.¹ Generally, females experience cramps or pain during menstruation, known as dysmenorrhea.^{3,4} Dysmenorrhea is associated with menstrual cycle disorders and is characterized by localized pain in the lower abdomen or pelvis, which can radiate to the lower back, thighs, and inner legs.⁴

Primary dysmenorrhea is a common menstrual cycle disorder frequently experienced by women. Globally, over half of menstruating women report primary dysmenorrhea, and 10–20% of them suffer from severe symptoms. In Indonesia, the reported prevalence of dysmenorrhea reaches 64.25%, with primary dysmenorrhea comprising most cases. (54.89%) and the rest secondary dysmenorrhea (9.36%). Additionally, primary dysmenorrhea affects approximately 60–75% of adolescent females, where most (about three-quarters) experience mild to moderate discomfort, while the remainder experience severe pain.⁴

Nutritional factors play an essential role in reproductive health and may influence the severity of menstrual pain. A common habit is the consumption of high-tannin drinks such as tea and coffee, which inhibit the absorption of important nutrients, especially iron (Fe). As a result, blood iron levels

become low. Furthermore, adolescents' tendency to consume insufficient fruits and vegetables as iron sources worsens the condition, increasing the risk of dysmenorrhea complaints during menstruation.⁵ Inadequate dietary iron intake, common among adolescent girls, may lead to subclinical or overt anemia, resulting in tissue hypoxia and increased uterine prostaglandin production, this mechanisms thought to aggravate menstrual pain. Conversely, sufficient iron intake supports optimal oxygenation and may mitigate uterine ischemia during menstruation.^{5,6}

Previous studies have reported inconsistent findings regarding the association between iron intake and primary dysmenorrhea. A study by Wildayani et al. (2023) found no significant relationship between iron intake and dysmenorrhea ($p = 0.083$), but adolescents with iron intake below the daily requirement (26 mg) had a higher risk of experiencing dysmenorrhea.⁶ Research by Masruroh and Aini Fitri (2019) showed a significant correlation between iron intake and dysmenorrhea incidence in female adolescents, where iron intake was below the nutrient adequacy level (2013) with a p -value of 0.014.⁵ Although adolescents with lower iron intake tended to experience more menstrual pain. These discrepancies may be attributed to differences in dietary assessment methods, sample size, or population characteristics. Moreover, there is a scarcity of community-based data from Indonesian Islamic boarding schools (*pesantren*), where dietary patterns and lifestyle behaviors differ from those of general urban adolescents. Dysmenorrhea has significant impacts on sufferers, particularly in daily activities. It can cause increased absenteeism at school, reduced social interaction, decreased academic performance, and low participation in sports activities.⁷

This study aimed to examine the relationship between iron intake and the incidence of primary dysmenorrhea in female adolescents at SMAIT Al-Kahfi-Indonesia. The findings are expected to contribute to a clearer understanding of nutritional determinants of menstrual health and to inform preventive dietary interventions in school and boarding-school settings.

B. Method

The respondents in this study were female adolescents aged 15-17 years who attended the boarding school of SMAIT Al-Kahfi, had experienced menstruation for at least two years, and agreed to participate by signing an informed consent form. The study subjects consisted of 90 female students selected through stratified random sampling who met the inclusion criteria and did not meet the exclusion criteria. The inclusion criteria included female adolescents aged 15-17 years who had experienced menstruation for at least two years and were willing to participate in the study. The exclusion criteria encompassed history of smoking or used hormonal medications such as estrogen or progestin, consumed antidepressants or anxiolytics, diagnosed endocrine or systemic disease such as diabetes mellitus, thyroid disorder, cardiovascular disease. Furthermore, subjects with pathological pelvic conditions such as endometriosis, chronic pelvic inflammatory disease, adenomyosis, polycystic ovarian syndrome (PCOS), endometrial fibroids/polyps, sexually transmitted infections, or a history of abdominal disease or surgery were also excluded.

The data collected were primary data obtained after obtaining informed consent from the subjects. Iron intake data were obtained from completed 3x24 hour food record forms, covering two school days and one holiday. Iron intake was categorized as: adequate: ≥ 15 mg/day (based on and Inadequate: < 15 mg/day based on Permenkes No. 28 of 2019).⁸

Data on the incidence of primary dysmenorrhea were collected using a primary dysmenorrhea questionnaire.^{9,10} The data obtained were analyzed univariately to describe the distribution of each variable and bivariately using the Chi-square test to determine the relationship between the two variables. Data analysis was conducted using SPSS software with a 95% confidence interval and a significance level of $p < 0.05$. Ethical approval was obtained from the Health Research Ethics Committee of the Faculty of Medicine, Universitas Islam Bandung (Approval No. 034/KEPK-Unisba/VI/2025).

C. Result and Discussion

The present study involved 90 adolescent aged between 15 and 17 years. The data's frequency distribution outlines respondent characteristics, specifically regarding iron intake and the occurrence of primary dysmenorrhea.

Table 1. Distribution Iron Intake and Incidence of Primary Dysmenorrhea

Variable	Frequency	Percentage (%)
Asupan Zat Besi		
Adequate (≥ 15 mg/day)	17	18.9
Inadequate (< 15 mg/day)	73	81.1
Primary Dysmenorrhea		
Yes	77	85.6
No	13	14.4

Table 1 presents the frequency distribution and percentage of respondents categorized by iron intake and the incidence of primary dysmenorrhea. The study findings reveal that the majority of female students at SMAIT Al-Kahfi had iron intake below 15 mg/day according to AKG (2019)⁸, with 73 students (81.1%) falling into the insufficient intake category, while only 17 students (18.9%) meet the adequate iron intake level.

Furthermore, as shown in Table 1, most respondents experienced menstrual cramps or pain consistent with primary dysmenorrhea, totaling 77 students (85.6%), while 13 students (14.4%) reported no had experienced primary dysmenorrhea. These results indicate that primary dysmenorrhea is a common complaint among adolescent girls at SMAIT Al-Kahfi.

Table 2. Relationship between Iron Intake and Incidence of Primary Dysmenorrhea

Iron Intake (Fe)	Primary Dysmenorrhea				Total		P value
	Yes		No				
	N	%	N	%	N	%	
Adequate	4	5,2	13	100	17	18,9	<0,001
Inadequate	73	94,8	0	0	73	81,1	

Based on Table 2, the results show that the majority of respondents who experienced primary dysmenorrhea had inadequate iron intake (94.8%), compared to those with sufficient iron intake (5.2%). Meanwhile, all respondents with sufficient iron intake (100%) did not experience primary dysmenorrhea. Statistical analysis revealed a p-value of less than 0.001, indicating a significant association between iron intake and the incidence of primary dysmenorrhea.

Analysis and Discussion

The present study demonstrated a statistically significant association between low dietary iron intake and the incidence of primary dysmenorrhea among adolescent girls at SMAIT Al-Kahfi-Indonesia. Menstrual disorders can occur in women and may affect their quality of life and cause medical symptoms. The age at menarche, duration, quantity, and quality of bleeding determine the classification of menstrual disorders. In addition, dysmenorrhea, premenstrual symptoms, oligomenorrhea, polymenorrhea, abnormal bleeding, amenorrhea, and menorrhagia are several types of menstrual disorders that can result in infertility.² During menstruation, many adolescent girls experience pain caused by uterine muscle contractions that impede blood flow to the uterus, leading to pain known as dysmenorrhea. Dysmenorrhea refers to pain that usually feels severe in the lower abdomen during the menstrual cycle. Dysmenorrhea is divided into two types: primary dysmenorrhea and secondary dysmenorrhea. Primary dysmenorrhea, also known as spasmodic dysmenorrhea, is pain or cramping in the lower abdomen occurring before or during menstruation without any associated organic abnormality of the reproductive organs. Meanwhile, secondary dysmenorrhea, also known as congestive dysmenorrhea, refers to menstrual pain caused by anatomical abnormalities or disorders of the pelvic organs, such as endometriosis or other uterine disorders that can be identified

clinically.^{9,11} This pain typically begins several days prior to menstruation and may persist throughout the period.¹² Factors that can cause dysmenorrhea include age at menarche, dietary patterns, level of physical activity, smoking habits, nutritional status, and psychological conditions such as stress. Among these factors, nutritional intake is considered one of the important contributors to the occurrence of dysmenorrhea.¹³

Iron is an essential nutrient in many cellular activities in the body.¹⁴ Iron is an important component in blood formation and is involved in the process of hemoglobin production or hematopoiesis.⁶ The high iron requirements in adolescent girls are due to two main factors: iron loss due to menstruation and rapid growth. This condition is related to increased blood volume, muscle mass, and enzymatic activity in the body. The need for iron absorption reaches its peak at around the age of 14–15 years.¹⁵ Adolescent girls who menstruate can lose about 0.6–2.5% more iron compared to boys or premenarcheal girls. To maintain iron balance, menstruating females need to absorb about 2 mg of iron per day.¹⁶ Low iron levels in the body will result in decreased hemoglobin in red blood cells. A decrease in hemoglobin levels in the blood will cause anemia. On the other hand, hemoglobin plays a role in transporting oxygen throughout the body. When hemoglobin is absent, the oxygen that should be bound by hemoglobin and distributed throughout the body will be reduced, resulting in vasoconstriction of tissues in the body, mainly the genital organs, causing pain.⁵ A lack of hemoglobin can trigger ischemia, which then stimulates the synthesis of phospholipids, arachidonic acid, prostaglandins, and vasopressin. An increase in prostaglandin and vasopressin levels causes arterial constriction (vasoconstriction) and ischemia in the uterus.¹⁷ This condition ultimately triggers the production of prostaglandins in greater amounts, which becomes the main cause of menstrual pain.¹² According to findings by Rahmawati (2022), the p-value was 0.001 ($p < 0.05$). This value indicates a significant relationship between iron intake and the incidence of primary dysmenorrhea in adolescent girls. In other words, the lower the iron intake, the higher the risk of menstrual pain.¹⁸

Based on analysis in Table 2, analysis revealed a p-value of less than 0.001, indicating a significant association between iron intake and the incidence of primary dysmenorrhea. These findings align with previous research by Masrurroh and Aini Fitri (2019), which also demonstrated a significant relationship between low iron intake and increased incidence of dysmenorrhea among adolescent girls.⁵ This similarity in results supports the theory that low hemoglobin levels in the body can interfere with oxygen distribution to all tissues, including the uterus. Such disruptions can cause vasoconstriction of blood vessels and result in pain in the reproductive organs. Hemoglobin deficiency may also lead to ischemia, which can subsequently induce the formation of phospholipids, arachidonic acid, prostaglandins, and vasopressin. Increased levels of prostaglandins and vasopressin cause arterial vasoconstriction and uterine ischemia, ultimately promoting higher prostaglandin production and resulting in menstrual pain.¹²

D. Conclusion

This study demonstrates a significant association between low dietary iron intake and the incidence of primary dysmenorrhea among adolescent girls at SMAIT Al-Kahfi, Indonesia.

Adolescents with insufficient iron intake were significantly more likely to experience menstrual pain compared with those whose intake met the recommended dietary levels. These findings further support the important role of nutritional status, especially iron intake, in reducing the risk and severity of menstrual pain in adolescent females.

For future research, longitudinal studies are recommended, featuring more comprehensive iron status assessments through laboratory measures such as serum ferritin, hemoglobin concentration, and other indicators. Interventional studies involving iron supplementation and holistic nutritional interventions are also important to evaluate their effectiveness in reducing primary dysmenorrhea. Additionally, other factors such as stress, physical activity, and the intake of other nutrients (e.g., calcium, magnesium, and vitamin D) should be explored to achieve a more thorough understanding of the determinants of dysmenorrhea.

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