The Association between Sleep Quality and Primary Dysmenorrhea Among Female Engineering Students at Nusa Cendana University: A Cross-Sectional Study

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ABSTRACT

Background: Primary dysmenorrhea is a common gynecological condition among young women and may significantly impair daily activities and academic performance. Sleep quality has been suggested as an important modifiable risk factor, as poor sleep may increase inflammatory mediators and prostaglandin production involved in menstrual pain. However, findings regarding the relationship between sleep quality and primary dysmenorrhea remain inconsistent across populations.

Objective: To determine the association between sleep quality and the incidence of primary dysmenorrhea among female engineering students at Nusa Cendana University.

Methods: This analytical observational study employed a cross-sectional design. A total of 60 female students who met the inclusion and exclusion criteria were recruited using purposive sampling. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), while the severity of dysmenorrhea was evaluated using the WaLIDD score. Data were analyzed using univariate and bivariate analyses. The Mann–Whitney test was applied to determine the association between sleep quality and primary dysmenorrhea.

Results: The majority of respondents (.7%) had poor sleep quality. Primary dysmenorrhea was reported by 86.7% of participants, with moderate severity being the most common (45%), followed by mild (33.3%) and severe dysmenorrhea (8.3%). Statistical analysis demonstrated a significant association between sleep quality and the incidence of primary dysmenorrhea ($p < 0.001$).

Conclusion: Poor sleep quality is significantly associated with the occurrence of primary dysmenorrhea among female engineering students at Nusa Cendana University. Improving sleep quality may represent a potential non-pharmacological approach to reducing menstrual pain in this population.

KEYWORDS: Female students, Primary dysmenorrhea, PSQI, Sleep quality, WaLIDD score

INTRODUCTION

Primary dysmenorrhea (PD) is defined as menstrual pain occurring in the absence of identifiable pelvic pathology and represents one of the most common gynecological complaints among women of reproductive age, particularly adolescents and young adults.[1] The condition is characterized by cramping pain in the lower abdomen that may radiate to the lower back or thighs and is frequently accompanied by systemic symptoms such as nausea, fatigue, and headache.[2] The prevalence of primary dysmenorrhea among young women worldwide remains high, with several studies reporting rates exceeding 60%, especially among university students.[3–6]

Primary dysmenorrhea has been shown to negatively affect daily functioning, academic performance, and overall quality of life.[6] In addition to pain-related disability, menstrual discomfort is often associated with sleep disturbances, including difficulty initiating sleep, reduced sleep duration, and poor subjective sleep quality.[7] Sleep disruption during the menstrual period may further exacerbate pain perception and contribute to a vicious cycle between poor sleep and menstrual symptoms.

Sleep quality is a multidimensional concept that includes sleep latency, duration, efficiency, disturbances, and daytime dysfunction. Poor sleep quality has been increasingly recognized as an important factor influencing inflammatory processes and neuroendocrine regulation.[8] Experimental and observational studies suggest that insufficient or disturbed sleep may increase pro-inflammatory mediators such as interleukin-6 and tumor necrosis factor-alpha, as well as prostaglandin production, which play key roles in the pathophysiology of primary dysmenorrhea.[9–11] Consequently, poor sleep quality may intensify uterine hypercontractility and ischemia, thereby worsening menstrual pain.

Several previous studies have reported a significant association between poor sleep quality and the occurrence or severity of primary dysmenorrhea among female students.[4,12] Nevertheless, inconsistent findings have also been documented, with some studies failing to demonstrate a statistically significant relationship between sleep quality and dysmenorrhea.[13] These discrepancies may be related to differences in population characteristics, academic workload, psychosocial stressors, and methodological approaches.

Female engineering students represent a population that may be particularly vulnerable to sleep disturbances due to demanding academic schedules, prolonged screen exposure, and irregular study patterns. However, evidence regarding the relationship between sleep quality and primary dysmenorrhea in this group remains limited, especially in the Indonesian academic context. Therefore, this study aimed to determine the association between sleep quality and the incidence of primary dysmenorrhea among female engineering students at Nusa Cendana University.

METHODS

This study employed an analytical observational design with a cross-sectional approach. The research was conducted at the Faculty of Science and Engineering, Nusa Cendana University, Kupang, Indonesia, during the 2024 academic year. The study population consisted of female undergraduate students enrolled in engineering programs. A total of 60 participants were recruited using purposive sampling based on predefined inclusion and exclusion criteria. Eligible participants were female students who had experienced regular menstruation and were willing to participate in the study. Participants were excluded if they had a history of gynecological disorders, secondary dysmenorrhea, chronic medical illness, or were using hormonal contraception or analgesic medications during the data collection period.

Data collection was performed using self-administered questionnaires. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which evaluates subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. A total PSQI score greater than 5 was categorized as poor sleep quality, while a score of 5 or below indicated good sleep quality. The severity of primary dysmenorrhea was measured using the WaLIDD score, which assesses working ability, pain location, pain intensity, and duration of pain during menstruation. Based on the total score, dysmenorrhea was classified as none, mild, moderate, or severe.

The independent variable in this study was sleep quality, while the dependent variable was the incidence of primary dysmenorrhea. Demographic characteristics of participants were collected to describe the study population. Data were analyzed using statistical software. Univariate analysis was conducted to describe participant characteristics, sleep quality, and dysmenorrhea severity using frequency and percentage distributions. Bivariate analysis was performed to examine the association between sleep quality and primary dysmenorrhea. Because the data were not normally distributed, the Mann–Whitney test was applied. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for this study was obtained from the Health Research Ethics Committee of the Faculty of Medicine and Veterinary Medicine, Nusa Cendana University, Kupang, Indonesia (ethical approval number: UN0154/KEPK/2024; approval date: 16 July 2024). All participants provided informed consent prior to data collection, and confidentiality of personal data was strictly maintained throughout the study.

RESULTS

A total of 60 female engineering students who met the inclusion and exclusion criteria were included in the analysis. Most participants had poor sleep quality based on PSQI assessment. Primary dysmenorrhea was reported by the majority of respondents, with moderate severity being the most frequent category. The distribution of sleep quality and primary dysmenorrhea severity is presented in Table 1.

Table 1. Distribution of Sleep Quality and Primary Dysmenorrhea Severity (n = 60)

Variable	Category	n	%
Sleep quality (PSQI)	Good	11	18.3
	Poor	49	81.7
Primary dysmenorrhea (WaLIDD)	None	8	13.3
	Mild	20	33.3
	Moderate	27	45.0
	Severe	5	8.3

Bivariate analysis using the Mann–Whitney test demonstrated a statistically significant association between sleep quality and the incidence of primary dysmenorrhea ($p < 0.001$).

Table 2. Association Between Sleep Quality and Primary Dysmenorrhea

Variable	Statistical test	p-value
Sleep quality vs primary dysmenorrhea	Mann -Whitney	< 0.001

DISCUSSION

This study demonstrated a statistically significant association between sleep quality and the incidence of primary dysmenorrhea among female engineering students at Nusa Cendana University ($p < 0.001$). This finding supports the concept that sleep quality represents a clinically relevant and potentially modifiable factor influencing menstrual pain and its functional consequences. Similar associations between sleep disturbance and menstrual symptoms have been reported in previous studies involving adolescent and university populations.[1,2]

The high prevalence of poor sleep quality and primary dysmenorrhea observed in this study is consistent with earlier reports indicating that dysmenorrhea is highly prevalent among young women and frequently interferes with daily activities and academic performance.[3-6] Several studies have documented that menstrual pain contributes to reduced concentration, decreased productivity, and absenteeism among students, emphasizing its importance as a public-health concern in educational settings.[6]

From a biological perspective, primary dysmenorrhea is closely associated with excessive prostaglandin synthesis, resulting in increased uterine contractility, vasoconstriction, and myometrial ischemia.[9-11] These mechanisms represent the central pathophysiological basis of menstrual pain. Sleep disturbance may further aggravate this process through dysregulation of inflammatory and neuroendocrine pathways, potentially enhancing pain sensitivity during menstruation.[8-11] This interaction provides a biologically plausible explanation for the association observed in the present study.

The relationship between sleep quality and dysmenorrhea may also be bidirectional. Menstrual pain can disrupt nocturnal sleep due to discomfort and stress-related arousal, while chronic poor sleep may lower pain thresholds and worsen somatic symptom perception.[7,11] This reciprocal interaction has been described in student populations and may contribute to persistent symptom burden across menstrual cycles.

Academic and behavioral factors may further influence this association. Time management difficulties, prolonged academic workload, and irregular daily schedules have been shown to negatively affect sleep quality among university students.[11,14] Poor regulation of study time may lead to delayed sleep onset and reduced sleep duration, which in turn may exacerbate menstrual discomfort through increased fatigue and altered pain perception. In addition, lifestyle-related behaviors such as prolonged screen exposure before bedtime have been associated with poorer sleep quality, including increased sleep latency and reduced sleep efficiency.[15] These behavioral patterns may partially explain the high prevalence of sleep disturbance observed among engineering students.

The use of validated instruments strengthens the methodological quality of this research. The Pittsburgh Sleep Quality Index has been widely applied in adolescent and student populations and has demonstrated acceptable validity and reliability in Indonesian settings.[15] The WaLIDD score provides a structured assessment of dysmenorrhea severity and functional limitation, supporting its applicability in university-based studies.

Several limitations should be acknowledged. The cross-sectional design does not allow determination of causal relationships or temporal direction between sleep quality and dysmenorrhea. The use of self-reported questionnaires may introduce recall bias, and the single-center design may limit generalizability. In addition, potential confounding factors such as psychological stress, physical activity, dietary habits, and body mass index were not included in multivariable analysis, which may have influenced the observed association.

CONCLUSION

A significant association was identified between sleep quality and the incidence of primary dysmenorrhea among female engineering students at Nusa Cendana University. Poor sleep quality was more frequently observed among students experiencing dysmenorrhea, suggesting that sleep-related factors may contribute to menstrual health problems in this population. These findings indicate that assessment and improvement of sleep quality could be considered as part of supportive and preventive strategies to reduce menstrual discomfort and its impact on daily functioning in academic settings. Further research employing longitudinal designs and broader variable assessment is warranted to clarify causal relationships and strengthen the evidence base.

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