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ORIGINAL ARTICLE

Premenstrual Dysphoric Disorder: A Cross-Sectional Study on Prevalence, Awareness, and Haematological Correlates Among Medical Students

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ABSTRACT

Background: Premenstrual Dysphoric Disorder (PMDD) is a severe mood disorder associated with significant emotional and physical distress during the luteal phase of the menstrual cycle. Despite its clinical relevance, it remains underdiagnosed, particularly among female medical students exposed to high academic stress.

Objective: To assess the prevalence, awareness, and haematological correlates of PMDD among female undergraduate medical students in Pakistan.

Methods: A cross-sectional study was conducted from June 2022 to June 2023 across three medical colleges: Shahida Islam Medical College, Lodhran; Islam Medical College, Sialkot; and Al-Aleem Medical College, Lahore. A total of 100 female students aged 18–26 years were evaluated using DSM-5-based PMDD diagnostic questionnaires and a structured awareness survey. Haematological parameters including hemoglobin, MCV, WBC count, platelet count, and ESR were analyzed. Data were interpreted using SPSS v26, with $p<0.05$ considered significant.

Results: PMDD was diagnosed in 27% of participants. Only 38% had adequate awareness of the disorder, and just 25.9% of those diagnosed with PMDD recognized the condition. Irregular sleep patterns ($p<0.001$) and a positive family history of mood disorders ($p=0.002$) were significantly associated with PMDD. Hemoglobin levels were significantly lower (11.3 ± 0.9 g/dL vs. 12.6 ± 0.8 g/dL, $p<0.001$), and ESR values significantly higher (25.2 ± 4.8 mm/hr vs. 16.5 ± 4.2 mm/hr, $p<0.001$) in the PMDD group.

Conclusion: PMDD is a common but under-recognized condition among female medical students. Significant associations with anemia, inflammation, and psychosocial stressors highlight the need for increased awareness, mental health screening, and preventive care within academic institutions.

Keywords: PMDD, Premenstrual Dysphoric Disorder, medical students, prevalence, awareness, hemoglobin, ESR, DSM-5, Pakistan

INTRODUCTION

Premenstrual Dysphoric Disorder (PMDD) is a clinically significant yet underrecognized menstrual-related mood disorder that affects the psychological, physiological, and social well-being of menstruating individuals, particularly in the reproductive age group[1]. It is classified in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) as a distinct psychiatric condition characterized by severe mood disturbances, irritability, anxiety, and somatic complaints that recur during the luteal phase of the menstrual cycle and resolve shortly after menstruation begins. Unlike premenstrual syndrome (PMS), which involves relatively mild and non-disruptive physical or emotional symptoms, PMDD is defined by its cyclic nature, its substantial interference with daily functioning, and the predominance of affective symptoms such as mood swings, anger or increased interpersonal conflicts, marked depression, feelings of hopelessness, and cognitive difficulties. This level of severity often leads to impaired academic, occupational, and interpersonal performance and places a considerable psychological and physical burden on affected individuals[2].

Globally, the prevalence of PMDD ranges from 3% to 8% when strict DSM-5 diagnostic criteria are applied. However, studies using broader symptom-based questionnaires have reported a much higher prevalence, particularly in younger populations and students exposed to higher psychosocial stress levels[3]. In South Asian contexts, including Pakistan, prevalence rates of moderate-to-severe premenstrual symptoms have been reported to exceed 20%, with PMDD affecting approximately 10%–15% of university-going women depending on diagnostic methodology. Among medical students, the burden of PMDD may be disproportionately high due to chronic academic stress, disrupted circadian rhythms, clinical rotations, performance-related anxiety, and limited mental health resources. These students often overlook their symptoms, normalize their distress, or misattribute their psychological fluctuations to academic pressure rather than recognizing them as manifestations of a cyclical, hormone-driven psychiatric condition[4].

Despite the known negative impact of PMDD on mental health and productivity, awareness about its existence and clinical implications remains critically low, even among medical professionals and students. A lack of formal education on women's mental health, menstrual cycle-related disorders, and reproductive psychiatry in undergraduate medical curricula contributes to this gap[5]. Most female students remain unaware of PMDD as a diagnosable entity, and male students are seldom sensitized to the disorder's implications. The resulting diagnostic delay, social stigma, and internalized minimization of symptoms can further aggravate the condition and predispose affected individuals to long-term psychiatric morbidity such as major depressive disorder or generalized anxiety disorder[6].

In addition to its psychological manifestations, a growing body of evidence suggests that PMDD may be associated with specific biological and haematological abnormalities. Studies have identified links between mood disorders and haematological derangements such as iron-deficiency anemia, low hemoglobin levels, and raised erythrocyte sedimentation rate (ESR) markers suggestive of systemic inflammation and subclinical nutrient deficiencies[7]. The pathophysiological mechanisms linking these biomarkers to PMDD may involve altered serotonergic activity, hypothalamic-pituitary-adrenal (HPA) axis dysregulation, oxidative stress, and inflammatory cytokine release[8]. These mechanisms may intensify luteal phase mood disturbances and contribute to the

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disabling symptomatology experienced by PMDD patients. Furthermore, anemia common in reproductive-age females in South Asia can exacerbate fatigue, cognitive dysfunction, and emotional lability, thereby amplifying the severity of PMDD symptoms. However, limited research has been conducted on the haematological profile of medical students experiencing PMDD, and data from Pakistan remains scarce[9].

This knowledge deficit underscores the urgent need for comprehensive studies that not only assess the prevalence of PMDD but also evaluate the level of awareness in medical students and explore any significant haematological associations. Identifying such correlates could offer valuable insight into early screening, preventive strategies, and targeted treatment approaches. Moreover, given the potential impact of PMDD on academic performance, emotional health, clinical decision-making, and patient care, this topic holds particular relevance for medical colleges, healthcare institutions, and policy-makers striving to improve female student wellness and capacity-building in gender-sensitive mental healthcare[10].

Therefore, the current study aims to (i) determine the prevalence of PMDD among female undergraduate medical students enrolled at two major institutions in Pakistan, (ii) assess their level of awareness regarding the disorder using a structured knowledge assessment tool, and (iii) evaluate possible haematological parameters associated with PMDD, including hemoglobin concentration, mean corpuscular volume (MCV), erythrocyte sedimentation rate (ESR), and white blood cell (WBC) count. This integrative, multidimensional approach is expected to generate meaningful data that can inform educational, diagnostic, and public health strategies aimed at addressing PMDD as both a clinical and social issue within academic and healthcare environments[11].

MATERIALS AND METHODS

Study Design and Duration: This study was designed as a descriptive, cross-sectional, multi-centered investigation aimed at assessing the prevalence, awareness, and haematological correlates of Premenstrual Dysphoric Disorder (PMDD) among female undergraduate medical students. The study was conducted over a one-year period, from June 2022 to June 2023.

Study Settings: Data collection was carried out simultaneously at three reputable medical institutions in Pakistan: Shahida Islam Medical College, Lodhran; Islam Medical College, located on Pasrur Road, Sialkot; and Al-Aleem Medical College, Lahore. These institutions were selected to ensure regional diversity, representativeness of both urban and semi-urban student populations, and comparability in curriculum and academic stress exposure among MBBS students.

Study Population and Sample Size: The target population comprised currently enrolled female MBBS students from first to final professional years. A total of 100 female students were selected through non-probability purposive sampling from all three colleges, with roughly equal representation from each site to maintain institutional balance. Participation was voluntary, and all eligible students were briefed about the study's objectives, confidentiality protocols, and the right to withdraw without consequence.

Inclusion and Exclusion Criteria: Inclusion criteria involved unmarried female MBBS students aged between 18 and 26 years, with a history of regular menstrual cycles (21–35 days) for the past six months, and willingness to complete the questionnaires and provide blood samples. Students were excluded if they had a history of diagnosed psychiatric illness, were currently on antidepressant or hormonal therapy, had been diagnosed with endocrinological disorders (such as polycystic ovarian syndrome, thyroid dysfunction), were pregnant or lactating, or declined to participate in any part of the study protocol.

Data Collection Tools and Diagnostic Criteria: Participants were screened for PMDD using a structured, self-administered questionnaire based on the diagnostic criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). The tool included 11 core symptom items, and a diagnosis of PMDD required the presence of at least five symptoms, including at least one mood-related symptom, occurring during the luteal phase and resolving with menstruation. For reliability, participants were also required to retrospectively confirm symptom cyclicity for at least two consecutive menstrual cycles.

Awareness was assessed using a separate pre-validated 10-item questionnaire developed by the research team to measure basic knowledge about PMDD, its diagnostic criteria, clinical implications, and treatment options. Each correct answer carried one point, with scores ≥7 classified as adequate awareness, and scores <7 classified as inadequate awareness.

Haematological Evaluation: After obtaining informed consent, 5 mL of venous blood was collected from each participant using aseptic techniques during the early follicular phase (days 3–6 of the menstrual cycle) to minimize hormonal variation. Blood samples were processed at the diagnostic laboratories of each respective college using automated hematology analyzers, and the following haematological parameters were evaluated:

- Hemoglobin (Hb) concentration (g/dL)
- Mean corpuscular volume (MCV, fL)
- White blood cell count (WBC $\times 10^3/\mu L$)
- Platelet count ($\times 10^3/\mu L$)
- Erythrocyte sedimentation rate (ESR, mm/hr)

Quality control protocols were maintained for all laboratory assessments, including calibration of equipment and use of internal controls. Results were recorded and matched with the participant's PMDD and awareness status.

Ethical Considerations: Ethical approval was obtained from the institutional review boards (IRBs) of all three participating colleges. Participants were informed about the study through information sheets, and written informed consent was acquired prior to enrollment. All data were anonymized and stored securely to protect participant confidentiality.

Data Analysis: The collected data were entered and analyzed using IBM SPSS Statistics version 26. Quantitative variables such as age, hemoglobin, MCV, WBC count, platelet count, and ESR were expressed as means ± standard deviation (SD), while categorical variables such as PMDD status and awareness level were presented as frequencies and percentages. Independent samples t-test was used to compare mean values between PMDD and non-PMDD groups, while chi-square tests assessed associations between categorical variables. A p-value less than 0.05 was considered statistically significant.

RESULTS

This section comprehensively presents the analytical findings of the cross-sectional study conducted among 100 female medical students from Shahida Islam Medical College, Lodhran; Islam Medical College, Sialkot; and Al-Aleem Medical College, Lahore. The aim was to determine the prevalence of PMDD, evaluate awareness levels, and explore any potential haematological correlates. The results are presented with appropriate statistical evidence and supported by well-structured tables, each of which is cited and interpreted thoroughly.

Prevalence of PMDD: Out of 100 participants, 27 female students met the DSM-5 diagnostic criteria for Premenstrual Dysphoric Disorder (PMDD), resulting in a prevalence of 27%. These individuals reported five or more significant affective and somatic symptoms during the luteal phase of the menstrual cycle, including at least one mood-related symptom such as irritability, mood swings, anxiety, or hopelessness. This finding aligns with global literature where PMDD prevalence ranges between 3–8% under strict diagnostic application but may rise to 20–30% when broader self-reported symptoms or high-stress academic settings are considered. In this study, the high prevalence may be attributed to the psychological burden of medical education, irregular sleep

patterns, high cortisol states, and limited coping mechanisms among female students.

Awareness of PMDD Among Participants: Assessment of awareness revealed that only 38% (n=38) of the students demonstrated an adequate understanding of PMDD, defined as scoring 7 or more on a structured 10-item awareness questionnaire. A significant portion 62% (n=62) had inadequate knowledge, failing to identify PMDD as a clinically distinct psychiatric disorder. Alarmingly, of the 27 students diagnosed with PMDD, only 7 (25.9%) had any awareness of the condition. This demonstrates a stark disconnection between symptom burden and knowledge, underscoring a major educational deficiency even among future healthcare professionals. Table 1 below presents the distribution of awareness levels in relation to PMDD status.As seen in Table 1, a significant majority of students with PMDD lacked awareness of the disorder. This highlights the need to integrate reproductive mental health education into the undergraduate curriculum, especially considering that medical students often act as primary informants and future clinicians in public health settings.

Table 1: Awareness Level Among Students With and Without PMDD

Awareness Level	PMDD (n = 27)	Non-PMDD (n = 73)	Total (n = 100)
Adequate (≥7/10 Score)	7 (25.9%)	31 (42.5%)	38 (38.0%)
Inadequate (<7/10 Score)	20 (74.1%)	42 (57.5%)	62 (62.0%)

Demographic and Lifestyle Characteristics: The mean age of participants was 21.2 ± 1.6 years, and the average body mass index (BMI) was 23.7 ± 3.1 kg/m². There was no statistically significant difference in age or BMI between PMDD and non-PMDD groups ($p = 0.564$ and $p = 0.436$ respectively). However, two variables showed strong associations with PMDD status: family history of mood disorders and irregular sleep patterns. Table 2 details the demographic and lifestyle differences between the two groups. Table 2 reveals that 40.7% of PMDD students reported a family history of mood disorders, compared to only 12.3% of non-PMDD students. Similarly, irregular sleep patterns were significantly more common in the PMDD group (59.3%) compared to the non-PMDD group (24.6%). Both findings were statistically significant and support the psychosocial model of PMDD, which suggests a complex interaction of genetic predisposition and environmental triggers like sleep deprivation, stress, and hormonal changes.

Table 2: Demographic and Lifestyle Characteristics by PMDD Status

Variable	PMDD (n = 27)	Non-PMDD (n = 73)	p-value
Mean Age (years)	21.3 ± 1.7	21.1 ± 1.6	0.564
BMI (kg/m²)	23.4 ± 2.9	23.8 ± 3.2	0.436
Family History of Mood Disorders (%)	11 (40.7%)	9 (12.3%)	0.002*
Irregular Sleep Pattern (%)	16 (59.3%)	18 (24.6%)	<0.001*
Physical Activity ≥ 3 times/week (%)	6 (22.2%)	25 (34.2%)	0.221

Haematological Profile and PMDD: Biochemical profiling revealed notable differences in blood parameters between the PMDD and non-PMDD groups. Students with PMDD had significantly lower hemoglobin concentrations and elevated ESR values, which may reflect underlying iron deficiency and subclinical inflammation both hypothesized to exacerbate mood symptoms and fatigue. While WBC and platelet counts remained within physiological limits, a trend of elevated values in the PMDD group was observed. Table 3 provides a detailed comparison of the haematological parameters. From Table 3, it is evident that the mean hemoglobin level was significantly lower in the PMDD group (11.3 g/dL) than in the non-PMDD group (12.6 g/dL, $p < 0.001$). This finding aligns with existing literature suggesting that anemia, especially iron-deficiency anemia, may intensify lethargy, brain fog, and irritability during the luteal phase. The mean ESR was also markedly elevated in PMDD participants (25.2 mm/hr) versus their counterparts (16.5 mm/hr, $p < 0.001$), indicating a possible inflammatory component contributing to PMDD pathophysiology. Although WBC and platelet counts did not differ significantly, the higher average values in the PMDD group warrant further investigation in future studies with larger samples.

Table 3: Haematological Parameters in PMDD and Non-PMDD Groups

Parameter	PMDD (n = 27)	Non-PMDD (n = 73)	p-value
Hemoglobin (g/dL)	11.3 ± 0.9	12.6 ± 0.8	<0.001*
Mean Corpuscular Volume (fL)	84.7 ± 3.6	86.3 ± 3.9	0.042*
White Blood Cell Count (×10³/μL)	7.5 ± 1.3	7.1 ± 1.4	0.173
Platelet Count (×10³/μL)	288 ± 36	276 ± 39	0.106
Erythrocyte Sedimentation Rate	25.2 ± 4.8	16.5 ± 4.2	<0.001*

The study conclusively demonstrates that PMDD affects a significant proportion 27% of female medical students in Pakistan. This high prevalence is particularly concerning given that 74.1% of the diagnosed students had no prior awareness of PMDD, despite their medical training. The awareness deficit was widespread, affecting 62% of all participants, thus reflecting a systemic educational gap in reproductive psychiatry and women's mental health.

In addition, the study establishes a statistically significant association between PMDD and two haematological markers: low hemoglobin and elevated ESR. These parameters suggest that iron-deficiency anemia and chronic low-grade inflammation may be relevant contributors or comorbidities in PMDD. Psychosocial correlates such as family history of mood disorders and irregular sleep patterns further compound the disorder's burden.

These findings highlight the urgent need for implementing structured awareness programs, menstrual mental health screenings, and nutritional interventions (particularly iron supplementation and anti-inflammatory dietary practices) for at-risk students. Early detection and multidisciplinary management could prevent academic disruption, enhance coping, and improve overall quality of life for young female medical students.

DISCUSSION

This cross-sectional study conducted across three major medical colleges in Pakistan Shahida Islam Medical College, Lodhran; Islam Medical College, Sialkot; and Al-Aleem Medical College, Lahore provides compelling evidence regarding the prevalence, awareness, and haematological correlates of Premenstrual Dysphoric Disorder (PMDD) among female medical students[12]. The observed prevalence of 27% is notably higher than the globally accepted estimate of 3–8% for clinically diagnosed PMDD based on DSM-5 criteria. However, this aligns with findings from high-stress academic populations where self-reported PMDD symptoms can range between 20–30%. The elevated prevalence in this study is likely reflective of the demanding nature of medical education in Pakistan, where prolonged academic stress, sleep deprivation, and limited psychosocial support exacerbate hormonal and emotional vulnerability during the luteal phase of the menstrual cycle[13].

A significant highlight of this study is the striking awareness gap even among those diagnosed with PMDD. Only 25.9% of students with PMDD had adequate awareness of the disorder, and overall, 62% of the entire study population lacked sufficient knowledge of PMDD. This finding is critical, especially in a population of medical students who are expected to possess a sound understanding of common psychiatric and reproductive disorders[14]. The lack of exposure to menstrual mental health education, social stigma surrounding menstruation, and inadequate integration of reproductive psychiatry into undergraduate medical curricula may contribute to this widespread knowledge deficit. Without adequate awareness, students are

unlikely to seek help, potentially allowing PMDD symptoms to persist or worsen, leading to functional impairments such as poor academic performance, social withdrawal, and long-term psychological distress[15].

In terms of demographic and lifestyle correlates, this study revealed a strong association between PMDD and both irregular sleep patterns ($p < 0.001$) and family history of mood disorders ($p = 0.002$). These findings are consistent with existing literature suggesting that disrupted circadian rhythms and genetic predisposition play a significant role in PMDD pathogenesis. Sleep disturbances can modulate cortisol levels, impair serotoninergic function, and dysregulate the hypothalamic-pituitary-gonadal axis all of which contribute to mood fluctuations in PMDD[16, 17].

The haematological analysis in this study revealed two significant physiological differences: lower hemoglobin levels and elevated ESR in students diagnosed with PMDD. The mean hemoglobin in the PMDD group was 11.3 g/dL compared to 12.6 g/dL in non-PMDD students ($p < 0.001$), indicating a trend toward iron-deficiency anemia[18]. Anemia is a known exacerbating factor for fatigue, poor concentration, and emotional instability, all of which are cardinal features of PMDD. This supports prior findings suggesting that iron plays a critical role in brain neurotransmitter metabolism, especially serotonin and dopamine, which are implicated in mood disorders[19].

More importantly, the erythrocyte sedimentation rate (ESR) was significantly higher in PMDD students (mean 25.2 mm/hr) than in non-PMDD counterparts (16.5 mm/hr), with $p < 0.001$. Elevated ESR suggests a state of low-grade systemic inflammation, a hypothesis that is increasingly being explored in relation to PMDD[20]. Emerging studies have proposed that inflammatory cytokines like IL-6 and TNF-α may interact with ovarian hormones to produce mood-related symptoms in susceptible individuals. Although this study did not analyze specific inflammatory cytokines, the elevated ESR may serve as a simple, accessible surrogate marker for underlying inflammation in PMDD patients[21].

Taken together, these findings underscore the multifactorial etiology of PMDD, involving psychological, genetic, lifestyle, and biological factors. The significant associations between PMDD and both psychosocial stressors (like sleep disturbance and family history) as well as biological markers (like anemia and inflammation) highlight the need for a biopsychosocial approach to diagnosis and management. Moreover, the results reinforce the importance of routine mental health screening and nutritional assessments in high-risk populations such as female medical students[22].

CONCLUSION

Premenstrual Dysphoric Disorder (PMDD) is highly prevalent yet poorly recognized among female medical students in Pakistan. This study found significant associations between PMDD and low awareness, irregular sleep patterns, family history of mood disorders, anemia, and elevated inflammatory markers. These findings emphasize the urgent need for increased education, routine screening, and integrated mental health support within medical colleges to improve early recognition and management of PMDD.

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Conflict of Interest: The authors declare that there is no conflict of interest regarding the publication of this article.

Data Availability: The data generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Authors' Contributions: MTHK and NA contributed to study design and supervision. UA and MMUH coordinated data collection and participant recruitment. MS and AR oversaw the laboratory analyses and interpretation of haematological data. All authors participated in manuscript drafting, critically revised the content for intellectual input, and approved the final version for publication.

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