



## Premenstrual dysphoric disorder and suicide attempts as a correlation among women in reproductive age



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### ARTICLE INFO

#### Keywords:

Menstrual cycle  
Premenstrual dysphoric disorder  
Premenstrual syndrome  
Sex hormones  
Suicide  
Attempted

### ABSTRACT

**Aim:** Women likely attempt suicide more than men and sex hormones or menstrual cycle may be associated with female suicide attempts. There are debates regarding the correlation of premenstrual dysphoric disorder (PMDD) and suicidal behaviors. The objective of this study was to examine if PMDD was associated with suicidal attempts as sex hormones are contributed in its pathogenesis.

**Methods:** As a case-control study 120 fertile woman with regular menstrual cycles attempting suicide and admitted to a general hospital were compared with a matched control group of 120 women selected among those accompanying other patients in other wards. Psychiatric interview based on DSM-5 criteria was conducted for diagnosing PMDD.

**Results:** There was a significantly higher frequency of PMDD in suicide attempters than in the controls ( $P = 0.001$ ); while no remarkable difference was seen in frequency of premenstrual syndrome (PMS) between the two groups ( $P = 0.294$ ) and attempting suicide was not related to the menstrual cycle ( $P = 0.52$ ).

**Conclusions:** This study suggests that PMDD may be associated with suicidal attempts, however it is not related to menstrual cycle. No relationship was found between PMS and suicidal acts.

### 1. Introduction

Suicide is a worldwide public health problem in all ages (Centers for Disease Control and Prevention NCFPaC, 2010). It is a complex phenomenon with biological, psychological, and social roots (Cayköylü et al., 2004). Studies have shown that the risk of suicide is specifically higher in patients with depression and other mood, anxiety, and substance abuse disorders (Nock et al., 2010; McLean et al., 2008). Women likely attempt suicide three times more than men (Nock et al., 2010), and some researchers have emphasized on the role of sex hormones or menstrual cycle in female suicide attempts (Centers for Disease Control and Prevention NCFPaC, 2010; Cayköylü et al., 2004; Nock et al., 2010). Although some studies reported a specific relationship between suicide attempts and menstrual follicular phase (Baca-Garcia et al., 2000; Fourestie et al., 1986), several other studies did not confirm this correlation (Mann et al., 1999; Vanezis, 1990). Hence, the association

between suicide attempts and menstrual cycles remains contravertial (Cayköylü et al., 2004).

Premenstrual dysphoric disorder (PMDD) is among the disorders secondary to sex hormone fluctuations at the end of the luteal phase. It presents with symptoms such as mood swings, anxiety, sleep disorders and fatigue (American Psychiatric Association, 1994; Khazaie et al., 2016). PMDD is the more severe form of premenstrual syndrome (PMS) which begins one week before menstruation and could interfere with women's work, school, usual social activities, or relationships with others. PMDD occurs in 3–8% of women and may cause remarkable function loss (Halbreich et al., 2003). Moreover, some studies have shown that 75–90% of women in the reproductive age suffer from some PMS symptoms (Barnhart et al., 1995), and its prevalence in the general population is estimated to be 8.9–19% (Barnhart et al., 1995; Angst et al., 2001; Duenas et al., 2011; Potter et al., 2009; Wittchen et al., 2002).

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A high prevalence of suicide has been reported in women with PMDD. Baca-Garcia et al. found that the prevalence of PMDD among hospitalized suicide attempters, was significantly higher than that of controls (Baca-Garcia et al., 2004). Moreover, Yonkers et al. showed a high prevalence of suicidal ideation among women with a ‘probable’ diagnosis of PMDD up to 24% (Yonkers et al., 2003). However, it seems that studies on the relationship between PMDD and suicide behavior are scarce (Pilver et al., 2013) or not confirmatory (Cayköylü et al., 2004). Further studies are still required on the association of increased suicide behavior and the luteal phase or the relationship between psychiatric disorders and women’s menstrual cycle. We aimed to assess the frequency of PMDD and PMS in women who have attempted suicide and compare the results with a control group to assess the relationship between suicide behaviors and PMDD. Gaining more insight about women’s behavioral changes during their menstrual cycle and their possible relationship with psychiatric disorders could help identify those women at risk of suicide in order to implement better preventive measures.

**2. Material and methods**

This case-control study was done during one year (2014–2015) on women admitted to a general hospital in Sanandaj in west of Iran, because of attempting suicide. We included women aged 13–40 (reproductive age) with regular menstrual cycles (28 ± 5 days). Women who used contraceptives or at the time of study, were unable to provide correct information regarding their menstrual cycles or symptoms of PMS and PMDD, were over 40 years of age, had psychotic or bipolar disorders, or were intellectually disabled were excluded from the study.

Considering initial estimations on the average number of women in the reproductive age to had attempted suicide and were admitted to the hospital per month (n = 10), the sample size was calculated to be 120 in each case and control group. The control group was selected among women accompanying other patients in other wards who were matched with respect to age and occupational status. The women in the control group did not have any history of suicide behaviors and were similar to the case group in other inclusion and exclusion criteria. Convenient sampling was used until the sample size was reached.

With the collaboration of the hospital’s Emergency team, the researchers were informed about all new cases of suicide in women irrespective of their type. After being reassured about the condition of the patient, they were interviewed and an informed consent was obtained from those who had the inclusion criteria. The patients were interviewed by a skilled psychiatrist and they were excluded if they had one or more of exclusion criteria. The control group was also interviewed and if similar disorders were observed, they were excluded from the study. In order to differentiate a planned suicide attempt from impulsive suicide, Participants were asked if they had ever made a plan for committing suicide or their attempt was merely the result of a sudden desire. A planned suicide was considered to be preceded by the presence of preparation or contemplation. The investigation was carried out in accordance with the latest version of the Declaration of Helsinki. The protocol of this study was approved by the Ethics Committee of Kurdistan University of Medical Sciences.

Demographic characteristics of the case and control groups were recorded anonymously. Moreover, data regarding their suicide behavior, underlying psychiatric disorders, and medical condition, were recorded based on clinical interviews. The diagnosis of PMDD and PMS were made based on a clinical interview by an experienced psychiatrist according to DSM-5. Ultimately, the collected information was compared between the case and control groups. Because we did not assess the daily ratings during at least two consecutive menstrual cycles prospectively, the diagnosis of PMDD in this study was considered “provisional”.

Data were analyzed using SPSS software, version 20. Frequency and percentage was calculated for descriptive variables. Pearson’s Chi-

**Table 1**  
Demographic characteristics of the case and control groups.

| Variable         | Group                       | Case Control P-value |                     |      |
|------------------|-----------------------------|----------------------|---------------------|------|
|                  |                             | Frequency (Percent)  | Frequency (Percent) |      |
| Age (yrs)        | 13–20                       | 44(36.7)             | 44(36.7)            | 0.99 |
|                  | 21–28                       | 36(30)               | 36(30)              |      |
|                  | 29–40                       | 40(33.3)             | 40(33.3)            |      |
| Education        | Diploma or less             | 99(82.5)             | 98(81.7)            | 0.63 |
|                  | Associate degree            | 4(3.3)               | 2(1.7)              |      |
|                  | Bachelor’s degree or higher | 17(14.2)             | 20(16.7)            |      |
| Marital status   | Single                      | 59(49.2)             | 54(45)              | 0.52 |
|                  | Married                     | 61(50.8)             | 66(55)              |      |
| Residential area | Urban                       | 101(84.2)            | 101(84.2)           | 0.99 |
|                  | Rural                       | 19(15.8)             | 19(15.8)            |      |

square or its equivalent from maximum likelihood ratio was used to assess the relationship between four independent variables and attempting suicide.

**3. Results**

In this study, 120 women who had attempted suicide were compared with 120 women who had not. Only one woman was excluded due to a history of bipolar disorder in patients with suicidal attempt. The two groups had no significant difference with respect to the demographic characteristics (Table 1). Because of some cultural limitations the economic status of participants was not precisely attainable. We found that most women (86.7%) had attempted suicide, using pills and suicide was not pre-planned in most of them (91.7%). 22% of the women had a history of suicidal attempt and 3% had a familial history of suicide behaviors (Table 2).

The frequency of PMDD in the case group was significantly higher than the control group (P = 0.001); while no significant difference was seen in frequency of PMS between the two groups with respect to the control group (P = 0.294) (Table 3).

Almost half of the women attempting suicide were in the follicular phase of their menstrual cycle and the other half were in their luteal phase, no significant difference was seen between the two groups in this regard (P = 0.52). Therefore, it seems that attempting suicide in the case group was not related to their menstrual cycle (Table 4).

**4. Discussion**

In this study, we aimed to assess the relationship between PMDD and suicide among 120 women aged 13–40 years who were admitted to Tohid Hospital, Sanandaj, Iran. The admitted women had regular menstrual cycles and did not used contraceptives. We found that PMDD

**Table 2**  
Suicide specifications in women with suicide attempt.

|                             | Characteristics of suicide | Frequency (Percent) | Chi-square | P value |
|-----------------------------|----------------------------|---------------------|------------|---------|
| Type of suicide             | Planned                    | 10(8.3)             | 83.33      | 0.000   |
|                             | Impulsive                  | 110(91.7)           |            |         |
| Suicide tool                | Drug                       | 104(86.7)           | 153.8      | 0.000   |
|                             | Poison                     | 10(8.3)             |            |         |
|                             | Other                      | 6(5)                |            |         |
| Suicide history             | Yes                        | 27(22.5)            | 36.3       | 0.000   |
|                             | No                         | 93(77.5)            |            |         |
| Familial history of suicide | Yes                        | 4(3.3)              | 104.5      | 0.000   |
|                             | No                         | 116(96.7)           |            |         |

**Table 3**  
Frequency of PMDD and PMS in the case and control groups.

| Disorder | Case<br>Frequency(Percent) | Control<br>Frequency(Percent) | Chi-square | P-value |
|----------|----------------------------|-------------------------------|------------|---------|
| PMDD     | 37(30.8)                   | 6(5)                          | 33.56      | 0.001   |
| PMS      | 48(40)                     | 45(37.5)                      | 2.45       | 0.294   |
| None     | 35(29.2)                   | 69(57.5)                      | 1.97       | 0.567   |

**Table 4**  
Comparison of menstrual phases in the case and control groups.

| phase      | Case<br>Frequency(Percent) | Control<br>Frequency(Percent) | Chi-square | P-value |
|------------|----------------------------|-------------------------------|------------|---------|
| Follicular | 57(47.5)                   | 62(51.7)                      | 0.41       | 0.52    |
| Luteal     | 63(52.5)                   | 58(48.3)                      |            |         |

was more frequent in women who had attempted suicide compared with the control group. However, no significant difference was found between the two groups with respect to PMS and suicide or being in the luteal or follicular phase and suicide.

Although studies on the relationship between PMDD and suicide are scarce, Pilver et al. (2013) in America, and Hong et al. (2012) in South Korea, found significant relationships between PMDD and suicide. The methodology of both studies was different from ours and the sample size included 3965 and 2499 women, respectively. The researchers initially screened the women for PMDD and then assessed the history of suicide attempts. Despite major differences in methodology, our results about the relationship between PMDD and suicide attempts are in line with the mentioned studies.

Regarding the possible relationship between PMDD and suicide, it seems that the serum levels of serotonin could be influential. Some studies have shown that women with PMDD have lower serum serotonin levels in the premenstrual phase and lower serotonin platelet reabsorption compared with women without PMDD (Saunders and Hawton, 2006; Taylor et al., 1984; Rapkin et al., 1987; Mann et al., 1990). Lower levels of serotonin are related to suicidal behavior (Mann et al., 1990; van Heeringen, 2001). On the other hand, other studies have emphasized on the role of estrogen and progesterone as a possible theory in depression and suicide attempts in women. Therefore, the interaction between estrogen and serotonergic system could be a possible cause of attempting suicide (Saunders and Hawton, 2006).

There is also evidence regarding the neuro-modulatory effects of estrogen and progesterone on the serotonergic system (Leibenluft et al., 1994; Linnoila et al., 1993; Malone et al., 1996; Rubinow et al., 1998). Estrogen and progesterone receptors have been found in different regions of the brain including serotonergic, dopaminergic, and noradrenergic neurons that could play a significant role in depression and suicide (Joffe and Cohen, 1998; Young et al., 2000). Although initial theories have emphasized on dysregulations in sexual steroids in PMS, further studies did not confirm any differences between progesterone levels in women with and without PMS (Walsh et al., 2015). Some researchers have found a progesterone metabolite which may contribute to the generation of the affective and physical symptoms of PMS through a different receptor (Rapkin et al., 1987).

Some studies have shown that women with PMS and PMDD could have impulsive-aggressive personality that is not related to a specific phase of the menstrual cycle. This means that women with PMS or PMDD who attempt suicide are more aggressive, impulsive, and hostile and have higher levels of mood instability (Ducasse et al., 2016). Since the participants in our study had attempted suicide impulsively without association to menstrual cycle, this theory could better justify suicide in our sample.

Moreover, in a study in Spain, the researchers compared 125 women who had attempted suicide with 83 women who had referred to

donate blood with respect to PMDD. They found that the frequency of PMDD was significantly higher in those who had attempted suicide (Yonkers et al., 2003). The methodology of their study was very similar to ours.

We found no relationship between suicide attempt in patients with PMDD and their menstrual phase. The results of previous studies on the relationship between menstrual cycle and suicide have been controversial. One study has reported a higher prevalence of suicide among women in the follicular phase (Centers for Disease Control and Prevention NCfPaC, 2010), while another reported a higher prevalence in the luteal phase (Saunders and Hawton, 2006). One study showed no such relationships between suicide and menstrual cycle (Yonkers et al., 2003). These differences could be attributed to non-homogeneity in dividing the phases in different studies (Saunders and Hawton, 2006). Moreover, it seems that methodological variations from sample selection to menstrual cycle evaluation have contributed to variations in the results of different studies.

This study had several limitations. According to the DSM-5, the diagnosis of PMDD is done by screening the symptoms in two consecutive menstrual cycles. However, since it was not possible to follow the patients, we performed the study in a retrospective manner based on the patient's self-report. Therefore, based on DSM-5 criteria, the word provisional PMDD must be used. Moreover, it was possible that the patients did not report their menstrual cycle status accurately because estimating the exact date of menstruation was done based on the patient's memory. Therefore, this date might not have been accurate considering the patient's stress or poisoning (in the case group) that could affect the memory. Furthermore, considering the methodology of the study, causal relationships could not be studied and since our sample were patients who had attempted suicide mostly by pills, they might not be a suitable representative of all patients who attempt suicide. Despite the limitations, this study provided data regarding plausible association between PMDD and suicide. However, no significant relationship was found between suicidal attempt and menstrual cycle. Eventually, considering the scarcity of studies and controversial results, studies with larger sample sizes with prospective designs based on the time criteria of the DSM should be performed.

## Funding

This work was supported by Kurdistan University of Medical Sciences.

## Disclosure statement

The authors declare no conflict of interest to disclose and this manuscript is based on the doctoral thesis of Mahsa Rashidi, who has graduated from Kurdistan University of Medical Sciences.

## Authors' contribution

Narges Shams-Alizadeh; Azad Maroufi; Fariba Farhadifar; Habibollah Khazaie: Concept and design of the research, writing the draft of the article, and final approval.

Mahsa Rashidi: Data gathering, critically revision of the article, and final approval.

Daem Roshani: Analysis and interpretation of data, critically revision of the article, and final approval.

## Acknowledgments

Kurdistan University of Medical Sciences provided the funding for the study. We are thankful to our colleagues in Tohid Hospital in Sanandaj that greatly assisted the research.

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