Women's Health: The Menstrual Cycle

Premenstrual Symptoms: Another Look

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Synopsis

A collection of over 200 symptoms has been labeled premenstrual syndrome. Common belief is that most women experience a marked increase in symptoms premenses.

Cyclic variations in the prevalence of commonly cited perimenstrual symptoms were estimated from daily symptom recording. A community-based, multiethnic sample of 345 women recorded symptom severity from "not present" to "extreme" for 90 days. Maximum total reported symptom score occurred during menses, not during premenses. When individual symptoms are considered, the prevalence of those rated as moderate to extreme during menses is less than 15 percent.

A method for identifying symptom severity patterns throughout the menstrual cycle is described. Six symptom severity patterns were identified. Only 13 percent of the women exhibited a pattern of increased symptom severity in the premenses. Another 13 percent had a pattern of decreased symptom severity in the premenses.

PERIMENSTRUAL SYMPTOMS (PS) occur immediately before and during menstruation and include irritability, mood swings, depression, tension, anxiety, fatigue, cramps, backache, weight gain, painful or tender breasts, and swelling. Although a collection of nearly 200 symptoms has been labeled premenstrual syndrome (PMS), these symptoms do not constitute a single syndrome, but occur in multiple symptom configurations of negative affects, water retention, and discomfort. Moreover, they are not confined to the premenstruum, but occur during menses as well. Thus perimenstrual is a more apt descriptor (*1–6*).

One of the most striking characteristics of PS is its variability, reflected both in the variety of symptoms women experience and in the large variation in the prevalence of these symptoms from one population to another (*7–12*). Although 30–50 percent of U.S. women experience mild or moderate symptoms, only 10–20 percent describe their symptoms as severe and disabling (*4*).

Despite extensive research on the etiology and treatment of PS, the mechanisms producing them remain unclear. Most etiological studies have focused on either a single biological or behavioral explanation for PS. Early work on PMS focused on the biological etiology of symptoms. Because menstrual function is associated with ovarian activity, investigators originally speculated that an imbalance in the production of estrogen and progesterone was the factor precipitating PS (*13*). Although this hypothesis has been widely accepted, there have been conflicting reports of ovarian steroid imbalance in the perimenstruum (*14–18*). Additional theories have been proposed based on hypotheses of biological excesses or deficiencies such as hyperaldosteronism, hyperprolactinemia, hypoglycemia, and vitamin and mineral deficiencies (*19–27*). Symptoms associated with these excesses and deficiencies are similar to those described as PMS. However, for every etiological theory proposed, there is an equally convincing argument against it (*17, 28-31*).

Another biological line of investigation has addressed autonomic nervous system (ANS) alterations that may account for PS. Some investigators found no menstrual cycle phase differences in catecholamine excretion (epinephine and norepinephine) in healthy women (*32*), or in skin conductance, heart rate, or respiratory rate (*33*), while others found higher levels of ANS arousal in the premenstrual phase as indicated by increased heart rate, respiration rate, and body temperature (*34*). Koeske (*35*) found a premenstrual increase in skin conductance levels which correlated with pre-

menstrual moods. Coyne (*36*) found a statistically significant rise in premenstrual frontalis muscle tension levels that was exaggerated in women who anticipated experiencing high levels of symptoms. When symptomatic women were studied, cortisol levels were elevated in the luteal phase (*37, 38*), but not above the normal range (*39*). Moreover, circadian hormone secretory profiles did not differ in women with PMS and asymptomatic women (*40*). Some investigators now suggest that PMS is a consequence of falling endorphin levels in the late luteal phase (*40*).

Another line of investigation has addressed the influence of the social environment on symptom occurrence. Theories related to socialization include those linking individual differences in expectations about menstruation to symptoms (*41*). Socialization in a traditional feminine role has been linked to menstrual symptoms in some studies (*42*), but not in others (*43, 44*). The influence of social stressors on symptoms has been demonstrated for major life events and daily stresses. Moreover, there is evidence for differential effects of stressors given the nature of symptoms, with the major effect seen on negative affects (*44*).

In controlled clinical trials of pharmacologic agents such as progesterone (*45*), antiprostaglandins (*46–48*), bromocriptine (*22, 49*), spironolactone (*29, 50*), pyridoxine (*51, 52*), magnesium (*21*), tryptophan (*51*), and gonadotropin-releasing hormone (*53*), medical treatment has been no more effective than placebo therapy. Approximately 40 percent of women respond favorably to inert placebo drugs.

Our early prevalence study (*4*) revealed that both biological and social factors were associated with PS. Parity and oral contraceptive use were associated with less severe cramping, whereas intrauterine device use was associated with more severe cramping. Women with long menstrual cycles and longer and heavier menstrual flows reported more severe PS, including water retention, cramps, and negative affects than did their counterparts with short cycles and less flow. Women who could accurately predict their next menses also had more symptoms of weight gain and backache. In general, older women and employed women reported less severe symptoms than younger women. Black women reported less severe cramping and premenstrual negative feelings but more weight gain, swelling, and headache than white women. Women exposed to stressful life circumstances, including major life events and daily stresses and who had few resources to deal with them (little formal education and low incomes), reported the most symptoms (*4, 44*).

Our earlier prevalence estimates relied on retrospective measures that required women to recall their symptom experiences over the most recent menstrual period. Our comparisons of retrospective and prospective measures revealed higher prevalence estimates for retrospective versus prospective reporting (*54*).

The purposes of this study were to

- Describe the prevalence of PS obtained from daily recordings in a multiethnic population.
- Describe the patterns of cycle phase change in symptom severity and their prevalence.

Method

Sampling. The sampling framework employed in this study involved multiple steps. First, census block groups (fractions of census tracts) in which 40 percent or more of the population reported an income between $12,900 and $39,900 were identified from the 1980 census data from King County, WA. Of those block groups meeting the initial income criterion (901), in only 119 were 10 percent or more of the population, Black or Asian. Profiles of the number of females between the ages of 15 and 59 years (these are the age bands employed in reporting census data) and the educational status (completion of more than elementary school) of each ethnic group were generated for each of the 119 block groups. The most suitable block groups from the standpoint of age, ethnicity, and educational groups were then identified by the research team. The street segments of the selected block groups were then identified and randomly ordered with a computer program. The numbers of the street segments within block groups provided the link between this initial set of criteria and a city directory from which all potential participants' telephone numbers were obtained.

Design. The hybrid design employed in this study involved cross-sectional, prospective, and retrospective elements. After households were screened to identify eligible women willing to participate in the study, participants completed an in-home interview and a 90–day health diary. After the women completed their diaries, some were asked to participate in a food diary component of the study. Following completion of the 90–day diary or the food diary, or both, all women were interviewed by telephone.

Measures. Perception of symptoms referred to the participants' daily rating of the presence and severity

Table 1. Percentage of 345 women with perimenstrual symptoms and positive feelings reported in daily diaries as moderate or extreme, premenstrual and menstrual

Symptoms	Premenses (days –1, –3)	Menses (days 1 and 3)
Abdominal pain, discomfort (other than cramps)	5.7	7.8
Anger	8.1	2.5
Anxiety	9.7	6.0
Awakening during the night	12.9	4.8
Backache	8.1	6.3
Bloating or swelling of the abdomen	10.1	8.5
Blurred or fuzzy vision	0.9	1.3
Bursts of energy or activity[1]	9.7	7.1
Confusion	4.3	0.9
Cramps—uterine or pelvic	0.9	8.2
Craving for specific foods or tastes	2.5	4.4
Craving for alcohol	6.2	0.0
Decreased appetite	5.0	4.8
Decreased food intake	6.5	4.8
Decreased sexual desire	5.3	4.7
Depression (feel sad or blue)	11.3	5.5
Desire to be alone	7.2	3.8
Diarrhea	2.2	2.2
Difficulty concentrating	3.1	2.6
Difficulty in getting to sleep	8.1	4.2
Difficulty making decisions	2.5	2.2
Dizziness or lightheadedness	6.9	1.2
Early morning awakening	9.1	7.4
Fatigue or tiredness	26.3	17.6
Feelings of guilt	3.4	3.5
Feelings of well-being[1]	47.2	28.5
Forgetfulness	0.6	0.3
General aches and pains	7.5	4.4
Headache	9.4	8.0
Hostility	3.4	0.9
Hot flashes or sweats	1.9	1.3
Impatient, intolerant	7.9	9.0
Impulsiveness	6.1	1.6
In control[1]	52.0	44.3
Increased activity[1]	17.6	8.3
Increased appetite	6.6	2.9
Increased food intake	7.9	3.2
Increased sensitivity to cold	7.2	2.8
Increased sexual desire[1]	10.4	3.9
Increased sleeping	7.0	6.4
Intentional self-injury	0.6	0.6
Irritable	8.2	3.2
Lonely	3.5	4.1
Lowered coordination or clumsiness	1.0	0.6
Lowered desire to talk or move	3.1	2.2
Nausea	1.3	0.7
Nervousness	2.9	0.9
Out of control	5.7	1.6
Painful or tender breasts	10.8	1.3
Rapid mood changes	5.4	1.6
Restlessness or jitteriness	5.1	3.2
Sensation of weight gain	14.3	8.9
Skin disorders	5.8	3.5
Suicidal ideas or thoughts	0.0	0.0
Swelling of hands or feet	5.7	2.9
Tearfulness, crying easily	5.7	2.6
Tension	9.0	5.4
Mean symptom score (maximum possible 208)	40.89 ± 35.82	52.52 ± 40.12
Mean positive score (maximum possible 20)	13.59 ± 9.97	12.33 ± 8.65

[1] Indicates positive feelings.

of symptoms from a 90–day health diary. The 57 items included in the health diary were generated from several sources, including the Moos Menstrual Distress Questionnaire (*3*), the Premenstrual Assessment Form (*2*), Woods and co-workers (*4*), and other literature. In addition to the symptoms, the participants recorded five descriptors of arousal and positive mood. Participants rated their experiences daily on a 0-4 scale, where 0 represented "not present" and 4 represented "extreme."

Results

The sample consisted of 103 Asian, 149 Black, 374 white, and 30 Native American and Hispanic women. They ranged in age from 18 to 45, with a mean age of 31.95 years (standard deviation (SD) = 6.83). They reported a mean educational level of 14.2 years (SD = 2.10) and a mean income range from $29,000 to $30,999. In this group of women, 75.9 percent reported some level of employment outside the home. At the time, 57.7 percent were married or partnered, 27.2 percent had never married, and 14.4 percent were divorced or separated.

Prevalence of perimenstrual symptoms. Of the 656 women who participated in the study, 448 (68 percent) returned a daily diary. Of these, 392 diaries included data spanning at least one menstrual cycle. Days with missing data were subtracted, leaving a total of 345 diaries to be used in calculating the prevalence of PS. The prevalence of PS and the positive feelings the women rated moderate or extreme for premenses (days –1 and –3) and menses (days 1 + 3) are reported in table 1, and the prevalence of the same symptoms during the postmenses and periovulatory phases is reported in table 2. Mean total symptom scores were lower in the premenses then during menses. Mean total positive feelings were higher in the premenses than during menses (table 1). The prevalence of symptoms and positive feelings rated as moderate or extreme for the postmenses days (–17 and –19) and ovulation days (–13 and –14) are given in table 2.

Symptom severity patterns. The total symptom severity score, obtained by summing the severity score for each negative symptom, peaked with menses. The total positive items were summed similarly, revealing a peak at ovulation (see chart). To identify symptom severity patterns across menstrual cycle phases, we calculated a total symptom severity score based on 40 negative symptoms commonly cited in the literature as increasing during premenses

Table 2. Percentage of 345 women with perimenstrual symptoms and positive feelings reported in daily diaries as moderate or extreme, postmenses and ovulatory phase

Symptoms	Premenses (days -1, -3)	Menses (days 1 and 3)	Symptoms	Postmenses (days -17, -19)	Ovulation (days -13.-14)
Abdominal pain, discomfort (other than cramps)	4.9	5.3	Hot flashes or sweats	3.6	1.9
Anger[1]	9.0	8.1	Impatient, intolerant[1]	6.1	6.9
Anxiety[1]	12.2	9.0	Impulsiveness[1]	3.2	4.0
Awakening during the night[1]	10.0	10.2	In control	57.4	55.5
Backache	5.5	6.2	Increased activity	16.9	14.6
Bloating or swelling of the abdomen[1]	1.9	3.1	Increased appetite[1]	6.2	7.8
Blurred or fuzzy vision	1.2	4.6	Increased food intake[1]	8.1	8.1
Bursts of energy or activity	11.6	14.3	Increased sensitivity to cold	2.3	4.4
Confusion[1]	3.2	3.7	Increased sexual desire	12.3	13.1
Cramps—uterine or pelvic	1.6	3.4	Increased sleeping[1]	7.7	9.0
Craving for specific foods or tastes[1]	6.4	5.6	Intentional self-injury[1]	0.0	0.0
Craving for alcohol	1.9	1.2	Irritable[1]	6.5	6.2
Decreased appetite[1]	5.5	7.4	Lonely[1]	8.4	5.0
Decreased food intake[1]	9.3	7.8	Lowered coordination or clumsiness[1]	0.6	2.2
Decreased sexual desire[1]	5.8	4.7	Lowered desire to talk or move[1]	3.9	5.1
Depression (feel sad or blue)[1]	12.3	10.3	Nausea	2.0	2.4
Desire to be alone[1]	5.8	5.0	Nervousness[1]	5.9	3.4
Diarrhea	2.5	2.5	Out of control[1]	4.9	5.6
Difficulty concentrating[1]	2.9	3.1	Painful or tender breasts[1]	0.3	1.6
Difficulty in getting to sleep[1]	7.8	7.7	Rapid mood changes[1]	3.2	4.4
Difficulty making decisions[1]	3.9	2.2	Restlessness or jitteriness[1]	3.2	5.7
Dizziness or lightheadedness[1]	2.3	2.8	Sensation of weight gain[1]	4.2	5.6
Early morning awakening[1]	9.1	11.8	Skin disorders	5.5	3.1
Fatigue or tiredness[1]	24.1	25.0	Suicidal ideas or thoughts[1]	0.3	0.0
Feelings of guilt[1]	4.5	5.6	Swelling of hands or feet[1]	2.3	2.5
Feelings of well-being	44.9	47.6	Tearfulness, crying easily[1]	5.5	3.7
Forgetfulness[1]	1.6	2.2	Tension[1]	11.0	7.9
General aches and pains	6.1	7.5	Mean symptom score (maximum possible 208)	34.96 ± 33.06	35.96 ± 35.29
Headache	12.4	9.6	Mean positive score (maximum possible 20)	14.21 ± 9.79	14.43 ± 9.93
Hostility[1]	3.9	5.4			

[1] Indicates positive feelings.

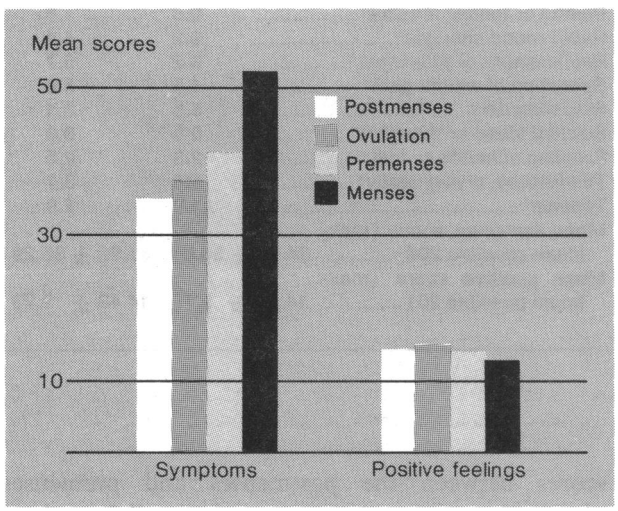
(table 2). Daily total symptom severity reported for the 40 items of interest was calculated for each of the first eligible 85 women to return diaries. Eligible women were those who returned two full cycles of data, were not on birth control pills, and who had cycle lengths within 3 days of each other. Symptom severity was calculated for days 4 through 10 postmenses and days -7 through -1 premenses. The means of the three most severely symptomatic days were calculated for both cycle phases. A group mean was then derived for each phase based on the individual means, resulting in a postmenses severity score of 10 (SD = 7.8) and a premenses severity score of 18 (SD = 11.9) (*55*). Thus, a high postmenses score was one that was 10 or greater, while a low postmenses score was less than 10. In a similar manner, a high premenses score was one that was 18 or above and a low premenses score was less than 18.

A cycle phase difference score was then calculated using the individual symptom severity difference scores between the postmenses and premenses phases; then a group mean was calculated from these individual cycle phase difference scores. A group mean of 7.7 and SD of 6.0 were obtained from these individual cycle phase difference scores. The mean and SD obtained from these calculations were then used to define a cycle phase difference in which symptom severity levels between cycle phases were at least 1 SD apart, that is, 0.5 SD above and 0.5 SD below the mean difference score of 7.7. Thus, in order to say that an adequate cycle phase difference existed, a woman had to demonstrate a difference in symptom severity level between her postmenses and premenses cycle phases of 10.7 or greater (which rounded to 11 or greater). The score of 10.7 represents three units or 0.5 SD of 6.0 above the group mean difference score of 7.7. To say that a cycle phase difference did not exist, and to be considered for one of the "control" or comparison groups, a difference of at least three units or 0.5 SD

Table 3. Cycle phase symptom severity patterns

Subgroup name	Postmenses severity	Premenses severity	Direction of change
No cycle phase difference:			
Low control	low	low	minimal change in symptom severity across menstrual cycle
High control	high	high	
Cycle phase difference:			
Low-high	low	high	increasing symptoms across the menstrual cycle
High-high	high	higher	
High-low	high	low	decreasing symptoms across the menstrual cycle
High-high-low	high	less high	

Mean scores of symptom severity scores and positive feelings by phases of the menstrual cycle



of 6.0 below the group mean of 7.7 was required, that is, a difference score of 4.7 or less (which rounded to 5.0). Thus, those women with a cycle phase difference score between 5 and 11 were not included in any of the symptom severity pattern groups because they did not demonstrate sufficient cycle phase difference in symptom severity level across menstrual cycle phases and too much cycle phase difference to qualify for one of the "control" groups (*55*).

These criteria of symptom severity level and cycle phase difference allowed us to identify six patterns of symptom severity and direction of change of symptoms over the menstrual cycle (table 3). These symptom severity patterns demonstrate that women with PS represent three underlying populations: those who have symptoms in both the postmenses and premenses phases, but do not experience an exacerbation of symptoms premenstrually; those who have symptoms in both phases with exacerbation premenstrually; and those who are asymptomatic during the postmenses phase but experience symptoms premenstrually.

The derived symptom severity pattern criteria were applied to the diary data of 342 women. They included all women who reported symptoms for the required days across one cycle, without regard to cycle length or use of birth control pills. In this group of women, 30 percent failed the cycle phase difference criteria or symptom severity criteria. Of the remaining 238 women, 64 percent exhibited no cycle phase difference, with 46 percent exhibiting low symptom severity across phases and 18 percent high severity across phases (table 4). Thirty-six percent of the group exhibited cycle phase changes, with 18 percent exhibiting greater symptom severity during the premenses phase. Only 8 percent exhibited the classic PMS pattern, that is, low severity during the postmenses phase and high severity during the premenses phase. Eighteen percent experienced lower symptom severity during the premenses phase than during the postmenses phase.

Discussion

The prevalence of PS in this population is consistent with our earlier estimates (*54*). Although the overall prevalence of PS has been projected to be higher, women who report moderately and extremely severe symptoms clearly constitute a minority of all women. When individual symptoms are considered, the prevalence of those rated as moderate or extreme

during premenses is about 13 percent. The most commonly experienced symptoms are fatigue (26.3 percent), sensation of weight gain (14.3 percent), awakening during the night (12.9 percent), depression (11.3 percent), painful or tender breasts (10.8 percent), and bloating (10.1 percent). Much more common are the positive feelings and experiences: in control (52 percent), feelings of well being (47.2 percent), and increased activity (17.6 percent).

The total symptom severity scores across postmenses, ovulation, premenses, and menses days reveal that women are most severely symptomatic during menses, not during premenses as is commonly assumed. This pattern is attributable not only to women's experiences of dysmenorrheic-like symptoms but also to symptoms of water retention and negative affects. These findings are in contrast to the claims that PS is characterized by an on-off pattern, dissipating with the onset of menses. Restricting our attention only to symptoms of negative feelings, we see the same pattern: symptoms peak at menses. Moreover, positive affects, which are highest at midcycle, are lower during menses than premenses.

Cycle phase differences in symptom severity calculated for individual women across one menstrual cycle revealed that only a small proportion of women experience a PMS-like symptom pattern. Contrary to popular belief, most women do not experience a significant cycle phase difference. A substantial proportion (13 percent) of women experienced heightened well being during the premenstruum. Moreover, many of the women who experienced increasing symptom severity premenses had severe symptoms postmenses, suggesting that this group is chronically distressed.

Further analyses contrasted symptom severity scores obtained through the telephone interviews for women who completed versus those who did not complete the daily diaries. Those who completed the diaries were similar to those who did not complete diaries with respect to education, income, and depression scores as measured by the CES-D scale (*56*). The two groups did not differ significantly in the proportion reporting moderate or extreme symptoms for either premenses or menses.

In summary, this study demonstrated a low prevalence of PS, with peak symptom severity for all women at menses rather than premenses. Individual analyses revealed three major symptom severity patterns, only one of which increased from postmenses to premenses.

Table 4. Percentage of women by symptom severity pattern

Subgroup name	*Number*	*Percent of total*	*Adjusted percent*
Cycle phase difference:			
Low-high	19	6	8
High-high	24	7	10
High-low	9	3	4
High-high-low	34	10	14
No cycle phase difference:			
Low control	110	32	46
High control	42	12	18
Failed cycle phase difference or severity criteria or both	104	30	0
Total	342	100	100

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