

Does the Menstrual Cycle Affect Mood Disorders?

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SUMMARY

Objective: To review the literature on the relationship between the menstrual cycle and mood disorders.

Method: We performed a MEDLINE search of the Turkish and English language literature for the years 1955-2005 using the following terms: depression, bipolar disorder, premenstrual syndrome, premenstrual exacerbation, premenstrual dysphoric disorder, menstrual cycle, and suicide. Earlier reports had shown high rates of psychiatric admissions during the premenstrual period of the menstrual cycle and a higher prevalence of suicide attempts during the specific phase of the menstrual cycle.

Results: Women of reproductive age with mental disorders may experience a fluctuating course of illness during the course of the menstrual cycle. Some data suggest that for a subset of women, there is a relationship between the phases of the menstrual cycle and increased vulnerability to an exacerbation of ongoing mood disorders (especially major depressive episode) or the development of a new episode. The question of whether the direction of mood shifts in the course of bipolar disorder is associated with specific menstrual cycle phases has been raised, albeit with limited and inconsistent results.

Conclusion: There are a limited number of studies that have attempted to elucidate these relationships, and most of them lack prospective assessments, include small numbers of patients, and use unreliable methods of determining menstrual cycle phases. Additionally, many reports do not specify whether the exacerbations reflect an aggravation of the underlying mood disorder or a new subset of symptoms that occur only during certain phases of the menstrual cycle. Future studies should provide more information about the contribution of premenstrual fluctuation or worsening to increased illness severity of mood disorders and treatment resistance.

Key Words: Bipolar disorder, comorbidity, depression, menstrual cycle, premenstrual exacerbation

INTRODUCTION

During their reproductive years, the majority of women experience psychological and/or physical symptoms of varying severity in the days before menstruation. It was proposed that female reproductive hormones are responsible for the shifts in mood and behavior, but the possible mechanisms were not clearly identified. Estrogen, progesterone, and their metabolite levels decrease in the late luteal or premenstrual phase of the menstrual cycle and remain low throughout menstruation. It is acknowledged that female reproductive hormones harmonize the functions of neurotransmitters, such as serotonin, dopamine, norepinephrine, and gamma amino butyric acid (GABA), and that hormone shifts indirectly result in psychological problems.

Many authors, beginning with Hippocrates in 600 BC, Troutula and Salerno in the 11th century, and during the Renaissance have reported psychological changes related to menstruation. The concept of premenstrual tension syndrome was initially proposed by Frank in 1931. The condition was defined as premenstrual syndrome (PMS) in the 1950's, late luteal phase dysphoric disorder in the DSM-III-R in 1987, and as premenstrual dysphoric disorder (PMDD) in 1984 in the DSM-IV (Pearlstein and Stone, 1998).

There are few published reports that aim to define and explore mood and behavior fluctuations related to the menstrual cycle. Although there is an increase in systematic data related to the etiology and treatment of PMS and PMDD, there is still no

consensus on the differential diagnosis between PMS and PMDD, and other mood disorders.

With this aim, all research associated with mood and/or behavioral changes related to certain periods of menstruation, PMS, and PMDD overlapping with depressive and manic periods, as well as articles covering theoretical information and all available research findings related to the subject were reviewed.

All articles published in English and Turkish between the years 1955 and 2005 were searched for using the following keywords: depression, bipolar disorder, premenstrual syndrome, premenstrual dysphoric disorder, menstrual cycle, and suicide. Theoretical and practical findings related to mood disorders and the effects of the menstrual cycle are discussed. Etiological mechanisms and treatment options were excluded in the examination of the effect of the menstrual cycle on mood disorders.

Concepts related to the menstrual cycle

The nature, timing, and severity of symptoms related to the menstrual cycle constitute the diagnosis of disorders related to the menstrual cycle. Daily follow-up charts are necessary and beneficial to identify when the symptoms begin and end, to observe the changing patterns of clinical symptoms, and to understand the nature of the symptoms and if they cause disturbance. PMDD is classified within "Diagnostic criteria and sets for further research" in DSM-IV. PMDD patients are classified under "depressive disorders not otherwise specified" in this diagnostic system.

Diagnostic criteria for PMDD suggested for the studies are: In the past year, experiencing a minimum of 5 of the following symptoms (one of which must be a mood symptom; for example, depressed mood or dysphoria, anxiety, tension, irritability, affective lability, or anger): decreased interest in usual activities, difficulty on concentrating, a marked lack of energy, a marked change in appetite, hypersomnia or insomnia, feelings of being overwhelmed, and other physical symptoms, i.e., breast tenderness, bloating, headaches, muscle or joint aches, weight gain) regularly in the last week of the luteal phase (premenstrual period). Symptoms should be absent for at least 1 week during the postmenstrual period (follicular period). Symptoms must interfere with an individual's life. Symptoms must not merely be an exacerbation of

another disorder. Criteria must be confirmed by prospective daily ratings for at least 2 menstrual cycles (APA, 1994). There are no definitive criteria for PMS in DSM-IV; however it is stated that it can be differentiated from PMDD by lesser severity and only mild functional impairment. According to ICD-10, in order to diagnose PMS, one psychological (such as irritability, difficulty concentrating, sleep disorder, or changes in appetite) or physical (such as bloating, weight gain, or breast tenderness) symptom in the premenstrual phase is sufficient (ICD-10, 1996).

It is known that many mental disorders (such as major depressive disorder, panic disorder, schizophrenic disorder, and bulimia nervosa) or medical illnesses (such as migraine headache, asthma, and epilepsy) worsen in the premenstrual phase of the menstrual cycle. This phenomenon is called "premenstrual exacerbation". Women who experience premenstrual exacerbation have significant complaints in the postmenstrual phase of the menstrual cycle (Pearlstein and Stone, 1998).

Evidence regarding the menstrual cycle and mood disorders

1. Increase in psychiatric admissions during premenstrual period: Some clinicians reported an increase in psychiatric admissions during the premenstrual or menstrual period. (Dalton, 1959; Janowsky et al, 1969; Jacob and Charles, 1970; Glass et al., 1971; Diamond et al., 1976; Abramowitz et al., 1982; Targum et al., 1991). Dalton (1959) reported that one third of depressive women had hospital admissions during menstruation. Janowsky et al. (1969) repeated similar findings. Jacobs and Charles (1970) showed that 47% of psychiatric admissions took place during the menstruation period. In a study by Abramowitz et al. (1982) it was reported that depressive women presented for psychiatric treatment one day before and/or on the first day of menstruation. Similarly, Targum et al. (1991) reported that 47% of psychiatric referrals took place during menstruation and that 22% of healthy controls did not have psychiatric admissions during that period. However, they were unable to find any relationship between the severity of depression and phases of the menstrual cycle.

2. The relationship between suicidal behavior and the menstrual cycle

Suicidal behavior can also be affected by the

menstrual cycle. However, findings regarding the relationship between suicidal behavior and certain periods of the menstrual cycle are controversial. Methodological problems in some of the studies may explain the controversial findings. The most important methodological problems in the studies are improper sampling and the inability to detect the menstrual cycle period. Despite all the limitations of these studies, the latest research shows that suicidal attempts are more frequent during the menstrual period (Baca-Garcia et al., 2000).

McKion et al. (1959) found the relationship between completed suicides and the luteal phase of the menstrual cycle for the first time in the 1950s; however, no relationship was found between suicide and a certain phase of menstrual cycle identified during autopsies following suicides (Vanezis, 1990).

Despite the methodological problems of the studies conducted in last 40 years

i) Some studies did not find a relationship between the menstrual cycle and suicidal behavior (Luggin et al., 1984; Ekeberg et al., 1986; Targum et al., 1991; Holding and Minkoff, 1973; Buckle et al., 1965; Birtchell and Floyd, 1974).

ii) Some studies showed that suicide attempts were more frequent in the premenstrual phase or before menstruation (Glass et al., 1971; Tonks et al., 1968; Janowsky et al., 1969).

iii) Some studies showed that suicidal attempts or completed suicides were more frequent in the first week of the menstrual cycle. (Baca-Garcia et al., 1998 and 2000; Çayköylü et al., 2004; Forestie et al., 1986; Trautman, 1961; Thin, 1968).

iv) Few studies reported that suicidal attempts were more frequent before or after menstruation. (Dalton, 1959).

3. Increase in existing depressive symptoms or the appearance of depressive symptoms (worsening of mood symptoms): It was observed that in a group of women with depressive disorder and premenstrual complaints, irritability and somatic complaints continued after tricyclic antidepressant treatment (Yonkers and White, 1992). The authors proposed that premenstrual symptoms, such as irritability and somatic complaints, reveal a disorder process that is different than depression. Glick et al. (1991) evaluated 27 female patients with major depression who treated with phenelzine or imip-

ramine using the Premenstrual Evaluation Form (PEF). Psychological complaints reappeared before menstruation in 25% of depressive women. Symptoms that reappear before menstruation were depressive mood, anhedonia, anxiety, increase in appetite, and hypersomnia.

4. Increasing the dosage of antidepressants in PMS and depression comorbidity: It has been reported that increasing the dosage of antidepressants in the luteal phase for women with depression and premenstrual complaints yields positive results (Kimmel et al., 1992; Jensvold et al., 1992; Miller et al., 2002). Jensvold et al. (1992) reported recurrence in depressive symptoms in the premenstrual period in 11 depressive women while they were euthymic. It was observed that well-being was prolonged by increasing the dosages of antidepressant treatment (for example, increasing the dosage of fluoxetine from 20 mg to 40 mg or nortriptilin from 75 mg to 100 mg) before menstruation. Kimmel et al. (1992) reported that 2 women had lower serum antidepressant levels in the luteal phase than in the postmenstrual phase. They proposed that increasing dosages of the antidepressant 7-10 days before menstruation is beneficial. Miller et al. (2002) reported that increasing the dose of nefazodone prior to menstruation diminished mood fluctuation during that period.

5. Diagnosis of depression in patients presenting with PMS complaints: It was observed that a majority of the women presenting to psychiatry or gynecology and obstetrics units for PMS or PMDD treatment had exacerbated mood disorders (especially major depression or dysthymic disorder) (Harrison et al., 1989). Exacerbation of depression in the period before menstruation was present in nearly 50% of the women admitted for complaints during the premenstrual period (Plouffe et al., 1993). The frequency of depressive disorder reported by studies that retrospectively evaluated PMS symptoms is 18%–69 %. These studies conclude that it is necessary to consider depression in women with premenstrual complaints (Kim et al., 2004).

6. Psychiatric disorders accompanying PMDD: There are few studies examining the additional diagnosis of depression in women with PMDD. Fava et al. (1994) reported dysthymic disorder in 16% of 32 women with PMDD and Schnurr et al. (1994) found a mood disorder other than PMDD in 15% of the 648 women they studied. In their exten-

sive epidemiological study, Wittchen et al, (2002) observed comorbid major depression in 16% of women with PMDD, whereas they reported a frequency of depression in women without PMDD of 7%. None of the authors above made differential diagnoses between depression plus PMDD and worsening of existing depression in the premenstrual period; if women met the requirements of both diagnoses simultaneously, both diagnoses were given. However, one of the diagnostic criteria of PMDD is the inability to explain the existing disorder as the worsening of another psychiatric disorder.

Quite a few studies reported that the occurrence of major depressive disorder is high in women with PMS and PMDD (Harrison et al., 1989; Pearlstein et al., 1990; Severino et al., 1989); however nearly all the women that participated in these studies were treated for PMS. It was reported that a history of a mental disorder is higher in patients who admit for treatment. When strict and exact diagnostic criteria were used for the diagnosis of PMDD, the above findings could not be replicated in the majority of studies (Breau et al., 2000).

7. Percentage of premenstrual complaints in patients with mood disorders: There are few studies examining premenstrual complaints in women with mood disorders. The prevalence of premenstrual complaints among women with mood disorder is range from 25 to 72 % and the median is 60% (Coppen, 1965; Diamond et al., 1976; Halbreich and Endicott, 1985; Roy-Byrne et al., 1986; Endicott and Halbreich, 1988) Women with mood disorders participated in these studies and some of the studies examined both bipolar and unipolar mood disorders. The main purpose of these studies was to examine the comorbidity of lifetime diagnosis of mood disorder with PMS and PMDD. In addition, retrospective evaluation instruments were used in order to assess premenstrual complaints.

8. The relationship between postpartum period and PMS: It was reported that women with postpartum mood disorders had depressive complaints exacerbated in the luteal phase of menstruation after regular menstruation begins (Brockington et al., 1988; Schenck et al., 1992). Other researchers had also found a relationship between postpartum depression and current premenstrual depressive mood (Warner et al., 1991).

Differential diagnosis of premenstrual worsening depression and PMDD with additional diagnosis

Some researchers examined ways to differentiate whether worsening of depression in the premenstrual period demonstrated a single process or 2 processes (one secondary to the other). Defining the fluctuation between the late luteal phase of the menstrual cycle and postmenstrual phase seems to be easy; however, if the difference is small, statistical methods are insufficient in detecting the fluctuation. There are no ideal criteria to define the difference between the 2 phases in terms of fluctuation. Furthermore, there are also no criteria to explain whether major depressive disorder is secondary to PMDD or an existing depression that has been exacerbated during the premenstrual period.

Simply, if an Axis I mental disorder worsens during the premenstrual period, it can be called, premenstrual exacerbation; if symptoms of a new illness (for example, irritability and physical symptoms) occur during the premenstrual period, PMDD should be considered. Experts suggest that differentiation between premenstrual exacerbation and PMS/PMDD can be easily made using prospective daily recordings. However, when the overlapping criteria for PMDD and major depression are considered, differentiating between these two mental disorders is not easy. Six diagnostic criteria for major depressive disorder are also diagnostic criteria for PMDD. In the last 10 years, researchers have proposed many methods to define premenstrual fluctuation.

1. The Absolute Severity Method considers the postmenstrual period during which symptoms are not evident. In a scale, symptoms that last more than 2 days should not be rated more than 3 (mild) and should be scored as 4 (moderate) at least one day in the premenstrual period (Schnurr et al., 1994) The problem here is the proposal of different numbers of days when defining the premenstrual period. Although there is no agreement between the clinicians, if the day when menstruation starts is accepted as the first day, the premenstrual period is accepted as the days between the 6th and 10th days of the menstrual cycle.

2. The Percentage Change Method: The increase of percentage from postmenstrual period to premenstrual period is evaluated. Generally, 30% or 50% change definition is used (Rubinow and

Roy-Byrne, 1984; Schnurr et al., 1994). There are researchers who accept 75% change for PMDD diagnosis (Yonkers et al., 1997).

3. Effect Size Method: In the evaluated menstrual cycle, the mean of the premenstrual period scores of an item of the scale is expected to be at least one standard deviation higher than the mean postmenstrual period score (Schnurr et al., 1994).

Ekholm et al. (1998) compared non-parametric Mann-Whitney U-test, effect size, Run-test, and the 30% change method. They found that the least effective method was the 30% change method. However, the most frequently used methods in the analysis of prospective studies were percentage change and effect size methods (Smith et al., 2003; Kim et al., 2004).

The frequency of symptoms worsening in depressive women during the premenstrual period

The percentage of premenstrual complaints in depressive women is given above. The most important limitations were using lifetime evidence, examining lifetime comorbidity in the relationship between PMS and mood disorders, and using retrospective scales instead of prospective scales. There are a limited number of studies that examine depression worsened during the menstrual cycle.

Hsiao et al. (2004) examined PMS and premenstrual symptom exacerbation in depressed Chinese women, with broad definitions and without using a specific scale. They found PMS in 80% and premenstrual worsening in 52% of the depressive cases. In a more systematic study, Hartlage et al. (2004) aimed to examine the frequency of exacerbation of depressive symptoms during the premenstrual period, its possible causes, and whether the phenomenon displays consistency between cycles. They found that 58% of the patients experienced exacerbation in one or more depressive symptoms, and the symptoms that fluctuated most frequently were sleep disorders, appetite changes, fatigue, and feelings of worthlessness. In addition, they proposed that premenstrual exacerbation is not only specific to depressive women, but is a function of the menstrual cycle seen in all women. There are two studies presented by Kornstein et al. related to the issue; the first one was not published, but was cited in their second article. They examined the frequency of premenstrual exacerbation in women with depressive disorder in the first study

and proposed that 52% of 229 women reported symptom worsening during the premenstrual period, and when a premenstrual symptom checklist was used, 27% of 97 women met the criteria for premenstrual exacerbation.

In a naturalistic follow-up study of patients with major depressive disorder (STAR-D) conducted in United States of America, it was found that 64% of 443 premenopausal women who did not use oral contraceptives experienced premenstrual exacerbation (Kornstein et al., 2005). The women that reported premenstrual exacerbation of depression had durations of the depressive period that were longer, they had more frequent general medical condition disorders, and they were older than women who did not report premenstrual exacerbation. Lead paralysis, somatic complaints, gastrointestinal complaints, psychomotor retardation, and affective lability were the symptoms that exacerbated during the premenstrual period.

Twenty-three young girl were followed-up for major depressive disorder in the Child and Adolescent Psychiatry Outpatient Clinic of Ege University using the Daily Record of Severity of Problems (DRSP) developed by Endicott, for 2 to 6 months follow-up.

On retrospective forms, depressive girls and healthy controls reported similar premenstrual complaints. The most frequently fluctuating symptoms in depressive girls were sleep disorders, somatic complaints, depressive mood state, fatigue, and appetite changes; whereas in healthy controls it was somatic complaints. Total scores of DRSP of the depressive girls were higher than controls in both the premenstrual and postmenstrual period. Somatic complaint scores of the two groups were similar. The number of patients with premenstrual exacerbation (22% of the depressed girls) was lower, which differed from previously mentioned studies. The only condition that explains this difference is the age of the patient group being younger than the previously mentioned studies (Korkmaz, 2002).

. The relationship between bipolar disorder and the menstrual cycle: There is limited information about the effect of the menstrual cycle on the course and symptoms of bipolar disorder. While findings of increased frequency of depression after adolescence is mounting (Kessler et al., 1993; Mattisson et al., 2005), there is limited information

about the differences in the course or symptoms of bipolar disorder with adolescence. For example, does the ratio of depression/mania change when bipolar girls enter puberty, or is rapid cycling more frequent in bipolar female children or adolescents? When looking for the answers to these questions, two studies are attention-grabbing. In their 9-year-follow-up study of bipolar adolescents, Krasa and Tolbert (1994) reported an increase in manic episodes when compared with the number of depressive episodes. Schraufnagel et al. (2001) found that manic/hypomanic symptomatology, such as cyclothymia and rapid cycling bipolar disorder/ultra rapid cycling bipolar disorder, was more frequent in 65 preadolescent children, whereas depressive symptomatology was more evident in 26 adolescents. This study, by emphasizing that manic symptoms are more frequent in children and depressive symptoms are more frequent in adolescents, supports the observation that mood disorder symptoms change with age.

As it is seen, the findings of these two studies are controversial and neither study explored the relationship between mood episodes and gender. In conclusion, there are no answers for these questions and further studies are needed.

When we search for an answer to the question, “are illness phases related to the phases of the menstrual cycle?” we encounter case presentations that report bipolar women experience specific mood episodes in certain periods of the menstrual cycle. D’Mello et al. (1993) reported 2 women with excess activity, insomnia, and irritability in the 5 days before menstruation and who were euthymic the remaining days of menstruation. One woman who displayed recurrent hypomania followed by depression during the premenstrual period and improved with the beginning of menstruation was published by Kukopulos et al. (1985). The authors observed that during a 3-month follow-up, an extreme decrease in the blood lithium level (0.3 mmol/L) was observed 7-10 days before menstruation in hypomanic women, which increased (1.1 mmol/L) during the depressive period 1-2 days before menstruation.

Women who become psychotic during certain phases of the menstrual cycle were described in other case reports. As examples of such “periodic psychosis”, Endo et al. (1978) described 7 women who became psychotic during certain phases of the menstrual cycle, Brockington et al. (1988)

reported 8 women with a history of postpartum psychosis who showed recurrence during the premenstrual period, and Matsugana and Sarai (1993) noted 12 bipolar women whose symptoms fluctuated with menstruation, and whose serum luteinizing hormone and androgen levels were higher than the controls. Eight out of these 12 women had polycystic ovary syndrome. Among all these case reports, the case followed-up for 11 years by Sothorn et al. (1993) was most notable. The female patient with bipolar disorder experienced mood episodes more frequently during the periods before or after menstruation than during other periods of the menstrual cycle. Can all these case reports be generalized to women with bipolar disorder? First of all, there seems to be a problem in the documentation of these cases. Except for the study of Sothorn et al. (1993), the follow-up periods of the cases are too short for making differential diagnosis between schizophrenia and bipolar disorder and to detect whether psychotic episodes were related to a particular phase of the menstrual cycle. In addition, these studies did not include control groups except Matsugana and Sarai’s study (1993).

In addition to these case studies, a number of studies examined mood changes related to the menstrual cycle in women with bipolar disorder. Price and Di-Marzio (1986) compared 25 rapid cycling bipolar women to 25 controls and found that 20% of the controls and 60% of the bipolar group had premenstrual tension. Furthermore, the authors pointed out that the frequency of cycling was higher in rapid cycling patients whose premenstrual symptoms were most severe. However, due to study’s use of retrospective assessment, the existence of premenstrual symptoms might have been exaggerated.

In one prospective study conducted with 47 rapid cycling patients (Wehr et al., 1988) and another prospective study, which included 25 rapid cycling bipolar disorder patients followed-up for at least 3 months (Leibenluft et al., 1999) a significant relationship between mood shift and the menstrual cycle was not found. In another study conducted with patients who presented to a lithium clinic (Diamond et al., 1976), no significant difference in social functioning due to mood changes related to menstruation, between bipolar patients and healthy controls was noted; however, it was shown that the bipolar group had more hospital admissions due to psychiatric complaints during both

premenstrual and postmenstrual periods. Rasgon et al. (2003) followed-up 17 bipolar female patients, of which 35% were using oral contraceptives, for 3 months using prospective assessment scales. They noted significant mood shifts in the 65% of the patients not using oral contraceptives during the premenstrual to postmenstrual periods; whereas these shifts were not evident in the patients who were using oral contraceptives.

These studies suggest a higher probability of hospitalization or mood episodes in female patients during the premenstrual period. However, more expansive studies are needed. In addition, some methodological deficiencies in these studies should be considered. None of these studies, except for the Diamond et al. (1976) study, had control groups. Furthermore, the premenstrual period was defined by the dates on the scales which evaluated the premenstrual symptoms and was not shown with physiological measurements such as, ovulation, basal body temperature, or serum progesterone levels. Therefore, menstrual cycles without ovulation were also taken in to account.

The last study conducted by taking these limitations in to consideration was by Karadağ et al. (2004). Thirty-four women who had bipolar disorder and 35 healthy controls were prospectively evaluated for 2 months. Ovulation was defined by measuring serum progesterone levels within 19-22 days of menstruation.

In the prospective and retrospective assessments of female bipolar patients who had good response to mood stabilizing treatment, it was shown that mood shifts occurred less frequently than in controls and it is suggested that mood stabilizers may have a protective effect against premenstrual symptoms in bipolar women (Karadağ et al., 2004).

REFERENCES

- Abramowitz ES, Baker AH, Fleischer SF (1982) Onset of depressive psychiatric crises and menstrual cycle. *Am J Psychiatry*, 139: 475-478.
- American Psychiatric Association (1994) Diagnostic and Statistical Manual Mental Disorders-DSM-IV. American Psychiatric Association, Washington, D.C.
- Baca-Garcia E, Sanchez GA, Gonzalez DCP et al. (1998) Menstrual cycle and profiles of suicidal behaviour. *Acta Psychiatr Scand*, 97: 33-35.
- Baca-Garcia E, Diaz-Sastre C, Leon J et al. (2000) The relationship between menstrual cycle phases and suicide attempts. *Psychosom Med*, 62: 50-60.

CONCLUSION

There is a connection between the menstrual cycle and psychiatric complaints in some women; therefore, the relationship between the menstrual cycle and present complaints should be considered in the evaluation of female patients during their reproductive years. However, complaint patterns can vary from woman to woman. PMS and PMDD display comorbidity with Axis I diagnoses, especially mood disorders; however, phenomenological and treatment studies on the subject are insufficient. This review highlighted that there are very few methodologically adequate studies on the interaction of major depressive disorder and bipolar disorder with the menstrual cycle.

Although the quantity of data related to the menstrual cycle and psychiatric complaints is increasing, publications are limited to anecdotal data, case reports, and small population studies. In many studies, the number of subjects included is inadequate, research groups are heterogeneous, and prospective assessment is lacking. Moreover, because the patients included in the studies are under treatment, it is difficult to evaluate the effect of the menstrual cycle on the natural course of disorder. In addition, the premenstrual period is not sufficiently defined in the majority of studies and is specified as 1-14 days before menstruation. Required evaluations for detecting the phase of the menstrual cycle (for example; blood luteinizing hormone levels, basal body temperature, or blood progesterone levels) were not performed in the studies. The majority of the studies are also insufficient in terms of methodology. Because the setups and methods of the existing studies vary, it is difficult to make comparisons and interpretations.

Birtchnell J, Floyd S (1974) Attempted suicide and the menstrual cycle: a negative conclusion. *J Psychosom Res*, 18: 361-369.

Breaux C, Hartlage S, Gehlert S (2000) relationships of premenstrual dysphoric disorder to major depression and anxiety disorders: a re-examination. *J Psychosom Obstet Gynecol*, 21:17-24.

Brockington IF, Kelly A, Hall P et al. (1988) Premenstrual relapse of puerperal psychosis. *J Affect Disord*, 14: 287-292.

Buckle RC, Linnene J (1965) Attempted suicide presenting at the Alfred Hospital, Melbourne. *M J Aust*, 1: 751-758.

Coppen A (1965) The prevalence of menstrual disorders in psychiatric patients. *Br J Psychiatry*, 111: 155-167.

Çayköylü A, Çapoğlu I, Öztürk I (2004) The possible factors

affecting suicide attempts in the different phases of the menstrual cycle. *Psychiatry Clin Neurosci* 58(5):460-464.

Dalton K (1959) Menstruation and acute psychiatric illnesses. *BMJ*, 17:148-149.

Diamond SB, Rubenstein AA, Dunner DL et al. (1976) Menstrual problems in women with primary affective illness. *Compr Psychiatry*, 17: 541-548.

D'Mello DA, Pinheiro AL, Lalinec-Michaud M (1993) Premenstrual mania: two case reports. *Nerv Ment Dis*, 181(5):330-1.

Ekeberg O, Jacobsen D, Sorum Y et al. (1986) Self-poisoning and the menstrual cycle. *Acta Psychiatr Scand*, 73: 239-241.

Ekholm UB, Ekholm NO, Backstrom T (1998) Premenstrual syndrome: comparison between different methods to diagnose cyclicality using daily symptom ratings. *Acta Obstet Gynecol Scand* 77:551-557.

Endicott J, Halbreich U (1988) Clinical significance of premenstrual dysphoric changes. *J Clin Psychiatry*, 49: 486-489.

Endo M, Daiguji M, Asano Y et al. (1978) Periodic psychosis recurring in association with menstrual cycle. *J Clin Psychiatry*, 39: 456-66.

Fava M, Pedrazzi F, Guaraldi GP et al. (1992) Comorbid anxiety and depression among patients with late luteal phase dysphoric disorder. *J Anxiety Disord*, 6: 325-335.

Forestie V, De Lignieres B, Roudot TF et al. (1986) Suicide attempts in hypo-estrogenic phases of the menstrual cycle. *Lancet*, 2: 1357-1360.

Glass GS, Heninger GR, Lansky M et al. (1971) Psychiatric emergency related to the menstrual cycle. *Am J Psychiatry*, 128:705-711.

Glick R, Harrison W, Endicott J et al. (1991) Treatment of premenstrual depressive symptoms in depressive women. *J Am Wom Med Assoc*, 46: 182-185.

Halbreich U, Endicott J (1985) relationship of dysphoric premenstrual mood changes and depressive disorders. *Acta Psychiatr Scand*, 71: 331-338.

Harrison WM, Endicott J, Nee J et al. (1989) Characteristics of women seeking treatment for premenstrual syndrome. *Psychosomatics*, 30: 405-411.

Hartlage SA, Brandenburg DL, Kravitz HM (2004) Premenstrual exacerbation of depressive disorders in a community-based sample in the United States. *Psychosom Med*, 66: 698-706.

Holding TA, Minkoff K (1973) Parasuicide and the menstrual cycle. *J Psychosom Res*, 17: 365-368.

Hsiao MC, Hsiao CC, Liu C (2004) Premenstrual symptoms and premenstrual exacerbation in patients with psychiatric disorders. *Psychiat Clin Neurosciences*, 58:186-190.

Jacobs TJ, Charles E (1970) Correlation of psychiatric symptomatology and the menstrual cycle in an outpatient population. *Am J Psychiatry*, 126:1504-1508.

Janowsky DS, Gorney R, Castelnuovo-Tedesco P et al. (1969) Premenstrual-menstrual increases in psychiatric hospital admission rates. *Am J Obstet Gynecol*, 103:189-191.

Jensvold MF, Reed K, Jarett DB et al. (1992) Menstrual cycle-related depressive symptoms treated with variable antidepressant dosage. *J Womens Health*, 1:109-115.

Karadağ F, Akdeniz F, Erten E et al. (2004) Menstrually related symptom changes in women with treatment-responsive bipolar disorder. *Bipolar Disord*, 6:253-9.

Kessler RC, McGonagle GA, Swartz M et al. (1993) Sex and depression in the National Comorbidity Survey, I: life-time prevalence, chronicity and recurrence. *J Affect Disord*, 29:85-96.

Kim DR, Gyulai L, Freeman EW et al. (2004) Premenstrual

dysphoric disorder and psychiatric co-morbidity. *Arch Womens Ment Health*, 7: 37-47.

Kimmel S, Gonsalves L, Youngs D et al. (1992) Fluctuating levels of antidepressants premenstrually. *J Psychosom Obstet Gynaecol*, 13:277-280.

Kornstein SG, Harvey AT, Rush AJ et al. (2005) Self-reported premenstrual exacerbation of depressive symptoms in patient seeking treatment for major depression. *Psychol Med*, 35: 683-692.

Korkmaz S (2002) Depresif bozukluğu olan ergen kızlarda adet döngüsünün duygudurum üzerine etkileri. *Yayınlanmamış uzmanlık tezi*.

Krasa NR, Tolbert HA (1994) Adolescent bipolar disorder: a nine-year experience. *J Affect Disord*, 30:175-84.

Kukopulos A, Minnai G, Müller-Oerlinghausen B (1985) The influence of mania and depression on the pharmacokinetics of lithium. A longitudinal single-case study. *J Affect Disord*, 8: 159-166.

Leibenluft E, Ashman SB, Feldman-Naim S, Yonkers KA. Lack of relationship between menstrual cycle phase and mood in a sample of women with rapid cycling bipolar disorder. *Biol Psychiatry* 1999; 46: 577-580.

Luggin R, Bernsted B, Petersson B et al. (1984) Acute psychiatric admission related to the menstrual cycle. *Acta Psychiatr Scand*, 69: 461-465.

Matsunaga H, Sarai M (1993) Elevated serum LH and androgens in affective disorder related to the menstrual cycle: with reference to polycystic ovary syndrome. *Japan J Psychiatr Neurology*, 47: 825-842.

Mattisson C, Bogren M, Nettelbladh P et al. (2005) First incidence depression in the Lundby Study: a comparison of the two time periods 1947-1972 and 1972-1997. *J Affect Disord*, 87:151-60.

McKinnon LC, McKinnon PC, Thompson AD (1959) Lethal hazards of luteal phase of the menstrual cycle. *BMJ*, 1: 1015-1017.

Miller MN, Miller BE, Chinouth R et al. (2002) Increased premenstrual dosing of nefazadone relieves premenstrual magnification of depression. *Depress Anxiety*, 15: 48-51.

Pearlstein TB, Frank E, Rivera-Tovar A et al. (1990) Prevalence of axis I and II disorders in women with late luteal phase dysphoric disorder. *J Affect Disord*, 20: 129-134.

Pearlstein T, Stone AB (1998) Premenstrual syndrome. *Psychiat Clin N Am*, 21: 577-590.

Plouffe LJ, Stewart K, Craft KS et al. (1993) Diagnostic and treatment results from a southeastern academic center-based premenstrual syndrome clinic: the first year. *Am J Obstet Gynecol*, 169:295-303.

Price W, DiMarzio L (1986) Premenstrual tension syndrome in rapid-cycling bipolar affective disorder. *J Clin Psychiatry*, 47: 415-417.

Rasgon N, Bauer M, Glenn T et al. (2003) Menstrual cycle related mood changes in women with bipolar disorder. *Bipolar Disord*. 5:48-52.

Roy-Byrne PP, Rubinow DR, Hoban MC et al. (1986) Premenstrual change: a comparison of five populations. *Psychiatry Res*, 17: 77-85.

Rubinow DR, Roy-Byrne PP (1984) Premenstrual syndromes: overview from a methodological perspective. *Am J Psychiatry*, 141: 161-172.

Schenck CH, Mandell M, Lewis GM (1992) A case of monthly unipolar psychotic depression with suicide attempt by self-burning. *Compr Psychiatry*, 33: 353-356.

Schraufnagel CD, Brumback RA, Harper CR et al. (2001) Affective illness in children and adolescents: patterns of presentation in relation to pubertal maturation and family history. *J Child Neurol*, 16:553-61.

- Schnurr PP, Hurt SW, Stout AL (1994) Consequences of methodological decisions in the diagnosis of late luteal phase dysphoric disorder. *Premenstrual Dysphorias: Myths and Realities*. Gold JH, Severino SK (Ed). American Psychiatric Press, Washington D.C.
- Severino SK, Hurt SW, Shindledecker RD (1989) Spectral analysis of cyclic symptoms in luteal phase dysphoric disorder. *Am J Psychiatry*, 146: 1155-1160.
- Smith MJ, Schmidt PJ, Rubinow DR (2003) Operationalizing DSM-IV criteria for PMDD: selecting symptomatic and asymptomatic cycle for research. *J Psychiatr Res*, 37:75-83.
- Sothorn RB, Slover GP, Morris RW (1993) Circannual and menstrual rhythm characteristics in manic episodes and body temperature. *Biol Psychiatry*, 33:194-203.
- Targum SD, Caputo KP, Ball SK (1991) Menstrual cycle phase and psychiatric admissions. *J Affect Disord*, 22:49-53.
- Thin RNT (1968) Premenstrual symptoms in women who attempted suicide. *J R Army Med Corp*, 114: 136-139.
- Tonks CM, Rack PH, Rose MJ (1968) Attempted suicide and menstrual cycle. *J Psychosom Res*, 11:319-323.
- Trautman EC (1961) The suicidal act. *Arch Gen Psychiatry*, 5:98-105.
- Vanezis P (1990) Deaths in women of reproductive age and relationship with menstrual cycle phase: an autopsy study of cases reported to the coroner. *J Forensic Sci*, 47:39-57.
- Warner P, Bancroft J, Dixon A et al. (1991) The relationship between perimenstrual depressive mood and depressive illness. *J Affect Disord*, 23; 9-23.
- Wehr TA, Sack DA, Rosenthal NE et al. (1988) Rapid cycling affective disorder: contributing factors and treatment responses in 51 patients. *Am J Psychiatry*, 145:179-184.
- Wittchen HU, Becker E, Lieb R et al. (2002) Prevalence, incidence and stability of premenstrual dysphoric disorder in the community. *Psychol Med*, 32:119-132.
- World Health Organization (1996) Mental, behavioral and developmental disorders. *International Statistical Classification of Diseases and Related Health Problems*. Geneva: World Health Organization.
- Yonkers KA, White K (1992) Premenstrual exacerbation of depression: one process or two? *J Clin Psychiatry*, 53: 289-292.
- Yonkers KA, Halbreich U, Freeman E et al. (1997) Symptomatic improvement of premenstrual dysphoric disorder with sertraline treatment. *JAMA*, 278: 983-988.