

## Short Report

## Factors associated with premenstrual syndrome of emergency nurse: A multicenter study in China

Yiqian Chen<sup>a,b,1</sup>, Xin Yang<sup>a,\*</sup>, Xiaodan Li<sup>a,1,\*</sup>, Xiaoting Wei<sup>a</sup>, Lianhua Bai<sup>a</sup><sup>a</sup> Department of Obstetrics and Gynecology, Peking University People's Hospital, Beijing, China<sup>b</sup> Peking University School of Nursing, Beijing, China

## ARTICLE INFO

**Keywords:**  
Premenstrual syndrome  
Emergency department  
Nurse

## ABSTRACT

**Objective:** To study the factors associated with premenstrual syndrome (PMS) in emergency department (ED) nurses.

**Methods:** A multicenter cross-sectional study was conducted in female ED nurses in China. Data gathering questionnaires included the Daily Record of Severity of Problems, Chinese Nurses Stressor Scale, Social Support Rating Scale, and Self-Rating Anxiety Scale. All questionnaires were used to assess the symptoms prospectively over 2 months.

**Results:** A total of 289 ED nurses were recruited. The incidence of PMS was 67.47%. The most common symptoms were tiredness (76.90%), anger (76.90%), restlessness (75.40%), snoring (69.20%). Univariate analysis showed that the BMI and occupational stress score was significantly higher, and the age was significantly younger in the PMS group compared with the non-PMS group. According to the multiple linear regression, the symptoms of PMS were positively associated with the occupational stress score and anxiety score, and negatively with the level of education received.

**Conclusions:** occupational stress, anxiety, and education level may associated with the occurrence of PMS in ED nurses.

## 1. Introduction

Premenstrual syndrome (PMS) refers to a symptom complex in which women repeatedly experience physical, mental and behavioral changes that affect their daily life and work during the premenstrual phase. Although PMS is widely recognized as a type of disease, there remains a lack of uniform diagnostic criteria. Currently, the commonly used diagnostic criteria of PMS include the John Bancroft diagnostic criteria,<sup>1</sup> American College of Obstetrics and Gynecology (ACOG) recommended criteria,<sup>2</sup> the Fifth edition of Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-5),<sup>3</sup> and so on. Because of the different populations studied and diagnosis used, the incidence reported in different studies was also different. An epidemiological survey in Switzerland showed that 91% of participants suffered from at least one

symptom before the start of menstruation, and 10.3% were diagnosed with PMS.<sup>4</sup> In a survey among 6 Chinese cities,<sup>5</sup> for 18–45 age groups, the incidence of PMS was 21.1%. PMS has a serious impact on women's health and life in childbearing age. The exact mechanism of PMS is unclear, but possible causes include changes in hormones, stress levels and lifestyle habits.

Occupational stress occurs when occupational demands force people to make changes that deviate from normal functioning, which will lead to health and safety challenges. Nursing practice in the emergency department (ED) involves managing and nursing patients who will encounter kinds of stressful situations. This will lead to physical and mental distress in healthcare. Some have reported that PMS was a common menstrual problem in nurses and more than half of them feel discomfort at work.<sup>6</sup> This study's purpose was to assess the prevalence of PMS and the

\* Corresponding author. Department of Obstetrics and Gynecology, No. 11 Xizhimen South Street, Xicheng District, Beijing, China.

E-mail addresses: [xinyang\\_2003@sina.com](mailto:xinyang_2003@sina.com) (X. Yang), [lixiaodan6390@163.com](mailto:lixiaodan6390@163.com) (X. Li).<sup>1</sup> Xiaodan Li and Yiqian Chen contributed equally to this manuscript and should be regarded as co-first authors.

frequency and severity of premenstrual symptoms in ED nurses. We attempted to find out and analyze the influencing factors of PMS, especially its correlations with occupational stress and anxiety.

## 2. Methods

### 2.1. Design and sample

This is a multicenter cross-sectional study using a cluster sampling method. From February to June 2019, PMS related factors were investigated in ED nurses in Beijing, Guangdong, Jilin, Heilongjiang, Jiangsu, and Gansu in China. The eligible criteria for the PMS were as follows: (1) regular menstrual cycles; (2) the Daily Record of Severity of Problems (DRSP) questionnaire score was 50 or more; The DRSP score less than 50 was categorized as the non-PMS group. The excluded criteria were as follows: (1) were pregnant; (2) were in menopause; (3) had given birth within 1 year; (4) had a history of gynecological inflammation, hysterectomy or bilateral oophorectomy, mastopathy or cancer, diabetes or any other systemic diseases; (5) were not willing to participate in the study; and (6) psychiatric diagnosed in the past 2 years.

The sample size was calculated according to the incidence of PMS. In this study, the formula is  $N = 400Q/P$ , ( $P$  was selected as 60%,  $Q = 1 - P$ ), and the sample size is calculated as 270. Assuming 20% losses, the sample size should be 324. The study was anonymous, and each participant agreed and signed an informed consent form before the study started.

### 2.2. Assessment indicators and scales

The study was approved by the Clinical Research Ethics Committee. Participants were asked to record data daily for two consecutive menstrual cycles using the Daily Record of Severity of Problems (DRSP) questionnaire, with menarche as the first day. At the same time, three other scales included the Chinese Nurses Stressor Scale (CNSS), Social Support Rating Scale (SSRS),<sup>8</sup> and Self-Rating Anxiety Scale (SAS).<sup>9</sup> In addition, we also collected the following information from each participant: age, education level, body mass index (BMI), menstrual cycle, and dysmenorrhea.

#### 2.2.1. Daily Record of Severity of Problems (DRSP) questionnaire

The questionnaire was developed by Endicott with the aim of identifying women with premenstrual syndrome. It is a simple screening tool that was translated into Chinese, and the Chinese version of the DRSP has demonstrated adequate content validity and satisfactory reliability.<sup>10</sup> It consists of 24 items that assess psychological, behavioral and physical symptoms. The internal consistency coefficient of the two period DRSP scores was 0.95. The items of the scale are classified into six levels of severity, ranging from “no change” to “extreme change”.<sup>11</sup>

#### 2.2.2. Chinese Nurses Stressor Scale (CNSS)

CNSS was assessed by experts in the field of nursing in China, Thailand and the United States. It has 35 items, which were divided into 5 dimensions, including nursing professional and working problems, time allocation and workload issues, working environment and equipment problems, issues in patient care, management and interpersonal relationship problems. The stress was rated on a 4-point Likert scale (1 = never, 2 = seldom, 3 = sometimes, 4 = often). The higher the score, the higher the stress. The internal consistency coefficient of reliability for the total score was 0.98.<sup>8</sup> We used the CNSS scale to evaluate the occupational stress of ED nurses in this study.

#### 2.2.3. Social Support Rating Scale (SSRS)

The SSRS contains 10 items, and the higher the participant's score, the stronger the social support. The test-retest reliability of the scale exceeded 0.92. The SSRS has high reliability and validity and has been widely used in the Chinese population.<sup>8</sup> The SSRS was used to investigate the social support of ED nurses in this study.

#### 2.2.4. Self-Rating Anxiety Scale (SAS)

The SAS is used to evaluate anxiety levels and contains 20 items, whose responses vary from 1 (little or no time) to 4 (most or all of the time). A higher score reflects a higher level of anxiety. The Cronbach's alpha of the SAS ranged from 0.72 to 0.81 among the Chinese population.<sup>9</sup>

### 2.3. Data analysis

SPSS (version 20.0) software was used to perform the statistical analyses. Means and standard deviations are used for demographic variables. Absolute values and percentages for categorical variables. To compare the study groups, *t*-test and Chi square test were used. The stepwise method (0.1 for entering and 0.05 for removal) in multiple linear regressions was used to evaluate the association in PMS and other factors. The *P* value < 0.05 was considered statistically significant.

## 3. Results

### 3.1. Participants

Of the 343 participants involved in the investigation, 33 of them were withdrawn from the study, and the other 21 participants did not finish all questionnaires. A total of 289 participants finished the study and completed the self-report questionnaire completely. One hundred and ninety-five participants had DRSP scores of 50 or more, and met the diagnosis of PMS according to ACOG recommendations. The incidence of PMS was 67.47%, and other 84 participants were divided into non-PMS group. Characteristics of the participants are shown in Table 1. The average age of PMS group was younger than non-PMS ( $31.27 \pm 5.74$  vs  $35.23 \pm 31.69$  year old), the BMI of PMS group was higher than non-PMS ( $23.38 \pm 5.88$  vs  $21.91 \pm 3.67$ ), the incidence of moderate and severe dysmenorrhea of PMS group was higher than that of non-PMS group (32.80% vs 12.80%; 5.10% vs 1.10%, respectively), the difference were statistically significant ( $P < 0.05$ ). With regard to professional title, the incidence of PMS in nurse assistant and nurse was higher (25.1% vs 17.00%, 50.80% vs 48.90%), suggesting that the newly employed nurses might face greater occupational stress. In addition, the PMS group had a higher occupational stress score compared with the non-PMS group ( $69.65 \pm 14.62$  vs  $54.70 \pm 12.07$ ), there was a significant difference ( $P < 0.05$ ). However, no significant difference was observed in smoking or other characteristics.

### 3.2. Premenstrual syndrome related symptoms

Fig. 1 shows DRSP total symptoms in the premenstrual phase. Symptoms of anger or irritability accounted for 76.90%; drowsiness or tiredness accounted for 76.90%; anxiety, or nervousness accounted for 75.40%; drowsiness or snoring accounted for 69.20%; “inattention”, “reduced interest in normal activities”, “more sensitive than rejection, or more vulnerable”, “emotional instability”, “feeling depressed”, and “sad” accounted for 60%–67.7%; “feeling depressed, and there is no way to overcome it” and “increased appetite or excessive diet” accounted for about 50%; “feeling useless or blaming self” accounted for 31.8%; “feeling desperate” accounted for 33.3% other symptoms accounted for about 40%–50%. See Fig. 1 for all details.

### 3.3. Multiple factor analysis for premenstrual syndrome

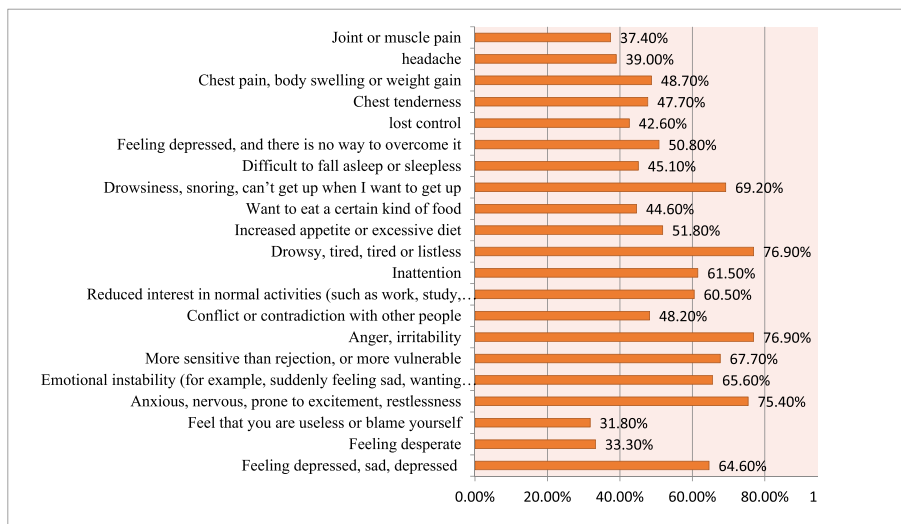
As revealed by the multiple linear regression test, occupational stress, anxiety and education level were three independent factors influencing premenstrual syndrome in ED nurses. The symptoms of PMS were positively associated with the occupational stress score and anxiety score, and negatively with the level of education received. Participants with higher education level were less likely to develop PMS, suggesting that people with higher education level are more concerned about their physical state. (Table 2).

**Table 1**  
Basic information and comparison between the two groups.

Variable	All (n = 289)	PMS ( n = 195 )	Non-PMS(n = 84)	P
	X ± SD/n(%)	X ± SD/n(%)	X ± SD/n(%)	
Age (y)	32.56 ± 18.71	31.27 ± 5.74	35.23 ± 31.69	0.028
BMI (kg/m2)	22.88 ± 5.25	23.38 ± 5.88	21.91 ± 3.67	0.005
Menstrual Cycle (d)	30.13 ± 5.22	29.88 ± 6.54	30.06 ± 4.02	0.094
Menstruation (d)	5.62 ± 1.50	5.69 ± 1.56	5.49 ± 1.36	0.090
Smoking				0.297
Yes	5 (1.73)	3 (1.54)	2 (2.38)	
No	284 (98.27)	192 (98.46)	82 (97.62)	
Menstrual Flow				0.927
Little	27 (9.30)	24 (12.30)	3 (3.20)	
Moderate	213 (73.70)	133 (68.20)	80 (85.10)	
A lot	49 (17.00)	38 (19.50)	11 (11.70)	
Dysmenorrhea				<0.001
None	76 (26.30)	41 (21.00)	35 (37.20)	
Slight	126 (43.60)	80 (41.00)	46 (48.90)	
Moderate	76 (26.30)	64 (32.80)	12 (12.80)	
Severe	11 (3.80)	10 (5.10)	1 (1.10)	
Working years (y)	9.42 ± 6.48	9.47 ± 6.37	10.32 ± 7.21	0.241
Professional title				0.027
Nurse assistant	65 (22.50)	49 (25.10)	16 (17.00)	
Nurse	145 (50.20)	99 (50.80)	46 (48.90)	
Supervisor	66 (22.80)	42 (21.50)	24 (25.50)	
Deputy chief nurse	11 (3.80)	5 (2.60)	6 (6.40)	
Chief nurse	2 (0.70)	0	2 (2.10)	
Education				0.312
Vocational	2 (0.70)	1 (0.50)	1 (1.10)	
Junior college	82 (28.40)	60 (30.80)	22 (23.40)	
Undergraduate and above	205 (70.90)	134 (68.70)	71 (75.50)	
Occupational stress <sup>a</sup>	65.67 ± 14.97	69.65 ± 14.62	54.70 ± 12.07	0.010
Anxiety <sup>b</sup>	39.14 ± 8.70	42.06 ± 8.00	33.10 ± 6.79	0.529
Social support <sup>c</sup>	38.10 ± 8.75	36.93 ± 8.97	40.51 ± 7.76	0.098

BMI, body mass index; PMS, premenstrual syndrome.

- <sup>a</sup> According to the Chinese Nurses Stressor Scale.
- <sup>b</sup> According to the Self-Rating Anxiety Scale.
- <sup>c</sup> According to the Social Support Rating Scale.



**Fig. 1.** Percentage of daily record of severity of problems scores in each item (According to the Daily Record of Severity of Problems questionnaire).

**4. Discussion**

This multicenter study investigated the characteristics and the effect factors of PMS in ED nurses in China. Participants were asked to record detailed information about PMS symptoms over two menstrual cycles. The ACOG recommends the daily record of the severity of problems for the diagnosis of PMS.<sup>12</sup>

PMS has neither specific symptoms that can be taken as the criteria to make diagnosis, nor special laboratory diagnostic indicators. The prevalence of PMS can vary due to different evaluation methods adopted by different researchers.<sup>4</sup> Besides, there are various measurement tools available for PMS. Among them, DRSP is considered a valid and reliable tool for the diagnosis of PMS.<sup>10</sup> The results of the study showed that the prevalence of PMS in ED nurses who met the diagnosis of PMS according to ACOG

**Table 2**  
Results of multiple linear stepwise regression.

Independent	B	S.E.	$\beta$	t	P
Occupational stress <sup>a</sup>	0.347	0.094	0.353	3.702	< 0.001
Anxiety <sup>b</sup>	0.907	0.183	0.353	4.949	< 0.001
Education	-6.788	2.576	-0.176	-2.635	0.009

<sup>a</sup> According to the Chinese Nurses Stressor Scale.

<sup>b</sup> According to the Self-Rating Anxiety Scale.

recommendations was 67.47%, which was higher than previously reported in ordinary people, but consistent with Li's studies (2014), which reported that up to 60% of nurses of fertile age had PMS.<sup>6</sup> In some studies and surveys, there are also some differences in the frequency of premenstrual symptoms. In our study the most frequent symptoms were tiredness (76.90%), anger (76.90%), anxious or nervousness (75.40%); and drowsiness or snoring (69.20%), which was similar to reported findings among adolescents.<sup>7</sup> In the study of QIAO (2012), the most common symptoms reported were irritability (91.21%), breast tenderness (77.62%), depression (68.31%), abdominal bloating (63.70%) and angry outbursts (59.62%).

PMS often occurs in high-stress female populations.<sup>13</sup> Prolonged stress will lead to neuroendocrine system disorders and PMS. At present, the pathogenesis of PMS is not clear. It has been suggested that PMS is related to multifactorial etiology. Some researchers have shown that personality and the environment are important factors for the occurrence of PMS.<sup>14</sup> Work stress in the ED is associated with sickness absence and high staff turnover. And negative lifestyle behaviors could lead to PMS. In this study, several factors related with PMS have been reported, including occupation stress, education, and anxiety, which are consistent with previous research.<sup>15</sup> Stress is related to poor health and career outcomes. Furthermore, acute exposure to occupational stress can lead to sleep disturbance and gastrointestinal distress. All this will contribute to emotional, behavioral, and physical changes several days before the start of menstruation. We found that the stress of nurses in ED will aggravate the symptoms of PMS. However, due to the particularity of the working environment, it is inevitable for ED nurses to come under occupational stress. Currently, there are a number of treatments applicable for PMS, including those methods used to alleviate stress, such as keep on a healthy diet, doing regular exercise to improve abnormal hormone secretion, and engaging in such psychological intervention as decompression therapy.<sup>16</sup> In severe cases, anti-anxiety drugs and contraceptives can be provided.<sup>17</sup> In addition, there is evidence suggesting that acupressure and acupuncture may contribute to reducing PMS symptoms and improving the quality of life for patients.<sup>18</sup>

## 5. Conclusions

The incidence of PMS in ED nurses was 67.47. The most frequent symptoms were anger, irritability, drowsy, tiredness, anxious, nervousness, and prone to excitement. These symptoms are related to occupational stress. Occupational stress is the main factor leading to the occurrence of PMS. Nursing managers should take measures to reduce occupational stress and then reduce the incidence of PMS in ED nurses.

## Ethics approval

Ethical approval was obtained from the Clinical Research Ethics Committee of the Peking University People's Hospital.

## Consent to participate

All participants in this study agreed to participate.

## Consent for publication

All authors consented to the content and publication.

## CRediT authorship contribution statement

LX: data analysis ; a preliminary draft. CY : data analysis ; a preliminary draft. YX : review and revise the preliminary draft; providing support and guidance for this study.WX&BL: data gathering

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgment

We thank the health professionals who participated in this survey and thank the hospitals providing us.

## References

- Rapkin AJ, Akopians AL. Pathophysiology of premenstrual syndrome and premenstrual dysphoric disorder. *Menopause Int.* 2012;18(2):52–59. <https://doi.org/10.1258/mi.2012.012014>.
- Ziomkiewicz A, Pawlowski B, Ellison PT, et al. Higher luteal progesterone is associated with low levels of premenstrual aggressive behavior and fatigue. *Biol Psychol.* 2012;91(3):376–382. <https://doi.org/10.1016/j.biopsycho.2012.08.001>.
- Jarvis CI, Lynch AM, Morin AK. Management strategies for premenstrual syndrome/premenstrual Dysphoric Disorder. *Women's Health.* 2008;42(7):967–978. <https://doi.org/10.1345/aph.1K673>.
- Tschudin S, Berteau PC, Zemp E. Prevalence and predictors of premenstrual syndrome and premenstrual dysphoric disorder in a population-based sample. *Arch. Womens Ment. Health.* 2010;13(6):485–494. <https://doi.org/10.1007/s00737-010-0165-3>.
- Qiao M, Zhang H, Liu H, et al. Prevalence of premenstrual syndrome and premenstrual dysphoric disorder in a population-based sample in China. *Eur J Obstet Gynecol Reprod Biol.* 2012;162(1):83–86. <https://doi.org/10.1016/j.ejogrb.2012.01.017>.
- Li XD, Lu H, Yang X, et al. Study on relations between job stress and premenstrual syndrome among Chinese nurses. *Chin. J. Clin. Obstet. Gynecol.* 2014;15(5):430–432. <https://doi.org/10.13390/j.issn.1672-1861.2014.05.013>.
- Ranjbaran M, Omani Samani R, Almasi-Hashiani A, et al. Prevalence of premenstrual syndrome in Iran: a systematic review and meta-analysis. *Int. J. Reprod. BioMe.* 2017; 15(11):679–686. <https://doi.org/10.29252/ijrm.15.11.679>.
- Zhou K, Li H, Wei X, et al. Reliability and validity of the multidimensional scale of perceived social support in Chinese mainland patients with methadone maintenance treatment. *Compr Psychiatr.* 2015;60:182–188. <https://doi.org/10.1016/j.comppsy.2015.03.007>.
- Zung WW. A Rating instrument for anxiety disorders. *Psychosomatics.* 1971;6(12): 371–379. [https://doi.org/10.1016/S0033-3182\(71\)71479-0](https://doi.org/10.1016/S0033-3182(71)71479-0).
- Endicott J, Nee J, Harrison W. Daily record of severity of problems (DRSP): reliability and validity. *Arch. Womens Ment. Health.* 2006;9(1):41–49. <https://doi.org/10.1007/s00737-005-0103-y>.
- Borenstein JE, Dean BB, Yonkers KA, et al. Using the daily record of severity of problems as a screening instrument for premenstrual syndrome. *Obstet Gynecol.* 2007; 109(5):1068–1075. <https://doi.org/10.1097/01.AOG.0000259920.73000.3b>.
- Gao L, Chan SW, Mao Q. Depression, perceived stress, and social support among first-time Chinese mothers and fathers in the postpartum period. *Res Nurs Health.* 2009; 32(1):50–58. <https://doi.org/10.1002/nur.20306>.
- Buddhabunyakan N, Kaewrudee S, Chongsomchai C, et al. Premenstrual syndrome (PMS) among high school students. *Int. J. Womens Health.* 2017;9:501–505. <https://doi.org/10.2147/IJWH.S140679>.
- Rad M, Sabzevari M, Dehnavi Z. Factors associated with premenstrual syndrome in female high school students. *J Educ Health Promot.* 2018;7(1):64. [https://doi.org/10.4103/jehp.jehp\\_126\\_17](https://doi.org/10.4103/jehp.jehp_126_17).
- Tadakawa M, Takeda T, Monma Y, et al. The prevalence and risk factors of school absenteeism due to premenstrual disorders in Japanese high school students—a school-based cross-sectional study. *Biospsychosoc Med.* 2016;10(1):13. <https://doi.org/10.1186/s13030-016-0067-3>.
- Mingzhou G, Dongmei G, Jieqiong W. Progress in psychology of premenstrual syndrome. *J Med Postgra.* 2018;31(9). <https://doi.org/10.16571/j.cnki.1008-8199.2018.09.016>.
- Heying H, Bing L, Han Y. Premenstrual syndrome. *Chin Prac J Rural Doctor.* 2020; 27(9). <https://doi.org/10.3969/j.issn.1672-7185.2020.09.005>.
- Armour M, Ee CC, Hao J, et al. Acupuncture and acupressure for premenstrual syndrome. *Cochrane Database Syst Rev.* 2018;8(8):CD005290. <https://doi.org/10.1002/14651858.CD005290.pub2>.