

PREVENTIVE HEALTH INSIGHTS: THE CORRELATION OF JUNK FOOD INTAKE AND SLEEP QUALITY WITH DYSMENORRHEA

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ABSTRACT

Background: Dysmenorrhea is a prevalent gynecological problem among adolescent girls, often influenced by modifiable lifestyle factors such as diet, sleep quality, and nutritional status. This study aimed to examine the association of junk food consumption, sleep quality, and nutritional status with dysmenorrhea among female students.

Methods: A cross-sectional study was conducted among 169 female students at SMKN 1 Palu, Indonesia. Data were collected using validated questionnaires: Food Frequency Questionnaire (FFQ) for junk food intake, Pittsburgh Sleep Quality Index (PSQI) for sleep quality, and BMI-for-age for nutritional status. Dysmenorrhea severity was assessed using the Numeric Rating Scale (NRS). Data were analyzed using Chi-square and Spearman tests.

Results: The findings revealed that poor sleep quality was significantly associated with dysmenorrhea ($p = 0.038$), while junk food consumption ($p = 0.646$) and nutritional status ($p = 0.426$) showed no significant association.

Conclusion: Sleep quality emerged as a modifiable determinant of dysmenorrhea, suggesting that improving sleep hygiene may help alleviate menstrual pain among adolescents. Integrated health promotion strategies that combine sleep education and balanced nutrition are recommended for adolescent reproductive health programs.

Keywords: Dysmenorrhea, Junk Food, Sleep Quality, Nutritional Status, Adolescent Health

INTRODUCTION

Dysmenorrhea—painful menstrual cramping attributable to uterine contractions and associated biochemical mediators—is among the most common gynecological complaints in adolescent girls worldwide and constitutes a major cause of functional impairment during the reproductive years¹⁻³. Global prevalence estimates vary widely by study design and population, with systematic reviews and large cross-sectional surveys reporting ranges from roughly 16% to over 90%, and school-based estimates commonly exceeding 50% among adolescents²⁻⁴. A substantial subset of affected adolescents report severe pain: population syntheses and community studies indicate that approximately 10–

15% of young women experience dysmenorrhea severe enough to limit daily activities or require absenteeism from school or work, thereby producing measurable educational and economic consequences^{2,3,5}. Beyond episodic pain, dysmenorrhea has recurrent associations with diminished health-related quality of life and elevated psychological distress—relationships that compound individual morbidity and generate a broader societal burden through increased healthcare use and losses in productivity^{2,5,6}.

The high burden of dysmenorrhea is evident in Indonesia and across Southeast Asia, where school- and community-based investigations repeatedly document prevalence estimates above 50% in adolescent samples, with several local studies

reporting prevalences near or above the 60% mark (for example, East Java and broader Indonesian cohorts)⁷⁻⁹. Comparable regional evidence from neighboring countries confirms the magnitude of the problem: cross-sectional studies in Jordan and in Palestinian adolescent populations report high dysmenorrhea prevalence accompanied by substantive interference with schooling and daily activities, indicating a consistent regional pattern of reproductive health need^{10,11}. Indonesian studies further highlight gaps in health literacy and a tendency toward self-management of menstrual pain, which together contribute to underutilization of formal health services and lost opportunities for school-based prevention and early intervention^{4,12}.

Etiologic models of primary dysmenorrhea emphasize prostaglandin-mediated uterine hypercontractility. Still, modifiable lifestyle and nutritional determinants are increasingly recognized as contributors to symptom occurrence and severity in adolescents, with dietary quality (notably frequent “junk” food consumption), sleep quality, and nutritional status repeatedly identified in observational and mechanistic studies¹³⁻¹⁵. Frequent consumption of energy-dense, nutrient-poor “junk” foods promotes adiposity, systemic low-grade inflammation, and oxidative stress while tending to provide inadequate intakes of antioxidants and minerals; these metabolic and micronutrient disturbances are biologically plausible drivers of increased prostaglandin synthesis, altered uterine contractility, and greater menstrual pain. These factors have been associated with menstrual complaints in

multiple empirical reports^{12,16}. Sleep disturbance and poor sleep quality exert effects on central pain processing—lowering pain thresholds, promoting central sensitization, and enhancing pro-inflammatory signaling—and epidemiologic analyses, including mediation studies, have linked poor sleep to greater dysmenorrhea severity and to psychological pathways that amplify symptom perception^{2,6,9}. Nutritional status, most often proxied by Body Mass Index (BMI), may influence menstrual pain through adipose-derived estrogenic and inflammatory mechanisms; nevertheless, recent meta-analytic and primary studies show heterogeneous associations between BMI and dysmenorrhea, suggesting that gross anthropometry alone may not capture clinically relevant nutritional domains such as micronutrient sufficiency or fat distribution^{14,17}.

Despite coherent biological rationale and a substantive empirical literature, findings remain heterogeneous across settings and methodologies: some primary studies report significant positive associations between unhealthy dietary patterns or higher BMI and dysmenorrhea, whereas others report null or context-specific effects^{14,15,18}. In Indonesia, the evidence base contains many single-exposure studies and few investigations that simultaneously measure dietary behavior (with specific attention to junk-food frequency), validated sleep indices, and objectively classified nutritional status within one adolescent cohort, thereby limiting the ability to estimate independent, mediating, or interactive effects that would inform pragmatic school-level

interventions^{7,12}. Given the demonstrated impact of dysmenorrhea on school attendance, academic performance, and psychosocial well-being, clarifying which modifiable determinants are most strongly and independently associated with menstrual pain in Indonesian adolescents is a public health priority that can guide nutrition education, sleep hygiene promotion, and targeted reproductive health services in schools^{2,5,19}.

To address these evidence gaps in a school-based Indonesian adolescent population and to provide data directly relevant to school health programming and clinical guidance, the present cross-sectional study examines the concurrent associations of dietary behavior (junk food consumption), sleep quality, and nutritional status (BMI categories) with dysmenorrhea in adolescent girls^{12,13,20}. This study aims to analyze the association of junk food consumption, sleep quality, and nutritional status with dysmenorrhea among adolescent girls^{13,21}.

METHOD

This study employed a quantitative descriptive design with a correlational analytic approach using a cross-sectional method, in which all variables were measured at a single point in time. The research was conducted at SMKN 1 Palu, located in Palu City, Central Sulawesi, Indonesia.

The study population consisted of all female students who met the inclusion criteria: (a) actively enrolled in school, (b) present at the study location during data collection, (c) unmarried, and (d) had

experienced menstruation. The sample size was determined using the Slovin formula, resulting in 169 respondents. Sampling was carried out using stratified random sampling.

The research instruments included: (a) Dysmenorrhea, measured using the Numeric Rating Scale (NRS), categorized as no pain, mild pain, and moderate pain²², (b) Frequency of junk food consumption, assessed using a qualitative Food Frequency Questionnaire (FFQ), which had been content-validated through a preliminary study among adolescents in Palu City in consultation with nutrition experts, and categorized as infrequent (< median) and frequent (\geq median)²³. Categorization based on the median was used to account for the non-normal distribution of the data and to facilitate interpretation within the cross-sectional study design. (c) Sleep quality, measured with the Pittsburgh Sleep Quality Index (PSQI), was categorized as good (≤ 5) and poor (> 5)²⁴. (d) Nutritional status was assessed based on body weight, height, and age using the Body Mass Index (BMI)-for-age indicator, and categorized as undernourished (< -2 SD), normal (-2 SD to $+1$ SD), and overweight ($> +1$ SD), following the classification modified from the Indonesian Ministry of Health²⁵.

Data analysis was performed using univariate analysis to describe respondent characteristics and bivariate analysis to examine associations between variables, employing Chi-Square and Spearman tests. Ethical approval was obtained from the Research Ethics Committee of the Faculty of Public Health, Hasanuddin University, on May 28, 2025, with ethical

clearance number
919/UN4.14.1/TP.01.0/2025.

RESULTS AND DISCUSSION

A total of 169 respondents participated in this study, all of whom were female students at SMKN 1 Palu, Central Sulawesi. The demographic and characteristic distribution of respondents is presented in **Table 1**. Most participants were aged 16 years (55.0%), followed by 17 years (43.8%) and 15 years (1.2%). The grade level distribution was relatively balanced, consisting of 49.7% in Grade X and 50.3% in Grade XI. Based on the field of study, the largest proportion of respondents came from the Beauty Department (20.2%), followed by Culinary (18.3%), Fashion (14.2%), Hospitality (14.2%), Tourism and Service Business (13.6%), and Computer Network & Telecommunication Technology (10.2%).

Regarding lifestyle and health-related variables, most respondents were infrequent junk food consumers (65.7%), while 34.3% were frequent consumers. The majority of respondents (63.9%) had poor sleep quality, while 36.1% had good sleep quality. In terms of nutritional status, most respondents were within the normal category (82.8%), followed by overweight (12.5%) and underweight (4.7%). Based on dysmenorrhea assessment, 65.1% of respondents experienced moderate dysmenorrhea, 19.5% had mild dysmenorrhea, and 15.4% reported no dysmenorrhea.

Table 1. Respondent Characteristics

Characteristics	n	%
Age		
15 years	2	1.2
16 years	93	55
17 years	74	43.8
Grade Level		
Grade X	84	49.7
Grade XI	85	50.3
Major		
Beauty	34	20.2
Culinary	31	18.3
Fashion	24	14.2
Hospitality	24	14.2
TSB	23	13.6
CNTT	17	10.2
Junk Food Consumption Frequency		
Rarely	111	65.7
Frequently	58	34.3
Sleep Quality		
Good	61	36.1
Poor	108	63.9
Nutritional Status		
Normal	140	82.8
Overweight	21	12.5
Underweight	8	4.7
Dysmenorrhea		
No	26	15.4
Mild	33	19.5
Moderate	110	65.1

Source: Primary Data, 2025; Note: TSB= Tourism & Service Business, CNTT= Computer Network & Telecommunication Technology

Bivariate analysis was conducted to determine the relationship between junk food consumption frequency, sleep quality, nutritional status, and dysmenorrhea. The results are presented in **Table 2**.

The analysis revealed that sleep quality was significantly associated with dysmenorrhea ($p = 0.038$), whereas junk food consumption ($p = 0.646$) and nutritional status ($p = 0.426$) showed no statistically significant relationships. Respondents with poor sleep quality exhibited a higher proportion of moderate dysmenorrhea (70.4%) compared to those with good sleep quality (55.7%).

Table 2. Association between Junk Food Consumption, Sleep Quality, Nutritional Status, and Dysmenorrhea

Variable	Dysmenorrhea n (%)				p-value
	No	Mild	Moderate	Total	
Junk Food Consumption					0.646 ^a
Rarely	15 (13.5)	22 (19.8)	74 (66.7)	111	
Frequently	11 (19)	11 (19)	36 (62.1)	58	
Sleep Quality					0.038 ^{a*}
Good	15 (24.6)	12 (19.7)	34 (55.7)	61	
Poor	11 (10.2)	21 (19.4)	76 (70.4)	108	
Nutritional Status					0.426 ^b
Underweight	3 (37.5)	1 (12,5)	4 (50)	8	
Normal	18 (12.9)	31 (22.1)	91 (65)	140	
Overweight	5 (23.8)	1 (4,8)	15 (71.4)	21	

Source: Primary Data, 2025; ^aChi-Square test; ^bSpearman test; *Significant ($p < 0.05$).

This discussion elaborates on the findings regarding the association between junk food consumption, sleep quality, and nutritional status with dysmenorrhea among adolescent girls at SMKN 1 Palu. In the present cross-sectional sample of 169 female students (age predominantly 16–17 years), moderate dysmenorrhea was the most commonly reported level of pain (65.1%), whereas 19.5% reported mild pain and 15.4% reported no dysmenorrhea; frequent junk food consumption was reported by 34.3%, poor sleep quality by 63.9%, and nutritional status was largely normal (82.8%). On bivariate analysis, sleep quality was significantly associated with dysmenorrhea ($p = 0.038$) while junk food consumption ($p = 0.646$) and nutritional status ($p = 0.426$) were not. These findings are considered against the contemporary literature on adolescent dysmenorrhea, diet and lifestyle correlates, and putative biological pathways.

Junk food consumption and dysmenorrhea

In this study, junk food consumption (categorized as frequent versus rare) did not show a statistically significant association with the presence or level of dysmenorrhea ($p = 0.646$). This non-significant bivariate

result contrasts with several observational reports that have described positive associations between unhealthy dietary patterns (including frequent consumption of fast/junk food or high-sugar items) and menstrual pain or greater dysmenorrhea severity^{26–28}. At the same time, other studies have reported null or mixed associations between measures of adiposity/nutritional status and dysmenorrhea, indicating heterogeneity across contexts and methods^{15,17}.

Mechanistically, unhealthy diets high in saturated fat, refined carbohydrates, and food additives can promote systemic inflammation and adiposity, which may influence the synthesis or activity of prostaglandins and other mediators implicated in primary dysmenorrhea^{13,29}. Nutrient deficits (for example, lower intakes of antioxidants such as vitamin E, vitamin C, β -carotene, and minerals such as zinc and calcium) can impair redox balance and inflammatory regulation and have been linked to higher dysmenorrhea severity in observational analyses and to pain reduction in some supplementation trials^{29,30}. In addition, frequent consumption of energy-dense, nutrient-poor “junk” foods is consistently associated with increased overweight/obesity risk in adolescents^{16,27},

and adiposity can itself modify sex steroid metabolism and low-grade inflammation, forming a plausible pathway to altered menstrual pain³¹.

Several cross-sectional surveys in adolescent and young-adult populations have reported associations between fast/junk food intake and either higher prevalence or greater severity of dysmenorrhea^{18,32}, as well as highlighting poor dietary quality as an external influence on dysmenorrhea^{33,34}. Conversely, other field studies have failed to find consistent relationships between indices of body composition or nutritional status and dysmenorrhea¹⁷, emphasizing that the relationship between diet, body composition, and menstrual pain is complex and likely context-dependent.

The lack of a significant association in the present sample should be interpreted with caution. First, statistical power may have been limited: only ~34% of participants were classified as frequent junk-food consumers, and the absolute numbers of cases per exposure category may not have supported the detection of modest associations. Second, exposure measurement was categorical and self-reported (frequency-based), which can attenuate dose-response effects and is susceptible to misclassification and recall bias, a limitation commonly recognized in cross-sectional dietary studies^{16,35}. Third, confounding by unmeasured or uncontrolled variables (for example, family history of dysmenorrhea, detailed menstrual cycle characteristics, physical activity, analgesic use, caffeine intake, or psychosocial stress) could mask true associations—these variables are commonly reported correlates of dysmenorrhea and adolescent eating

behavior^{18,26,32,35}. Fourth, the pathway from junk food to dysmenorrhea may be mediated (rather than immediate): for example, junk food may have its strongest effect through promoting adiposity, which in turn may affect menstrual pain; if the sample has a high proportion of adolescents with normal BMI (as in the present study), the mediating effect through obesity may be difficult to detect^{16,27,31}.

While our data do not show a direct cross-sectional association between frequency of junk-food consumption and dysmenorrhea, the broader literature supports continued public health efforts to reduce unhealthy food intake among adolescents given the established links between junk food, overweight/obesity, and other cardiometabolic risks^{16,27,28}, and because certain dietary patterns and micronutrient deficiencies have been associated with dysmenorrhea severity in other studies^{13,29}. Intervention and education programs that aim to improve adolescent dietary choices (for example, school-based nutrition education or behavior-change interventions grounded in the Theory of Planned Behavior) are feasible and have demonstrated changes in consumption patterns; such programs could be integrated into menstrual health promotion and evaluated for effects on dysmenorrhea as an outcome^{19,36-38}.

Sleep quality and dysmenorrhea

The present analysis identified a statistically significant association between poor sleep quality and dysmenorrhea ($p = 0.038$): participants reporting poor sleep were more likely to report dysmenorrhea. This finding aligns with evidence from adolescent samples that links sleep disturbance or inadequate sleep with

menstrual pain and other menstrual disturbances^{9,39}.

Sleep quality modulates nociception, inflammatory status, and central pain processing: insufficient or disrupted sleep increases central sensitization, lowers pain thresholds, and can augment pro-inflammatory signaling that may interact with uterine prostaglandin-mediated pain pathways implicated in primary dysmenorrhea^{9,13}. Sleep disruption is also closely related to psychological stress and impaired coping, which in turn worsen pain perception and symptom reporting^{32,33}. Moreover, behaviors that negatively affect sleep (for example, late caffeine intake or irregular sleep schedules) are common in adolescents and may amplify menstrual pain through compounding physiological and behavioral mechanisms^{9,26}.

Empirical studies and literature reviews have reported associations between sleep problems and dysmenorrhea or other menstrual complaints in adolescents and young women^{9,33,39}. Larger observational surveys have identified sleep as an important modifiable correlate of menstrual symptoms³². The convergence of evidence from different settings supports the plausibility of a sleep-pain link in adolescent menstrual health.

The cross-sectional design of the present study cannot determine the direction of the observed association: dysmenorrhea may disrupt sleep (pain disturbing nocturnal rest), poor sleep may worsen pain perception, or a bidirectional relationship may exist^{9,33}. Measurement considerations are also pertinent: sleep quality in many adolescent studies is assessed by self-report questionnaires rather than objective measures (e.g., actigraphy or polysomnography), which introduces

subjectivity and possible reporting bias^{9,35}. Additional confounders—particularly caffeine intake, psychological stress, and coexisting mental health conditions—may partly account for associations between poor sleep and menstrual pain; caffeine and stimulant intake, for example, have been associated with both sleep disturbance and higher dysmenorrhea pain in student samples²⁶. Despite these limitations, the consistency of associations across studies strengthens the inference that sleep is a relevant and modifiable factor in adolescent dysmenorrhea.

Clinicians and school health programs should consider routine assessment of sleep quality among adolescents presenting with dysmenorrhea and offer sleep hygiene counseling and behavioral interventions as part of a holistic management plan^{9,31}. Non-pharmacological interventions that target stress reduction and somatic comfort (for example, therapeutic massage) have demonstrated benefit for dysmenorrhea in adolescent cohorts and could be integrated alongside sleep interventions in controlled evaluations³¹. Future research employing longitudinal designs and objective sleep measurement is warranted to disentangle causality and to test sleep-focused interventions for menstrual pain reduction^{9,13,19}.

Nutritional status and dysmenorrhea

Nutritional status as classified by BMI categories in the present sample (normal 82.8%, overweight 12.5%, underweight 4.7%) did not show a significant bivariate association with dysmenorrhea ($p = 0.426$). This null finding is consistent with multiple studies that report no simple linear relationship between

BMI and dysmenorrhea but contrasts with other reports that link extremes of weight or poor eating habits with menstrual problems^{15,17,27}.

Body composition may influence menstrual pain via several biological pathways: adipose tissue is hormonally active and contributes to estrogenic milieu and to systemic inflammatory cytokine production, which could plausibly affect uterine contractility and prostaglandin activity relevant for dysmenorrhea^{13,31}. Simultaneously, micronutrient inadequacies (for example, low vitamin E, vitamin C, or zinc) associated with poor diets may independently increase susceptibility to menstrual pain through oxidative and inflammatory mechanisms^{13,29}. Thus, BMI alone may not capture the relevant nutritional or metabolic dimensions that determine dysmenorrhea risk; measures of body fat distribution, lean mass, or direct micronutrient status may be more informative.

Supporting literature. Evidence on the relationship between anthropometric nutritional indicators and dysmenorrhea is mixed. Some studies report associations between high BMI or poor food habits and menstrual problems^{17,27}, whereas others have not found a significant relationship between BMI (or body-fat percentage) and dysmenorrhea^{15,40}. Observational and interventional research on micronutrients, however, indicates that low antioxidant and mineral status may be associated with greater menstrual pain and that supplementation in selected trials can reduce pain intensity, underscoring the importance of nutritional composition beyond gross anthropometry^{13,29}.

Several methodological and sample-related factors could account for the null

result in the current study. The low prevalence of underweight and overweight in this cohort reduces statistical power to detect associations with either extreme^{16,27}. Use of BMI as a crude proxy for nutritional status does not distinguish central adiposity, body fat percentage, or micronutrient deficiencies that may be mechanistically important^{15,16}. Pubertal stage, recent weight change, and energy balance behaviors (for example, meal skipping) can modify menstrual characteristics but were not incorporated into the bivariate models here¹⁷. Given that micronutrient deficits (rather than BMI per se) have been implicated in dysmenorrhea, the absence of biochemical assessments (for example, serum zinc, vitamin E) limits mechanistic inference^{13,29}.

The findings indicate that BMI classification alone may be insufficient to characterize menstrual pain risk in adolescents. Future investigations should include direct measures of body composition and assays of relevant micronutrients, as well as detailed dietary intake data, to clarify which nutritional domains—if any—are causally related to dysmenorrhea^{13,19,29}. Meanwhile, nutritional counseling for adolescents should emphasize a balanced diet rich in antioxidants and minerals, which has both general health benefits and the potential to modulate menstrual symptoms, as suggested by prior studies^{13,19,29}.

Limitations and strengths

Limitations of the present work deserve explicit acknowledgment. The cross-sectional design precludes causal inference and temporal ordering between sleep, diet, nutritional status, and dysmenorrhea^{9,13,35}. Exposures and

outcomes were based on self-report questionnaires, which are vulnerable to recall bias and misclassification; frequency categories for junk food consumption and a single measure of sleep quality lack granularity and objective confirmation (for example, dietary records, actigraphy)^{16,35}. The sample was drawn from a single vocational high school, and the distribution of BMI categories was skewed toward normal weight, which limits external generalizability and reduces power to detect associations for underweight/overweight categories^{16,27}. Finally, potential confounders and mediators—such as family history of dysmenorrhea, menstrual cycle characteristics (e.g., duration, flow), analgesic use, psychosocial stress, and physical activity—were not fully adjusted in the bivariate analyses presented here, leaving open the possibility of residual confounding^{18,32}.

Notwithstanding these limitations, the study has strengths. It examines several modifiable and clinically relevant exposures (dietary behavior, sleep quality, and anthropometric nutritional status) in the same adolescent sample, permitting a comparative appraisal of their relative associations with dysmenorrhea in a school setting where interventions can be feasibly delivered^{16,33}. The findings add locally relevant data from an Indonesian adolescent population, complementing broader epidemiologic evidence, and underscoring the importance of sleep as a potential target for symptom mitigation.

CONCLUSION

This study concludes that among female students at SMKN 1 Palu, poor sleep

quality was significantly associated with dysmenorrhea, whereas the frequency of junk food consumption and BMI-based nutritional status showed no significant relationship. These findings suggest that sleep is a modifiable determinant of menstrual pain in adolescents. Therefore, routine screening and management of sleep quality should be incorporated into school-based and primary health programs focusing on adolescent reproductive health.

Although this study did not identify a direct association between junk food intake or BMI and dysmenorrhea, unhealthy dietary habits remain an important target for adolescent health promotion due to their potential contribution to hormonal imbalance, micronutrient deficiency, and metabolic disturbances. Encouraging balanced nutrition and healthy eating behaviors can indirectly support menstrual health and overall well-being.

From a public health perspective, integrated health promotion strategies that combine sleep hygiene education, nutritional guidance, and behavioral interventions — including reducing caffeine and processed snack consumption — should be developed and implemented to alleviate the burden of dysmenorrhea among adolescents. For future research, longitudinal and experimental designs using objective measures of sleep, diet, and nutritional biomarkers are recommended to clarify causal pathways and evaluate the effectiveness of targeted preventive or therapeutic interventions.

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