•Original research article•

Sleep quality in university students with Premenstrual Dysphoric Disorder

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Background: Up to 8% of women in their reproductive years are affected by Premenstrual Dysphoric Disorder (PMDD). Sleep disturbances such as insomnia or hypersomnia are one of the DSM-IV-TR's defining criteria for the diagnosis of PMDD and are found in about 70% of women with the disorder. However, studies are lacking that specifically address the effects of PMDD on quality of sleep.

Aim: This study was designed to evaluate the prevalence of Premenstrual Dysphoric Disorder (PMDD) and its impact on sleep quality in female university students.

Methods: We developed an 18-item PMDD scale based on *The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR) to diagnose PMDD in female university students who ranged in age from 18 to 30 years and had regular menstrual cycles. Participants were categorized into a PMDD group or a No/PMDD group and sleep quality was compared between the two groups. The evaluation tool used to measure sleep quality was the Pittsburgh Sleep Quality Index (PSQI).

Results: The prevalence of PMDD in female university students was 25.5%. Analysis of the PSQI demonstrated that 80.5% of those in PMDD group had a PSQI that scored >5; however, only 56.4% in the No/PMDD group had a PSQI that scored >5 ($\chi^2=12.459$, $p<0.001$). The mean PSQI score was 8.2(3.4) in the PMDD group and was 6.5(3.1) in the No/PMDD group ($t=3.648$, $p<0.001$).

Conclusions: Female university students who experience PMDD are deeply affected by sleep problems. Lower sleep quality, daytime dysfunction, and sleep disturbance are common sleep problems among female university students with PMDD.

Keywords: Premenstrual Dysphoric Disorder; Sleep quality; Pittsburgh Sleep Quality Index; female university students

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1. Introduction:

About 50-80% of women during their reproductive years experience premenstrual symptoms that vary from mild to severe.^[1] Premenstrual Syndrome (PMS) affects 20-40% of women, and its more severe form, Premenstrual Dysphoric Disorder (PMDD), affects 3-8% of women.^[2,3] PMDD is classified under "depressive disorder not otherwise specified" in the *The Diagnostic and Statistical Manual of Mental Disorders, Fourth*

Edition, Text Revision (DSM-IV-TR).^[4] PMDD symptoms such as depressed mood, anxiety, irritability, fatigue, and sleep disruption occur exclusively during the luteal phase of the menstrual cycle, remit after the onset of menses, and disappear throughout the follicular phase.^[5] PMDD is associated with significant functional impairment and impact on quality of life, but the etiologies remain poorly understood.^[6,7] Studies indicate that women with PMS or PMDD report sleep-related

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complaints such as difficulty sleeping, fatigue, and poor concentration.^[8] Furthermore, sleep disturbances such as insomnia or hypersomnia are one of the DSM-IV-TR's defining criteria for the diagnosis of PMDD,^[4, 6] and they are present in about 70% of women with PMDD.^[9]

A study by Parry and colleagues did not show any difference regarding sleep EEG variables between controls and patients with PMDD,^[10] but other studies showed significantly increased rapid eye movement (REM) sleep onset latency,^[6] significantly increased stage-two sleep, or significantly reduced REM sleep^[11] in women with PMDD when compared to healthy controls, regardless of the menstrual phase.

Some studies have shown that work-related stress may increase PMS or PMDD.^[12, 13] Work pressure, low autonomy at work, and little variety in work conditions have been shown to be significantly higher among women with PMS when compared to those without the symptoms.^[14, 15] PMDD symptoms can also interfere with school and home life. Stress due to long hours of study and work-related pressure may affect the prevalence rate of PMDD as well as sleep disturbance in adolescent girls. However there is a lack of studies on the assessment of PMDD and its impact on sleep quality among female university students, so this study was designed to evaluate the prevalence of PMDD as well as statements regarding sleep quality within this cohort.

2. Material and methods

2.1 Participants

As shown in Figure 1, this cross-sectional study was conducted from May 2013 to August 2014 at the Kermanshah Azad University, Kermanshah, Iran. Of the 2409 students at Kermanshah Azad University, 1486 were female.

Approximately 20% of the female students were recruited by random sampling. Inclusion criteria was as follows: (a) age range of 18-30 years; (b) regular menstrual cycles (3-7 days of menstruation between intervals of 21-35 days); (c) no use of medication such as hormonal contraceptives or antipsychotics; (d) no major medical problems; (e) no recent experience of catastrophe before or during the study. Subjects who had a psychiatric illness or any other underlying disease (e.g. diabetes, cardiovascular) were excluded from the study. All participants provided written informed consent and completed a questionnaire.

2.2 Procedure

2.2.1 Demographics

Demographic information such as age, marital status and history of disease was obtained. We also asked information about the respondents' menstruation

Figure 1. Flowchart of the study

regarding the regularity of menstrual cycles, physical symptoms during menstruation, knowledge of PMS, and actions taken to attenuate its symptoms.

2.2.2 PMDD scale

In order to confirm the diagnosis of PMDD, we used the Premenstrual Symptoms Screening Tool (PSST).^[16] This scale is a standard form and includes 19 items that describe both physical and emotional symptoms. Each item is rated on a scale of 0 “not at all” to 3 “extreme”. These items represent the PMS and PMDD criteria as described in the DSM-IV-TR.^[4] Participants were first asked whether or not they had any symptoms listed in the questionnaire that began to appear one or two weeks prior to the start of menstruation and disappeared 3-4 days after menstruation in most menstrual cycles during the past year.

A participant was given the diagnosis of PMDD if she answered “severe” for at least one of the following items in the core symptoms: depressed mood, moodiness, anxiety and edginess, and anger or irritability; answered “moderate” or “severe” for at least four items in other symptoms: fatigue, insomnia/hypersomnia, difficulty concentrating, appetite change/cravings, decreased interest in usual activities, feeling overwhelmed/out of control, physical symptoms (headache, breast tenderness and/or swelling, bloating and joint/muscle pain, etc.); and also answered “severe” for at least one of the items regarding interference with work, school, usual activities and relationships. The Iranian version of the PSST was validated with Cronbach’s alpha coefficient, 0.93.^[17]

2.2.3 Sleep assessment

The evaluation tool used to assess sleep quality was the Pittsburgh Sleep Quality Index (PSQI).^[18] The tool measures subjective sleep quality in the preceding

one-month period and is comprised of 19 self-rated questions. The items are grouped into seven component scores: sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The PSQI score (range, 0-21) is calculated by summing the component scores, whereby a higher score indicates a worse sleep condition. A global PSQI score of five has been suggested to distinguish poor quality of sleep (PSQI>5) from good quality of sleep (PSQI<5). The Iranian version of PSQI has diagnostic sensitivity of 100% and specificity of 93%. Overall the Cronbach’s alpha coefficient was 0.89.^[19]

2.2.4 Statistical analysis

Statistical analysis was conducted using SPSS version 19.0 with a significance threshold of $p < 0.05$. The Student t-test or Mann-Whitney U test, and χ^2 test were used to compare the variables between the groups.

3. Results

From a total of 298 female student participants, 262 completed the questionnaires. Thirty-six were dropped from the analysis because of incomplete data. After the assessment of the questionnaire by psychiatrists who were blinded from the study, 67 students were diagnosed with PMDD and 195 were recognized as healthy controls, as shown in Figure 1. So, we analyzed the data according to the presence or absence of PMDD symptoms. Demographic characteristics are shown in Table 1.

More students with PMDD reported ‘anxiety or tension’ (79.1%), ‘anger or irritability’ (74.6%), ‘decreased interest in usual activity’ (80.5%), and ‘fatigue or lack of energy’ (92.5%). Premenstrual symptoms impaired ‘work or school or social life activities’ (92.5%). The rates of prevalence of each premenstrual symptom are shown in Figure 2.

Table 1. Comparison of demographic variables between two groups of female university students with and without Premenstrual Dysphoric Disorder

characteristic	with PMDD (n=67)	without PMDD (n=197)	statistical value	p-value
age (years)	23.4 (4.1)	23.7 (4.7)	t=0.449	0.654
BMI (kg/m ²)	20.8 (2.3)	21.3 (3.9)	t=1.072	0.213
menstrual cycle (days)	6.0 (1.6)	6.0 (1.5)	t=0.287	0.956
age at menarche (years)	13.4 (1.1)	13.7 (1.2)	t=1.386	0.167
had given birth to children	3 (4.4%)	22 (11.2%)	$\chi^2=2.675$	0.102
data presented as mean (SD) or number (%)				

Figure 2. The rate of prevalence of each premenstrual symptoms

Table 2 shows the sleep quality parameters. Analysis of the PSQI demonstrated that 80.5% in the PMDD group had a PSQI score >5 , which indicates poor sleep quality. However, 56.4% in the No/PMDD group had a PSQI score >5 ($p<0.0001$). The mean PSQI score was 8.2(3.4) (range= 2-17) in the PMDD group and was 6.5 (3.1) (range= 2-19) in the No/PMDD group ($p<0.0001$). Analysis of PSQI components showed that the mean duration of sleep per night was reported to be 6.8 (1.6) hours in the PMDD group and was 6.9 (1.6) hours in the No/PMDD group ($p=0.771$). The mean duration of sleep latency was 39 (15) and 33 (25) min for the PMDD group and the No/PMDD group, respectively ($p=0.216$).

Habitual sleep efficacy of both groups did not differ significantly. Nonetheless, taking sleep medications was more frequent in the PMDD group when compared to the No/PMDD group (16.4% vs. 7.6%, [$p=0.039$]).

Sleep disturbance was present in 25.3% of the students in the PMDD group but only in 10.2% of the students in the No/PMDD group ($p<0.001$). Furthermore, 16.4% of those in the PMDD group reported that their sleep quality was "fairly bad or bad", while only 7.1% of those in No/PMDD group rated their sleep quality as "fairly bad or bad" ($p=0.026$).

Self-reports of daytime dysfunction was less frequent in students in the No/PMDD group with 34.3%, whereas 56.7% of students in the PMDD reported daytime dysfunction ($p=0.006$).

4. Discussion

4.1 Main Finding

4.1.1 Prevalence of PMDD

In this questionnaire-based, case-control study we evaluated the sleep quality in PMDD female university students and in controls. To our knowledge this is the first large sample study that assesses the relationship between PMDD and sleep quality. Our findings showed that the prevalence rate of PMDD among Iranian female university students was 25.5%. This prevalence rate was higher than those reported of women in other epidemiological studies which reported that 3-8% of women are affected by PMDD.^[2, 3] But our findings are similar to other studies reported specifically among students. The prevalence rate of 36.1% of PMDD was reported by Issa and colleagues in a study among medical students.^[15] Niser and colleagues reported a PMDD prevalence rate of 5.8% among unmarried

Table 2. Comparison of sleep quality parameters between two groups of female university students with and without Premenstrual Dysphoric Disorder

sleep abnormalities	with PMDD (n=67)	without PMDD (n=195)	statistical value	p-value
PSQI score	8.2 (3.4)	6.5 (3.1)	3.648	<0.0001
PSQI ≥ 5	54 (80.5%)	110 (56.4%)	12.459	<0.0001
subjective sleep quality (fairly/very bad)	11 (16.4%)	14 (7.1%)	4.931	0.026
sleep latency (minutes)	39 (15)	33 (25)	1.049	0.216
sleep duration (hours)	6.8 (1.6)	6.9 (1.6)	0.387	0.771
habitual sleep efficiency (<85%)	24 (35.8%)	61 (31.2%)	0.469	0.494
sleep disturbance	17 (25.3%)	20 (10.2%)	9.396	0.002
use of sleep medication (>once a week)	11 (16.4%)	15 (7.6%)	4.247	0.039
daytime dysfunction	38 (56.7%)	67 (34.3%)	10.379	0.001
data presented as mean (SD) or number (%)				

female medical students in Pakistan.^[20] Also, prevalence rates of 6.1%, 17.2%, and 18.2% were reported among university students in Nigeria, Croatia and Pakistan, respectively.^[21-23] The underlying causes of this high incidence of PMDD in these students are unknown, but we can suggest several possible mechanisms. The prevalence of PMDD in Iranian females is high, and other Iranian studies report a range of PMDD prevalence rates from 13%-59%.^[17, 24] It is a fact that this prevalence rate is affected by cultural influences.^[25] Life style is a main factor influencing PMDD in the Iranian population.^[26] The diagnosis of PMDD by the DSM-IV-TR criteria includes at least five mood symptoms that must present during repeated menstrual cycles. In a retrospective design of PMDD assessment which is based on memory, the description of the women's mood symptoms are subjective and the recall of symptoms' severity and frequency may be amplified among these women.^[27-29] Moreover, the responses may be associated with personality characteristics. Bailey and colleagues found that 40% of women diagnosed with PMS or PMDD also had comorbid affective or anxiety disorders.^[29] Contrary to the study by Cohen and colleagues that found an association of PMDD and lower education,^[30] other studies have found PMS/PMDD had higher prevalence rates among students,^[15, 29] which is also supported by the findings of Takeda and colleagues that showed that one half of female students experienced both irritability and depression.^[31] Limited information about the cause and treatment of PMDD may also contribute to the high prevalence rate of PMDD in adolescent girls. Furthermore, students are under much stress due to the long hours of study, employment pressure, and the costs of university tuition. In addition, because many female students experience much stress in daily life and

have little information about reproductive health, they may feel much stress about menstruation.

4.1.2 PMDD and sleep quality

In this study, we found that female university students with PMDD are deeply affected by sleep problems. Lower sleep quality and daytime dysfunction are common sleep problems among students with PMDD. These findings are important, given that sleep disturbance is highly prevalent in adolescence and university students.

As suggested by previous studies, several factors may contribute to an increased rate of sleep problems in the female study participants with premenstrual symptoms. Baker and colleagues^[6] conducted a sleep EEG analysis, including a subjective sleep quality measure and an objective polysomnography, of nine women with PMS or PMDD and twelve asymptomatic control subjects at the luteal phase (LP) and at the follicular phase (FP) of the menstrual cycle. The women with severe PMS had significantly higher depression scores and poorer subjective sleep quality when symptomatic during the LP, but based on the polysomnogram, there were no specific alterations in the sleep architecture associated with the premenstrual symptoms.

The association between sleep architecture and depressed mood in patients with depressive disorders is complex. Studies have shown no single sleep variable was specific for Major Depressive Disorder (MDD).^[32] Also, not all individuals with MDD show considerable sleep disturbances.^[33] On the other hand, sleep studies among women with PMDD have been limited. An EEG study on 23 women with PMDD and 18 controls

showed no intergroup differences; however, there were significant menstrual phase effects on sleep EEG measures. In both groups, REM sleep was decreased and REM latencies were increased in the LP compared to the FP.^[10] Lee and colleagues showed that compared to controls, women who experienced negative mood symptoms during the LP had slow-wave sleep (SWS) patterns that were decreased at both menstrual phases.^[34] Another study by Parry and colleagues revealed that women with PMS had more stage 2 sleep and less REM sleep, compared to controls.^[11] Similar results were shown in a study by Lamarche and colleagues who found decreased SWS and REM sleep and increased stage 2 sleep during the LP in both healthy and women with PMS.^[35] A reduction in REM sleep during LP compared to FP has also been reported by Shechter and colleagues who observed this variation in healthy women and patients with PMDD.^[36] Similarly, in their sleep EEG study Parry and colleagues examined eight women with moderate to severe premenstrual depression and eight controls, two nights per week over the course of one menstrual cycle and found that depressed women had more stage 2 sleep and less REM sleep than controls.^[11] In contrast, a small polysomnographic study by Chuong and colleagues demonstrated no significant change in nine sleep parameters associated with the menstrual cycle or differences between three patients with PMS and six control subjects who were studied for two consecutive nights during each of three different menstrual phases.^[37]

The studies of sleep in women across the life cycle have been summarized previously; some of them focused more on objective measures of sleep and other biological rhythms (such as melatonin and cortisol) in women with and without depressive disorders. Parry and colleagues observed that, compared to normal control subjects, women with PMDD had an earlier (phase-advanced) offset of melatonin secretion, which contributed to a shorter secretion duration.^[38] Similar findings were seen in a larger study of 21 women with PMDD and 11 normal controls; in those with MDD the melatonin onset time was delayed, the duration was compressed, and the amplitude and mean levels were decreased during the LP when compared with the FP. In the normal controls, melatonin rhythms did not change significantly throughout the menstrual cycle.

In conclusion, we have shown that university students with PMDD perceive their sleep quality to be poor. Studying as well as daily life stress may produce or exacerbate PMDD. Self-awareness and psychological and psychiatric interventions may help students with PMDD to increase their productivity and quality of life. Further studies need to address the associations between sleep problems and long term outcomes in students with PMDD, such as their psychological development.

4.2 Limitation

This study had some methodological limitations. First, it was a questionnaire based study and we did not use reliable objective measures such as actigraphy, which is a reliable tool for confirming a diagnosis and evaluating sleep problems.^[40,41] Second, the DSM-IV-TR suggests that PMDD should be diagnosed prospectively, which was not done in the present study.

4.3 Importance

With a prevalence rate of 25%, this study identifies PMDD as an important issue in female students' reproductive health. Another important implication of this study is the importance of evaluating the sleep quality of female students. The data suggest that low sleep quality strongly relates to PMDD symptoms. By screening students' sleep, it may be possible to intervene early and even prevent PMDD through counseling or psycho-education about sleep behaviors and their effects on PMDD symptoms.

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Conflict of interest statement

The authors declare no conflict of interest.

Informed consent

Written consent and/or assent were obtained from all study participants.

Ethical review

All procedures were approved by the Institutional Ethics Committee of Kermanshah University of Medical Sciences (KUMS).

Contribution:

HK and AC designed the study; HK, AC, BK, and MN performed the assessments; MRG analyzed the data;

HK, MRG, AC, BK, and MN evaluated the questionnaires; and HK and MRG wrote the paper.

大学生睡眠质量与经前期烦躁障碍

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背景: 高达 8% 的育龄妇女受经前期烦躁障碍 (PMDD) 所困。DSM-IV-TR 把失眠或嗜睡等睡眠紊乱作为 PMDD 的诊断标准之一。大约 70% 的 PMDD 患者存在睡眠紊乱。然而, 专注解决 PMDD 对睡眠质量影响的有关研究却非常缺乏。

目标: 本研究旨在评估女大学生中 PMDD 的患病率及其对睡眠质量的影响。

方法: 我们根据精神障碍诊断与统计手册第四版修订版 (DSM-IV-TR) 开发了 PMDD 量表 (18 项)。对月经周期规律、年龄在 18~30 岁的女大学生, 用上述量表诊断 PMDD。把研究对象分为 PMDD 组或非 PMDD 组, 比较两组的睡眠质量。用匹兹堡睡眠质量指数 (PSQI) 评估睡眠质量。

结果: 女大学生 PMDD 的患病率为 25.5%。PSQI 分析表明 PMDD 组中 80.5% 的女大学生 PSQI 得分 > 5, 而非 PMDD 组中相应的比例只有 56.4% ($\chi^2=12.459$, $p<0.001$)。PMDD 组 PSQI 平均分 (标准差) 为 8.2 (3.4) 而非 PMDD 组为 6.5 (3.1) ($t=3.648$, $p<0.001$)。

结论: 患有 PMDD 的女大学生睡眠问题严重。睡眠质量差、日间功能障碍以及睡眠紊乱是患 PMDD 的女大学生中常见的睡眠问题。

关键词: 经前期烦躁障碍; 睡眠质量; 匹兹堡睡眠质量指数; 女大学生

References

- Halbreich U. The etiology, biology, and evolving pathology of premenstrual syndromes. *Psychoneuroendocrinology*. 2003; **28**(Suppl 3): 55-99. doi: [http://dx.doi.org/10.1016/S0306-4530\(03\)00097-0](http://dx.doi.org/10.1016/S0306-4530(03)00097-0)
- Halbreich JT, Halbreich U, Smail N. Screening of patients for clinical trials of premenstrual syndrome/premenstrual dysphoric disorder: Methodological issues. *Psychiatry Res*. 2006; **141**(3): 349-352. doi: <http://dx.doi.org/10.1016/j.psychres.2005.08.003>
- Angst J, Sellaro R, Merikangas KR, Endicott J. The epidemiology of perimenstrual psychological symptoms. *Acta Psychiatr Scand*. 2001; **104**(2):110-116. doi: <http://dx.doi.org/10.1034/j.1600-0447.2001.00412.x>
- American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR)*. Washington D.C. and London: American Psychiatric Association; 2000
- Grady-Weliky TA. Premenstrual dysphoric disorder. *N Engl J Med*. 2003; **348**(5): 433-438. doi: <http://dx.doi.org/10.1056/NEJMcp012067>
- Baker FC, Kahan TL, Trinder J, Colrain IM. Sleep quality and the sleep electroencephalogram in women with severe premenstrual syndrome. *SLEEP*. 2007; **30**(10): 1283-1291
- Freeman EW. Premenstrual syndrome and premenstrual dysphoric disorder: definitions and diagnosis. *Psychoneuroendocrinology*. 2003; **28**(Suppl 3): 25-37. doi: [http://dx.doi.org/10.1016/S0306-4530\(03\)00099-4](http://dx.doi.org/10.1016/S0306-4530(03)00099-4)
- Strine TW, Chapman DP, Ahluwalia IB. Menstrual-related problems and psychological distress among women in the United States. *J Womens Health (Larchmt)*. 2005; **14**(4): 316-323.
- Hurt SW, Schnurr PP, Severino SK, Freeman EW, Gise LH, Rivera-Tovar A, et al. Late luteal phase dysphoric disorder in 670 women evaluated for premenstrual complaints. *Am J Psychiatry*. 1992; **149**(4): 525-530. doi: <http://dx.doi.org/10.1089/jwh.2005.14.316>
- Parry BL, Mostofi N, LeVeau B, Nahum HC, Golshan S, Laughlin GA, et al. Sleep EEG studies during early and late partial sleep deprivation in premenstrual dysphoric disorder and normal control subjects. *Psychiatry Res*. 1999; **85**(2): 127-143. doi: [http://dx.doi.org/10.1016/S0165-1781\(98\)00128-0](http://dx.doi.org/10.1016/S0165-1781(98)00128-0)
- Parry BL, Mendelson WB, Duncan WC, Sack DA, Wehr TA. Longitudinal sleep EEG, temperature, and activity measurements across the menstrual cycle in patients with premenstrual depression and in age-matched controls. *Psychiatry Res*. 1989; **30**(3): 285
- Deuster PA, Adera T, South-Paul J. Biological, social and behavioral factors associated with premenstrual syndrome. *Arch Fam Med*. 1999; **8**(2): 122-128
- Hourani LL, Yuan H, Bray RM. Psychosocial and lifestyle correlates of premenstrual symptoms among military women. *J Womens Health (Larchmt)*. 2004; **13**(7): 812-821. doi: <http://dx.doi.org/10.1089/jwh.2004.13.812>
- Kuczmierczyk AR, Labrum AH, Johnson CC. Perception of family and work environments in women with premenstrual syndrome. *J Psychosom Res*. 1992; **36**(8): 787-795
- Issa BA, Yussuf AD, Olatinwo AO, Ighodalo M. Premenstrual dysphoric disorder among medical students of a Nigerian university. *Ann Afr Med*. 2010; **9**(3): 118-122. doi: <http://dx.doi.org/10.4103/1596-3519.68354>
- Steiner M, Macdougall M, Brown E. The Premenstrual Symptoms Screening Tool (PSSST) for clinicians. *Arch Womens Ment Health*. 2003; **6**(3): 203-209
- Hariri FZ, Moghaddam-Banaem L, SiahBazi S, Saki Malehi A, Montazeri A. The Iranian version of the Premenstrual Symptoms Screening Tool (PSSST): a validation study. *Arch Womens Ment Health*. 2013; **16**(6): 531-537. doi: <http://dx.doi.org/10.1007/s00737-013-0375-6>
- The Pittsburgh Sleep Quality Index (PSQI): a new instrument for psychiatric research and practice. *Psychiatry Research*. 1989; **28**(2): 193-213

19. FarrahiMoghaddam J, Nakhaee N, Sheibani V, Garrusi B, Amirkafi A. Reliability and validity of the Persian version of the Pittsburgh Sleep Quality Index (PSQI-P). *Sleep Breath.* 2012; **16**(1): 79-82. doi: <http://dx.doi.org/10.1007/s11325-010-0478-5>
20. Nisar N, Zehra N, Haider G, Munir AA, Sohoo NA. Frequency, intensity and impact of premenstrual syndrome in medical students. *J Coll Physicians Surg Pak.* 2008; **18**(8): 481-484. doi: <http://dx.doi.org/10.2008/JCPSP.48148484>
21. Adewuya AO, Loto OM, Adewumi TA. Premenstrual dysphoric disorder amongst Nigerian university students: prevalence, comorbid conditions, and correlates. *Arch Womens Ment Health.* 2008; **11**(1): 13-18. doi: <http://dx.doi.org/10.1007/s00737-008-0213-4>
22. RojnicKuzman M, Hotujac L. Premenstrual dysphoric disorder: A neglected diagnosis? Preliminary study on a sample of Croatian students. *CollAntropol.* 2007; **31**(1): 131-137
23. Tabassum S, Afridi B, Aman Z, Tabassum W, Durrani R. Premenstrual syndrome: Frequency and severity in young college girls. *J Pak Med Assoc.* 2005; **55**(12): 546-549
24. Delara M, Borzuei H, Montazeri A. Premenstrual disorders: prevalence and associated factors in a sample of Iranian adolescents. *Iran Red Crescent Med J.* 2013; **15**(8): 695-700. doi: <http://dx.doi.org/10.5812/ircmj.2084>
25. Kirmayer LJ. Cultural variations in the response to psychiatric disorders and emotional distress. *Soc Sci Med.* 1989; **29**(3): 327-339
26. Grady-Weliky TA. Clinical practice. Premenstrual dysphoric disorder. *N Engl J Med.* 2003; **348**(5): 433-438. doi: <http://dx.doi.org/10.1056/NEJMcp012067>
27. Pearlstein T, Steiner M. Premenstrual dysphoric disorder: Burden of illness and treatment update. *J Psychiatry Neurosci.* 2008; **33**(4): 291-301
28. Qiao M, Zhang H, Liu H, Luo S, Wang T, Zhang J, Ji L. Prevalence of premenstrual syndrome and premenstrual dysphoric disorder in a population-based sample in China. *Eur J Obstet Gynecol Reprod Biol.* 2012; **162**(1): 83-86. doi: <http://dx.doi.org/10.1016/j.ejogrb.2012.01.017>
29. Bailey JW, Cohen LS. Prevalence of mood and anxiety disorders in women who seek treatment for premenstrual syndrome. *J Womens Health Gen Based Med.* 1999; **8**(9): 1181-1184. doi: <http://dx.doi.org/10.1089/jwh.1.1999.8.1181>
30. Cohen LS, Soares CN, Otto MW, Sweeney BH, Liberman RF, Harlow BL. Prevalence and predictors of premenstrual dysphoric disorder (PMDD) in older premenopausal women. The Harvard Study of Moods and Cycles. *J Affect Disord.* 2002; **70**(2): 125-132. doi: [http://dx.doi.org/10.1016/S0165-0327\(01\)00458-X](http://dx.doi.org/10.1016/S0165-0327(01)00458-X)
31. Takeda T, Koga S, Yaegashi N. Prevalence of premenstrual syndrome and premenstrual dysphoric disorder in Japanese high school students. *Arch Womens Ment Health.* 2010; **13**(6): 535-537. doi: <http://dx.doi.org/10.1007/s00737-010-0181-3>
32. Benca RM, Obermeyer WH, Thisted RA, Gillin JC. Sleep and psychiatric disorders. A meta-analysis. *Arch Gen Psychiatry.* 1992; **49**(8): 651-670. doi: <http://dx.doi.org/10.1001/archpsyc.1992.01820080059010>
33. Benca R. Mood Disorders. In: Kryger M, Roth T, Dement W, eds. *Principles and Practice of Sleep Medicine 4th Ed.* Philadelphia: Elsevier Saunders; 2005. pp: 1311-1326
34. Lee KA, Shaver JF, Giblin EC, Woods NF. Sleep patterns related to menstrual cycle phase and premenstrual affective symptoms. *SLEEP.* 1990; **13**(5): 403-409
35. Lamarche LJ, Driver HS, Wiebe S, Crawford L, DE Koninck JM. Nocturnal sleep, daytime sleepiness, and napping among women with significant emotional/behavioral premenstrual symptoms. *J Sleep Res.* 2007; **16**(3): 262-268. doi: <http://dx.doi.org/10.1111/j.1365-2869.2007.00604.x>
36. Shechter A, Varin F, Boivin DB. Circadian variation of sleep during the follicular and luteal phases of the menstrual cycle. *SLEEP.* 2010; **33**(5): 647-656
37. Chuong CJ, Kim SR, Taskin O, Karacan I. Sleep pattern changes in menstrual cycles of women with premenstrual syndrome: a preliminary study. *Am J Obstet Gynecol.* 1997; **177**(3): 554-558. doi: [http://dx.doi.org/10.1016/S0002-9378\(97\)70145-5](http://dx.doi.org/10.1016/S0002-9378(97)70145-5)
38. Parry BL, Berga SL, Kripke DF, Klauber MR, Laughlin GA, Yen SS, et al. Altered waveform of plasma nocturnal melatonin secretion in premenstrual depression. *Arch Gen Psychiatry.* 1990; **47**(12): 1139-1146. doi: <http://dx.doi.org/10.1001/archpsyc.1990.01810240059010>
39. Parry BL, Berga SL, Mostofi N, Klauber MR, Resnick A. Plasma melatonin circadian rhythms during the menstrual cycle and after light therapy in premenstrual dysphoric disorder and normal control subjects. *J Biol Rhythms.* 1997; **12**(1): 47-64. doi: <http://dx.doi.org/10.1177/074873049701200107>
40. Tahmasian M, Khazaie H, Golshani S, Avis KT. Clinical application of actigraphy in psychotic disorders: a systematic review. *Curr Psychiatry Rep.* 2013; **15**(6): 359. doi: <http://dx.doi.org/10.1007/s11920-013-0359-2>
41. Khazaie H, Ghadami MR, Knight DC, Emamian F, Tahmasian M. Insomnia treatment in the third trimester of pregnancy reduces postpartum depression symptoms: a randomized clinical trial. *Psychiatry Res.* 2013; **210**(3): 901-905. doi: <http://dx.doi.org/10.1016/j.psychres.2013.08.017>

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