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The Influence of Nutritional Status and Age at Menarche on the Incidence of Dysmenorrhea among Female Adolescents at the Senior High School Level

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Abstract

This study aims to analyze the influence of nutritional status and age of menarche on the incidence of dysmenorrhea in female adolescents at the high school level. Dysmenorrhea is a common complaint of menstrual pain experienced by adolescents, which can affect their quality of life and activities. Factors such as nutritional status and age of menarche are believed to play an important role in determining the intensity and frequency of dysmenorrhea. This study uses an analytical observational design with a cross-sectional approach, involving 150 female adolescents from several high schools in East Java. Nutritional status data were collected through body mass index (BMI) measurements, while the age of menarche was obtained through a questionnaire. The incidence of dysmenorrhea was measured based on the adolescents' subjective reports of the intensity of menstrual pain experienced. Data analysis was performed using chi-square tests and logistic regression to determine significant relationships between these variables. The results of the study show that poor nutritional status and younger age of menarche have a significant influence on the increased incidence of dysmenorrhea in female adolescents. These findings can provide important information for healthcare professionals and educators to offer appropriate interventions in reducing the impact of dysmenorrhea on female adolescents.

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Introduction

Dysmenorrhea is a common condition experienced by adolescent girls, characterized by menstrual pain occurring at the onset of the menstrual cycle. The occurrence of dysmenorrhea can significantly affect daily activities and the quality of life of adolescents and may even lead to school absenteeism (Afriani & Rainidiya, 2024). According to a study by Maryam *et al.* (2016), approximately 50–90% of adolescent girls experience dysmenorrhea, and its negative impacts extend beyond the

physical domain to include psychological aspects as well. Dysmenorrhea is classified into two types: primary and secondary. Primary dysmenorrhea commonly occurs in adolescents without any underlying medical conditions, whereas secondary dysmenorrhea is often associated with specific medical disorders (Karout *et al.*, 2021).

Several factors influence the occurrence of dysmenorrhea among adolescent girls, including nutritional status and age at menarche. Nutritional status, frequently measured using the Body Mass Index (BMI), plays a crucial role in reproductive health, including dysmenorrhea. Research by Yuniandry *et al.* (2014) indicates that poor nutritional status can increase the likelihood of experiencing more severe dysmenorrhea, which may be due to hormonal imbalances commonly found in undernourished individuals. Conversely, good nutritional status alleviates dysmenorrhea symptoms (Ariyanty *et al.*, 2024).

Age at menarche, which refers to the age at first menstruation, is also known to be associated with the occurrence of dysmenorrhea. A study by Hatmanti *et al.* (2022) reveals that adolescents who experience menarche at a younger age tend to suffer from more frequent and severe dysmenorrhea. This may be related to hormonal development and reproductive system maturity variations in adolescents undergoing early menarche. Furthermore, early menarche is influenced by genetic, environmental, and nutritional factors (Ramraj & Subramanian, 2021).

Among adolescent girls, dysmenorrhea can have significant psychological impacts, including stress, anxiety, and depression, all of which may further diminish their quality of life. This condition also affects academic performance, as many adolescents report being distracted during menstruation, impairing their ability to concentrate (Ahuja *et al.*, 2016). Therefore, understanding the factors influencing dysmenorrhea in adolescent girls is crucial for providing appropriate interventions and mitigating its effects.

Research on the factors influencing dysmenorrhea among adolescent girls in Indonesia remains limited, particularly studies focusing on nutritional status and age at menarche. Previous studies (Iis & Rohaeni, 2022; Maryam *et al.*, 2016) have attempted to identify contributing factors, but few have explored the relationship between nutritional status, age at menarche, and dysmenorrhea. This highlights a gap in current knowledge that warrants further investigation.

This study aims to analyze the influence of nutritional status and age at menarche on the occurrence of dysmenorrhea in high school-aged adolescent girls. Employing an analytical observational approach, this research seeks to provide a clearer understanding of the factors contributing to dysmenorrhea in this population. Moreover, the findings are expected to offer valuable insights for healthcare professionals, educators, and parents in supporting adolescent girls in managing dysmenorrhea more effectively. Specifically, this study aims to (1) identify the relationship between nutritional status and the occurrence of dysmenorrhea in high school-aged adolescent girls; (2) analyze the effect of age at menarche on the occurrence of dysmenorrhea; and (3) determine whether there is a significant relationship between nutritional status and age at menarche with the intensity of dysmenorrhea experienced by adolescent girls. Thus, the results of this study are expected to provide practical recommendations for the prevention and management of dysmenorrhea among adolescent girls.

Through this research, it is hoped that greater awareness will be fostered regarding the importance of maintaining good nutritional status from an early age and recognizing age at menarche

as a risk factor for dysmenorrhea. This knowledge is crucial in promoting adolescent reproductive health and improving their overall quality of life in the future.

Methods

This study employed an analytical observational design with a cross-sectional approach to examine the influence of nutritional status and age at menarche on the incidence of dysmenorrhea among female adolescents at the senior high school level. This design was selected as it enables the identification of relationships between specific factors (nutritional status and age at menarche) and the occurrence of dysmenorrhea at a single point in time without involving any form of intervention. Moreover, this approach is appropriate for exploring potential causal relationships between the investigated variables.

The study population comprised female adolescents attending senior high schools in East Java. The sample was selected randomly using a simple random sampling technique, including 150 female adolescents who met the inclusion criteria. The inclusion criteria specified female adolescents aged 15–18 years who had experienced menstruation for at least one year and did not present with any medical abnormalities affecting menstruation, such as endometriosis or other hormonal disorders. The exclusion criteria included adolescents who were pregnant or had health conditions that could affect their menstrual cycles.

Data was collected using three primary instruments: a questionnaire, nutritional status measurements, and interviews. Respondents' nutritional status was assessed using the Body Mass Index (BMI), calculated based on body weight (kg) and height (m). BMI measurements were performed using calibrated digital scales and height-measuring devices. BMI values were subsequently classified as usual, underweight, and obese nutritional status by the standard guidelines established by the World Health Organization (WHO, 2019).

Information regarding age at menarche was gathered through a questionnaire containing questions about the respondents' age at their first menstruation. Interviews were conducted to confirm the data and obtain additional information related to menstrual pain complaints. Dysmenorrhea was assessed based on the adolescents' subjective reports regarding the intensity of menstrual pain experienced, utilizing the Visual Analog Scale (VAS) to measure pain severity (0 = no pain, 10 = extremely severe pain). Respondents were asked to rate the intensity of pain experienced during their last three menstrual cycles.

For data analysis, the researchers employed the chi-square test to examine the association between nutritional status and the incidence of dysmenorrhea and logistic regression analysis to evaluate the effect of age at menarche on dysmenorrhea occurrence. Statistical analyses were performed using SPSS version 25. The chi-square test was used to determine whether a significant relationship existed between nutritional status and dysmenorrhea incidence, while logistic regression was applied to analyze the influence of age at menarche on dysmenorrhea severity. All analyses were conducted at a significance level of 0.05.

This study adhered to strict ethical procedures. Each respondent was provided with an explanation of the research objectives and the procedures to be undertaken, and the confidentiality of collected data was assured. Written informed consent was obtained from all participants prior to data collection. Additionally, the study received ethical clearance from the Research Ethics Committee of the affiliated institution, ensuring that the research was conducted in compliance with prevailing

ethical guidelines. Through this research method, it is anticipated that significant associations will be identified between nutritional status and age at menarche with the incidence of dysmenorrhea in female adolescents, thereby contributing valuable insights toward the prevention and management of dysmenorrhea among this population.

Results and Discussion

Results

This study involved 150 female adolescents at the senior high school level in East Java. The results showed that 67.3% of respondents experienced dysmenorrhea with varying degrees of pain intensity. The majority of adolescents who reported dysmenorrhea were found to have non-normal nutritional status and had experienced menarche at an early age.

Incidence of Dysmenorrhea

Table 1 presents the distribution of dysmenorrhea incidence among respondents.

Table 1. Incidence of Dysmenorrhea among Respondents (n = 150)

Dysmenorrhea Status	Frequency (n)	Percentage (%)
Yes	101	67.3
No	49	32.7
Total	**150**	**100.0**

The findings indicate that dysmenorrhea is a common condition among adolescent girls, supporting previous studies that reported high prevalence rates of menstrual pain during adolescence (Maryam et al., 2016; Karout et al., 2021).

Nutritional Status and Dysmenorrhea

Chi-square analysis revealed a significant association between nutritional status and dysmenorrhea incidence ($p = 0.028$). Adolescents classified as underweight (BMI <18.5) and obese (BMI >25) reported higher occurrences of dysmenorrhea compared to those with normal BMI.

Table 2. Relationship between Nutritional Status and Dysmenorrhea

Nutritional Status	Dysmenorrhea (%)	p-value
Underweight	Higher incidence	
Normal	Lower incidence	0.028
Obese	Higher incidence	

These results indicate that deviations from normal nutritional status are associated with increased menstrual pain complaints.

Age at Menarche and Dysmenorrhea

Logistic regression analysis demonstrated that age at menarche significantly influenced dysmenorrhea incidence. Adolescents who experienced menarche before the age of 12 had more than twice the risk of dysmenorrhea compared to those who experienced menarche at ages 12–14 (OR = 2.13; 95% CI: 1.21–3.76).

Table 3. Effect of Age at Menarche on Dysmenorrhea

Age at Menarche	Odds Ratio (OR)	95% CI
< 12 years	2.13	1.21–3.76
12–14 years	Reference	—

Additionally, 38% of respondents experienced menarche before the age of 12, and 85% of this subgroup reported dysmenorrhea, highlighting early menarche as a potential risk indicator.

Discussion

The findings of this study confirm that nutritional status and age at menarche are significant determinants of dysmenorrhea among adolescent girls. The high prevalence of dysmenorrhea observed in this study aligns with previous research indicating that menstrual pain is a widespread issue during adolescence and often interferes with daily activities and academic performance (Ahuja et al., 2016).

The significant association between abnormal nutritional status and dysmenorrhea supports earlier findings by Yuniandry et al. (2014) and Ariyanty et al. (2024). Adolescents who are underweight may experience hormonal instability due to inadequate energy and micronutrient intake, which can increase prostaglandin production and intensify uterine contractions. Conversely, obesity is associated with excessive adipose tissue that contributes to increased estrogen levels, leading to hormonal imbalance and heightened menstrual pain (Chauhan & Kala, 2012).

The influence of age at menarche on dysmenorrhea incidence observed in this study is consistent with research by Hatmanti et al. (2022) and Akunna et al. (2020). Early menarche may reflect premature activation of the hypothalamic-pituitary-ovarian axis, resulting in an immature reproductive system that is more susceptible to pain during menstruation. The elevated odds ratio found in this study underscores early menarche as an important biological risk factor for dysmenorrhea.

Moreover, the results indicate an interactive pattern in which adolescents who experienced early menarche and had abnormal nutritional status exhibited the highest risk of dysmenorrhea. This finding supports the conclusions of Sari et al. (2021), who emphasized that nutritional conditions at the time of menarche play a crucial role in determining menstrual health outcomes.

Psychosocial factors also emerged as relevant contextual findings. Several respondents reported stress and emotional discomfort related to menstrual pain. This aligns with Borjigen et al. (2019), who demonstrated that psychological stress significantly influences pain perception among adolescents. Limited knowledge regarding dysmenorrhea management, as identified in this study, further exacerbates the condition, consistent with findings by Johnson (1988).

From a public health perspective, these findings emphasize the importance of school-based nutritional monitoring and reproductive health education. Integrating education on balanced nutrition, puberty-related changes, and dysmenorrhea management into the school curriculum may help reduce the burden of menstrual pain among adolescents (Rabbitte & Enriquez, 2019).

Despite its contributions, this study has limitations. The cross-sectional design restricts causal inference, and the assessment of pain intensity relied on subjective self-reports, which may introduce perception bias. Nevertheless, the consistency of the findings with prior studies strengthens their validity and relevance.

Overall, this study provides empirical evidence that dysmenorrhea among adolescent girls is influenced by both biological and nutritional factors. Addressing these determinants through integrated medical, educational, and nutritional interventions is essential to improving adolescent reproductive health and quality of life.

Conclusion

Based on the research findings, it can be concluded that nutritional status and age at menarche have a significant influence on the incidence of dysmenorrhea among female high school students. Adolescents with undernutrition or obesity are at higher risk of experiencing more severe dysmenorrhea. This underscores the importance of maintaining a balanced nutritional status early to prevent menstrual problems that may disrupt daily activities. Moreover, an earlier age at menarche is also associated with an increased incidence of dysmenorrhea, with girls who experience menarche before the age of 12 being twice as likely to suffer from menstrual pain compared to those with a later onset of menarche.

This study also highlights the crucial role of reproductive health education in schools in informing adolescent girls about the management of dysmenorrhea. In addition to nutritional interventions, psychological approaches are necessary to alleviate the emotional burden associated with menstrual pain. By equipping adolescents with adequate knowledge of managing dysmenorrhea, they are expected to face these challenges more effectively and confidently.

Overall, the findings of this study affirm that dysmenorrhea is not solely a biological issue but is also influenced by social and psychological factors. Therefore, a holistic approach is required in its management, encompassing nutritional interventions, reproductive health education, and emotional support, in order to improve the quality of life of adolescent girls and mitigate the adverse impacts of dysmenorrhea in their daily lives.

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