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Original Article

A Study of Prevalence and Psychological Correlates of Premenstrual Syndrome and Premenstrual Dysphoric Disorder

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Abstract

Background: The premenstrual period is a vulnerable phase for prevalence of bodily and psychological signs and symptoms named the premenstrual syndrome (PMS). There is a paucity of Indian work in this area. **Aim:** The aim was to study the prevalence and psychological correlates of PMS and premenstrual dysphoric disorder (PMDD). **Materials and Methods:** This cross-sectional study was carried out in a tertiary care hospital after obtaining the institute ethics committee clearance. Written informed consent was obtained from participants. By purposive sampling, 587 females from urban areas of Pimpri and Alandi were interviewed and subjected to the sociodemographic pro forma and the Premenstrual Symptoms Screening Tool, Menstrual Symptom Questionnaire, Pittsburgh Sleep Quality Index, and Depression Anxiety Stress Scale-21. From this sample, 140 subjects meeting diagnostic criteria of PMS or PMDD were included in the study group. An equal number of age-matched healthy controls with no known psychiatric disorders after clinical interview were included in the control group. All the questionnaires were scored as per the test manuals. Statistical analysis was performed using the SPSS. **Results:** It was observed that 63.57% of the total cases are moderate PMS, 30.71% are severe PMS, and 5.71% are PMDD. Overall, the more common type of dysmenorrhea was the spasmodic type, but among the PMS/PMDD cases, the more common type of dysmenorrhea was the congestive type. There is significantly higher stress, anxiety, and depression and poorer sleep quality in the cases of PMS and PMDD as compared to the controls. Stress, anxiety, and depression have a significant positive correlation with poor sleep quality. **Conclusions:** The prevalence of PMS was 22.49% and that of PMDD was 1.36%. Congestive kind of dysmenorrhea was more frequently seen in cases of PMS. There is significantly higher stress, anxiety, depression, and disturbed sleep in females suffering from PMS and PMDD as compared to the controls.

Keywords: *Anxiety, depression, premenstrual dysphoric disorder, premenstrual syndrome, stress*

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Introduction

The menstrual cycle is a physiological system that all women experience. It is characterized by changes in the bodily levels of ovarian hormones that is estrogen and progesterone. Levels of estrogen and progesterone fluctuate cyclically and have main organic consequences on a woman's body, having both bodily and emotional ramifications.[1] The premenstrual period is a vulnerable phase for prevalence of bodily and psychological signs and symptoms which appear 1 week earlier than menstruation and disappear with the beginning of menstrual bleeding. About 75% of the females at childbearing age face some symptoms related to the premenstrual segment of the cycle. More than one

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hundred bodily and psychological signs are mentioned in the literature.[2] The most regularly encountered physical complains are stomach bloating, fatigue, breast pain, and headache, and emotional instability, irritability, depression, appetite gain, forgetfulness, and concern in concentration constitute the behavioral symptoms. Usually, these signs and symptoms manifest in the course of the remaining 7–10 days of the cycle. Premenstrual syndrome (PMS) not only results in impairment in productiveness at work front, but also it leads to economic penalties attributed to work absenteeism, decline in learning efficiency, and progress of students. A lot of interpersonal disputes can also arise.[3]

A large number of females in childbearing period experience some premenstrual symptoms. However, only 5%–8% of these ladies face premenstrual symptoms to a degree whereby it interferes with the day-to-day functioning. Such women are identified as patients of premenstrual dysphoric disease (PMDD).[4] Presence of a cluster of temperamental symptoms, such as depression, tension, affective lability, sleep disorder, anxiety, irritability and fatigue, with five or more signs existing in the course of the luteal phase of menstrual cycle is hallmark of PMDD. PMDD can solely be diagnosed by means of having ladies demonstrating their signs and symptoms for at least two consecutive symptomatic menstrual cycles prospectively.[4]

Women having PMDD suffer of dysphoric temperament all through the luteal phase, and in addition, they undergo cognitive impairment presenting as reduced concentration, impairment of cognitive functioning, and motor coordination. These do interfere extensively with their productiveness and efficiency.[4] There is now not substantial research work done that could possibly point to the extent to which psychomotor or cognitive impairment factually happens all through the luteal phase in ladies with PMDD. Results of many studies have not been consistent, with some reporting no differences.[4] A lot of females suffering from PMS and PMDD reported sleep-related problems such as difficulty in sleeping, fatigue, and concentration issues. About 70% of females with PMDD record sleep disturbances such as insomnia or hypersomnia. PMDD signs and symptoms interfere with academic and personal space as well. Work-related stress or educational strain largely affects the prevalence of PMDD.[5]

Although no particular age group is spared, the ladies in ages 25–45 years stay the most regularly affected. Typically, the girls think about the want for seeking therapy in their middle or late third decade of life. It is believed that advancing age is directly proportional to amplify in symptoms.[6] About 50% of patients consulting the gynecology outpatient department represent the female suffering from this syndrome. PMS is a psychosocial phenomenon, which is linked biologically, psychologically, or sociologically with the menstrual cycle.[6] Gynecologists and psychiatrists diagnose PMS and PMDD by assessing the exacerbation of signs and symptoms all through the premenstrual period. This includes both bodily and depressive symptoms. However, it is hard to set up the differential diagnosis of PMS and PMDD.[2] There is limited research carried out in India on PMS and PMDD, hence the present study was undertaken.

Materials and Methods

This cross-sectional analytical study was carried out in the department of psychiatry in a tertiary care hospital during April 2018 to March 2019. Institute ethics committee clearance was obtained before starting the study (DPU/R&R (M)/19/(12)/2019 dated January 08, 2019. Written informed consent was obtained from all subjects recruited for the study after explaining the purpose and design of the study.

Sample size calculation

Using the formula, with incidence 10%, the sample size calculated was 138.

As a few dropout cases were expected, the sample size taken was 140.

Formula used in calculating sample size:

$$n = \frac{t2 \times p\,(1 - p)}{m2}$$

$t = 1.96$

$m = 0.05$

$p = 10\%$

Sample selection

By purposive sampling, 587 females from urban areas of Pimpri and Alandi were approached to participate in the study. They were interviewed, and those who met the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) criteria for PMS and PMDD and the inclusion and exclusion criteria given below were included in the study group.[7] An equal number of age-matched healthy controls with no known psychiatric disorders were included in the control group.

Inclusion criteria

1. Females from the urban areas of Pimpri and Alandi who have been diagnosed with PMS or PMDD based on DSM-5
2. Females between ages 18 and 49 years.

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Exclusion criteria

1. Known history of head injury, mental retardation, or any other psychiatric illness
2. Known endocrine disorder, gynecological disorder, or physical illness
3. Females receiving hormonal therapy.

Tools

Sociodemographic and menstrual history pro forma

A specially designed pro forma was used to document background details, sociodemographic profile, past and family history, and the menstrual and obstetric profile.

Premenstrual Symptoms Screening Tool

This scale is a standard form and includes 19 items that describes both physical and emotional symptoms. Each item is rated on a scale of 0 "not at all" to "extreme." This tool separated the PMS and PMDD groups from healthy group well. The sensitivity and specificity coefficients were 0.9 and 0.77, respectively. The Cronbach's alpha was 0.91 and the test reliability was 0.56 for the total tool. The Premenstrual Symptoms Screening Tool (PSST) is a useful tool to detect candidates for PMDD and moderate-to-severe PMS.[8]

Menstrual Symptom Questionnaire

The Menstrual Symptom Questionnaire (MSQ) is a 23-item self-report measure which assesses menstrual pain and symptoms. It is rated as 1 = "never" to 5 = "always." The Cronbach's alpha is 0.79.[9]

The Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI) is an effective instrument used to measure the quality and patterns of sleep in the older adult. It is a 9-item questionnaire which differentiates "poor" from "good" sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the last month. Scoring of the answers is based on a 0–3 scale, whereby 3 reflects the negative extreme, a global sum of 5 or greater indicates a "poor" sleeper. The PSQI has diagnostic sensitivity of 100% and specificity of 93%. The PSQI has Cronbach's alpha of 0.89.[10]

The Depression Anxiety Stress Scale-21

The Depression Anxiety Stress Scale-21 (DASS-21) is a 21-item self-report instrument designed to measure the three related negative emotional states of depression, anxiety, and tension/stress. Responses on each item range from 0 (did not apply to me at all) to 3 (applied to me very much). Cronbach's alpha of the entire scale was 0.89. The DASS-21 is a valid and reliable instrument.[11]

Procedure

By purposive sampling, 587 females from urban areas of Pimpri and Alandi were approached to participate in the study. They were interviewed, and those who met the DSM-5 criteria for PMS and PMDD and the inclusion and exclusion criteria given below were included in the study group. An equal number of age-matched healthy controls with no known psychiatric disorders after clinical interview were included in the control group. All the subjects were evaluated with the sociodemographic and menstrual history pro forma PSST, MSQ, PSQI, and DASS 21. All the scales were scored as per the test booklets.

Statistical analysis

Statistical analysis was performed using the SPSS (IBM, Atlanta, USA). Frequency data were compared using Chi-square test and Fisher's exact test. Continuous data were analyzed using the Student's *t*-test and ordinal data by Mann–Whitney test.

Results

The study sample consisted of 140 females meeting diagnostic criteria of PMS or PMDD. One hundred and forty age-matched healthy female controls with no known psychiatric or physical disorders formed the control group. The demographic and clinical variables of the subjects are shown in Tables 1-3. Based on the interpretation of PSST, 63% of the total cases were moderate PMS, 31% had severe PMS, and 6% had PMDD [Table 4]. The distribution of scores obtained by subjects with PMS and PMDD and controls on MSQ, PSQI, and DASS-21 is shown in Table 5. The comparison of scores obtained by subjects with PMS and PMDD and controls on PSQI and DASS-21 is given in Table 6. A Spearman's correlation was run to determine the relationship between age, age at menarche, duration of menstrual cycles, PSQI score, and DASS scores [Table 7]. There was a strong, positive monotonic correlation between PSQI scores and DASS stress (rs = 0.402, n = 280, $P < 0.001$), DASS anxiety (rs = 0.357, n = 140, $P < 0.001$), and DASS depression (rs = 0.312, n = 280, $P < 0.001$). Results show that stress, anxiety, and depression have a positive correlation with poor sleep quality and also stress, anxiety, and depression, are positively correlated to each other. The correlation is significant at the 0.01 level (two-tailed).

Table 8 shows the multiple linear regression model summary and overall fit statistics. The adjusted R^2 of our model is 0.453 with the R^2 = 0.473, indicating that the linear regression explains 47.3% of the variance in the data. The Durbin-Watson (d = 1.532) is between the two

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Table 1: Age, age at menarche, and duration of menstrual cycles of subjects with premenstrual syndrome, premenstrual dysphoric disease, and matched control subjects

Variables	PMS	PMDD	Subjects with PMS and PMDD	Controls	*t*-test	*P*
Age						
Mean	29.59848	26	29.39	28.81	0.928	0.354 (NS)
SD	5.456084	4.070802	5.439	4.984		
Age at menarche						
Mean	12.81	12.25	12.78	12.81	0.292	0.770 (NS)
SD	0.82	0.70	0.822	0.812		
Duration of cycles						
Mean	31.18	29.12	31.071	30.96	0.193	0.847 (NS)
SD	4.98	4.45	4.96	4.95		

NS: Not significant, SD: Standard deviation, PMS: Premenstrual syndrome, PMDD: Premenstrual dysphoric disease

Table 2: Demographic characteristics of subjects with premenstrual syndrome/premenstrual dysphoric disease and control subjects

Demographic characteristics	PMS	PMDD	Subjects with PMS and PMDD	Controls	*t*-test/χ^2	*P*
Age distribution						
>30	70	6	76	82	Fisher's exact test	−0.242 (NS)
20-39	59	2	61	58		
40-49	3	0	3	0		
Education (%)						
Degree course - 156 (55)	67	7	74	82	2.508	0.473 (NS)
School dropouts - 54 (20)	32	0	32	22		
Secondary school - 27 (10)	13	1	14	13		
High school - 43 (15)	20	0	20	23		
Occupation (%)						
Students - 95 (34)	45	6	51	44	0.782	0.676
Working - 98 (35)	45	2	47	51		
Unemployed - 87 (31)	42	0	42	45		
Marital status (%)						
Unmarried - 121 (43)	54	6	60	61	Fisher's exact test	0.013
Married - 152 (54)	75	2	77	75		
Divorced - 3 (1)	1	0	1	2		
Widow - 4 (2)	2	0	2	2		
Religion (%)						
Hindu - 263 (94)	123	8	131	132	Fisher's exact test	0.0094
Muslim - 10 (4)	7	0	7	3		
Christian - 5 (1)	0	1	1	4		
Sikh - 2 (1)	1	0	1	1		
Socioeconomic status (%)						
Lower - 43 (15)	24	0	24	19	0.686	0.709
Lower middle - 94 (34)	44	2	46	48		
Upper middle - 143 (51)	64	6	70	73		

PMS: Premenstrual syndrome, PMDD: Premenstrual dysphoric disease, NS: Not significant

critical values of $1.5 < d < 2.5$. This indicates that there is no first-order linear auto-correlation in our multiple linear regression data. The multiple linear regression's F-test is highly significant. Thus, we can assume that the model explains a significant amount of the variance in PSST in patients with PMS/PMDD [Table 9]. Table 10 shows the multiple linear regression estimates including the intercept and the significance levels. The statistical significance of each of the independent variables can be seen from t and Sig columns. In the present study, we see that stress, depression, PSQI, age at menarche, and anxiety are significant. We can also see that stress has the highest impact followed by PSQI, depression, anxiety, and age at menarche by comparing the standardized coefficients. The information in Table 10 also allows us to check for multicollinearity in our multiple linear regression model. Tolerance should be >0.1 (or variance inflation factor <10) for all variables, which they are.

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Table 3: Clinical characteristics of subjects with premenstrual syndrome/premenstrual dysphoric disease and controls

Clinical characteristics	PMS	PMDD	Subjects with PMS and PMDD	Controls	χ^2	*P*
Regularity of cycles (%)						
Regular cycles - 244 (87)	115	7	122	122	0	1 (NS)
Irregular cycles - 36 (13)	17	1	18	18		
Menstrual flow (%)						
Heavy - 21 (8)	8	1	9	12	0.560	0.755 (NS)
Scanty - 15 (5)	7	0	7	8		
Average - 244 (87)	117	7	124	120		
Parity (%)						
Parous - 154 (55)	74	2	76	78	0.057	0.810 (NS)
Nulliparous - 126 (45)	58	6	64	62		

PMS: Premenstrual syndrome, PMDD: Premenstrual dysphoric disease, NS: Not significant

Table 4: Distribution of moderate and severe premenstrual syndrome and premenstrual dysphoric disease in the subjects

PSST interpretation	Subjects with PMS and PMDD	Controls
Moderate PMS	89 (63.57% of cases)	0
Severe PMS	43 (30.71% of cases)	0
PMDD	8 (5.71% of cases)	0

PMS: Premenstrual syndrome, PMDD: Premenstrual dysphoric disease

Finally, normality of residuals can be checked with a normal P-P plot [Figure 1]. The plot shows that the points generally follow the normal (diagonal) line with no strong deviations. This indicates that the residuals are normally distributed. To summarize, a multiple regression was run to predict PSST in subjects with PMS/PMDD from age, age at menarche, duration of cycles, PSQI, stress, depression, and anxiety. These variables statistically significantly predicted depression, F (5, 134) = 24.014, $P < 0.000$, $R2 = 0.473$. Of the eight variables, only stress, depression, PSQI, anxiety, and age at menarche added statistically significantly to the prediction ($P < 0.05$).

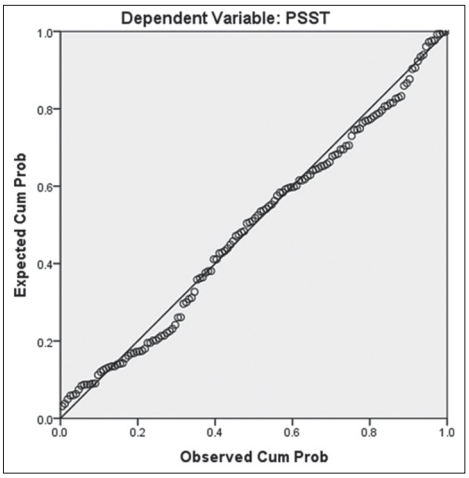


Figure 1: Normal P-P plot of regression standardized residual

Discussion

According to the literature, the prevalence of PMS varies substantially depending on the methodology and evaluation measures used.[12-19] Although figuratively, it can be pictured that the occurrence of the syndrome varies among different ethnic groups and cultures,[20,21] country-specific studies on the prevalence are necessary for proper and accurate assessment of the occurrence of the syndrome.[22] However, a large-scale study carried out on the females of European, East Asian, and South Asian ethnicity found that 99% of the subjects reported experiencing premenstrual symptoms. The same prevalence estimates were found in female university students in Thailand and Iran.[23,24] Prevalence reported in other studies has been slightly lower and has ranged from 80% to 95%.[14,25-28] These variations in prevalence estimates may be explained by differences in symptom assessment, subject population, and subject characteristics such as age.[29] For example, the lowest prevalence of 80% was reported in a German community survey which included adolescent subjects aged 14–24 years.[14] The inclusion of adolescents could explain the lower prevalence, as was shown in a previous study which found that subjects under 20 or over 45 years of age had the lowest symptom prevalence, with prevalence peaking at age 35.[30] Alternatively, a survey of only married Iranian women from health clinics aged 20–45 reported a prevalence of 86%.[28] Two previous studies that included women of similar age as in the present study reported similar prevalence for the various premenstrual symptoms.[23,24]

In the current study, out of 140 subjects included in the case group, 23.85% subjects met the DSM-5 criteria of PMS and 1.36% subjects met the diagnostic criteria of PMDD. Out of the 132 cases of PMS, 89 (63%) were cases of moderate PMS and 43 (31%) had severe PMS. Our findings are in line with the findings of earlier studies.[23,24,31] Despite the use of different diagnostic

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Table 5: Distribution of scores obtained by cases of premenstrual syndrome and premenstrual dysphoric disease and controls on Menstrual Symptom Questionnaire, Pittsburg Sleep Quality Index, and Depression Anxiety Stress Scale

	PMS	PMDD	Subjects with PMS and PMDD	Controls	χ^2	*P*
Menstrual Symptom Questionnaire dysmenorrhea type						
Spasmodic - 212 (76%)	93	4	97	115	6.293	0.012
Congestive - 68 (24%)	39	4	43	25		
PSQI-sleep quality						
Fair (0-4) - 243 (87%)	105	3	108	135	22.702	0.00001
Poor (≥5) - 37 (13%)	27	5	32	5		
DASS S						
Normal (0-10) - 117 (42%)	15	0	15	102	124.602	0.00001
Mild (11-18) - 67 (24%)	40	0	40	27		
Moderate (19-26) - 67 (24%)	54	4	58	9		
Severe (27-34) - 29 (10%)	23	4	27	2		
DASS A						
Normal (0-6) - 128 (46%)	24	0	24	104	101.631	0.00001
Mild (7-9) - 70 (25%)	43	1	44	26		
Moderate (10-14) - 69 (25%)	55	5	60	9		
Severe (15-19) - 13 (4%)	9	3	12	1		
DASS D						
Normal (0-9) - 125 (45%)	29	0	29	96	Fisher's	0.0
Mild (10-12) - 98 (35%)	61	1	62	36	exact test	
Moderate (13-20) - 52 (18%)	40	5	45	7		
Severe (21-27) - 5 (2%)	2	2	4	1		

PMS: Premenstrual syndrome, PMDD: Premenstrual dysphoric disease, DASS: Depression Anxiety Stress Scale, DASS A: DASS anxiety, DASS D: DASS depression, DASS S: DASS stress, PSQI: Pittsburgh Sleep Quality Index

Table 6: Comparison of scores obtained by cases of premenstrual syndrome and premenstrual dysphoric disease and controls on Pittsburgh Sleep Quality Index, Depression Anxiety Stress Scale scores, Depression Anxiety Stress Scale anxiety, and Depression Anxiety Stress Scale anxiety depression

	Mean (SD)				Mann-Whitney *U*-test	Asymptotic significant (two-tailed)
	PMS	PMDD	Subjects with PMS and PMDD	Controls		
PSQI	3.79 (0.94)	4.62 (0.91)	3.84 (0.96)	3.07 (0.76)	5417.500	0.000
DASS S	19.57 (7.29)	26.75 (3.69)	19.98 (7.32)	9.05 (5.17)	2380.500	0.000
DASS A	9.81 (3.60)	13.5 (2.56)	10.02 (3.64)	6.2 (2.13)	3602.500	0.000
DASS D	12.19 (3.78)	16.5 (5.09)	12.44 (3.97)	8.88 (2.77)	4404.000	0.000

PMS: Premenstrual syndrome, PMDD: Premenstrual dysphoric disease, SD: Standard deviation, PSQI: Pittsburgh Sleep Quality Index, DASS: Depression Anxiety Stress Scale, DASS A: DASS anxiety, DASS D: DASS depression, DASS S: DASS stress

instruments, studies show that up to 90% of ladies of reproductive age suffer from a variety of premenstrual symptoms of variable intensities, but the prevalence of PMS varies around 20%–40% and that of PMDD is 3%–8%,[18,19,21,31-33] although one study reported that the prevalence of PMS in female students was high (42.9%) and that the prevalence of severe PMS/PMDD was also high (47.6%) in women with PMS.[34]

Our study could not statistically prove an association of sociodemographic correlates with PMS/PMDD. Few studies have demonstrated a connection between socioeconomic, biological, cultural, and lifestyle factors and PMDD. A study analyzed the predictors of PMS and PMDD among college girls with respect to sociodemographic, menstrual, and lifestyle variables. Mean age of the student >19 years correlated significantly with the prevalence of PMS and PMDD.[35] Many studies have reported increased prevalence in older students,[36,37-41] but few studies had conflicting results.[31,33] This can be explained by increased academic stress and understanding of symptoms in older students. Medical students had statistically significant increased prevalence of PMS and PMDD than the engineering students.[31,33] Several noncomparative studies have reported higher prevalence rate among medical students.[38,39,41-43] This could be either due to the difference in the knowledge of the disease or academic curriculum. On the contrary, Raval *et al*. found the highest prevalence in commerce students than medical and nursing students.[33] Residence either at hostel or house and socioeconomic status are not statistically significant in the prevalence of PMS and PMDD, and this is in agreement with few other

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Table 7: Spearman's correlation to determine the relationship between age, age at menarche, duration of menstrual cycles, Pittsburgh Sleep Quality Index score, and Depression Anxiety Stress Scale 21 scores

Correlations									
Spearman's rho	**Age**	**Menarche**	**Duration**	**PSST**	**MSQ**	**PSQI**	**Stress**	**Anxiety**	**Depression**
Age									
Correlation coefficient	1.000	0.151	−0.027	−0.027	−0.054	−0.102	0.078	0.141	−0.046
Significant (two-tailed)		0.076	0.749	0.749	0.523	0.231	0.357	0.097	0.591
Menarche									
Correlation coefficient	0.151	1.000	0.028	−0.143	−0.076	−0.002	−0.026	0.004	−0.027
Significant (two-tailed)	0.076		0.744	0.093	0.372	0.978	0.764	0.962	0.755
Duration									
Correlation coefficient	−0.027	0.028	1.000	−0.104	−0.034	−0.079	−0.049	−0.038	0.041
Significant (two-tailed)	0.749	0.744		0.220	0.692	0.353	0.562	0.652	0.633
PSST									
Correlation coefficient	−0.027	−0.143	−0.104	1.000	0.058	0.469**	0.574**	0.519**	0.494**
Significant (two-tailed)	0.749	0.093	0.220		0.497	0.000	0.000	0.000	0.000
MSQ									
Correlation coefficient	−0.054	−0.076	−0.034	0.058	1.000	0.142	0.055	0.062	0.098
Significant (two-tailed)	0.523	0.372	0.692	0.497		0.094	0.521	0.466	0.252
PSQI									
Correlation coefficient	−0.102	−0.002	−0.079	0.469**	0.142	1.000	0.402**	0.357**	0.312**
Significant (two-tailed)	0.231	0.978	0.353	0.000	0.094		0.000	0.000	0.000
Stress									
Correlation coefficient	0.078	−0.026	−0.049	0.574**	0.055	0.402**	1.000	0.556**	0.469**
Significant (two-tailed)	0.357	0.764	0.562	0.000	0.521	0.000		0.000	0.000
Anxiety									
Correlation coefficient	0.141	0.004	−0.038	0.519**	0.062	0.357**	0.556**	1.000	0.479**
Significant (two-tailed)	0.097	0.962	0.652	0.000	0.466	0.000	0.000		0.000
Depression									
Correlation coefficient	−0.046	−0.027	0.041	0.494**	0.098	0.312**	0.469**	0.479**	1.000
Significant (two-tailed)	0.591	0.755	0.633	0.000	0.252	0.000	0.000	0.000	

**Correlation is significant at the 0.01 level (two-tailed). PSQI: Pittsburgh Sleep Quality Index, PSST: Premenstrual Symptoms Screening Tool, MSQ: Menstrual Symptom Questionnaire

Table 8: Multiple linear regression analysis: Model summary[f]

Model	*R*	R^2	Adjusted R^2	SE of the estimate	Durbin-Watson
5	0.687e	0.473	0.453	0.44422	1.532

[e]Predictors: (Constant), stress, depression, PSQI, menarche, anxiety, [f]Dependent variable: PSST. SE: Standard error, PSQI: Pittsburgh Sleep Quality Index, PSST: Premenstrual Symptoms Screening Tool

studies.[33,40] In the present study, PMS/PMDD was not associated with the level of education. Few studies reported that women with higher education suffered from PMDD rather frequently.[14,36] One study reported that women with PMDD tended to have lower formal education[13] while another found a negative correlation between education and PMDD hazard (women with higher education have been much less chance to suffer from PMDD).[44]

There was no statistically significant association between the age at menarche, duration of cycles, regularity of menstrual cycles, amount of menstrual blood flow, and obstetric parity of subjects with the cases of PMS and PMDD in our study. This was in agreement with Durairaj *et al*. who did not find an association between age of menarche and days of menstrual bleeding[35] but was contrary to the findings of two studies,[36,45] who found that low parity, menstrual cycle length, and the duration of menstruation were associated with risk of PMDD. A few studies had found an association with early age of menarche.[31,40,41] Contrary to our findings, one study reported that heavy menstrual bleeding had a positive correlation with PMS and PMDD.[35]

Dysmenorrhea had been consistently associated with PMS and PMDD in several studies.[31,36-38,41] Out of the 280 subjects included in our study (cases and controls), 212 (76%) subjects had spasmodic type of dysmenorrhea and 68 (24%) subjects had congestive type of dysmenorrhea. However, out of the 68 subjects having congestive sort of dysmenorrhea, 43 (64%) were affected cases and 25 (36%) were healthy controls. Hence, it was discovered that although spasmodic

Table 9: Multiple linear regression analysis: ANOVA[a]

Model		Sum of squares	df	Mean square	*F*	Significant
5	Regression	23.693	5	4.739	24.014	0.000[f]
	Residual	26.442	134	0.197		
	Total	50.136	139			

[a]Dependent variable: PSST, [f]Predictors: (Constant), stress, depression, PSQI, menarche, anxiety. PSQI: Pittsburgh Sleep Quality Index, PSST: Premenstrual Symptoms Screening Tool

Table 10: Multiple linear regression analysis: Coefficients[a]

Model	Unstandardized coefficients		Standardized coefficients	*t*	Significant	Collinearity statistics	
5	*B*	SE	β			Tolerance	VIF
Constant	1.180	0.619		1.908	0.059		
Stress	0.021	0.006	0.261	3.302	0.001	0.629	1.590
Depression	0.031	0.011	0.206	2.804	0.006	0.729	1.371
PSQI	0.142	0.044	0.228	3.243	0.001	0.798	1.253
Menarche	−0.112	0.046	−0.154	−2.443	0.016	0.990	1.010
Anxiety	0.032	0.013	0.191	2.405	0.018	0.622	1.608

[a]Dependent variable: PSST. PSST: Premenstrual Symptoms Screening Tool, SE: Standard error, VIF: Variance inflation factor, PSQI: Pittsburgh Sleep Quality Index

type of dysmenorrhea was more frequent overall, the congestive type of dysmenorrhea was more frequently seen in cases of PMS and PMDD. These findings are in line with the findings of an earlier study.[46]

Women who have PMDD may complain of insomnia, depression, fatigue, headache, abdominal bloating, breast tenderness, and severe dysmenorrhea. These signs and symptoms occur for the duration of the late luteal part of a woman's menstrual cycle and subside with the onset of menstruation.[47] Diminished levels of progesterone metabolite and greater serum concentrations of progesterone could contribute to the signs and symptoms of PMDD, including temper symptoms and symptoms such as anxiousness, melancholy, and nervousness.[48] Recent research has validated that a female suffers from a range of sleep disturbances for the period of the late luteal phase of the menstrual cycle.[49] Women with PMDD demonstrated a minimization in melatonin secretion as in contrast to non-PMDD women. Sleep disturbance and decreased melatonin secretions due to hormonal fluctuations at some point of the luteal phase of the menstrual cycle ought to grant a rationalization for the sleep complaints of PMDD.[49] Studies have moreover proven altered sleep and wake cycles in females with PMDD. There is a drop in rapid eye movement (REM) sleep and slow-wave sleep or stage N3 sleep in PMDD as in contrast to healthful people at some stage in the luteal phase as in contrast to the follicular phase. It has been observed that altered REM sleep is a hallmark of PMDD sleep disturbances.[50] ShaziaJehan cites that more research is wanted to acknowledge this menstrual-related problem, which could be the most important enabling factor of women's disturbed sleep in the reproductive period.[51] In our study, out of the 280 subjects, 37 subjects (13% of the whole study population) had poor sleep quality, out of which 32 (86%) were patients of PMS and PMDD and 5 (14%) were controls. It was statistically proved that the sleep in cases of PMS and PMDD was markedly disturbed as compared to the controls. These findings are in line with the findings of an earlier study.[5]

Like mood disorders, a recent comparison of the facts proposed by Kim *et al.* shows that anxiety-associated ailments have been frequently encountered in females with PMDD than in controls.[52] Panic disorder co-occurs in 25% of subjects with PMDD, social phobia in about 20%, obsessive-compulsive disorder in 12%, and generalized anxiety disorder ranging from 4% to 38%.[53]

In sufferers of PMDD, there is a 30%–70% and a 14%–16% lifetime chance of major depression and anxiety, respectively. Patients with PMDD need to be screened for complaints such as despair and nervousness. There are few authentic guidelines to propose treatment alternatives in these patients, but the use of SSRIs is regarded first line with more than a few dosing strategies to ensure increased effectiveness.[54]

The comorbidity of PMS with temperamental issues was a matter of quite a few studies.[55] The intention of this research work was to set up whether or not females with PMS have greater likelihood to develop temperamental disorders. However, a comparison between these autonomous studies is very difficult, first off due to the one of a kind methodology used to take a look and confirm PMS and secondly due to the clearly demarcated and well-defined diagnostic classification

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of psychiatric disorders. On the one hand, it used to be mentioned that a female with a lifetime record of major depressive disorder (MDD) is highly probable to exhibit premenstrual temperamental alterations than healthful women, or those who have been through different kinds of psychiatric illness.[55,56] One study observed that girls with premenstrual temperamental changes have higher incidence of MDD than females lacking such a past record.[57] It is documented that the evaluation of premenstrual melancholic features has validity in figuring out individuals at chance for developing future MDD.[58] Moreover, a past psychiatric history of depressive ailments as defined in guidelines of treatment with antidepressant agents was invariably more liable to be frequent in female complaining of PMS.[59]

In our study, out of the 280 subjects, 117 subjects (42% of the whole study population) had normally acceptable stress levels, out of which 102 (87%) have been controls and 15 (13%) were cases. Sixty-seven subjects (24% of the complete study group) had mild stress reactions, out of which 40 (60%) subjects had been cases and 27 (40%) subjects were controls. Sixty-seven subjects (24% of the whole study group) had moderate stress levels, out of which 58 (86%) subjects have been cases and 9 (14%) subjects have been controls. Twenty-nine subjects (10% of the total study group) had severe stress reaction, out of which 27 (93%) subjects had been cases and 2 (7%) subjects have been controls. It was hence statistically proved that there is substantially greater stress in cases of PMS and PMDD as compared to the controls, which goes in hand with the findings of Kim *et al*.[52]

It was similarly encountered that, out of the 280 subjects, 128 subjects (46% of the whole study population) had normally explainable anxiety levels, out of which104 (81%) subjects had been controls and 24 (19%) subjects had been cases. Seventy subjects (25% of the total study population) had mild anxiety outcomes, out of which 44 (63%) subjects had been cases and 26 (37%) subjects had been controls. Sixty-nine subjects (25% of the complete study population) had moderate level of anxiety, out of which 60 (87%) subjects were cases and 9 (13%) subjects were controls. Thirteen subjects (4% of the total study group) had severe anxiety levels, out of which 12 (92%) subjects were cases and 1 (8%) subject was a healthy control. It was statistically established that there is considerably higher anxiety in females suffering from PMS and PMDD as compared to the controls, which is in congruence with the findings of an earlier study.[60]

Furthermore, in our study, out of the 280 subjects, 125 subjects (45% of the whole study population) had normal depressive levels, out of which 96 (77%) subjects were controls and 29 (23%) subjects were cases. Ninety-eight subjects (35% of the total study group) had mild depression levels, out of which 62 (63%) subjects were cases and 36 (37%) subjects were controls. Fifty-two subjects (18% of the complete study sample) had moderate level of depression, out of which 45 (87%) subjects were cases and 7 (13%) subjects were controls. Five subjects (2% of the total study group) had severe depressive reaction, out of which 4 (80%) subjects were cases and 1 (20%) subject was a normal healthy control. It was observed as per statistical analysis that there is markedly prevalent depression in cases of PMS and PMDD as compared to the controls, which is in parallel line with the findings of earlier publications.[55,56]

Limitations

The sample size was modest. This was a hospital-based study and included females from urban area. Therefore, the findings of this study cannot be generalized.

Conclusions

PMS is present in substantial proportion of females in reproductive age group. The prevalence of PMS found in the study was 22.48% and that of PMDD was 1.36%. Sixty-three percent of the total index cases had moderate PMS, 31% had severe PMS, and 6% had PMDD. Overall, the spasmodic type of dysmenorrhea was more common, but the congestive type of dysmenorrhea was more frequently encountered in patients of PMS and PMDD. PMS and PMDD are associated with poor sleep quality. Psychiatric comorbidities such as depression, anxiety, and stress are commonly found in patients of PMS and PMDD. Depression, anxiety, and stress have a positive correlation with poor sleep quality. Timely screening of patients for depression, anxiety, and stress and prompt referral to mental health professional will improve the outcomes of the condition.

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Conflicts of interest

There are no conflicts of interest.

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