PREVALENCE AND PREDICTORS OF PREMENSTRUAL SYNDROME AMONG COLLEGE-AGED WOMEN IN SAUDI ARABIA

Parveen Rasheed, MBBS, MD; Latifa Saad Al-Sowielem, MBBS, FFCM

From the Department of Family & Community Medicine, College of Medicine, King Faisal University, Dammam, Saudi Arabia

**Background:** Research on risk factors for premenstrual syndrome (PMS) is lacking for the Gulf countries of the Middle East, a region with unique cultural features that might influence expectations and self-perception of the disease. We examined the association of PMS frequency with possible risk factors for the disease.

**Methods:** Using a self-report questionnaire, we surveyed all eligible young women (n=464) enrolled in the medical, nursing and medical technology/respiratory therapy educational programs at a university in Dammam. Women were asked about the frequency of symptoms during the previous six months. A stepwise multiple regression analysis was performed to determine which of several biopsychosocial and dietary factors influenced the premenstrual symptom score.

**Results:** At least one premenstrual symptom was experienced by 448 women (96.6%), and 176 (37.5%) had a high symptom severity score. Premenstrual symptom frequency was significantly associated with a maternal history of premenstrual syndrome, self-perception of mental stress, physical activity, consumption of sweet-tasting foods, and coffee, but these factors only explained 14% of the variability in the multiple regression model.

**Conclusions:** We recommend that women vulnerable to mental stress take advantage of relaxation techniques and psychotropic therapies. Moreover, women with PMS might eliminate sweet-tasting food and caffeine-containing beverages, particularly coffee, from their diet.

**Key Words:** Premenstrual syndrome, caffeinated beverages, cocoa-chocolate, physical exercise, mental stress, Saudi Arabia

Premenstrual syndrome (PMS) is a cyclical disorder involving behavioral, emotional and physical symptoms during the premenstrual phase. Its etiology remains controversial. Various hypothesis include biosocial and psychological causes, endocrinological dysfunctions, altered endorphin modulation of gonadotropic secretion, exercise habits, smoking, use of alcohol, altered transcapillary fluid balance, oral contraceptive use, and a diet high in beef, refined sugar products or caffeine containing beverages. Despite considerable research, the causes of PMS remain enigmatic and further study is needed to establish stronger evidence for putative risk factors.

Most research on PMS has been done in the West or Far East. To the authors’ knowledge, none has been reported from the Gulf countries of the Middle East. Cultural variations influence expectations and self-perception of disease phenomena as well as lifestyle. Cultural features in this part of the world include close-knit families in whom perceptions of health and disease have a sociological bearing. Though alcohol is not consumed for religious reasons and smoking is uncommon among women, diets rich in calories are popular, and a variety of caffeinated beverages ranging from coffee to cola drink are commonly consumed. Could these factors and others influence the occurrence of PMS? With this question in mind, the current study was undertaken to examine the association of PMS frequency with perceived stress in the daily routine of life, maternal history of PMS, a family history of depression or other mental illness, exercise habits, and consumption of beef, fiber-rich food, or sweet-tasting food items such as chocolates and deserts, intake of water and caffeine-containing beverages.

**Methods**

The study subjects were women enrolled at a university in Dammam (Saudi Arabia) who were pursuing nursing, medical laboratory technology and respiratory therapy educational programs. Out of a total of 488 women enrolled, 9 (1.8%) students had withdrawn from all courses for that year, 4 (0.8%) were...
not wish to participate. Women taking any hormonal medication or suffering from a major gynecological problem (1.6%) were also excluded from the study. The remaining 464 eligible students participated in the study, which was conducted during a one-week period in April 1999.

Data collection was done through a self-administered questionnaire. Students were provided with explanations to questions by a group of trained researchers. The questionnaire solicited information on personal characteristics of students such as age, marital status, program of study and grade level. Information was obtained for level of physical activity (none, daily housework for at least two hours, thrice weekly sessions of walking or aerobic/rhythmic exercises for at least 20 minutes or participation in sports). Inquiry was made for perceived mental stress in the daily routine of life (none, mild, moderate and severe), a maternal history of PMS and a family history of depression or other mental illness. The dietary history included intake of sweet-tasting food items such as chocolates, cakes, sweets, deserts (<1/week, 1-3 times/week, 4-7 times/week, twice/day, ≥ three times/day) beef (<1 times per week, 1-2 times per week, ≥ 3 times per week) and fiber-rich foods such as fruits, vegetables and whole wheat products (0-1/week, 2-4 times/week ≥5/week). Intake of water or caffeinated beverages was recorded as the number of cups (1 cup=6 oz) consumed per week. Participants indicated the type of caffeinated beverage consumed from a list that included cola drinks, tea, cocoa-chocolates and coffee, including the Arab coffee “Gahwa.” For frequent and regular consumers of caffeine-containing drugs, the estimates of the number of cups of a caffeine-containing beverage consumed per week were proportionately increased based on the caffeine content of the drug.

The women were asked whether they had experienced premenstrual symptoms during the last six months on three or more occasions. The questionnaire included an explicit explanation of the timing of the symptoms (one week prior to the onset of the menstrual period and generally ending a couple of days before periods or at the commencement of periods). A list of 13 symptoms plus the “other” symptom category was provided and respondents were asked to assess the severity for each symptom. A score of 1 was assigned to each symptom rated mild (daily activities not affected and no medication taken), a score of 2 was assigned to each symptom rated moderate (daily activities not affected but medication was taken) and a score of 3 was assigned to each symptom rated severe (daily activities were affected despite medication). The total premenstrual symptom score was calculated for each woman. The range of possible scores was 0 (no symptoms) to 42 (maximum of 14 severe symptoms). The total score was arbitrarily categorized by three levels: 0, 1-9, ≥10. Scoring was done for each of the qualitative independent variables such as marital status, physical activity, perceived mental stress, family history of depression/mental illness, maternal history of PMS, intake of beef, fiber-rich foods and sweet-tasting foods. The quantitative independent variables included age, water intake, and caffeinated beverages per week.

**Data Analysis**

The total premenstrual symptom score was the dependant variable. Initially, the distribution of independent variables by premenstrual symptom score was determined and a univariate analysis of data was done. A stepwise multiple regression analysis was then done to determine which of the independent variables exerted a significant influence on the premenstrual symptom score while others were held constant. A P value of less than 0.05 was considered significant. Data were analyzed using SPSS.

**Results**

The age of the women ranged from 17 to 27 years with a mean (±SD) of 20.3±1.8 years. A majority were Saudi (95%) and not married (93.5%). More than half of the women (55.5%) were enrolled in the medical program, 25.6% in the nursing and 19.1% in the medical technology/respiratory therapy programs. Of the 464 eligible women, 448 (96.6%) experienced at least one premenstrual symptom during the last six months. The premenstrual symptom scores ranged from 0 to 33. Of the 464 women, 16 (3.4%) had a premenstrual score of 0 (no symptoms), 272 (58.6%) had a premenstrual symptom score of 1 to 9 and 176 (37.9%) had a premenstrual symptom score from 10 to 33. A large proportion of women having a premenstrual symptom score from 1 to 9 reported all their symptoms as mild (64%) whereas few women in this group reported all their symptoms as severe (5.1%). On the other hand, for women with premenstrual symptom scores from 10 to 33, only 2.2% had mild symptoms and 82.6% had severe symptoms.

A univariate analysis of the data between the premenstrual symptom score and the independent demographic variables of age, marital status, and study program or grade level showed no significant association. However, a maternal history of PMS exerted a significant influence on the occurrence of premenstrual symptoms in daughters. More women
(45.4%) whose mothers suffered from PMS had high premenstrual symptom scores (10-33) than women (33%) whose mothers did not suffer from PMS ($P < 0.01$). Among women with low scores (0-9), more had a negative than positive maternal history (Table 1, Figure 1). Self-perception of mental stress in the daily routine of life was also closely associated with premenstrual symptom frequency (Figure 2). Among students with high premenstrual symptom scores (10-33), more reported moderate to severe mental stress (48.1%) than no or mild stress (32.5%) ($P < 0.01$). Family history of depression or mental illness showed that high premenstrual symptom severity was more common in women with a positive history (46.9%) than those who did not have such a history (36.8%), but the results did not reach the significant level ($P > 0.05$). While intake of ‘Gahwa’ (Arabian coffee) showed no significant influence on the premenstrual symptom score in our study.

In model 1 of the multiple regression analysis, the total weekly intake in cups of caffeinated beverages consumed by each woman was one of the independent variables. Its relationship with the premenstrual symptom score was studied along with the other independent variables. In model 2, each caffeinated drink was analyzed as a separate independent variable and along with the other variables. In model 1, self-reported mental stress, a history of maternal PMS, physical activity, intake of sweet-tasting food items and total caffeinated beverages explained 14% of the variation in the premenstrual symptom score. Each variable exerted a significant, positive, and independent influence on symptom severity when other variables were held constant. Being married, a family history of psychiatric illness and intake of water were not significantly related to premenstrual symptom frequency in this study. In model 2 of the analysis, a similar observation was made for the association between premenstrual symptom severity and the independent variables (other than the total caffeinated beverages) as in Model 1. Among the caffeinated beverages, consumption of coffee and cocoa-chocolate drinks was found to be significantly associated with premenstrual symptom frequency ($P < 0.05$). While intake of ‘Gahwa’ (Arabian coffee) showed a positive association with premenstrual symptom score at the 1% level, the influence of other caffeinated drinks such as tea and cola was insignificant ($P > 0.05$).

### Table 1: Distribution of women according to premenstrual (PM) symptom scores and maternal history of premenstrual syndrome, self-reported mental stress, physical activity, and intake of certain foods and caffeinated drinks.

<table>
<thead>
<tr>
<th>PM symptom score</th>
<th>Maternal history (PMS)*</th>
<th>Mental stress*</th>
<th>Physical activity</th>
<th>Sweet-tasting food items*</th>
<th>Beef*</th>
<th>Fiber-rich** food*</th>
<th>Coffee* (cups/week)</th>
<th>Cocoa-chocolate** (cups/week)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>Mild</td>
<td>Mod/serv</td>
<td>Yes</td>
<td>No</td>
<td>2-3/ day</td>
<td>3/ day</td>
</tr>
<tr>
<td>0-9</td>
<td>187</td>
<td>101</td>
<td>204</td>
<td>84</td>
<td>161</td>
<td>127</td>
<td>278</td>
<td>10</td>
</tr>
<tr>
<td>n=288</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-33</td>
<td>67.0</td>
<td>54.6</td>
<td>67.5</td>
<td>51.9</td>
<td>69.4</td>
<td>54.7</td>
<td>62.9</td>
<td>38.5</td>
</tr>
<tr>
<td>n=176</td>
<td>33</td>
<td>25.4</td>
<td>32.5</td>
<td>48.1</td>
<td>30.6</td>
<td>45.3</td>
<td>36.5</td>
<td>61.5</td>
</tr>
<tr>
<td>Total</td>
<td>279</td>
<td>185</td>
<td>302</td>
<td>162</td>
<td>232</td>
<td>232</td>
<td>438</td>
<td>26</td>
</tr>
<tr>
<td>n=464</td>
<td>60.1</td>
<td>39.9</td>
<td>65.1</td>
<td>34.9</td>
<td>50</td>
<td>50</td>
<td>94.4</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Percentages in bold
Figure 1. Distribution of women by premenstrual symptom score and maternal history of premenstrual syndrome.

Figure 2. Distribution of women by premenstrual symptom score and self-reported mental stress.

Figure 3. Distribution of women by premenstrual symptom score and physical activity.

Figure 4. Distribution of women by premenstrual symptom score and intake of sweet-tasting food items.

Figure 5. Distribution of women by premenstrual symptom score and intake of beef.

Figure 6. Distribution of women by premenstrual symptoms score and intake of fiber-rich foods.

Figure 7. Distribution of women by premenstrual symptom score and intake of coffee.

Figure 8. Distribution of women by premenstrual symptom score and intake of cocoa-chocolate drinks.
Discussion

The proportion of women in our study reporting at least one premenstrual symptom during the last six months (96.6%) is in line with several other population-based, retrospective studies conducted in young women. Several series have also reported that premenstrual syndrome is more common among young, urban literate women, especially among those involved in professional studies, than older, rural and illiterate women. This may be related to an increased level of perception and reporting of these symptoms in this group. A review of published data on premenstrual syndrome has shown that retrospective, self-report studies generally show a much higher prevalence of the condition than in prospective studies linking specific symptoms with the menstrual cycle. Though the superiority of prospective versus retrospective studies in diagnosing premenstrual syndrome is established, the inherent difficulties in conducting such research over large samples of population is obvious. What is important to note is that premenstrual syndrome remains a clinical entity of great significance in medical practice due to its common occurrence and its symptomatic polymorphism. In 25-35% of women it is a worrisome problem that requires specialized consultation and in 5-10% it becomes grave due to the extension or seriousness of symptoms. Hence it is necessary to identify women who are functionally affected and manage them so as to improve their quality of life.

Our findings of a significant positive association between premenstrual symptom severity and a history of maternal PMS are similar to those of Freeman et al for women in the USA. Moreover, Wilson et al observed that PMS mother/daughter dyads experienced significantly more and severe luteal phase symptoms compared to non-PMS mother/daughter dyads. Shared biological and or psychological factors, which may influence expectations and self-perceptions, may explain mother-daughter dyads. Support for a familial connection related to genetic and environmental factors was provided by Kendler et al in a population-based twin study.

Our results agree with other studies showing that perceived stress in daily life influences the occurrence of PMS. Some women are more vulnerable to stress than others and are more likely to be victims of PMS. Deuster et al observed that PMS was 3.7 times more common in women with perceived stress than in those with no stress. Moreover, Gannon and colleagues found that chronic stress accounted for a significant amount of variance in premenstrual syndrome. According to the biopsychosocial model, predisposition to PMS is realized as a consequence of biological and genetic influences by which attitudes, beliefs, coping styles and social forces interact to stress women. These findings suggest the need for intervention strategies to cope with stress as they may prove to be effective in ameliorating luteal phase symptoms.

There have been anecdotal accounts and unsystematic reports in the past suggesting that women who exercise experience fewer premenstrual symptoms than sedentary women. Recent studies have reported variable results. Deuster et al found that women with PMS were 2.9 times more likely to be physically active than women without PMS. Choi and Salmon found that competitive sportswomen are not protected from deterioration of mood during the premenstrual period unlike other women who exercise frequently and are protected to some extent. Others have reported that the amount (and not the intensity) of aerobic exercise was significantly associated with lower water retention, autonomic reactions and appetite. Aerobic exercise seems to have more beneficial effect on premenstrual symptoms than anaerobic exercise, especially with respect to premenstrual depression. Carefully controlled prospective studies of 3 to 6 months duration have shown that conditioning exercises carried out by either formerly sedentary or marathon runners significantly decreased premenstrual symptoms related to breast, fluid retention, personal stress, depression and anxiety. Another study found that the menstrual cycle and physical exercise had an independent effect on the emotional state of women. Our study showed that women with a higher premenstrual symptom score were exercising more than those with lower premenstrual symptom scores, but it is difficult to tell from our data whether exercise was a cause or a response to their symptoms. Further studies are needed locally to see whether women with PMS exercise more regularly than those without PMS because of the belief that exercise is effective in attenuating symptoms.

Our findings of a significant and independent increase in PMS symptoms with intake of sweet-tasting foods are in agreement with the observations of Rossingal and Bonlander who found this association even when they controlled for beverages high in caffeine content. This points to the need for educating PMS sufferers on curtailing these dietary items. Several studies have observed a strong association between caffeine and caffeine-containing beverages and PMS. Phillis has suggested that the depressive action of adenosine on central neurons is the mechanism by which caffeine might cause PMS.
Research conducted on medical students and the general population has shown that caffeine in general, causes or exacerbates symptoms of anxiety or depression and increases these symptoms during the premenstrual period. Our study also showed a significant, positive and independent effect on premenstrual symptom severity by total intake of caffeinated beverages in general, and caffeinated coffee and cocoa-chocolate drinks in particular. The observed effects of tea, ‘Gahwa’ (Arabian coffee) and cola drinks did not reach significant levels possibly due to a lower dose effect of caffeine per cup for these beverages compared to coffee. As per standard values, one cup (5-6 oz) of caffeinated coffee usually has 60-85 mg of caffeine while that for tea and cola drinks is reported to be 20-30 mg and 18 mg per cup, respectively. The caffeine content for “Gahwa,” a very mild coffee drink that is popular in the Middle East, has not been reported in the scientific literature. Cocoa drinks may contain 6 to 142 mg of caffeine, depending on the amount of cocoa powder added per cup. Contrary to our findings, Rossingnol and colleagues reported a strong positive relationship between tea consumption and PMS. A possible explanation for this discrepancy is that many of their subjects were tea factory workers who were consuming up to 8 cups of tea per day whereas 97% of our study population drank ≤2 cups of tea per day.

One is often faced with the question of whether women with premenstrual syndrome self-medicate themselves with caffeine in response to symptoms and thereby exacerbate symptoms. While one prospective study investigating the relationship of caffeine intake with PMS found that women do self-medicate themselves with caffeine during the premenstrual period, another case-control study showed no variation in the amount of caffeine consumed in the pre- or post menstrual period.

While an association between caffeine intake and PMS is plausible, more studies are required to establish whether caffeine consumption is a cause or a response to PMS. Some authors have suggested that the observed association between caffeine-containing beverages and PMS is that the consumption of these beverages is related to intake of large quantities of fluid, which per se may increase the frequency premenstrual symptoms. One of the limitations of our study is that we did not estimate the effects of total fluid intake on PMS. Others who have studied this relationship have found it difficult to ascertain a causal relationship. It is believed that the mechanism is either related to a perceived increase in fluid retention or instability of vascular regulation in women with PMS.

The multiple regression analysis showed that self-reported mental stress, history of maternal PMS, physical activity, frequent intake of sweet-tasting food items and caffeinated beverages explained only 14% of the variation in the premenstrual symptom score. Various studies have suggested other putative causes: hormonal imbalance, dietary deficiencies, high-fat foods, tobacco use and psycho-social disorders, none of which were investigated by us. No single theory has been established to explain the entire diversity of PMS symptomatology. More explanatory research is required to unravel the etiological factors of PMS and its pathophysiological mechanism. The findings of the current study could be generalized to young Saudi women who are urban and literate. Our data lend support to the concept that a differential response to daily stresses is an important aspect of the severity of PMS. It would be worthwhile to suggest to women with PMS that they take advantage of the beneficial effects of relaxation techniques and psychotropic therapies. Moreover, as others have also suggested, women with PMS might also consider eliminating sweet-tasting food items and caffeinated-containing beverages, particularly coffee, from their diet.

References

1. Deuster PA, Ader T, South-Paul J. Biological, social and behavioral factors associated with premenstrual syndrome. Arch Fam Med. 1999;8:122-128.
12. Rossingnol AM, Bonnlander H. Prevalence and severity of the premenstrual syndrome. Effects of foods and beverages that are