

Prevalence and Symptom Spectrum of Premenstrual Syndrome in Medical Students: A Cross-sectional Study

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ABSTRACT

Introduction: Premenstrual Syndrome (PMS) is the presence of recurrent symptoms during the premenstrual phase or the first few days of menses, and complete absence of these symptoms in the post menstrual phase. PMS is common, affecting many women of reproductive age group, manifesting in a variety of physical, psychological and behavioural symptoms which may impact daily activities and overall quality of life.

Aim: To estimate the prevalence of PMS among female Bachelor of Medicine and Bachelor of Surgery (MBBS) students and interns, to determine the factors influencing PMS and the coping mechanisms used for relieving the symptoms.

Materials and Methods: The present observational cross-sectional study was conducted over a period of three months (April 2024- June 2024), including 418 female medical students and female interns of Index Medical College, Hospital and Research Centre, Indore, Madhya Pradesh, India, using a semistructured, self-administered questionnaire; after obtaining ethical clearance. All female MBBS students and interns present on the day of data collection and provided informed consent were included. Data entered into MS excel and analysed using Statistical Package for Social Sciences (SPSS). 25.0. Chi-

square assessed associations between PMS and independent variables. A p-value of <0.05 was considered statistically significant.

Results: Prevalence of PMS was found to be 354 (84.69%). PMS was statistically significantly associated with factors like year of study (p-value=0.039), socioeconomic status (p-value=0.030), Body Mass Index (BMI) (p-value≤0.001), physical activity (p-value=0.0013), sleep pattern (p-value=0.008), regularity of menses (p-value=0.017), number of days of menstruation (p-value=0.034) and dysmenorrhoea (p-value=0.01). Taking rest/ sleeping was found to be the most common coping mechanism used by the participants (90.78%), followed by listening to music (61.65%) and hot fomentation/ hot shower (49.51%).

Conclusion: High prevalence of PMS amongst young girls is a matter of concern, impacting their daily activities and overall quality of life. Certain coping mechanisms like taking adequate rest, listening music and taking hot shower have been found to relieve the symptoms. Also meditation and Yoga can be promoted for relief of PMS symptoms and calmness of mind and body. Severe cases might be advised to seek medical treatments like HRT.

Keywords: Bachelor of medicine and bachelor of surgery students, Coping mechanism, Dysmenorrhoea, Menstrual cycle

INTRODUCTION

The PMS is used to describe physical, cognitive, affective and behavioural symptoms that occur cyclically during the luteal phase of the menstrual cycle and resolve quickly at or within a few days of the onset of menstruation [1]. It is a common condition affecting many women of reproductive age group, manifesting in a variety of physical, psychological, and behavioural symptoms which may impact daily activities, work and overall quality of life. These symptoms typically occur in the luteal phase of the menstrual cycle and resolve with the onset of menstruation. Common symptoms include mood swings, irritability, depression, fatigue, bloating, breast tenderness, and headaches etc., [2].

The PMS symptoms usually start posing problem in the adolescent years [3] and decline towards the climacteric. Severity of the symptoms is at their peak in the late 20s to mid-30s but women are more likely to seek treatment after the age of 30 years [4]. The prevalence of PMS varies widely, with various studies indicating that it affects approximately 30-75% of women globally. In India, the prevalence of PMS ranges from 14.3 to 74.4% among women of reproductive age [5]. This variation is influenced by differences in study populations, cultural factors, awareness and symptoms perception [6]. PMS significantly impacts the quality of life and productivity of affected women, highlighting the need for increased awareness, accurate diagnosis and effective management

strategies within the Indian healthcare system [7]. Understanding the prevalence and impact of PMS in India is crucial for developing targeted interventions.

Insights from research can lead to the development of more effective treatments and interventions, both pharmacological and non pharmacological, to alleviate symptoms. Preventing PMS involves a combination of lifestyle changes and medical treatments, for example, regular physical activity can alleviate symptoms by reducing stress and improving mood [8]. For severe cases, pharmacological treatments such as hormonal contraceptives, antidepressants, and Non Steroidal Anti-inflammatory Drugs (NSAIDs) may be prescribed. Also, addressing PMS through research can significantly enhance the quality of life for many women, reducing absenteeism from work or school and improving interpersonal relationships. Understanding the variability in PMS symptoms and responses to treatments can lead to more personalised and effective management strategies [9].

It is well understood that adolescents (10-19 years) and youth (15-24 years) are the budding future of the society and the nation at large. Adolescence being the bridge between childhood and adulthood, experiences dynamic anatomical, physiological and psychological changes, which may push some of these young women into a whirl wind of depression [10]. Hence, this vulnerable phase of life requires special attention by healthcare providers who can help to create

awareness among young females on comprehensive measures to reduce PMS in their child bearing age. This in turn helps to prevent the negative impact on the quality of life of women. Overall, research on PMS is crucial for improving women's health and well-being on multiple levels. Thus, the present study aimed to:

- To estimate the prevalence of PMS among female MBBS students and interns of Index Medical College, Indore, Madhya Pradesh, India.
- To determine the factors influencing PMS by analysing the associations between PMS and independent variables.
- To study the physical, psychological and behavioural symptoms associated with PMS.
- To identify the coping mechanisms used for relieving the symptoms associated with PMS.

MATERIALS AND METHODS

The present observational cross-sectional study was conducted over a period of three months (April 2024 to June 2024) among all the female medical students from the 1st to final professional years and female interns of Index Medical College, Hospital and Research Centre, Indore, Madhya Pradesh, India. Ethical approval was obtained from the Institutional Ethical Committee (IEC) of Index Medical College. (IEC letter no.- IMCHRC/IEC/2023/127). Written informed consent was obtained from all participants. Confidentiality and anonymity of participant data were maintained throughout the study.

Inclusion criteria: All female MBBS students and interns who were present on the day of data collection and provided informed consent.

Exclusion criteria: Female students who had not attained menarche due to any cause and incompletely filled questionnaires.

Sample size calculation: Sample size was calculated using following formula:

$$n = \frac{Z^2 * (pq)}{d^2}$$

Where, Z = 1.96, p = 0.5 [5], q = 0.5, d = 0.05

$$\text{Thus, } n = \frac{1.96 * 1.96 * 0.5 * 0.5}{0.05 * 0.05} = 384.16 = 385$$

After adding for 5% non- response rate, the minimum sample size obtained was 405.

Purposive sampling was used in the study. After applying the inclusion and exclusion criteria, a total of 418 participants were included in the final analysis. Prior to actual data collection, a pilot study was carried out to check the validity and reliability of the questionnaire. (Pilot study was conducted in a group of 50 MBBS students and the results of pilot study were included in the main study. The questionnaire had a Cronbach's alpha value of 0.82 and the Scale-level Content Validity Index (S-CVI) value was 0.88.

Based on the responses and results of the pilot study the questionnaire was modified accordingly before distributing it for the final data collection.

Study Procedure

Data collection: Data were collected using a semistructured, self-administered, pre-tested and validated questionnaire. Participants were briefed regarding the purpose of the study and were given instructions and clarifications about the terminologies used. They were asked to respond based on their experiences over the past six months which coincides with 5-6 menstrual cycles. Only those questionnaires were included which were completely filled. The diagnosis of PMS was made on the basis of self-reported symptoms experienced by the participants. If they "always" experienced at least one symptom from each of the three categories (physical,

behavioural and psychological), then they were considered to be experiencing PMS. The questionnaire covered the following domains:

Sociodemographic details: Age, year of study, marital status, socioeconomic status, etc. Socioeconomic class was determined using modified BG Prasad Scale 2024 [11].

Personal history: Sleep patterns (Sleep pattern was recorded as disturbed when the participant found it difficult to fall asleep, found difficult to stay asleep, woke up at the middle of the night suddenly without any reason, waking up before alarm, feeling tired and exhausted during day time and these events occurred regularly during the past eight weeks. When these were absent, the sleep pattern was recorded as normal);

Bowel habits were recorded as normal with no loss of appetite or constipation or loose stools and no change in frequency of motion during the past eight weeks;

Bladder habits recorded as normal when there was no frequency or urgency of micturition, no burning micturition or no change in frequency of micturition in the night during the past eight weeks;

Substance use (alcohol, smoking, other drugs);

Tea/coffee intake;

Diet type;

Physical activity.

Medical history: Height, weight, BMI (BMI was classified using WHO classification of BMI), history of medical conditions, contraceptive use.

Menstrual History: Age at menarche, cycle regularity, duration and flow.

PMS- related Symptoms: Physical, psychological and behavioural symptoms assessed using a Likert- type scale.

Coping mechanisms used by participants such as taking rest, hot fomentation, meditation/yoga, listening music, massaging, modification in dietary habits, using home remedies, taking medicines etc.,

STATISTICAL ANALYSIS

Data were coded and entered into Microsoft excel and analysed using SPSS trial version 25. Descriptive statistics were used to present frequencies and percentages. Chi-square tests were used to assess associations between PMS and independent variables. A p-value of <0.05 was considered statistically significant.

RESULTS

In the present study, the age of the study participants ranged from 17-30 years with mean age 21.98±1.96 (SD) years. The mean age at menarche was found to be 13.6±1.39 (SD) years. Out of the total participants, 354 individuals, which accounts for 84.69%, exhibited symptoms of PMS.

The distribution of the study participants according to association between PMS and sociodemographic factors is shown in [Table/ Fig-1]. It was found that PMS was statistically significantly associated with year of study (p-value=0.039) and socioeconomic status (p-value=0.030) of the study participants.

The distribution of the study participants according to association between PMS and lifestyle factors is shown in [Table/Fig-2]. It was found that PMS was statistically highly significantly associated with Body Mass Index (BMI) (p-value ≤0.001), physical activity (p-value=0.0013) and sleep pattern (p-value=0.008) of the study participants.

The distribution of the study participants according to association between PMS and menstrual factors is shown in [Table/Fig-3]. It denotes that 298 (86.63%) of study participants having regular menstrual cycles experienced PMS while 56 (75.67%) participants

S. No.	Sociodemographic factors	Premenstrual Syndrome (PMS)		p-value
		Present (n) (%)	Absent (n) (%)	
1. Age groups (in years)				
	<18	6 (85.71%)	1 (14.29%)	0.183
	18 to 20	85 (90.43%)	9 (9.57%)	
	21 to 23	199 (84.32%)	37 (15.68%)	
	>23	64 (79.01%)	17 (20.99%)	
2. Year of study				
	MBBS Intern	85 (79.44%)	22 (20.56%)	0.039*
	MBBS 1 st prof	64 (86.49%)	10 (13.51%)	
	MBBS 2 nd prof	82 (94.25%)	5 (5.75%)	
	MBBS 3 rd prof	78 (83.87%)	15 (16.13%)	
	MBBS 4 th prof	45 (78.95%)	12 (21.05%)	
3. Marital status				
	Married	4 (80%)	1 (20%)	0.566
	Unmarried	350 (84.75%)	63 (15.25%)	
4. Type of family				
	Joint	91 (81.98%)	20 (18.02)	0.355
	Nuclear/single	263 (85.67%)	44 (14.33)	
5. Socioeconomic class				
	I	113 (86.26%)	18 (13.74%)	0.030*
	II	114 (88.37%)	15 (11.63%)	
	III	75 (74.26%)	26 (25.74%)	
	IV	32 (91.43%)	3 (8.57%)	
	V	20(90.91%)	2(9.09%)	
[Table/Fig-1]: Distribution of study participants showing association between premenstrual syndrome and sociodemographic factors.				
*- statistically significant				

S. No.	Lifestyle factors	Premenstrual Syndrome (PMS)		p-value
		Present (n) (%)	Absent (n) (%)	
1. Body Mass Index (BMI)				
	<18.5	70 (69.31%)	31 (30.69%)	≤0.001*
	18.5- 24.9	231 (92.03%)	20 (7.97%)	
	25- 29.9	53 (81.53%)	12 (18.47%)	
	≥30	0	1 (100%)	
2. Alcohol intake				
	Yes	11 (78.57%)	3 (21.43%)	0.518
	No	343 (84.9%)	61 (15.1%)	
3. Smoking				
	Yes	3 (75%)	1 (25%)	0.487
	No	351 (84.78%)	63 (15.22%)	
4. Physical activity				
	Never	46 (97.87%)	1 (2.13%)	0.0013*
	Occasional	255 (85.28%)	44 (14.72%)	
	Regular/ daily	53 (73.61%)	19 (26.39%)	
5. Type of diet				
	Vegetarian	236 (86.13%)	38 (13.87%)	0.257
	Mixed	118 (81.94%)	26 (18.06%)	
6. Sleep pattern				
	Normal	255 (81.99%)	56 (18.11%)	0.008*
	Disturbed	99 (92.52%)	8 (2.22%)	
7. Bowel/Bladder habits				
	Regular	306 (84.53%)	56 (15.47%)	0.818
	Disturbed	48 (85.71%)	8 (14.29%)	

[Table/Fig-2]: Distribution of study participants showing association between premenstrual syndrome and lifestyle factors.

S. No.	Menstrual History	Premenstrual Syndrome (PMS)		p-value
		Present (n) (%)	Absent (n) (%)	
1. Age at menarche				
	<14 years	275 (85.67%)	46 (14.33%)	0.311
	≥14 years	79 (81.44%)	18 (18.56%)	
2. Regularity of cycles				
	Regular	298 (86.63%)	46 (13.37%)	0.017*
	Irregular	56 (75.67%)	18 (24.33%)	
3. No. of days of menstrual bleeding				
	<2	7 (58.33%)	5 (41.67%)	0.034*
	2 to 5	281 (85.15%)	49 (14.85%)	
	>5	66 (86.84%)	10 (13.16%)	
4. Duration of menstrual cycle				
	<25	38 (84.44%)	7 (15.56%)	0.709
	25 to 35	276 (84.15%)	52 (15.85%)	
	>35	40 (88.89%)	5 (11.11%)	
5. Flow/No. of pads used per day				
	1 to 2	191 (83.04%)	39 (16.96%)	0.521
	3 to 4	149 (86.13%)	24 (13.87%)	
	>5	14 (93.33%)	1 (6.67%)	
6. Dysmenorrhoea				
	Present	200 (88.89%)	25 (11.11%)	0.01*
	Absent	154 (79.79%)	39 (20.21%)	
7. History of OCP use				
	Yes	14 (93.33%)	1 (6.67%)	0.485
	No	340 (84.37)	63 (15.63%)	
[Table/Fig-3]: Distribution of study participants showing association between premenstrual syndrome and menstrual history. OCP: Oral contraceptive				

having irregular cycles experienced PMS and this difference was found to be statistically significant (p-value=0.017). Likewise, 66 (86.84%) participants whose cycle lasted for more than five days experienced PMS as compared to only 7 (58.33%) study participants experiencing PMS, having menstrual cycles lasting for less than two days and this difference was found to be statistically significant (p-value=0.034). Also, 200 (88.89%) participants reporting dysmenorrhoea during menstruation experienced PMS as opposed to 154 (79.79%) participants with no dysmenorrhoea experiencing PMS and this difference was found to be statistically significant (p-value= 0.01).

The distribution of study participants with respect to association between duration of PMS with different variables is shown in [Table/Fig-4]. Duration of PMS prior to menstruation was found to statistically significantly associated with variables like type of family, physical activity, sleep pattern, regularity of cycles, duration of menstrual cycles, dysmenorrhoea and history of OCP use.

S. No.	Variables	Duration of PMS prior to menstruation			p-value
		1-3 days (n) (%)	4-7 days (n) (%)	>7 days (n) (%)	
1. Type of family					
	Nuclear/Single	169 (64.26%)	76 (28.9%)	18 (6.84%)	0.027*
	Joint	70 (76.92%)	20 (21.98%)	1 (1.1%)	
2. Physical activity					
	Never	28 (60.87%)	10 (21.73%)	8 (17.4%)	0.008*
	Occasional	147 (57.65%)	96 (37.65%)	12 (4.70%)	
	Regular/daily	34 (64.15%)	14 (26.42%)	5 (9.43%)	
3. Sleep pattern					
	Normal	178 (69.8%)	64 (25.1%)	13 (5.1%)	0.015*
	Disturbed	61 (61.62%)	24 (24.24%)	14 (14.14%)	

4. Regularity of cycles					
	Regular	207 (69.46%)	79 (26.51%)	12 (4.03%)	0.001*
	Irregular	32 (57.14%)	17 (30.36%)	7 (12.50%)	
5. Duration of menstrual cycle					
	<25	25 (65.79%)	10 (26.32%)	3 (7.89%)	0.003*
	25 to 35	195 (70.65%)	72 (26.09%)	9 (3.26%)	
	>35	19 (47.5%)	14 (35%)	7 (17.5%)	
6. Dysmenorrhoea					
	Yes	125 (62.5%)	66 (33%)	9 (4.5%)	0.038*
	No	114 (74.03%)	30 (19.48%)	10 (6.49%)	
7. History of OCP use					
	Yes	5 (35.71%)	7 (50%)	2 (14.29%)	0.016*
	No	234 (68.82%)	89 (26.18%)	17 (5%)	

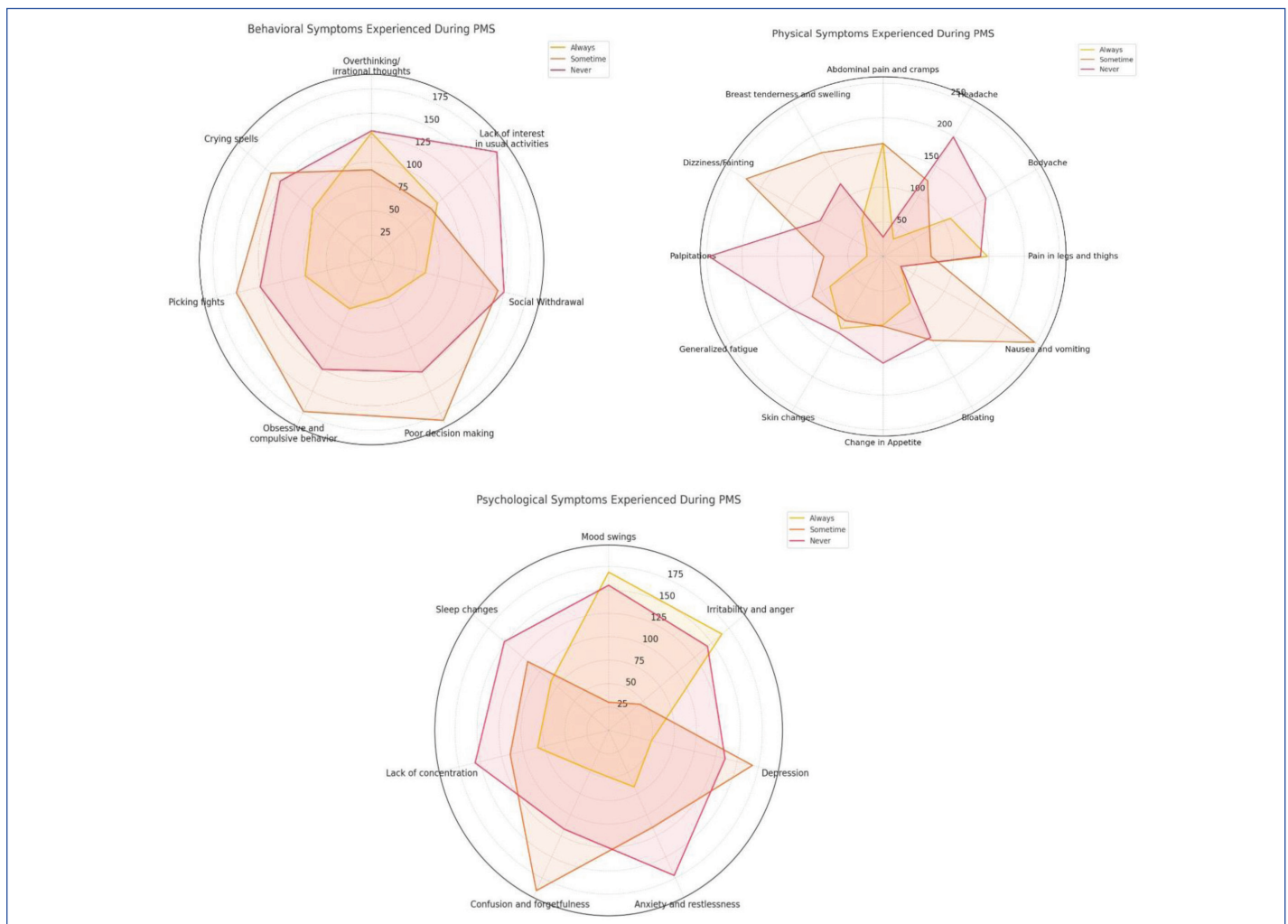
[Table/Fig-4]: Distribution of study participants showing association between duration of PMS with different variables.

The graph of the distribution of study participants according to physical, psychological and behavioural symptoms experienced during PMS is shown in [Table/Fig-5]. The three most common physical symptoms experienced always by the study participants are abdominal pain and cramps (46.05%), pain in legs and thighs (41.81%) and skin changes (33.9%). Likewise, the three most common psychological symptoms experienced always by the study participants are mood swings (47.74%), irritability and anger (46.61%), lack of concentration and anxiety and restlessness (23.73%). With regard to behavioural symptoms, the three most common ones experienced always by the study participants are overthinking/irrational thoughts (36.72%), lack of interest in usual activities (26.27%) and crying spells (23.45%).

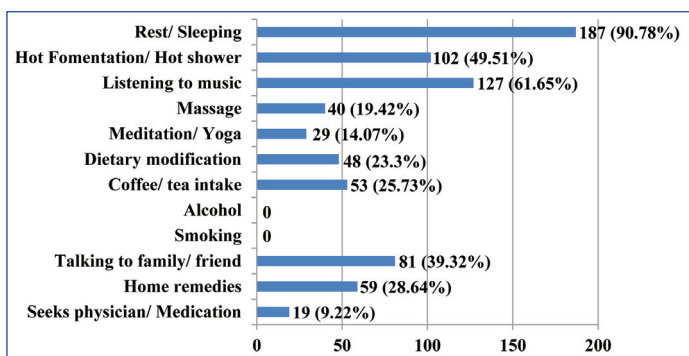
A total of 206 (58.19%) participants experiencing PMS, used one or more coping mechanisms to overcome the symptoms; and 148 (41.81%) participants did not use any coping mechanisms. [Table/Fig-6] is a bar diagram showing that taking rest/sleeping is the most common coping mechanism used by the participants 187 (90.78%), followed by listening to music 127 (61.65%) and hot fomentation/ hot shower 102 (49.51%). Almost none of the participants used hormonal contraceptives. However, very small percentage {(15/418) 3.59%} gave the history of use of hormonal contraception in past.

DISCUSSION

In the present study, mean age of study participants was found to be 21.98 ± 1.96 (SD) and the mean age at menarche was found to be 13.6 ± 1.39 (SD) years, similar to this Mandal R et al., who found it to be 15.61 ± 1.3 (SD) and 11.98 ± 1.08 (SD), respectively [12]. High prevalence of PMS among the study group (84.69%) is a significant finding that aligns with prior research by Upadhyay M et al. and Lakshmi D et al., reporting similar rates of 86% and 79.8%, respectively [13,14]. This consistency suggests that PMS is a prevalent issue within this specific population. The mean age of menarche (13.6 years) in the present study group provides a baseline for a critical developmental stage. However, the study's prevalence is much higher than the 31.1 to 51% reported by Akbari M et al., Brahmabhatt S et al., Molugulu N et al., and Bharti P et al., [15-18]. Some other studies like done by Alwafa RA et al., found prevalence to be 100% [19]. These variations indicate that variations in study design, cultural contexts or socioeconomic factors could influence these outcomes. These discrepancies highlight the need for standardised diagnostic criteria and tools across studies to allow for more accurate comparisons.



[Table/Fig-5]: Graph showing distribution of study participants according to physical, psychological and behavioural symptoms experienced during PMS.



[Table/Fig-6]: Bar diagram showing coping measures adopted by study participants for relieving PMS symptoms.

The study also reveals a significant association between PMS symptoms and the year of study, with symptoms increasing from the first to the fourth year. Akbari M et al., also found similar association between PMS and year of study [15]. The most probable reason for increasing PMS with year of study could be due to rising stress levels with each year of study. This trend, also supported by Eshetu N et al., who suggests that the increasing academic and professional pressures unique to medical training may exacerbate PMS symptoms over time [20]. In the present study, significant association was found between socioeconomic status and PMS symptoms which could be due to better awareness in higher socioeconomic groups or a better living condition might help ease the symptoms to some extent. However, Alwafa RA et al., did not find any significant relationship in their study for the same [19].

Several lifestyle factors were found to be strongly associated with PMS. The study highlights an association between PMS and a sedentary lifestyle, lack of physical activity, and disturbed sleep patterns. Yang H et al., and Chen Z et al., support this, showing that a lack of physical activity is directly linked to PMS symptom severity [21,22]. Furthermore, Jeong D et al., emphasised that poor sleep hygiene, including late sleeping, short sleep duration, and poor sleep quality, are significant risk factors for moderate- to-severe PMS [23]. The study's finding on the association between PMS and obesity is particularly noteworthy, as Mahishale A et al., found obese women (BMI ≥ 30) had nearly a threefold increased risk for PMS than non obese women [24]. Similarly, Bertone-Johnson ER found strong positive relationship between PMS and BMI in their study [25]. However, Mizgier M et al., reported women with normal BMI suffered from PMS twice as often as the women with BMI ≥ 25 kg/m² [26]. Also, in the present study PMS was found to be more common among those who had less physical activity. These findings collectively suggest that promoting healthy lifestyle habits could be a key strategy for managing PMS in medical students.

The three most commonly reported physical symptoms included abdominal pain and cramps, generalised fatigue and pain in legs and thighs. Bharti P et al., also represents similar finding [18], while Laxmi D et al., found generalised aches and pain as most common physical symptom [14]. Most common psychological symptoms experienced in the present study were mood swings (47.74%), irritability and anger (46.61%) and altered sleep (23.73%). While Mandal R et al., found depression as most common psychological symptom. This difference might be due to different age group of the study participants [12]. In case of behavioural symptoms, the three most common symptoms experienced by the participants in this study were over thinking/irrational thoughts (36.72%), followed by lack of interest in usual activities (26.27%). These findings resonate with the research of Bharti P et al., who identified restlessness as a common behavioural symptom [18].

The study establishes that participants with regular menstrual cycles, whose cycle lasted for more than five days and those experiencing dysmenorrhea were more likely to report PMS. This distinction supported by Mandal R et al., [12], who provide a more

nuanced understanding of how menstrual cycle regularity, duration and Dysmenorrhoea influence the type and severity of premenstrual and menstrual symptoms.

The coping mechanisms adopted by the students were primarily rest (90.78%), followed by listening music (61.65%) and hot fomentation (49.51%). Physician help/medication was sought by only 19% participants. This indicates a preference for non pharmacological interventions. In a similar study conducted by Eshetu N et al., rest (67.6%) and sleeping (60.7%) were found to be the most commonly used coping mechanism and painkiller medicines were used by only 28% participants [20]. The fact that only a small number of students used painkillers suggests a need for better education on effective medical management of PMS symptoms.

The present study highlights the multifaceted nature of PMS, influenced by a combination of academic stress, lifestyle choices, and individual physiological factors, all of which are pertinent to the medical student population.

Limitation(s)

Purposive sampling has been used in the present study which might introduce selection bias. Subjective assessment was done for sleep pattern, bowel habits and bladder habits. Likewise, the study population was restricted to only medical students which reduce the external validity of the study. Further studies should be done to assess prevalence of PMS among different age groups, other professionals and general population.

CONCLUSION(S)

The present study concluded that high prevalence of PMS is a matter of concern amongst young girls. It affects their physical as well as psychological health impacting their daily activities and overall quality of life. Most common physical, behavioural and psychological symptoms found in the present study were abdominal pain/cramps, overthinking/irrational thoughts and mood swings. PMS was found to be significantly associated with socioeconomic status, year of study, BMI, physical activity, sleep pattern, Dysmenorrhoea and regularity of menstrual cycles.

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