

Original Research Article

A cross-sectional study to assess the impact of dietary and lifestyle behaviour on menstrual patterns in medical students of GRMC Gwalior city, Madhya Pradesh, India

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ABSTRACT

Background: Menstrual health is an important indicator of reproductive well-being. Medical students are particularly vulnerable to menstrual irregularities due to stress and lifestyle factors. To assess menstrual patterns and their association with dietary and lifestyle factors among female medical students.

Methods: A cross-sectional study was conducted among 183 female undergraduate medical students at Gajra Raja Medical College, Gwalior, from November 2024 to January 2025. Data were collected using a structured questionnaire covering sociodemographic details, menstrual history, BMI, diet, physical activity, stress, and sleep. Dysmenorrhea severity was assessed using the Visual Analogue Scale. Statistical analysis was performed using Jamovi 2.6.26, with Chi-square test and $p < 0.05$ considered significant.

Results: Most participants (70.2%) attained menarche at 12–15 years. Normal BMI was observed in 56.9%, while 70.7% reported no physical exercise and 80.1% experienced stress. Irregular menstrual cycles were present in 53.6% of students. Significant associations were found between menstrual irregularity and BMI ($p = 0.003$), physical activity ($p = 0.023$), study duration ($p < 0.001$), and dysmenorrhea ($p < 0.001$). Junk food consumption and stress were not significantly associated.

Conclusion: Menstrual irregularities are common among medical students and are significantly associated with modifiable lifestyle factors such as BMI, physical inactivity, and prolonged study duration. Early lifestyle interventions are essential to improve menstrual health.

Keywords: Menstrual patterns, Lifestyle, BMI, Dysmenorrhea, Medical students

INTRODUCTION

Menstrual health is a fundamental component of women's reproductive well-being and an important indicator of overall health.¹ Menstrual irregularities such as dysmenorrhea, oligomenorrhea, polymenorrhea, and menorrhagia can significantly affect physical comfort, psychological stability, and academic performance.² Young adult females, particularly undergraduate medical students, may be vulnerable to such disturbances due to

academic stress, altered sleep patterns, irregular dietary habits, and sedentary lifestyles.³

Lifestyle factors including body mass index (BMI), nutritional practices, physical activity, stress levels, screen exposure, and sleep duration have been increasingly implicated in menstrual disturbances.⁴ Understanding the relationship between these modifiable factors and menstrual abnormalities in medical students is essential for designing preventive and corrective strategies. The present

study aimed to assess menstrual patterns and examine their association with selected lifestyle factors among female undergraduate medical students.

Objectives

To determine the mean age at menarche among female medical students. To assess the prevalence and types of menstrual abnormalities. To evaluate the association between menstrual abnormalities and BMI, diet, physical activity, stress, study duration, screen time, and sleep duration.

METHODS

Study design and setting

A cross-sectional study was conducted among female undergraduate medical students at Gajra Raja Medical College (GRMC), Gwalior, Madhya Pradesh, from 5 November 2024 to 5 January 2025.

Study population and sample size

Female undergraduate medical students who provided informed consent were included.

The sample size was calculated based on a previously reported 57% prevalence of menstrual disorders¹, with 7.5% absolute precision at 95% confidence level, yielding a required sample of 167 participants. After accounting for 10% non-response, the final sample size was 183.

Inclusion criteria

Female undergraduate medical students aged 18–25 years. Participants who attained menarche. Participants who provided informed written consent

Exclusion criteria

Participants not attended menarche or with known gynaecological disorder. Participants with known endocrine disorders (e.g., thyroid dysfunction, diabetes mellitus). Participants who did not provide consent or had incomplete responses.

Data collection

Data were collected using a structured, self-administered questionnaire. Information on sociodemographic characteristics, lifestyle factors (diet, physical activity, stress, study duration, screen time, and sleep), and menstrual history was obtained.

Height and weight were measured using standard procedures, and BMI was calculated. Menstrual details included age at menarche, cycle pattern, duration of flow, and presence of abnormalities. Severity of dysmenorrhea was assessed using the VAS.

Statistical analysis

Data were analysed using Jamovi version 2.6.26. Descriptive statistics were calculated, and associations between menstrual abnormalities and lifestyle factors were assessed using the Chi-square test. A p value <0.05 was considered statistically significant.

RESULTS

A total of 183 female undergraduate medical students participated in this study.

Socio-demographic and lifestyle characteristics

Among the participants, half (50.3%) were aged 18–20 years, followed by 33.7% in the 21–23 years age group. More than half of the students (56.9%) had a normal BMI, while 25.4% were underweight and 17.7% were overweight.

A high proportion of students (75.7%) reported consuming junk food 4–5 days per week. Regarding study duration, 62.1% studied between 2–6 hours daily, whereas 24.9% studied more than 6 hours per day. Notably, 70.7% of participants reported no regular physical exercise.

Menstrual characteristics

The majority of students (70.2%) attained menarche between 12–15 years of age. Sanitary napkins were the most commonly used menstrual absorbent (85.1%).

Regarding duration of menstrual flow, 38.1% reported 3–5 days of bleeding, whereas 35.9% reported bleeding lasting less than 2 days and 16.0% reported flow exceeding 7 days. Moderate menstrual blood flow was reported by 55.8% of students, while 29.3% experienced heavy flow. Dysmenorrhea was reported by 12.7% of participants.

Premenstrual symptoms

Premenstrual symptoms were highly prevalent among participants. Bloating was reported by 92.8%, followed by tender breasts (77.9%) and back pain (72.9%). Moderate cramps and pelvic pain were reported by 60.2% of students.

Psychological symptoms were also common, with 80.1% reporting stress, 50.8% anxiety, and 42.5% depression. Food cravings (61.3%), lack of concentration (54.7%), irritability (49.2%), and headache (49.2%) were also frequently reported. Nausea and vomiting were less common (5.5%).

Association between menstrual regularity and lifestyle factors

Out of 183 participants, 98 (53.6%) had irregular menstrual cycles, while 85 (46.4%) reported regular

cycles. A statistically significant association was observed between BMI category and menstrual regularity ($\chi^2=11.7$, $p=0.003$), with higher proportions of irregular cycles among underweight and overweight students. Physical exercise frequency was also significantly associated with menstrual regularity ($\chi^2=2.91$, $p=0.023$), with irregular cycles being more common among students who did not exercise. Duration of study hours showed a highly significant association with menstrual irregularity

($\chi^2=19.2$, $p<0.001$), particularly among those studying more than 6 hours daily.

Dysmenorrhea demonstrated a strong and statistically significant association with menstrual irregularity ($\chi^2=35.3$, $p<0.001$). However, junk food consumption ($p=0.82$) and perceived stress levels ($p=0.07$) did not show statistically significant associations with menstrual regularity.

Table 1: Characteristics of medical students.

Characteristics	No. of students (N=183)	%
Age (in years)		
18-20	92	50.3
21-23	62	33.7
24 and above	29	16.0
Frequencies of BMI category		
Normal	103	56.9
Underweight	46	25.4
Overweight	32	17.7
Frequencies of junk food consumption		
2-3 days/week	44	24.3
4-5 days/week	137	75.7
Duration of study hours		
Less than 2	23	13.0
Between 2-6	110	62.1
More than 6	44	24.9
Frequencies of physical exercise		
2-3 days/week	28	15.5
4-5 days/week	25	13.8
No physical exercise	130	70.7

Table 2: Menstrual pattern in medical students.

Parameter	No. of students	%
Age of menarche (in years)		
Less than 9	7	3.9
9 to 12	39	21.5
12 to 15	127	70.2
Type of absorbent		
Cloth	10	5.5
Menstrual cup	17	9.4
Sanitary napkins	154	85.1
Duration of cycle		
<2 days	65	35.9
3-5 days	69	38.1
5-7 days	18	9.9
>7 days	29	16.0
Amount of blood flow		
Scanty	27	14.9
Moderate	101	55.8
Heavy	53	29.3
Dysmenorrhea		
Yes	23	12.7
No	158	87.3

Table 3: Prevalence of premenstrual symptoms among medical students.

Factors	No. of students	%
Back pain		
Yes	132	72.9
No	49	27.1
Cramps and pelvic pain with heavy blood flow		
Mild	49	27.1
Moderate	109	60.2
Heavy	23	12.7
Stress		
Yes	145	80.1
No	36	19.9
Anxiety		
Yes	92	50.8
No	89	49.2
Depression		
Yes	77	42.5
No	104	57.5
Irritability		
Yes	98	49.2
No	92	50.8
Headache		
Yes	98	49.2
No	92	50.8
Nausea and vomiting		
Yes	10	5.5
No	171	94.5
Tender breast		
Yes	141	77.9
No	40	22.1
Bloating		
Yes	168	92.8
No	13	7.2
Lack of concentration		
Yes	99	54.7
No	82	45.3
Food craving		
Yes	111	61.3
No	70	38.7

Table 4: Menstrual cycle regularity and its correlation with lifestyle.

Factors	Regular (n=85)	Irregular (n=98)	Statistical values (x2)
BMI category			
Normal	59	22	Value=11.7, Df=2, p=0.003*
Underweight	17	30	
Overweight	9	44	
Physical exercise			
2-3 days/week	17	11	Value=2.91, Df=2, p=0.023*
4-5 days/week	12	13	
No physical exercise	56	74	
Junk food consumption			
2-3 days/week	21	23	Value=0.03, Df=1, p=0.82
4-5 days/week	64	75	

Continued.

Factors	Regular (n=85)	Irregular (n=98)	Statistical values (x ²)
Duration of study in hours			
Less than 2	11	13	Value=19.2, Df=2, p<0.001*
Between 2-6	65	69	
More than 6	9	16	
Stress			
Yes	61	81	Value=3.1, Df=1, p=0.07
No	24	17	
Dysmenorrhea			
Yes	11	54	Value=35.3, Df=3, p<0.001*
No	74	44	

Note: *- statistically significant (p<0.05).

DISCUSSION

The present cross-sectional study explored the association between lifestyle behaviours and menstrual patterns among female undergraduate medical students. The findings indicate a considerable burden of menstrual irregularities in this population, supporting existing evidence that young women exposed to academic stressors and lifestyle disruptions may experience altered reproductive health outcomes.¹ The majority of participants reported attainment of menarche between 12–15 years, which aligns with established normative age ranges reported in Indian and international literature.^{2,3,13} This suggests that the onset of menstruation in the study population follows expected biological trends and does not appear to be significantly influenced by extreme early or delayed menarche.

A key finding of the present study was the statistically significant association between BMI and menstrual irregularity (p=0.003). Both underweight and overweight students demonstrated a higher proportion of irregular cycles. These findings are biologically plausible, as deviations in body fat composition are known to influence the hypothalamic–pituitary–ovarian axis, thereby disrupting hormonal regulation of the menstrual cycle.^{4,5} Similar associations between abnormal BMI and menstrual disturbances have been reported in university-based studies conducted in India and other countries.^{6,12}

Physical inactivity was highly prevalent, with more than two-thirds of participants reporting no regular exercise. A significant association was observed between lack of physical activity and menstrual irregularity (p=0.023). Regular physical activity has been shown to improve metabolic balance, reduce stress levels, and stabilize endocrine function.^{5,11} The present findings reinforce the protective role of moderate physical exercise in maintaining menstrual regularity.

Although junk food consumption was frequent among participants, it did not demonstrate a statistically significant association with menstrual irregularity (p=0.82). This may reflect limitations in measuring dietary exposure using broad frequency categories. Previous studies suggest that overall dietary patterns, micronutrient

intake, and caloric balance may exert greater influence on menstrual health than isolated food items⁷. Future studies using detailed dietary assessment tools may provide clearer insights. Study duration emerged as a strong correlate of menstrual irregularity, with students studying more than six hours daily showing significantly higher irregularity (p<0.001). Academic burden may act as a chronic stressor, leading to neuroendocrine alterations that affect ovulatory cycles.⁸ Although perceived stress did not reach statistical significance (p=0.07), the strong association with prolonged study hours suggests that academic strain may indirectly contribute to menstrual dysfunction.

Dysmenorrhea showed a highly significant association with irregular cycles (p<0.001). Painful menstruation may reflect underlying hormonal imbalance, prostaglandin excess, or ovulatory dysfunction.⁹ Furthermore, the high prevalence of premenstrual symptoms particularly bloating, breast tenderness, and back pain highlights the substantial physical and psychological impact of the menstrual cycle on daily functioning. Similar symptom patterns have been reported among university students in other settings.^{10,11} Menstrual disorders during adolescence are often multifactorial and influenced by hormonal, behavioural, and environmental factors.^{15,16}

Overall, the findings suggest that modifiable lifestyle factors particularly abnormal BMI, insufficient physical activity, and prolonged academic workload are significantly associated with menstrual irregularities among medical students. These results underscore the need for early lifestyle interventions within academic institutions.

Limitations

The cross-sectional design precludes establishment of causal relationships between lifestyle factors and menstrual irregularities. Data were self-reported, which may introduce recall bias and reporting bias. The study was conducted in a single medical college, limiting generalizability. Dietary assessment was based on frequency of junk food intake rather than comprehensive nutritional analysis. Hormonal profiles and clinical evaluations were not performed to confirm underlying

endocrine disorders. Future longitudinal and multi-centric studies incorporating biochemical assessment are recommended to strengthen causal inferences.

CONCLUSION

This study demonstrates that menstrual irregularities are common among female medical students and are significantly associated with abnormal BMI, lack of regular physical exercise, extended study hours, and dysmenorrhea. These findings emphasize the influence of modifiable lifestyle behaviours on menstrual health in young adults. Early identification of at-risk individuals and structured lifestyle-based interventions may help reduce menstrual morbidity in this vulnerable population.

Recommendations

Implementation of structured health education programs within medical colleges focusing on menstrual health awareness. Promotion of regular physical activity through institutional wellness initiatives. Encouragement of balanced dietary practices and healthy weight maintenance. Integration of stress management and time-management counselling services for students. Early screening and referral for students experiencing persistent menstrual irregularities.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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