

Prevalence of premenstrual syndrome and related factors among nurses

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Abstract

Objective: Premenstrual syndrome (PMS) is a common condition among women during their menstrual cycle. PMS can negatively affect a woman's daily life and function. Nurses, as an important and substantial segment of healthcare staff, are affected by the demanding environment of work place. Since PMS, as a prevalent counterproductive condition, has not been studied in this population in Iran, we assessed the prevalence of PMS and its associated factors among nurses aged 23 to 49 in teaching hospitals of the Tehran province of Iran.

Material and Methods: In this cross-sectional study from April 2021 to January 2022, 280 participants from teaching hospitals were enrolled. Simple random sampling was used to determine the sample size of the study. Two validated questionnaires and a data gathering sheet were used to collect information. The premenstrual symptoms screening tool was used to determine PMS severity and the Copenhagen Psychosocial Questionnaire to evaluate the associated job demands. Demographic data and work-related data included: night shift, shift type, monthly COVID-19 care and gynecologic and past medical history were gathered. Then data were analyzed using logistic regression analysis, chi-square and t-test.

Results: The severity of PMS was: mild (42.5%); moderate (30%); and severe (27.5%). Regular menstruation and dysmenorrhea were reported by 84.6% and 72.3%, respectively. Moderate to severe PMS was associated with: monthly COVID shift ($p=0.02$); emotional ($p<0.01$) and quantitative ($p<0.01$) demands; regular caffeine intake ($p=0.01$); education level ($p=0.005$); regular exercise ($p=0.003$); regular fiber intake ($p=0.08$); and irregular menstrual cycles ($p=0.007$). In logistic regression only quantitative ($p=0.003$) and emotional ($p=0.018$) job demands were significant.

Conclusion: Results showed that the prevalence of PMS was high among Iranian nurses and was associated with quantitative and emotional job demands. We suggest further studies focusing on preventative and effective interventions to diminish the consequences of PMS in this population. We also suggest investigating the practical application of the findings of this study for healthcare professionals and policymakers. (J Turk Ger Gynecol Assoc 2024; 25: 74-80)

Keywords: Premenstrual syndrome, nurses, job demands, occupational stressor

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Introduction

Premenstrual syndrome (PMS) and premenstrual dysphoric disorder (PMDD) are common conditions that are characterized by associated physical and psychological symptoms, which occur during the luteal phase of an individual's menstrual cycle, and have a significant impact on a woman's functionality (1). PMDD and PMS resolve after menstruation without any

necessary intervention (2). The physical symptoms usually include a variety of pains, such as headaches, abdominal pains, mastalgia, and back pain, and nausea or constipation are also reported to be prevalent (3). The psychological symptoms, which may severely interfere with routine daily functioning, include anxiety, mood changes, anger, depression, agitation, restlessness, and sleep problems or insomnia (4). Although various risk factors and etiologies have been suggested for



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PMS/PMDD, the precise pathophysiology of these syndromes is not completely understood. Genetic susceptibility has also been suggested as a possible explanation for these disorders and some studies have found a significant association between the *estrogen receptor alpha 1 (ESR1)* gene and PMS (5-7). Other risk factors include obesity, smoking, and pre-existing anxiety disorder (8).

The prevalence of PMS has been estimated to be more than 50% among menstruating women (1). A systematic review and meta-analysis reported the prevalence of PMS to be 47.8% with an increasing trend from 1996 to 2011. The lowest prevalence was in France (12%) and the highest was in Iran (98%) (9). In a more recent study it has also been reported that the worldwide prevalence of PMS is 47.8% (10) of which 20% suffer from such severe symptoms that they interfere with daily routines while the remainder experienced mild to moderate symptoms (11). However, based on a recent systematic review and meta-analysis in Iran, the prevalence of PMS varied from 30% to 99% (12). Further epidemiological studies should investigate the global and national prevalence of this syndrome.

PMS as a major health problem impacts the ability of affected nurses to perform their normal roles and may compromise the outcome and safety of patient care (13). Women form a large proportion of healthcare staff in Iran and most work as nurses. Thus, PMS may have a major impact on the functioning of the Iranian healthcare system.

Studies in Korea have shown that PMS prevalence was 36.1% in adolescents and 38.1% in women of childbearing age (14), while its prevalence was 98.1% to 100% in female college students (15). In a study by Tsai et al. (16) on a population of female employee in Taiwan, the prevalence of the symptoms of PMS was reported to be 24% for fatigue, 21.2% for headache and 17.4% for abdominal bloating. In some studies it has been reported that PMS is mostly affecting female university students (11) and this observation is supported reported prevalence rates in Turkey of 72.1% to 91.8% (17), Japan at 79% (18), and Egypt at 65% (19).

Nurses have a critical role in healthcare provision in any healthcare system. Certain conditions, such as a high workload or stressful working environment and their crucial responsibilities may negatively affect their general health and job satisfaction (20). As there are few studies investigating the prevalence of PMS and its associated factors among nurses, the present study aimed to investigate the prevalence of PMS among nurses and its associated factors in Iran.

Material and Methods

The research questions for the present study were:

- How are quantitative and emotional demands associated with the severity of PMS among nurses?

- Are lifestyle factors, such as regular exercise, caffeine intake, and fiber intake related to the occurrence and severity of PMS in nurses?

- Is there a relationship between monthly shifts and the prevalence and severity of PMS?

- Are background disease history and regular menstruation related to PMS?

In this cross-sectional study, participants from teaching hospitals in Tehran province of Iran were included and the study period was from April 2021 to January 2022. Simple random sampling was used and to determine the sample size, the formula of was used. Our sample is the known universe. The inclusion criteria were: being a serving nurse and being aged between 23 and 49 years. Participants who were older than 49 years old, were pregnant, used hormonal drugs or had any underlying psychological disorder were excluded from this study.

Two validated questionnaires were used to gather data. We also used a data-gathering sheet for information regarding demographic characteristics (age, marital status, socioeconomic status, physical activity, daily habits such as smoking, coffee intake frequency, and other dietary habits). Past medical history included any psychological disorders and all chronic diseases. Work related data included: day or night shift, shift type, monthly COVID-19 shift. Gynecologic data included: menarche age, regular menstruation cycle, dysmenorrhea, menstruation duration and using contraception. The first validated questionnaire used was the premenstrual symptoms screening tool (PSST) questionnaire, developed by Steiner et al. (21). This was validated in Persian by Hariri et al. (22) with a Cronbach's alpha coefficient of 0.93, content validity by Content Validity Ratio and Content Validity Index of 0.7 and 0.8, respectively, showing it was suitable for use in an Iranian female population. The PSST evaluates premenstrual clinical symptoms and their severity a week before menstruation and disappearance after it. PSST comprises two separate domains. The first domain has 14 items regarding the psychological, physical, and behavioral aspects of PMS while the second domain with five items, focuses on functionality and social and family connections of the subjects. The items are rated on a four-point scale (not at all: 0, mild: 1, moderate: 2, severe: 3).

The job demand domain from the medium version of the Copenhagen Psychosocial Questionnaire (COPSOQ) was used to determine occupational stressors (23,24). The Persian version COPSOQ was previously validated by Arsalani et al. (25) with a Cronbach's alpha and intraclass correlation coefficient of 0.60 and 0.70 respectively, and also proved to be applicable for work situation studies such as studies on nurses. This job demand domain has five scales include: quantitative (4 questions), emotional (3 questions), demand

to conceal emotion (2 questions), cognitive (4 questions), and sensorial demands (4 questions). The score of the domain is calculated by adding the scores of scales. A higher score indicates more unfavorable psychosocial conditions in the work place.

Ethical Consideration

All ethical considerations have been addressed to respect the rights and dignity of the studied population. Participants joined the research voluntarily and signed an informed consent prior to data gathering and were free to leave the study. Anonymity and confidentiality were ensured. The Ethics Committee of Tehran University of Medical Sciences approved this study (approval number: IR.TUMS.MEDICINE.REC.1399.681, date: 28.10.2020).

Statistical analysis

Data was analyzed using IBM SPSS for Windows, version 24.0 (IBM Corp., Armonk, NY, USA). Due to the high prevalence of PMS among the participants in this study, we divided the participants into two groups; a) those with mild and b) those with moderate to severe symptoms. The categorical and numerical variables were reported using descriptive statistics. The association of different variables was evaluated using t-test and chi-square test. A p-value less than 0.05 was considered statistically significant. All the variables were normally distributed.

For comparison between a qualitative variable (PMS) and quantitative variables, we have used an Independent sample t-test was performed initially, followed by regression analysis. Similarly, for comparison of the relationship between PMS severity and qualitative variables, a chi-square analysis was performed.

For the final assessment of variables showing significance by Independent samples t-test, logistic regression was performed.

Results

Demographic characteristics and COPSOQ score

A total of 323 individuals were eligible for the study but after exclusions, the study population numbered 280. The mean \pm standard deviation age and body mass index (BMI) of 280 participants were 33.42 ± 7.42 years and 24.6 ± 3.51 kg/m², among which 42.5%, 30%, and 27.5% suffered from mild, moderate, or severe PMS, respectively. Having a regular caffeine intake ($p=0.01$), having a Master's degree rather than a Bachelor degree ($p=0.005$), and poor dietary fiber consumption ($p=0.048$) were associated with PMS severity, but other demographic variables listed in Table 1, 2 did not show association with PMS prevalence and PMS severity. Emotional and quantitative demands from job demands variables

(COPSOQ questionnaire) were associated with PMS and PMS severity ($p=0.001$) (Table 1).

Health- and work-related characteristics

Irregular menstruation cycle was associated with higher rates of moderate to severe PMS ($p=0.007$). Nurses that didn't exercise regularly reported more severe PMS ($p=0.003$). Monthly COVID shift was associated with PMS severity, such that moderate to severe PMS cases had more shift months dealing with patients suffering from COVID-19 ($p=0.02$). Other health- and work-related characteristics of participants are summarized in Table 2 and showed no significant difference regarding PMS severity (Table 2).

Job demands

Based on logistic regression analysis (Table 3) quantitative/workload demand and emotional demand were significantly associated with PMS severity. Severe PMS was associated with higher workload [$p=0.003$, odds ratio (OR): 1.06], and emotional demands ($p=0.018$, OR: 1.04), but sensorial demands and cognitive demands did not show any association with PMS severity.

Discussion

PMS has a complex pathophysiology that has not yet been fully understood. PMS is believed to be caused by the action of progesterone on some neurotransmitters, such as catecholamine, serotonin, opioids and gamma-aminobutyric acid. Another situation that may lead to PMS is when serotonin is less than the optimal level and then the sensitivity to progesterone is increased. Other conditions that are believed to have roles in PMS occurrence are increased prolactin level, increased sensitivity to the effect of prolactin, alterations in the metabolism of glucose, abnormal function of the hypothalamic-pituitary-adrenal axis, insulin resistance, some nutritional and electrolyte deficiencies and genetic tendencies. In addition, stress can trigger the activity of the sympathetic nervous system which results in intense uterine contractions, causing menstrual pain (11).

The results of the present study showed that more than 42.5% of nurses in the teaching hospitals included in the study suffered from mild PMS and 57.5% suffered from moderate or severe PMS. In logistic regression analysis, PMS severity was significantly associated with irregular menses, higher education level, having to undertake COVID-19 shifts, higher workload and emotional job demands. In a study on female knitting workers, it was reported that stress menstrual disorders may be a result of high stress levels, resulting in disturbed hormone homeostasis with low testosterone levels, and high follicle stimulating hormone and estradiol 2 levels (26).

Table 1. Comparing the relationship between PMS severity and different quantitative variables and mean values obtained from assessment of psychosocial job demand domain and its scales of Copenhagen questionnaire and PMS severity

Variable	Mild (mean \pm SD)	Moderate to severe (mean \pm SD)	p-value
COVID shift/months	16.44\pm8.84	20.25\pm10.97	0.02
Income	7.27 \pm 2.21	6.96 \pm 1.89	0.23
Age	32.88 \pm 7.46	33.84 \pm 7.38	0.28
BMI	24.38 \pm 3.36	24.91 \pm 3.61	0.21
Age of menarche	13.53 \pm 1.78	13.31 \pm 1.59	0.31
Menstrual duration	6.39 \pm 1.42	6.21 \pm 1.41	0.33
Emotional demands	47.86 \pm 18.24	62.01 \pm 19.09	<0.01
Cognitive demand	63.04 \pm 19.15	66.25 \pm 18.18	0.16
Quantitative demand	49.13 \pm 20.00	65.14 \pm 18.68	<0.01
Sensorial demands	79.96 \pm 17.68	80.43 \pm 16.90	0.82

PMS: Premenstrual syndrome, SD: Standard deviation, BMI: Body mass index, COVID: Coronavirus

Table 2. Comparing the relationship between PMS severity and different qualitative variables

Variables	Class	Mild, n (%)	Moderate to severe, n (%)	p-value OR (CI, 95%)
Marital status	Single	51 (43.2)	67 (56.8)	0.83 1.05 (0.65-1.70)
	Married	68 (42.00)	94 (58.00)	
Regular caffeine intake	No	78 (49.40)	80 (50.60)	0.01 1.90 (1.16-3.10)
	Yes	42 (33.90)	80 (66.10)	
Education	Bachelor	119 (45.40)	138 (54.60)	0.005 4.36 (1.45-13.07)
	Master	2 (16.0)	21 (84.0)	
Regular exercise	No	84 (38.00)	137 (62.00)	0.003 0.42 (0.23-0.75)
	Yes	35 (59.30)	24 (40.70)	
Dietary fiber intake	No	12 (28.60)	30 (71.40)	0.048 0.49 (0.23-1.00)
	Yes	107 (45.00)	131 (55.00)	
Meat consumption	No	17 (35.60)	29 (64.4)	0.29 0.70 (0.36-1.36)
	Yes	103 (44.00)	131 (56.00)	
Regular menstruation	Yes	108 (46.1)	127 (53.90)	0.007 0.36 (0.17-0.77)
	No	11 (23.80)	34 (76.20)	
Dysmenorrhea	Yes	82 (40.20)	121 (58.80)	0.20 1.41 (0.82-2.40)
	No	38 (48.70)	39 (51.30)	
Prevention	Yes	37 (44.00)	47 (56.00)	0.76 0.92 (0.54-1.55)
	No	74 (42.00)	102 (58.00)	
Disease hx.	Yes	11 (28.20)	29 (71.80)	0.050 2.07 (0.98-4.37)
	No	108 (45.00)	132 (55.00)	
Shift type	Fixed (%)	34 (38.90)	51 (61.10)	0.68 0.89 (0.51-1.55)

PMS: Premenstrual syndrome, OR: Odds ratio, CI: Confidence interval, Disease hx.: Positive disease history

Table 3. Multiple logistic regression modeling (other variables were also included in this model)

Variable	B	p-value	OR	95% CI for OR	
				Lower	Upper
Emotional demand	0.046	0.018	1.04	1.008	1.08
Workload demand	0.065	0.003	1.06	1.58	18.52
Monthly COVID shift	0.05	0.06	1.05	0.99	1.11
Regular menstruation	-1.62	0.06	0.19	0.03	1.1
Disease history	1.6	0.07	4.96	0.87	28

R²: 42%, OR: Odds ratio, CI: Confidence interval, COVID: Coronavirus

In contrast, variables such as income, age, BMI, age of menarche, menstrual duration, cognitive demand, and sensorial demands did not show significant differences between the two PMS severity groups in the present study.

According to a study of nursing students in Turkey, the prevalence of PMS was about 36% among the 250 students enrolled in the study compared to 100% prevalence of PMS in our study (27). This remarkable difference has been observed in other studies as well. A meta-analysis conducted on the prevalence of PMS, showed that Iran has the highest prevalence of PMS, globally, with a prevalence of 98% (7). However, in the aforementioned meta-analysis, only one study from Iran was included in the meta-analysis and thus, this number could be an overestimation of the prevalence of PMS in Iran. Based on several studies on different populations of women, the prevalence of PMS among Iranian population is estimated to be approximately 50 to 80% (28,29). The prevalence is particularly high in healthcare providers and is strongly associated with quality of life and social relationships in Iran (30). A study of work-related quality of life in nurses in Turkey found that PMS was associated with reduced quality of life (13). The result of our study is in concordance with previous studies in this regard. A review of the literature showed that precise estimation of the prevalence of PMS and PMDD at the national level in Iran is not available. Considering the importance of this syndrome and its impact on daily activities, quality of life, and social life, it is recommended that future studies should determine the prevalence of this PMS/PMDD by conducting nation-wide surveys.

The present study showed that there was a significant relationship between regular physical activity and the severity of PMS. Similar results have been reported in other studies. According to the latest systematic review and meta-analysis of the effects of physical activity on PMS in 2020, exercise has been shown to improve physical symptoms, such as pain, constipation, breast tenderness, and psychological symptoms such as anxiety and anger. Although exercise does not affect other symptoms and has more of a soothing role, it can be concluded that exercise can be recommended as a possible

intervention to reduce the severity of PMS symptoms. However, there is no guidance regarding the duration and intervals between episodes of physical activity and its effect on PMS (3). Our study found no significant association between marital status and PMS severity. However in another study on the relation between the lifestyle of Jordanian females and PMS, marital status was found to have association with PMS in a way that psychological symptoms were higher with marital status while behavioral symptoms were lower with it (31).

Furthermore, education level demonstrated a significant association with PMS severity, suggesting a strong association between higher education and moderate to severe PMS. This finding was in line with another study on female workers in a psychiatric hospital in which higher education level was associated with more PMS symptoms (32).

In addition, dietary fiber intake was found to be significantly associated with PMS severity, showing a potential protective effect against moderate to severe PMS. In another study the duration of PMS symptoms was reported to be reduced by low fat and high-fiber diets (33).

Other variables such as meat consumption, dysmenorrhea, prevention, and shift type did not show significant associations with PMS severity.

In the present study, no association was found between PMS and either age or BMI. A similar study on the prevalence of PMS among operating room technicians found similar results (34). Of the 112 technicians in the study, 57% had severe or moderate PMS and 43% had mild symptoms. No significant association was found between ages or BMI. According to the results of this study, the prevalence of PMS was lower among technicians with regular physical activity and less stress. In the present study there was a significant association between PMS severity and caffeine consumption, so that taking caffeine regularly increased severity of PMS. A similar study was performed on a population of nurses in Thailand, in which the prevalence of PMS was higher in the nurses who consumed more than one cup containing caffeine a day. However, among these variables, only caffeine consumption was significantly associated with PMS (35). Other studies have not reported

an association between caffeine consumption and PMS (36). Further research is needed to determine the relationship between caffeine consumption and its possible effect on the prevalence and severity of PMS.

The results of the present study showed that there was a significant association between irregular menstruation and PMS severity. Our results are in line with a similar study from Japan, in which logistic regression analysis revealed that stress scores, heavy menstrual bleeding, and dysmenorrhea were significant predictors of PMS symptoms (37). The results showed that psychosocial stress was independently related to PMS and the experience of irregular menstrual cycles. These authors suggested that stress was the most important factor in increasing the risk of PMS, dysmenorrhea, and irregular menstrual cycle.

Severity of PMS was significantly associated with emotional and workload needs in our study. Sex hormones, such as estrogen, progesterone and testosterone have significant effects on the brain, behavior and cognitive function. However, it is still unclear whether any identified cognitive impairments are attributed to the negative experiences of mood and psychological symptoms or are a direct consequence of hormonal dysregulation. There is a dearth of published evidence regarding cognitive function during the menstrual cycle (38). However, the existing literature using robust methodologies does not appear to show significant effects of the menstrual cycle on cognitive function. Besides, menstrual cycle fluctuations may be too transient to reveal significant findings (38).

The monthly COVID shift was associated with PMS severity, such that nurses reporting moderate to severe PMS had more shift months. This finding is in line with the results from other studies in which PMS was associated with shift working due to sleep quality and sleep time variability (39), which could result from a disrupted circadian rhythm (40).

In the present study, disease history encompassing every chronic disease, was shown to have the potential to impact PMS. Previous research has also demonstrated that underlying diseases, such as diabetes mellitus, hypertension, renal disease, anxiety, and depression were risk factors for PMS (41). Lastly, our study included all nurses aged 23 to 49 years from the teaching hospitals of Tehran University of Medical Sciences, providing a practical sample of Iranian healthcare workers. A host of demographic, work-related, and quality of life variables was assessed and compared regarding PMS severity. Furthermore, detailed quality of life, occupational, and performance-related factors were investigated in nurses with regard to PMS severity. Nonetheless, the causality of these variables cannot be determined through the current study; establishing a causal association among these many variables would require longitudinal studies recruiting large samples.

Further interventional studies may aid in identifying counter-measures to alleviate difficulties associated with PMS.

Study limitations

In terms of the limitations of the present study, since this was a cross-sectional study that was conducted in one section, the generalizability and causality are limited. Also, some of the data are self-reported which makes the recall bias probable.

Conclusion

PMS is common among nurses in Iran and its prevalence is remarkably high in comparison with other countries. PMS was associated with reduced quality of life, and focus disturbances. Several variables were shown to be associated with worse symptoms of PMS but only work place workload and emotional demand were shown to be associated using regression analysis. Therefore, further studies should focus on prevention strategies in order to reduce its prevalence or offer effective interventions to reduce its complications in the work place.

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Ethics Committee Approval: *The Ethics Committee of Tehran University of Medical Sciences approved this study (approval number: IR.TUMS.MEDICINE.REC.1399.681, date: 28.10.2020).*

Informed Consent: *Participants joined the research voluntarily and signed an informed consent prior to data gathering and were free to leave the study.*

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