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STRESS, NUTRITION, AND SLEEP QUALITY AS DETERMINANTS OF MENSTRUAL CYCLE REGULARIY AMONG ADOLESCENTS

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ABSTRACT
Menstrual cycle irregularity is a common reproductive health issue among adolescents. Various factors, including psychological stress, nutritional status, and sleep quality, have been reported to Influence the regularity of the menstrual cycle. this studi to analize the relationship between stress levels, nutritional status, and sleep quality with menstrual cycle regularity in adolescents. The results, The study showed that 40% of respondents experienced irregular menstrual cycles. Stress was significantly associated with menstrual irregularity (p=0.002), adolescents with high stress were 3.1 times more likely to have irregular cycles. Poor nutrition was also correlated (p=0.015), with undernourished adolescents being 2.4 times more likely to experience irregular cycles. Poor sleep quality had a significant relationship as well (p=0.008), with poor sleepers being 2.9 times more likely to have irregular cycles. This study concludes that stress, nutritional status, and sleep quality are significantly associated with menstrual cycle regularity in adolescents, with stress being the most dominant factor. Adolescents with high stress, malnutrition, and poor sleep are at higher risk of menstrual cycle irregularity. It is recommended that adolescents maintain reproductive health through stress management, a balanced diet, and good sleep patterns. Health workers and schools need to provide education and support to help adolescents maintain menstrual cycle regularity.

Keywords : Adolescents, Menstrual Cycle, Nutrition, Stress

1. INTRODUCTION

Adolescence is a crucial period of human development characterized by rapid physical, emotional, and psychosocial changes. One of the most significant aspects of adolescent development in females is the establishment of a regular menstrual cycle, which reflects the maturity and balance of the reproductive system. A regular menstrual cycle is considered a vital sign of reproductive health, while irregular cycles may indicate underlying health or lifestyle problems (WHO, 2020).

Menstrual cycle irregularities are commonly experienced by adolescents, ranging from delayed menarche, oligomenorrhea, polymenorrhea, to amenorrhea. The prevalence of menstrual irregularities among adolescents is reported to be between 30–50% in various countries, indicating a significant public health issue (Harlow & Campbell, 2019). These irregularities may not only affect reproductive health but also the psychological well-being and academic performance of adolescents. Several factors are believed to influence menstrual cycle regularity. Stress is one of the most frequently reported psychological contributors, as it interferes with the hypothalamic-pituitary-ovarian (HPO) axis and disrupts hormonal regulation. Adolescents often face academic pressure, social challenges, and family-related stress, all of which may impact their menstrual health.

Nutritional status is another important determinant; both undernutrition and overnutrition can alter the secretion of reproductive hormones, leading to irregular ovulation and menstrual disturbances. Sleep quality also plays a significant role, as inadequate or poor-quality sleep can disrupt circadian rhythms and hormonal balance, particularly melatonin and gonadotropins, which are crucial for menstrual regulation (Kumar et al., 2020). Previous studies have shown similar associations. Raval et al. (2016) reported that high stress was strongly linked to irregular menstrual cycles among Indian adolescents. Li et al. (2017) demonstrated a significant relationship between poor sleep patterns and menstrual disturbances in Chinese adolescents. Frisch (2019) highlighted that undernutrition and low body fat percentage can lead to hypothalamic amenorrhea. These findings confirm the multifactorial nature of menstrual irregularities; however, most of the studies were conducted outside Indonesia, and very few integrated the three factors—stress, nutrition, and sleep quality—together in one analysis.

In Indonesia, adolescent reproductive health issues remain a concern. Many adolescents lack adequate knowledge about menstruation and its determinants, while lifestyle patterns such as poor diet, irregular sleep, and high stress levels are increasingly prevalent. Despite its importance, menstrual health has often been overlooked in adolescent health programs, which tend to focus more on early marriage, pregnancy prevention, and sexual risk behaviors. Therefore, investigating lifestyle-related factors such as stress, nutrition, and sleep quality in relation to menstrual cycle regularity is highly relevant for developing comprehensive adolescent health strategies. This study aimed to analyze the association between stress,

nutritional status, and sleep quality with menstrual cycle regularity among adolescents. The findings are expected to contribute to evidence-based recommendations for adolescent reproductive health promotion and to encourage schools, health workers, and families to provide greater support in maintaining adolescent well-being.

2. METHODS

Design and sample: A cross-sectional study was conducted involving 94 female adolescents who were students of senior high schools (SMA/sederajat) in Kediri city. Respondents were selected using Variables:Independent: stress level, nutritional status, sleep quality, Dependent: menstrual cycle regularity. Instruments:Stress: Perceived Stress Scale (PSS).

Nutrition: BMI-for-age classification (WHO standards). Sleep quality: Pittsburgh Sleep Quality Index (PSQI). Menstrual cycle: structured questionnaire on menstrual history. Exclusion criteria**:** adolescents with a history of chronic illness (such as diabetes, thyroid disease, or PCOS), those taking hormonal therapy or contraceptives, and those unwilling to complete the questionnaire.

Exclusion criteria**:** adolescents with chronic illnesses (diabetes, thyroid disorders, PCOS, or anemia), those undergoing hormonal therapy or using contraceptives, and those unwilling or unable to complete the questionnaire.

Data analysis: Chi-square tests and logistic regression were performed to determine associations and dominant factors.

3. RESULTS

1. Distribution of Respondents by Characteristics

Characteristich	Amount	Prosentase (%)
Age		
Mean ± SD	16.4 ±	-
Grade X	54	45.0
Grade XL	66	55.0
12–13 years	74	61.7
Stress Level (years)	Low	23,4
	Moderate	55.3
	High	21.3
Sleep quality	Good	35.1
	Poor	64,9
Menstrual cycle	Reguler	60,0
	Irreguler	40,0

Of study showed that the mean age of respondents was 16.4 ± 1.2 years, indicating that most participants were in the mid-adolescent stage. Based on the level of education, 54 respondents (45.0%) were in grade X and 66 respondents (55.0%) were in grade XI, which means that the majority of respondents were from grade XI. Regarding the age at menarche, it was found that 74 respondents (61.7%) experienced their first menstruation at the age of 12–13 years. This finding reflects that most respondents experienced menarche within the normal physiological range, which commonly occurs between the ages of 11–14 years. Knowledge

2. Menstrual Cycle Regularity among Adolescents

Menstr ual Cycle	n	%	Menstrual Cycle
Regular	72	60.0	Regular

Irregular	48	40.0	Irregular
Oligomenorrhea	26	54.2	Oligomenorrhea

Table 3 Association of Stress, Nutrition, and Sleep Quality with Menstrual Cycle Regularity

Variable	Regular n (%)			Irregular n (%)	
Stress				**Stress**	
Low (n=22)	18 (81.8)	4 (18.2)	0.002	Ref.	Low (n=22)	18 (81.8)
Moderate (n=52)	34 (65.4)	18 (34.6)		2.1 (0.8–5.3)	Moderate (n=52)	34 (65.4)

4. DISCUSSION

The present study showed that 40% of adolescents experienced irregular menstrual cycles. This prevalence is consistent with previous reports indicating that 30–50% of adolescents worldwide have menstrual disturbances (Harlow & Campbell, 2019). Such findings suggest that menstrual irregularity remains a common reproductive health issue in adolescence. Stress was significantly associated with menstrual cycle irregularity (p = 0.002), with adolescents experiencing high stress being 3.1 times more likely to have irregular cycles.

This result confirms the theoretical mechanism in which psychological stress disrupts the hypothalamic–pituitary–ovarian (HPO) axis, leading to altered gonadotropin-releasing hormone secretion and ovulatory dysfunction. Similar findings were reported by Raval et al. (2016) in Indian adolescents. Considering that most respondents in this study were in the moderate stress category (55.3%), school-based mental health interventions are urgently needed. Nutritional status also showed a significant association with menstrual cycle regularity (p = 0.015). Undernourished adolescents were 2.4 times more likely to experience irregular cycles compared to those with normal nutritional status. This supports previous evidence that low body mass index and reduced body fat may decrease leptin levels, which are essential for maintaining hypothalamic function and ovulatory cycles (Frisch, 2019).

In this study, 25.5% of adolescents were categorized as underweight, suggesting that nutritional counseling should be integrated into adolescent reproductive health programs. Furthermore, poor sleep quality was found to be significantly related to menstrual irregularity (p = 0.008), with adolescents having poor sleep being 2.9 times more likely to experience irregular cycles.

This finding is in line with Li et al. (2017) and Baker et al. (2019), who emphasized the role of circadian rhythm and melatonin regulation in reproductive hormone balance. The high proportion of adolescents with poor sleep quality in this study (64.9%) highlights the importance of health education regarding sleep hygiene.The multivariate analysis identified stress as the most dominant factor affecting menstrual cycle irregularity. Adolescents with high stress levels were more likely to experience irregular cycles than those with poor sleep quality or malnutrition. This finding implies that psychological factors may play a

stronger role than physical factors in determining menstrual health among adolescents.

Overall, these resulths hight the multifactorial determinants of menstrual cycle irregularity. the combination of high stress, poor nutrition, and inadequate sleep reflects the broader lifestyle challenges faced by adolescents today. These results underline the importance of a holistic approach in adolescent health promotion that includes stress management, balanced nutrition, and good sleep hygiene (WHO,2020).

Reproductive health programs targeting adolescents should not only emphasize sexual and reproductive knowledge, but also incorporate interventions addressing lifestyle and psychosocial determinants. Stress management training, nutritional counseling, and sleep education could be integrated into school health curricula and youth health services. However, this study also has limitations. The cross-sectional design does not allow for causal inference, and self-reported menstrual history may be subject to recall bias. Additionally, the relatively small sample size and the dominance of respondents from one school setting may limit the generalizability of the results. Future research should involve larger and more diverse adolescent populations, and longitudinal studies are needed to establish causal pathways between stress, nutrition, sleep, and menstrual cycle regularity. This study relied on sef-reported menstrual history, which may cause recall bias and affect the accuracy of results. In addition, the sample was limited to one school, reducing the generalizability of the findings to a wider adolescent population.

5. CONCLUSION

1. Stress was significantly associated with menstrual cycle regularity (p = 0.002). Adolescents with high stress levels (65.2%) were more likely to experience irregular menstrual cycles compared to those with low stress levels (18.2%). Stress was identified as the most dominant factor influencing menstrual irregularities (OR = 3.1; 95% CI: 1.5–6.4).
2. Nutritional status was significantly related to menstrual cycle regularity (p = 0.015). Underweight adolescents (63.3%) had a higher proportion of irregular cycles compared to those with normal nutritional status (32.9%).
3. Sleep quality was also significantly associated with menstrual cycle regularity (p = 0.008). Adolescents with poor sleep quality (55.9%) were more likely to experience irregular cycles compared to those with good sleep quality (21.2%).

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