

# Associated Factors of Premenstrual Syndrome (PMS) and Premenstrual Dysphoric Disorder (PMDD) in Adolescent and Young Women in North Indian Population

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## ABSTRACT

**Background:** Premenstrual Syndrome occurs during the luteal phase of menstrual Periods. Premenstrual disorder (PMD) is a psyconeuroendocrine disorder with an unknown cause and consists of premenstrual dysphoric disorder (PMDD). The present study aimed to study the factors associated with PMS (Premenstrual syndrome) and PMDD in adolescent and young women.

**Methods:** This cross-sectional questionnaire-based study was carried out between 2019 to 2020. After considering the inclusion and exclusion criteria, adolescent and young women screened for PMS were enrolled. Following the acquisition of informed consent, 197 participants were assessed using the ACOG's PMS guideline. Then, the DSM IV-based premenstrual symptom screening test (PSST) was used to ask specific questions regarding the previous three menstrual cycles.  $p$ -value $<0.05$  was considered significant. The statistical analysis was done by using SPSS Windows software.

**Results:** The Affective symptoms like angry outbursts, Anxiety, and Irritability where  $p$ -value $<0.001$ ,  $<0.001$ , and  $0.003$ , respectively, of the participants were significantly more associated with PMS ( $n=190$  or  $96.5\%$ ) and PMDD ( $n=7$  or  $3.55\%$ ). In the somatic symptoms, Headache and Weight gain were found to have a significant association ( $p$ -value  $0.004$  &  $0.001$  respectively). Height weight and BMI ( $p$ -value  $0.001$ ,  $0.28$ ,  $0.005$  respectively) were also significantly associated with PMS and PMDD.

**Conclusions:** This study concluded that BMI, affective symptoms (Anger outbursts, irritation, and anxiety), and somatic symptoms (headache and weight gain) were significantly associated with and most prevalent in adolescent girls and young women with PMS and PMDD. So, there is a need for weight management and emotional support for women who have premenstrual illnesses, especially those who have PMDD.

**Key-words:** Anxiety, Irritability, Anger, Somatic symptom, Affective symptom

## INTRODUCTION

Premenstrual Syndrome is described by several physical, behavioral and emotional symptoms that occur during the luteal phase of the menstrual cycle and affects 75 to 85% of women's world <sup>[1]</sup>.

These symptoms are cyclical, usually disappearing a few days following menstruation. Premenstrual syndrome can have a significant impact on women of reproductive age's daily activities <sup>[2]</sup>. Breast enlargement and sensitivity, edoema, weight gain, headaches and weariness are some of the physical symptoms. Anxiety, as well as changes in labiality and sleep, are all symptoms of mood swings <sup>[3]</sup>.

Menstrual disorders have gained attention, even though myths and taboos in our society still surround them. PMD are nevertheless; still underdiagnosed. PMD is a psyconeuroendocrine disorder with an unknown cause. PMD was divided PMD and variant PMD by the

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International Society for Premenstrual Disorders (ISPMDD) [4]. The cores PMD consist of PMDD. PMDD is diagnosed when all physical and psychiatric diseases have been ruled out and it is based mostly on the timing and intensity of symptoms. PMD must be distinguished from a minor premenstrual syndrome that does not interfere with everyday activities [5]. The American Psychiatric Association adopted PMDD diagnostic criteria in the Diagnostic and Statistical Manual of Mental Disorders (fourth edition) in 2013. ACOG released differences in ethnicity, socioeconomic and cultural background, diagnostic criteria and study methodology. The prevalence of PMD varies. PMS affects 30-40% of women, while PMDD affects 3-8% of women. Premenstrual symptoms' type, severity and timing are all classified [6]. They could be minor annoyances or symptoms of PMS. They may even include the most severe (PMDD) [7-10], depending on the degree of emotional and somatic dysfunction. Multiple variables in the biological, psychological and socio-cultural domains are most likely involved in PMDD. Quality of interpersonal relationships and cooperation, self-esteem, expectation and perception of premenstrual symptoms, stress, socio-economic factors (marital status, race, occupation and profession), biological factors (length of menses, pregnancies) and lifestyle factors (especially dietary habits, physical activity, stimulants and oral contraceptives) are some of the currently investigated potential risk factors for PMDD [11,12]. The present study aimed to study the factors associated with PMS and PMDD in adolescent and young women.

## MATERIALS AND METHODS

This cross-sectional questionnaire-based study was approved by the institutional Ethical committee of King George's Medical University (KGMU), Lucknow, India. The study was conducted from 2019 to 2020. All adolescent & young women attending QHM at the Department of Obstetrics and Gynaecology, KGMU, Lucknow and various schools and colleges were enrolled after evaluating inclusion and exclusion criteria. After getting informed consent, 358 adolescent and young female participants were enrolled in this study out of which 197 were screened for PMS.

### Inclusion Criteria

- ✓ Adolescent / Guardian informed consent was taken

- ✓ Age 11-24 years with regular menstrual cycle (at least 3 cycles)
- ✓ Able to remember the previous three menstrual cycle

### Exclusion Criteria

- ✓ Pregnant women
- ✓ H/o of any other psychiatric comorbidities
- ✓ any other medical or surgical disorder which requires priority management
- ✓ Who had previously used menstrual-related medication (such as antidepressants, anticonvulsants, herbal remedies, hormones, and vitamins) within the previous three months?
- ✓ If any other stressful life incident present in the last three month
- ✓ Not giving consent for the study

Initially, all participants underwent screening by ACOG recommendations for PMS. Afterwards, the DSM IV-based PSST (Premenstrual Syndrome Screening Tool) was used which involved detailed questions regarding the previous three menstrual cycles. A scale measures the severity of the PMS symptoms questionnaire. Sociodemographic detail is also noted.

**Tools-** Semi-structured proforma sheets were used for all participants' sociodemographic and menstrual history profiles.

### Screening & Diagnosis

**ACOG guidelines for PMS (12)-** Key aspects for identifying PMS include the following according to AICOG:

- Symptom consistency with PMS- the presence of at least one following affective symptom and one somatic symptom occurring during the five days leading up to menstruation.

**Affective symptoms-** Anxiety, depression, confusion, anger outbursts, social withdrawal, irritability.

**Somatic symptoms-** Abdominal bloating, breast tenderness, swelling of extremities and headache,

- Symptoms should be limited to the luteal phase of the menstrual cycle.
- Symptom pattern must be confirmed through prospective assessment

- The symptoms must cause functional impairments.
- Exclusion of any other condition that could explain better the symptom rule out.

**DSM-IV-based PSST Scale for PMDD-** The PSST tool developed by Stener *et al.* [13] was used to diagnose PMS and PMDD. According to Yen *et al.* [14] the reliability of the PSST's first part had a Cronbach's alpha of 0.96, and the second part had 0.61. The content validity was 0.93 for the first part and 0.80 for the second part. This 19-item tool is divided into the following 2 domains:

**First Domain** includes 14 symptoms that must begin before menstruation and resolve within a few days after bleeding starts. These symptoms include anger/irritability, anxiety/tension, tearfulness/increased sensitivity to rejection, depressed mood/ hopelessness, decreased interest in work, home, and social activities, difficulty concentrating, fatigue, overeating, food craving, insomnia, hypersomnia, feeling overwhelmed or out of control and physical symptoms include breast tenderness, headaches, joint/muscle pain, bloating, weight gain.

**Second Domain-** it includes five items assessing the impact of symptoms on a woman's daily life: work efficacy, relationships with coworkers and family, social activities and home responsibilities.

Each item is related on a four-point Likert scale, ranging from "not at all" to "severe", reflecting the severity of symptoms over the past 12 months in most cycles.

For diagnosis of PMS, women participants must report at least five symptoms as moderate or severe from the first domain, whereas at least one should be from core symptoms (numbers 1-4). Additionally, she must report that her symptoms interfere moderately or severely with her ability to function in at least one area in the second domain.

For diagnosis of PMDD, the following criteria must be present: at least one of the core symptoms (from items 1 to 4) must be severe, in addition to at least four other symptoms (from items 1 to 14) rated as moderate to severe from first domain and at least one of the symptoms as severe from the second domain.

**Statistical Analysis-** The data was presented as percentage, range, median, mean and standard deviation (SD). We used the chi-square test to compare

all the categorical data. Two groups' continuous variables were compared using the t-test. One-way ANOVA and Tukey's post-hoc test were used to analyse more than two variables. Independent risk factors were analysed using binary multivariate logistic regression. As significant,  $p < 0.05$  was used. The statistical analysis used the Windows SPSS 21.0 version (Chicago, Inc., USA) program.

**Ethical Consideration-** Initially, before going to start this study, approval was taken by the institutional Ethical committee of King George's Medical University (KGMU), Lucknow, India (Ref. No: 97<sup>th</sup> ECM IIB-Thesis/P24, No. 963/Ethics/19, dated 29.07.2019).

## RESULTS

The distribution of cases with no/mild PMS, moderate to severe PMS, and PMDD are shown in Table 1. A total of 358 participants are enrolled in this study. Out of these 197 were screened for PMS, in which a total of 152 (77.16%) cases had no or mild PMS, 38 (19.29%) had moderate to severe PMS and 7 (3.55%) cases had PMDD. The age of participants is shown in Table 1 in which values are expressed as mean  $\pm$ SD. The mean  $\pm$ SD value of age (yrs.) was  $19.02 \pm 3.14$ ,  $18.79 \pm 3.44$  and  $21.71 \pm 3.69$  years in between No/mild PMS, Moderate to severe PMS and PMDD participants. The difference in mean age was not statistically significant between groups ( $p = 0.082$ ). Comparison of Weight (kg), Height (cm) and BMI ( $\text{kg}/\text{m}^2$ ) between No/mild PMS, Moderate to severe PMS and PMDD participants are also shown in Table 1. The mean Weight (kg), Height (cm) and BMI ( $\text{kg}/\text{m}^2$ ) were significantly different between No/mild PMS, Moderate to severe PMS and PMDD participants.

Comparisons between No/mild PMS, Moderate to severe PMS and PMDD participants regarding demographic and menstrual characteristics are shown in Table 2. The age range 20-24 was significantly higher in PMDD, whereas the age range 16-19 was significantly higher in Moderate to severe PMS ( $p = 0.001$ ). The menarche was maximum found in  $\geq 13$  years in No/mild PMS and Moderate to severe PMS, whereas 11-12 years in the PMDD group. The Menarche significantly differed between No/mild PMS, Moderate to severe PMS and PMDD group ( $p = 0.005$ ). The cycle duration (in days) was maximum found in 21 to 35 days in all groups. Moreover, the cycle duration significantly differed between No/mild PMS,

Moderate to severe PMS and PMDD groups ( $p=0.03$ ). The Family history of PMS was significantly more in PMDD group as compared to No/mild PMS and the Moderate to severe PMS group. Painful menses, Blood Flow, Duration of Period (days), H/O Medical or

Hormonal Therapy, number of days premenstrual symptoms and Years with premenstrual symptoms were comparable in between No/mild PMS, Moderate to severe PMS and PMDD groups.

**Table 1:** Comparison of Age, Weight (kg), Height (cm) and BMI (kg/m<sup>2</sup>) of participants in between No/mild PMS, Moderate to severe PMS and PMDD (n=197)

Parameter	No/mild PMS 77.16% (n=152)		Moderate to severe PMS 19.29% (n=38)		PMDD (3.55%) (n=7)		Raw total (%)		*p-value
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	
Age	19.02	3.14	18.79	3.44	21.71	3.69	19.07	3.24	0.082
Weight (kg)	58.78	7.19	59.76	10.38	71.00	5.72	59.41	8.14	0.001*
Height (cm)	157.7	8.13	154.21	8.50	161.00	4.62	157.15	8.23	0.028*
BMI (kg/m <sup>2</sup> )	23.76	3.34	25.30	4.96	27.41	2.15	24.19	3.76	0.005*

\*=ANOVA

**Table 2:** Comparisons between No/mild PMS, Moderate to severe PMS and PMDD participants regarding demographic and menstrual characteristics

	No/mild PMS (n=152)		Moderate to severe PMS (n=38)		PMDD (n=7)		p-value
	n	%	N	%	N	%	
Age in years							
11-15 years	24	15.79	11	28.95	1	14.29	0.001*
16-19 years	75	49.34	19	50.00	0	0.00	
20-24 years	53	33.55	8	21.05	6	85.71	
Menarche (Years)							
9-10 years	6	3.95	5	13.16	0	0.00	0.005*
11-12 years	49	32.24	3	7.89	4	57.14	
≥13 years	97	63.82	30	78.95	3	42.86	
Cycle duration (in days)							
<21 days	16	10.53	8	21.05	2	28.57	0.03*
21-35 days	133	87.50	30	78.95	4	57.14	
>35	3	1.97	0	0.00	1	14.29	
Duration of Period (days)							
<3	7	4.61	1	2.63	1	14.29	0.44
3-8	144	94.74	37	97.37	6	85.71	
>3	1	0.66	0	0.00	0	0.00	
Blood Flow							
Mild	54	35.53	12	31.58	0	0.00	0.21
Moderate	95	62.5	25	65.79	7	100	
Heavy	3	1.97	1	2.63	0	0.00	
Painful menses							
No	61	40.13	19	50.00	2	28.57	0.42
Yes	91	59.87	19		5	71.43	

Family history of PMS							
No	150	98.68	36	94.74	4	57.14	0.001*
Yes	2	1.31	2	5.26	3	42.85	
H/O Medical or Hormonal Therapy							
No	152	100.00	38	100.00	7	100	-
Yes	0	0.00	0	0.00	0	0.00	
No day's premenstrual symptom	4.43	0.79	4.63	1.15	4.49	1.35	0.82
Years with premenstrual symptoms	1.95	1.08	1.97	1.33	3.00	1.15	0.05

Comparisons of participants according to Symptoms of PMS between No/mild PMS, Moderate to severe PMS and PMDD are shown in Table 3. The frequencies of angry outbursts, anxiety and irritability of affective symptoms were significantly higher in Moderate to severe PMS and PMDD participants as compared to No/mild PMS (all p<0.01). Moreover, headache and

weight gain in Somatic symptoms were also significantly more in Moderate to severe PMS and PMDD participants as compared to No/mild PMS (all p<0.01). Whereas, other affective symptoms and somatic symptoms were comparable in between No/mild PMS, Moderate to severe PMS and PMDD groups.

**Table 3:** Comparisons of participants according to Symptoms of premenstrual syndrome in between No/mild PMS, Moderate to severe PMS and PMDD (n=197).

Symptoms	No/mild PMS (n=152)		Moderate to severe PMS (n=38)		PMDD (n=7)		Chi-square	p-value
	n	%	n	%	N	%		
Affective symptoms								
Angry outbursts	109	71.71	38	100.00	6	85.71	14.30	<0.001*
Anxiety	52	34.21	31	81.58	5	71.43	29.70	<0.001*
Confusion	48	31.58	8	21.05	4	57.14	4.03	0.13
Depression	42	27.63	17	44.74	2	28.57	4.18	0.12
Irritability	89	58.55	11	28.95	5	71.43	11.66	0.003*
Social withdrawal	69	45.39	18	47.37	5	71.43	1.83	0.40
Somatic symptoms								
Abdominal bloating	70	46.05	17	44.74	5	71.43	1.80	0.40
Breast tenderness or swelling	66	43.42	15	39.47	4	57.14	0.77	0.68
Headache	41	26.97	21	55.26	2	28.57	11.14	0.004*
Joint or muscle pain	53	34.87	6	15.79	2	28.57	1.20	0.07
Swelling of extremities	51	33.55	15	39.47	4	57.14	1.95	0.37
Weight gain	151	99.34	16	42.11	3	42.86	95.79	<0.001*

**DISCUSSION**

The key finding of this study, 77.16% had no/mild PMS, 19.29% had moderate to severe PMS and 3.55% had PMDD, showing the total pooled prevalence of 96.4 % of women affected due to PMS might be fluctuations of the menstrual cycle, hormonal disproportion like estrogen

surplus and progesterone deficiency in the North Indian population. Due to the increased pooled prevalence of PMS, the quality of life of women is greatly affected. A study reported by Raval *et al.*<sup>[15]</sup> among college students, the pooled prevalence of PMS was 33.1% (18.4%, Moderate to severe PMS, 14.7%) and PMDD, 3.7%, again

reported that PMS has greatly impacted the women's life. Evidence studies conducted in India showed that the greater pooled prevalence of PMS prompted the development of screening approaches for better diagnosis of PMS and its management. Various countries have reported a wide range of PMS prevalence widely 98% in Iran, 12% in France and 35.6 % in Saudi Arabia [16,17]. Among teenagers in Egypt, the percentage was 65% [18], while among medical students in Turkey, it was 72.1%. A study reported by Choi *et al.* [19], 98.6%, 32.1%, and 2.8%. Prevalence of PMS in 1000 women participants according to International Classification of Disease, ACOG, and DSM-IV criteria. This difference in the prevalence of PMS may be attributed to disparities in genetic, dietary, and lifestyle factors among young adult females. Also, it may be attributable to various community-adopted practices before and during menstruation [20].

The etiology of PMS is governed by multifactorial; Height, Weight and BMI were one of them that was positively correlated with PMS and PMDD; the study showed significant association with all three groups No/mild PMS, Moderate to severe PMS and PMDD participants supported the previous study conducted by Masho *et al.* [21]. Similarly, both moderate to severe PMS and PMDD groups had body mass index (BMI) on the higher side, and the study suggests an association of relatively higher BMI with moderate to severe PMS and PMDD groups than no/mild PMS groups [19]. This agrees with a review article from India, which showed that the risk of PMS in participants with high BMI was 2.43 times higher than that of participants with normal BMI [22,23]. The study has determined a strong relationship between the risk of PMS and higher BMI [24]. However, comparable to the results of the present study, there are also conflicting results showing no relationship between anthropometric measurement and PMS [25]. Obesity is thought to alter neurotransmitter function by affecting oestrogen and progesterone levels. Estrogen improves its function by enhancing the synthesis, transport, reuptake, receptor expression, and postsynaptic responsiveness of serotonin. As a result, adiposity-related reduced estradiol levels could compromise serotonin function and result in PMS [26]. The study findings suggest that maintaining a healthy body mass and meditation may be important for preventing the development of PMS.

Our study finds that the age range 20-24 was substantially greater in PMDD, but the age range 16-19 was significantly higher in moderate to severe PMS. Menarche occurred at a maximum of 13 years in the No/mild PMS and Moderate to Severe PMS groups and 11-12 years in the PMDD group. The menarche was substantially different between the groups with no/mild PMS, moderate to severe PMS, and PMDD. However, evidence from other contradictory studies reported by [27] showed no significant difference between the groups with no/mild PMS, moderate to severe PMS, and PMDD. However, in our study, 16-19 of adolescent girls who visit our adolescent clinical setup are more affected by Moderate to severe PMS. It may be due to dietary factors such as fast-food consumption, drinks containing sugar, and deep-fried foods, and lifestyle factors such as less habitual exercise and poor sleep quality more evident in adolescents. By maintaining a healthy lifestyle, it can be reduced. Moreover, the cycle duration (in days) was maximum found in 21 to 35 days between No/mild PMS, Moderate to severe PMS and PMDD group shows significant association ( $p < 0.03$ ). However, no statistically significant difference in Painful menses, Blood Flow, Duration of Period (days), H/O Medical or Hormonal Therapy family history shows a more significant association with Moderate to severe PMS and PMDD group ( $p < 0.001$ ) as compared to the No/mild PMS.

The study of Nisar *et al.* and Deuster *et al.* reported that more than half of the study participants (57%) had a family history of PMS and PMDD ( $p < 0.001$ ), which is consistent with our study (22,16). Another study conducted by Raval *et al.* [15] reports a significant association of positive family history of PMS in mothers/siblings with both "moderate to severe PMS" and "PDD was also supported.

Further, 55.03% of participants reported having premenstrual symptoms out of which on PSST 77.16% had mild/no PMS. A higher number of cases of PMS/PMDD by PSST can be because even a single positive response from the participant categorizes her into No/mild PMS. In our study, most of the participants presented with angry outbursts as a major affective symptom, followed by irritability, social withdrawal breast tenderness, and abdominal bloating as a major somatic symptom. More than 90% of students reported at least one premenstrual symptom in the study, similar to our results [15,27]. In a study, an adolescent sample



showed that all participants reported at least, one premenstrual symptom of minimal severity [28]. Overall, the frequency of somatic complaints was more than that of the abnormal mood and behavior in the study by Brahmhatt *et al.* which was in contrast to our results which reported out of the 100 participants 68% suffered from backache, 64% leg cramps, 62% fatigue, breast tenderness and anger whereas 58% suffered with anxiety and generalized body ache that is marked Angry outbursts and irritability as the most frequent affective symptom. The commonest affective symptom in adolescent girls and young women with PMS and PMDD in comparison between the three groups was found to be anger outbursts. Irritability and anxiety were significantly found in PMDD, which was significantly more in Moderate to severe PMS and PMDD participants as compared to No/mild PMS. Headache and weight gain in Somatic symptoms were also significantly more in Moderate to severe PMS and PMDD participants as compared to No/mild PMS [29]. Anger/irritability has been reported as the most common symptom by several previous studies [15,12,30]. Fatigue/lack of energy was the third most common symptom reported. At the same time, sadness and abdominal bloating were observed in another study and studies from Saudi Arabia and Turkey [31]. Decreased energy and irritability were the most commonly reported premenstrual symptoms in a community-based non-patient sample of 321 black and 462 white women [32]. A cross-sectional study among Indian college students reported that irritability was the most common symptom reported by subjects not having any impairment. For those with an impairment, the most common symptoms were tiredness and lack of energy [33]. The most common symptoms reported were low mood and physical symptoms in the study by Bakshani *et al.* [27] and Banerjee *et al.* [34], respectively. There is the repositioning of symptoms in diagnostic criteria of PMDD within the revised manual of DSM-5. The order of symptoms is shuffled in the revised manual. Mood swings and irritability are now at the top of the list. "Markedly depressed mood" was at the top of the DSM-IV research criteria for PMDD. Hence, the finding of this study is consistent with this context of change in DSM-5 [35]. It's necessary to build and strengthen reproductive health education programmes. The illness can be properly understood to aid in early diagnosis and

prevention, allowing these adolescents to operate on par with their healthier counterparts.

## CONCLUSIONS

We concluded that Anger outbursts, irritation and anxiety were revealed to be the most prevalent affective symptoms in adolescent girls and young women with PMS and PMDD. While in somatic symptoms, headache and weight gain were similarly significantly more common in persons with Moderate to severe PMS and PMDD compared to No/Mild PMS. BMI is also significantly associated with PMS and PMDD, so it also affects weight management. According to the findings, health and educational authorities should be aware of the issue and offer emotional support to women who have premenstrual illnesses, especially those who have PMDD. For young girls and adolescents to learn how to handle these issues, it is also necessary to build and strengthen reproductive health education programs. The illness can be properly understood to aid in early diagnosis and prevention, allowing these adolescents to operate on par with their healthier counterparts. It is important to develop and put into practice strategies for early detection and treatment of PMS and PMDD in adolescents and young females. The implementation and assessment of relevant health education programs should be the main focus of future study.

## CONTRIBUTION OF AUTHORS

**Research concept:** Dr. Sujata Deo

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