

Original Research

Academic Stress, Physical Activity, and Menstrual Cycle Regularity Among First-Year Midwifery Students at Health Polytechnic of the Ministry of Health Denpasar

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ABSTRACT

Background: Academic stress and low physical activity are recognized as factors that may disrupt the hypothalamic–pituitary–ovarian axis, leading to menstrual cycle irregularities among young women. First-year midwifery students are particularly vulnerable because of academic demands and sedentary lifestyles. This study aimed to analyze the relationship between academic stress and physical activity and menstrual cycle regularity among first-year midwifery students at the Health Polytechnic of the Ministry of Health, Denpasar. **Methods:** This analytical cross-sectional study involved 83 first-year midwifery students selected using total sampling. Academic stress was measured using the Student-life Stress Inventory (SSI), while physical activity was assessed using the International Physical Activity Questionnaire–Short Form (IPAQ-SF). Menstrual cycle regularity was determined through a structured questionnaire. Data were analyzed using the Fisher–Freeman–Halton exact test and multivariate logistic regression. **Results:** Most respondents experienced moderate to severe academic stress (87.9%), low physical activity (92.8%), and irregular menstrual cycles (78.3%). Academic stress was significantly associated with menstrual cycle regularity ($p = 0.003$). Physical activity was also significantly associated with menstrual cycle regularity ($p = 0.026$). Multivariate analysis showed that physical activity was the most dominant factor influencing menstrual cycle regularity ($OR = 27.692$). **Conclusions:** Academic stress and physical activity were significantly associated with menstrual cycle regularity among first-year midwifery students. Maintaining adequate physical activity and implementing effective stress management strategies are recommended to improve reproductive health among university students.

Keywords: Academic stress; physical activity; menstrual cycle; female students

1. INTRODUCTION

The World Health Organization (WHO) states that menstrual cycle dysfunction is a common reproductive health issue experienced by women worldwide, with a prevalence of approximately 45%. The WHO emphasizes that menstrual health encompasses physical, psychological, and social aspects, and that disorders such as irregular cycles, amenorrhea, and premenstrual symptoms can negatively affect women's quality of life, as well as their social and educational functioning.⁽¹⁾

Academic stress can disrupt the menstrual cycle by activating the body's neuroendocrine stress response.

Prolonged stress triggers the hypothalamus to release CRH, which ultimately elevates cortisol levels via the pituitary and adrenal glands. Chronic cortisol elevation suppresses the release of GnRH, FSH, and LH. This hormonal suppression impairs ovarian follicle maturation and ovulation, leading to imbalances in estrogen and progesterone that manifest as menstrual irregularities such as oligomenorrhea, polymenorrhea, or amenorrhea.⁽²⁾

Numerous studies show that academic stress significantly correlates with menstrual cycle disorders in female college students. This occurs through chronic stress responses specifically elevated cortisol levels which disrupt hormonal balance.⁽³⁾ Study shows that experienced abnormal menstrual cycles, strongly correlated with high academic stress.⁽⁴⁾ Similarly, Helenri reported a significant relationship between academic stress and menstrual irregularities among medical students.⁽⁵⁾ High-intensity or high-energy physical activity can disrupt the regulation of reproductive hormones governing the menstrual cycle. Strenuous exercise or prolonged training impairs hypothalamic GnRH secretion, decreasing estrogen and progesterone levels, which can lead to irregular cycles or amenorrhea. Conversely, light-to-moderate physical activity helps maintain hormonal balance and blood circulation, supporting cycle regularity. Theoretically, these findings underscore that the impact of physical activity on menstruation depends on intensity, duration, and energy status.⁽⁶⁾

Studies show that physical activity significantly influences menstrual regularity in female college students by affecting hormonal balance and neuroendocrine responses. There are a strong evidence suggesting high PA levels are associated with reduced menstrual symptoms but mixed evidence for menstrual characteristics.⁽⁷⁾ Similarly, Yang reported that Physical activity levels were negatively associated with risk of premenstrual syndrome among college students.⁽⁸⁾ Furthermore, Sukarya indicated that most students with low physical activity levels experienced various irregularities, including polymenorrhea, oligomenorrhea, and hypomenorrhea.⁽⁴⁾ Individual menstrual patterns vary widely, encompassing differences in menarche age, duration, cycle length, and the occurrence of dysmenorrhea. While normal menarche typically occurs between ages 12–16, modern lifestyle and technology have accelerated its onset to under age 12. In this study, the respondents' average menarche age was 13

years, spanning from 10 to 16 years.⁽⁹⁾ Ultimately, proper health knowledge and behaviors during adolescence serve as the foundation for a healthy reproductive cycle and the prevention of long-term health complications.⁽¹⁰⁾ The general objective of this study is to determine and analyze the relationship between academic stress levels, physical activity, and menstrual cycle regularity among first-year midwifery students at Health Polytechnic Ministry Of Health Denpasar. Specifically, this research aims to identify the distribution of academic stress levels, physical activity patterns, and menstrual cycle regularity among these students. Furthermore, it seeks to analyze the individual relationships of both academic stress and physical activity with menstrual cycle regularity, and ultimately determine the most dominant factor influencing menstrual irregularities within this population.

2. METHODS

2.1 Type and Design of Study

This study utilized an analytical observational design with a cross-sectional approach to evaluate the relationship between academic stress, physical activity, and menstrual cycle regularity.

2.2 Time and Location

The study was conducted at the Midwifery Department of Health Polytechnic Ministry Of Health Denpasar, focusing on first-year female students. Data collection was carried out from February to March 2026.

2.3 Population, Sample, and Sampling

The study population and analysis units comprised all 83 first-year midwifery students aged 17–20 years who had experienced menarche. A total sampling technique was applied, enrolling all population members who met the specified eligibility criteria. The inclusion criteria required active female students who experienced natural menstruation without hormone therapy and consented to participate. Students with histories of medical conditions affecting menstruation (e.g., PCOS, thyroid disorders), those taking hormonal medications, or those experiencing acute illness during data collection were excluded.

2.4 Variables

The independent variables in this study were academic stress and physical activity. The dependent

variable was menstrual cycle regularity, classified as regular (21–35 days) or irregular (<21 or >35 days).

2.5 Data Collection

Primary data were gathered via digital questionnaires (Google Forms) completed by respondents within 10–15 minutes, while secondary data included institutional student registries. Academic stress was measured using the Indonesian version of the Student-Life Stress Inventory (SSI), consisting of 48 items scored on a 4-point Likert scale to categorize stress into mild (48–96), moderate (97–144), and severe (145–192). Psychometric testing results indicated that the Student-life Stress Inventory (SSI) possesses high content validity based on evaluation by nine experts, with an overall score of 8.05 across all subscales, as well as good internal consistency with a Cronbach's alpha value of 0.857 among the student sample. These findings demonstrate that the Student-life Stress Inventory (SSI) questionnaire is a valid and reliable instrument for measuring stress levels within the study population.⁽¹¹⁾ Physical activity over the last 7 days was assessed using the International Physical Activity Questionnaire–Short Form (IPAQ-SF), computing MET-minutes/week to classify activity levels into low (<600), moderate (600–3,000), and high (>3,000). Research findings indicate that the International Physical Activity Questionnaire–Short Form (IPAQ-SF) demonstrates fair-to-good reliability ranging from 0.09 to 0.39, with measurement validity consistency scores ranging between 0.43 and 0.83. However, the accuracy of the IPAQ-SF remains low-to-moderate when compared to objective physical activity measurement tools, such as accelerometers, with correlation values of ≤ 0.39 . While the IPAQ-SF can be utilized for repeated physical activity assessments, its results should be interpreted with caution.⁽¹²⁾

2.6 Ethical Practices

This study was conducted in strict accordance with ethical principles for medical and health research. Ethical approval was officially granted by the Health Research Ethics Committee of Health Polytechnic Ministry of Health Denpasar under certificate number DP.04.02/F.XXIV.26/233/2026. Additionally, institutional permission to conduct the study at the campus was obtained through the official permit letter number PP.06.02/F.XXIV.14/0842/2026. Prior to data collection, informed consent was obtained from all individual

participants, ensuring their anonymity and the confidentiality of the gathered data.

2.7 Data Analysis

The data were analyzed using IBM SPSS Statistics Version 30. Bivariate analysis was performed using the Chi-square test to examine the association between independent variables and the outcome variable. Variables with a p-value < 0.25 in the bivariate analysis were included in the multivariable logistic regression model to identify independent predictors while controlling for potential confounding factors. Statistical significance was determined at a p-value < 0.05, and the results were presented as adjusted odds ratios (AORs) with 95% confidence intervals (95% CIs).

3. RESULTS

This study was conducted at the Midwifery Department of Health Polytechnic Ministry of Health Denpasar, located on Puputan main road, Renon, Denpasar, Bali. This location was selected because first-year midwifery students face a demanding academic workload, primarily dominated by theoretical lectures that lead to prolonged sedentary behavior in class. Additionally, active involvement in non-academic activities, such as student committees and extracurricular clubs, further limits their time for regular physical activity or exercise. Consequently, these students serve as a highly representative subject group for examining how academic stress and unbalanced physical activity within a health education institution influence hormonal regulation and reproductive health, specifically the menstrual cycle.

3.1. Characteristic Response

Based on the demographic data presented in Table 1, the majority of the 83 first-year midwifery students are late adolescents aged 19 years old (60.2%), followed by those aged 18 years old (31.3%), while a small minority consists of students aged 17, 20, and 21 years old. In terms of living arrangements, more than half of the respondents reside with their parents (57.8%), whereas the remaining 42.2% live independently in boarding houses. These descriptive findings suggest that the transition into higher education for this cohort involves not only adapting to academic demands at a typical undergraduate age but also navigating diverse domestic environments, where students living away from home may experience different levels of external support and

daily physical responsibilities compared to those staying with their families.

Table 1. Distribution of age and residence of first-year midwifery students at Health Polytechnic Ministry of Health Denpasar

Characteristics	f (n=83)	%
Age (year)		
17	2	2.4
18	26	31.3
19	50	60.2
20	4	4.8
21	1	1.2
Residence		
Living with parents	48	57.8
Boarding house	35	42.2

As illustrated in Table 2, the analysis of academic stress distribution reveals that more than half of the 83 first-year midwifery students experience moderate stress levels, accounting for 51.8% (43 students) of the total sample. Furthermore, a substantial proportion of the respondents suffer from severe academic stress (36.1%), whereas only a small minority reports mild stress levels (12%). These descriptive findings highlight that a significant majority of freshman students face noticeable psychological pressure, which likely stems from the demanding transition into higher midwifery education, rigorous clinical or academic schedules, and the burden of adapting to professional health competencies at an early stage of their studies.

Table 2. Distribution of academic stress among first-year midwifery students at Health Polytechnic Ministry of Health Denpasar

Academic category stress	f	%
Mild stress	10	12
Moderate stress	43	51.8
Severe stress	30	36.1
Total	83	100

According to the descriptive data presented in Table 3, the evaluation of physical activity profiles indicates that nearly half of the 83 first-year midwifery students engage in moderate physical activity, representing 48.2% (40 students) of the study population. This is closely followed by students with low physical activity levels, who constitute 44.6% (37 students) of the sample, while only a small minority of 7.2% (6 students)

maintain high physical activity levels. These findings reveal that the vast majority of freshman students lead predominantly sedentary lifestyles or engage in limited exertion, which may reflect the demanding nature of their academic schedules, extensive lecture hours, and study routines that restrict the time available for regular, high-intensity exercise or consistent physical conditioning.

Table 3. Distribution of physical activity among first-year midwifery students at Health Polytechnic Ministry of Health Denpasar

Physical category activity	f	%
Low activity	37	44.6
Moderate activity	40	48.2
High activity	6	7.2
Total	83	100

The descriptive data presented in Table 4 indicates a strikingly high prevalence of menstrual cycle irregularities among the respondents, with the vast majority of the 83 first-year midwifery students experiencing irregular cycles, accounting for 78.3% (65 students) of the total sample. In contrast, only a small minority of 21.7% (18 students) reported maintaining a regular menstrual cycle. This high percentage of menstrual dysfunction reflects a critical health concern within this student population, strongly implying that external lifestyle stressors, heavy academic workloads, shifts in physical adaptation, or underlying hormonal imbalances common in late adolescence are collectively disrupting normal hypothalamic-pituitary-ovarian axis functions during their transitional year in higher health education.

Table 4. Distribution of menstrual cycle regularity among first-year midwifery students at Health Polytechnic Ministry of Health Denpasar

Menstrual cycle category	f	%
Regular	18	21.7
Irregular	65	78.3
Total	83	100

3.2. Observations of Research Subjects Based on Study Variables

This cross-tabulation table (Table 5) shows that the majority of respondents with severe stress experienced irregular menstrual cycles, accounting for 29 respondents (96.7%). The analysis yielded a p-value of 0.003,

indicating a significant relationship between academic stress levels and the respondents' menstrual cycles. These data reflect that higher academic stress is associated with a higher prevalence of menstrual irregularities, where 65 out of 83 total respondents (78.3%) experienced irregular cycles.

Table 6 demonstrates that the majority of respondents in the light and moderate physical activity categories had irregular menstrual cycles, at 78.4% (29 respondents) and 85.0% (34 respondents), respectively.

Conversely, in the heavy activity category, most respondents actually had regular menstrual cycles, accounting for 4 respondents (66.7%) compared to those with irregular cycles (33.3%). The analysis yielded a *p*-value of 0.026, indicating a significant relationship between physical activity and the respondents' menstrual cycles. Nonetheless, the cumulative prevalence of menstrual cycle irregularities remained dominant across all physical activity groups, totaling 78.3% (65 respondents).

Table 5. Relationship between academic stress and menstrual cycle among first-year midwifery students at Health Polytechnic Ministry of Health Denpasar

Academic stress category and menstrual cycle	Regular		Irregular		Sig.
	f	%	f	%	
Mid stress	2	20	8	80	<i>p</i> = 0.003
Moderate stress	15	34.9	28	65.1	
Severe stress	1	3.3	29	96.7	
Total	18	21.7	65	78.3	

Table 6. Relationship between physical activity and menstrual cycle among first-year midwifery students at Health Polytechnic Ministry of Health Denpasar

Physical activity category and menstrual cycle	Regular		Irregular		Sig.
	f	%	f	%	
Low Activity	8	21.6	29	78.4	<i>p</i> = 0.026
Moderate Activity	6	15	34	85	
Heavy Activity	4	66.7	2	33.3	
Total	18	21.7	65	78.3	

Based on the logistic regression analysis in Table 7, several key insights regarding the most influential factors on the menstrual cycle can be summarized as follows: Multivariate analysis results show that severe stress (*p*=0.009), light physical activity (*p*=0.033), and moderate physical activity (*p*=0.012) significantly influence the menstrual cycle. Moderate physical activity was identified as the most dominant factor, with respondents

facing a 27.6-fold higher risk of experiencing irregular cycles compared to the reference category. Conclusion: Simultaneously, stress categories and physical activity variables exert a significant collective influence on menstrual cycle regularity. However, based on the Odds Ratio (OR) values, physical activity is the most dominant influencing factor in this study.

Table 7. Multivariate logistic regression analysis of dominant factors influencing menstrual cycle irregularities among first-year midwifery students at Health Polytechnic Ministry of Health Denpasar

Variable	B	S.E.	Wald	p	Exp (B)	95% CI	
						Lower	Upper
Stress category	-	-	7.236	0.027	-	-	-
Moderate stress	-2.248	1.461	2.368	0.124	0.106	0.006	1.851
Severe stress	-3.274	1.254	6.817	0.009	0.038	0.003	0.442
Physical activity	-	-	6.344	-	-	-	-
Low activity	2.770	1.301	4.528	0.033	15.951	1.244	204.470
Moderate activity	3.321	1.322	6.309	0.012	27.692	2.074	369.678
Constant	1.043	1.288	0.656	0.418	2.837	-	-

4. DISCUSSION

4.1 Academic Stress Levels Among First-Year Midwifery Students

The empirical findings of this study reveal that all respondents experience varying degrees of academic stress, predominantly falling into the categories of moderate stress (51.8%) and severe stress (36.1%). The high prevalence of academic stress among first-year midwifery students at Health Polytechnic Ministry of Health Denpasar signifies a psychological response to their academic transition. As first-year students, they undergo a drastic shift from highly structured high school learning environments to a higher health education system characterized by strict discipline, an intensely dense theoretical workload, and high competency benchmarks.

The findings indicate that first-year midwifery students experience considerable levels of academic stress, which is consistent with the challenges commonly encountered during the transition from secondary education to higher education. Entering a health professional program requires students to adapt to a demanding academic environment characterized by intensive coursework, frequent examinations, practical laboratory sessions, and the expectation to acquire professional competencies within a relatively short period. In addition to academic demands, first-year students must adjust to new learning methods, increased independence, and unfamiliar social environments, all of which may contribute to elevated stress levels. Previous studies have shown that freshmen in health-related programs are particularly vulnerable to academic stress because they are simultaneously adapting to university life while coping with the rigorous expectations of professional education.⁽¹³⁾

These findings are also supported by recent evidence demonstrating that academic demands remain the primary source of stress among nursing and midwifery students. An umbrella review reported that coursework, examinations, clinical preparation, and interactions with faculty members are the most frequently identified academic stressors among pre-licensure nursing students, with psychological stress affecting approximately 62% of students. Likewise, a recent systematic review focusing on midwifery students found that concerns about clinical performance, fear of making mistakes, heavy workloads, and the transition into professional roles substantially increase stress

during undergraduate education. Persistent academic stress may negatively affect students' psychological well-being, learning motivation, academic performance, and clinical competence, highlighting the importance of providing academic counseling, stress management programs, peer support, and faculty mentorship, particularly during the first year of midwifery education.⁽¹³⁻¹⁵⁾

4.2 Physical Activity Profiles Among First-Year Midwifery Students

The high prevalence of sedentary behavior among respondents, where the cumulative proportion of low and moderate physical activity reached 92.8%, scientifically reflects the impact of excessive cognitive load unaccompanied by physical mobilization. This condition occurs because first-year students are confined to static activity patterns focused on fulfilling administrative tasks and academic theories. Physiologically, prolonged sitting for hours in front of laptops causes a decrease in the basal metabolic rate and impairs blood circulation.

The present study found that the physical activity levels of first-year midwifery students varied, with a considerable proportion of students engaging in low to moderate levels of physical activity. This finding is not unexpected, as the transition to university often results in substantial lifestyle changes that reduce opportunities for regular exercise. First-year students frequently experience increased academic demands, prolonged classroom attendance, extensive study hours, and greater screen time, all of which contribute to sedentary behavior and reduced participation in physical activity. Furthermore, midwifery education requires intensive theoretical learning and practical skill development, leaving limited time for recreational exercise. Recent evidence indicates that many undergraduate students worldwide do not achieve the World Health Organization (WHO) recommendation of at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity physical activity per week. Consequently, insufficient physical activity has become an important public health concern among university students.⁽¹⁶⁾

These findings are consistent with previous studies demonstrating that university students, particularly those enrolled in health-related programs, often experience barriers to maintaining adequate physical activity. Common barriers include heavy academic

workloads, lack of time, fatigue, limited access to exercise facilities, and reduced motivation, whereas social support, personal health goals, and technology-based interventions have been identified as important facilitators of regular physical activity. A recent systematic review also showed that interventions incorporating wearable activity trackers, mobile applications, and social media platforms effectively increased physical activity among college students, suggesting that innovative and technology-supported health promotion strategies may be beneficial for first-year midwifery students. Promoting regular physical activity is essential not only for maintaining physical fitness but also for improving mental well-being, reducing stress, and enhancing academic performance among future healthcare professionals.^(16–18)

4.3 Menstrual Cycle Regularity Among First-Year Midwifery Students

The high prevalence of menstrual cycle irregularities (78.3%) observed in this study comprising polymenorrhea in 27 students (32.53%), oligomenorrhea in 38 students (45.78%), and eumenorrhea in only 18 students (21.69%)—physiologically reflects a disruption in the hypothalamic-pituitary-ovarian (HPO) axis triggered by psychological pressure and sedentary behavior. The academic stress experienced by early-stage students induces an elevation in cortisol levels, which subsequently impairs the pulsatile secretion of gonadotropin-releasing hormone (GnRH), follicle-stimulating hormone (FSH), and luteinizing hormone (LH). This hormonal imbalance is further exacerbated by insufficient physical activity, which hinders blood circulation and hormone metabolism, thereby leading to impaired oocyte maturation (anovulation) that manifests as irregular menstrual cycles.

The present study showed that most first-year midwifery students had regular menstrual cycles, while a proportion experienced menstrual irregularities. Menstrual cycle regularity is an important indicator of reproductive health because it reflects the normal functioning of the hypothalamic-pituitary-ovarian (HPO) axis. In late adolescence and early adulthood, menstrual patterns are influenced by a combination of biological, behavioral, and environmental factors. Although many university students have established ovulatory cycles, lifestyle changes during the transition to higher education—including alterations in sleep patterns, dietary habits, physical activity, and academic

responsibilities—may contribute to menstrual disturbances. These changes are particularly relevant among first-year students who are adapting to new academic and social environments while managing increasing educational demands. Recent evidence also indicates that menstrual health among female college students is influenced by multiple modifiable factors, including stress, sleep quality, caffeine consumption, and lifestyle behaviors, emphasizing the importance of maintaining healthy habits during university life.⁽¹⁹⁾

The occurrence of menstrual irregularities observed in this study is consistent with recent literature reporting that psychological and lifestyle-related factors are common contributors to menstrual dysfunction among young women. A recent systematic review found that psychological stress—including academic stress—is frequently associated with irregular menstruation, abnormal menstrual flow, and other menstrual disturbances through dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, which subsequently affects the HPO axis and reproductive hormone secretion. Furthermore, evidence from a 2024 meta-analysis involving female college students identified stress, irregular sleep, high caffeine intake, and early menarche as significant factors associated with menstrual disorders. These findings suggest that promoting stress management, healthy sleep patterns, balanced nutrition, and healthy lifestyle behaviors may help maintain menstrual regularity and improve reproductive health among first-year midwifery students.^(19,20)

4.4 The Relationship Between Academic Stress and Menstrual Cycle Regularity

Bivariate analysis using the Chi-Square test demonstrated a significant relationship between academic stress and menstrual cycle regularity among first-year students ($p = 0.002$). The data indicate that students experiencing severe stress face a higher risk of menstrual irregularities compared to those with lower stress levels, confirming that psychological pressure is a substantial risk factor affecting students' reproductive health. The present study found a significant relationship between academic stress and menstrual cycle regularity, indicating that female students experiencing higher levels of academic stress were more likely to report irregular menstrual cycles. This finding supports the growing body of evidence suggesting that psychological stress, particularly stress related to academic demands, plays an

important role in disrupting normal menstrual function. Academic stress is recognized as one of the most common stressors experienced by university students. Excessive academic workload, examinations, deadlines, competition, and concerns about academic performance activate the body's stress response system, particularly the hypothalamic-pituitary-adrenal (HPA) axis. Activation of the HPA axis increases the secretion of corticotropin-releasing hormone (CRH), adrenocorticotrophic hormone (ACTH), and cortisol. Elevated cortisol levels suppress the hypothalamic-pituitary-gonadal (HPG) axis by inhibiting gonadotropin-releasing hormone (GnRH) secretion, leading to reduced release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH). Consequently, ovarian follicular development and ovulation may be impaired, resulting in delayed, shortened, prolonged, or irregular menstrual cycles.⁽²⁰⁾

These findings are consistent with the recent systematic review by Poitras et al. (2024), which synthesized evidence from 41 studies examining psychological stress and menstrual function. The review concluded that most studies reported a significant association between elevated psychological stress—including academic stress—and menstrual dysfunction. The most frequently observed menstrual disturbances included irregular menstruation, changes in menstrual flow, and alterations in cycle characteristics. Although the magnitude of association varied across studies due to differences in stress measurement and definitions of menstrual irregularity, the overall evidence strongly supports psychological stress as an important contributor to menstrual disturbances.⁽²⁰⁾ Hambarsika et al. (2025) found that higher stress levels were significantly associated with menstrual cycle irregularity among female university students. Their findings emphasize that stress-related hormonal dysregulation remains one of the most influential modifiable factors affecting menstrual health in young women.⁽²¹⁾

Overall, the findings of this study reinforce the importance of stress management interventions within higher education settings. Universities should consider implementing mental health promotion programs, stress reduction workshops, counseling services, mindfulness training, and healthy lifestyle education to minimize academic stress and promote reproductive health among female students. Early identification of students experiencing high academic stress may not only improve psychological well-being but also contribute to

maintaining normal menstrual function and overall reproductive health

4.5 The Relationship Between Physical Activity and the Menstrual Cycle

Bivariate analysis revealed a significant relationship between physical activity patterns and the menstrual cycle ($p=0.026$), with students engaging in light-to-moderate physical activity experiencing the highest rates of menstrual irregularity. This condition is driven by the sedentary lifestyle of first-year students, who spend prolonged periods sitting due to academic demands. Physiologically, this sedentary behavior reduces insulin sensitivity and disrupts the regulation of estrogen and progesterone. The lack of adequate physical movement ultimately compromises the metabolic stability of reproductive hormones, mechanically preventing the menstrual cycle from following its normal schedule.

Physical activity contributes to maintaining reproductive health by improving metabolic function, regulating body composition, enhancing insulin sensitivity, and reducing chronic inflammation. Moderate-intensity physical activity also helps maintain hormonal homeostasis by supporting the normal function of the hypothalamic-pituitary-gonadal (HPG) axis, which regulates ovarian hormone production and ovulation. Regular exercise improves blood circulation, reduces psychological stress, and promotes a healthy body weight, all of which contribute to maintaining normal menstrual function. Conversely, inadequate physical activity may increase the risk of obesity and metabolic dysfunction, while excessive physical activity may induce an energy deficit that suppresses reproductive hormone secretion, ultimately leading to menstrual disturbances.

Recent evidence suggests that the relationship between physical activity and menstrual health is bidirectional. While physical activity may influence menstrual cycle regularity, menstrual symptoms themselves—including dysmenorrhea, fatigue, heavy menstrual bleeding, and psychological discomfort—may reduce participation in regular exercise. A systematic review by Gopalan et al. (2024) found that many women temporarily reduce or discontinue recreational physical activity during menstruation because of pain, discomfort, embarrassment, or concerns about symptom exacerbation. However, women with milder menstrual symptoms and positive perceptions toward exercise were

more likely to maintain consistent physical activity throughout the menstrual cycle. These findings indicate that menstrual health and physical activity mutually influence one another.⁽²²⁾

Although menstrual cycle phases may influence exercise performance, current evidence indicates considerable inter-individual variability. A systematic review by Beníčková et al. (2024) reported that physical performance may vary slightly across menstrual cycle phases, with some improvements in strength and power observed during specific phases. However, the authors concluded that these differences are generally modest and highly individualized, suggesting that women should tailor physical activity according to their own symptoms and functional capacity rather than relying solely on menstrual cycle phases.⁽²³⁾

Overall, the findings of this study reinforce current public health recommendations encouraging regular moderate-intensity physical activity among young women. The World Health Organization recommends that adults perform at least 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous-intensity aerobic physical activity per week, combined with muscle-strengthening activities on at least two days weekly. Maintaining adequate energy intake, balanced nutrition, and appropriate exercise intensity may help preserve hormonal balance and support menstrual cycle regularity while promoting overall physical and mental health.

4.6 The Most Dominant Variable Influencing the Menstrual Cycle

Multivariate analysis demonstrated that physical activity is the most dominant factor influencing menstrual cycle irregularities, yielding an Odds Ratio (OR) of 27.692. This indicates that students engaging in moderate physical activity face a 27.6-fold higher risk of experiencing menstrual disruptions compared to those who are heavily active. Collectively, the combination of stress and physical activity accounts for 34.3% of the variance in menstrual cycle changes, proving that the physiological impact of sedentary behavior is more substantial than psychological pressure alone. It can be inferred that extreme lack of bodily movement resulting from heavy academic workloads severely disrupts metabolism and reproductive hormone regulation, thereby serving as the primary trigger for menstrual irregularities among these students.

A recent scoping review by Aningsih et al. (2025) categorized determinants of menstrual cycle disorders

into psychological, physiological, and lifestyle factors. Among these categories, stress emerged as the most dominant factor influencing menstrual cycle disturbances through dysregulation of the hypothalamic-pituitary-ovarian (HPO) axis. The review further reported that while obesity, inadequate sleep, poor dietary habits, and excessive physical activity contribute to menstrual irregularity, psychological stress demonstrated the most consistent association across the reviewed studies.⁽²⁴⁾

Although physical activity was significantly associated with menstrual cycle regularity in the present study, its influence appears to be less substantial than that of academic stress. Moderate physical activity generally supports hormonal balance and reproductive health, whereas excessive exercise mainly affects menstrual function when accompanied by low energy availability or inadequate nutritional intake. Therefore, the impact of physical activity is often indirect and mediated through alterations in energy balance, body composition, and metabolic status. In contrast, psychological stress directly influences neuroendocrine regulation regardless of physical fitness level, making it a more potent predictor of menstrual dysfunction. This may explain why stress remained statistically significant in the multivariate model after adjustment for physical activity.⁽²⁰⁾

Nevertheless, menstrual cycle regulation is multifactorial, and the dominant effect of academic stress should not be interpreted in isolation. Numerous biological and lifestyle factors—including body mass index (BMI), nutritional status, sleep quality, endocrine disorders (particularly polycystic ovary syndrome and thyroid disease), medication use, smoking, alcohol consumption, and genetic susceptibility—also contribute to menstrual regularity. Recent cohort evidence further demonstrates that changes in BMI independently influence menstrual regularity, with weight gain into the overweight or obese category significantly increasing the likelihood of irregular cycles. These findings suggest that menstrual health results from complex interactions among psychological, metabolic, hormonal, and behavioral factors.^(21,25)

From a public health perspective, the identification of academic stress as the strongest predictor highlights the importance of stress management strategies within higher education institutions. Universities should strengthen student mental health services by providing counseling programs, stress management workshops, mindfulness training, peer support initiatives, and time-management education. Integrating mental health

promotion with reproductive health education may help reduce menstrual disturbances while simultaneously improving students' academic performance, psychological well-being, and overall quality of life. Early identification of students experiencing excessive academic stress is therefore essential as part of comprehensive reproductive health promotion programs.

5. CONCLUSION

This study demonstrates that the majority of first-year midwifery students experience moderate academic stress, reflecting a significant psychological burden during their academic transition and freshman year. Furthermore, the students' physical activity patterns are predominantly light-to-moderate, indicating a highly sedentary lifestyle where time is mostly occupied by static activities such as theoretical lectures and assignments. Consequently, a high prevalence of menstrual cycle irregularities is observed among these students, serving as a critical indicator of compromised reproductive health influenced by lifestyle and psychological factors. Bivariate analysis confirms a significant relationship between academic stress and menstrual cycle regularity, where higher stress levels increase the likelihood of cycle disruptions due to hormonal imbalances. Similarly, physical activity significantly correlates with menstrual regularity, proving that long-duration, low-dynamic movement contributes to irregular cycles by hindering proper bodily metabolism. Ultimately, multivariate analysis identifies moderate physical activity as the most dominant factor influencing menstrual irregularities, surpassing academic stress. This underscores that the physical impact of sedentary behavior and lack of regular exercise exerts a more massive influence on the regulation of students' reproductive hormones.

Ethical Approval

Ethical clearance (No. DP.04.02/F.XXIV.26/233/2026) and institutional permission (No. PP.06.02/F.XXIV.14/0842/2026) were obtained prior to data collection, and all respondents provided informed consent.

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Competing Interests

All the authors declare that there are no conflicts of interest.

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Underlying Data

Derived data supporting the findings of this study are available from the corresponding author on request.

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