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Relation between metabolic syndrome and psychiatric symptoms severity in women with premenstrual syndrome

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Abstract

Background Premenstrual syndrome (PMS) is a clinical condition characterized by recurrent moderate-to-severe affective, physical, and behavioral symptoms during the menstrual cycle. The present study aimed to assess the relation between metabolic syndrome (MetS) and symptoms severity in patients with premenstrual syndrome (PMS). This multicentric propensity score matched analysis included 300 women with PMS. They comprised 150 women with MetS and 150 women without MetS. Diagnosis of PMS was based on the validated Arabic version of Premenstrual Symptoms Screening Tool (PSST). For the diagnosis of MetS, we adopted the Harmonized Joint Scientific Statement (HJSS) on metabolic syndrome recommendations.

Results The present study included 300 patients with PMS. They comprised 150 patients with MetS and 150 patients without MetS. Comparison between the studied groups regarding the demographic and clinical data showed that patients with MetS had significantly higher BMI (30.5 ± 3.0 versus 25.2 ± 3.5 kg/m^2, $p < 0.001$) and longer symptoms duration (4.4 ± 0.9 versus 3.3 ± 1.1 days, $p < 0.001$). Patients with MetS included higher frequency of moderate-to-severe PMS (35.3% versus 20.7%, $p = 0.005$). In patients with MetS, it was found that patients with moderate-to-severe PMS have significantly higher BMI, younger age at menarche and longer symptoms duration. Multivariate logistic regression analysis identified age at menarche [OR (95% CI): 0.7 (0.55–0.9), $p = 0.005$], PMS symptoms duration [OR (95% CI): 4.45 (3.0–6.6), $p < 0.001$] and MetS [OR (95% CI): 1.67 (1.34–2.53), $p = 0.017$] as significant predictors of moderate-to-severe PMS.

Conclusions MetS is related to symptoms severity in PMS patients.

Keywords Premenstrual syndrome, Metabolic syndrome, Obesity, Dyslipidemia

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Introduction

Premenstrual syndrome (PMS) is a clinical condition characterized by a cluster of recurrent affective, physical, and behavioral symptoms of variable severity occurring during the luteal phase of menstrual cycle and usually fading within few days of menstruation [1, 2]. While most women experience premenstrual symptoms in the reproductive age, the condition presents with severe and debilitating symptoms in only 5.0% of women [3]. The premenstrual dysphoric disorder (PMDD) constitutes the most severe form of psychiatric premenstrual symptoms [4]. Interestingly, PMS was linked to postpartum depression (PPD) in affected women [5]. One third of women were found to have PPD as shown by one study [6] with endocrinal imbalance reported as a contributing factor [7].

The reported risk factors for PMS include young age, alcohol consumption, family history of PMS, genetic predisposition [8], vitamin D deficiency [9], dietary and lifestyles behaviors [10] and air pollution [11]. Suggested pathogenic mechanisms are dysfunctional reward responsiveness [12], altered leptin metabolism [13], altered cortisol awakening response [14] and augmented oxidative stress [15].

Severe somatic forms of PMS may respond to nutritional supplements, herbal remedies, lifestyle modifications, exercise or hormonal treatment. However, efficacy of these interventions remains debatable. So, identification of factors related to severe forms of PMS may be crucial for appropriate management of the condition [16, 17].

Metabolic syndrome (MetS) is a cluster of clinical and biochemical risk factors including obesity, elevated blood pressure, hyperglycemia and dyslipidemia. The estimated prevalence of MetS among premenopausal women ranges from 5.4% and 55.5% [18]. The condition is related to a wide range of morbidities affecting almost all body systems [19].

While the medial literature is replete with studies discussing the relation between MetS and many clinical conditions, no study assessed the clinical significance of MetS in PMS patients. So, the present study sought to assess the prevalence of MetS in a group of Egyptian women with PMS and to discover the relation between various parameters of MetS and clinical severity of PMS.

Methods

This cross-sectional study was conducted at outpatient clinics of gynecology and obstetrics departments. The study protocol was approved by the Institutional Review Board, and all patients gave informed consent before enrollment. The study findings were reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) initiative recommendations [20].

The study included 300 women with PMS. All patients were submitted to thorough clinical and gynecological examination. Diagnosis of PMS was based on the validated Arabic version of Premenstrual Symptoms Screening Tool (PSST). PSST includes 19 items assessing patients' psychiatric symptoms including anger, anxiety, depression and others in line with DSM-IV. The tool showed high internal consistency (Cronbach's $\alpha = 0.92$) and good construct validity [21]. Every item is rated as "not at all," "mild," "moderate," or "severe." Patients were classified to have moderate-to-severe PMS if at least one of the first 4 items was severe AND at least 4 of the first 14 items were moderate to severe AND at least one of the last five items was severe according to the instructions of Steiner and colleagues [22].

Exclusion criteria were receiving treatment for PMS or PMDD, associated psychosomatic disorders, associated gynecological conditions or other psychiatric conditions.

Patients included 150 patients with MetS and 150 patients without MetS. The studied groups were matched using a propensity score matching analysis calculated by logistic regression. Factors included in the score were age, age at menarche and cycle duration.

For the diagnosis of MetS, we adopted the Harmonized Joint Scientific Statement (HJSS) on metabolic syndrome recommendations. MetS criteria included elevated waist circumference (≥ 80 cm), elevated triglycerides levels (≥ 150 mg/dL), reduced high-density lipoprotein cholesterol (HDL-C) (< 50 mg/dL), elevated blood pressure (systolic ≥ 130 and/or diastolic ≥ 85 mm Hg) and elevated fasting glucose (≥ 100 mg/dL). MetS was diagnosed in the presence of any three criteria [23]. Data obtained from the present study was statistically analyzed using statistical package of social sciences (SPSS) 20 (IBM, USA). Numerical data were expressed as mean ± SD while categorical data were presented as number and percent. Numerical data were compared using t test and categorical data were compared using Chi-square test. Logistic regression analysis was used to identify predictors of PMS severity. p value less than 0.05 was considered statistically significant.

Results

The present study included 300 patients with PMS. They comprised 150 patients with MetS and 150 patients without MetS. Comparison between the studied groups regarding the demographic and clinical data showed that patients with MetS had significantly higher BMI (30.5 ± 3.0 versus 25.2 ± 3.5 kg/m^2, $p < 0.001$) and longer symptoms duration (4.4 ± 0.9 versus 3.3 ± 1.1 days, $p < 0.001$). Patients with MetS included higher frequency

Table 1 The reported demographic and clinical data in the studied patients (n = 300)

	MetS + ve n = 150	MetS − ve n = 150	p value
Age (years) mean ± SD	21.0 ± 1.8	20.9 ± 1.9	0.48
BMI (kg/m^2) mean ± SD	30.5 ± 3.0	25.2 ± 3.5	< 0.001
Marital status n (%)			
Married	12 (8.0)	17 (11.3)	0.33
Unmarried	138 (92.0)	133 (88.7)	
Residence n (%)			
Urban	116 (77.3)	125 (83.3)	0.19
Rural	34 (22.7)	25 (16.7)	
Education n (%)			
Elementary	40 (26.7)	48 (32.0)	0.53
Secondary	82 (54.7)	73 (48.7)	
University	28 (18.7)	29 (19.3)	
Age at menarche (years) mean ± SD	11.9 ± 1.3	11.7 ± 1.4	0.36
Cycle length (days) mean ± SD	31.2 ± 2.4	31.4 ± 2.3	0.9
Symptoms duration (days) mean ± SD	4.4 ± 0.9	3.3 ± 1.1	< 0.001
PMS severity n (%)			
Mild	97 (64.7)	119 (79.3)	0.005
Moderate-to-severe	53 (35.3)	31 (20.7)	

BMI body mass index, *MetS* metabolic syndrome, *PMS* premenstrual syndrome

of moderate-to-severe PMS (35.3% versus 20.7%, p = 0.005) (Table 1, Fig. 1).

In patients with MetS, it was found that patients with moderate-to-severe PMS have significantly higher BMI, younger age at menarche and longer symptoms duration. In patients without MetS, it was found that patients with moderate-to-severe PMS have significantly younger age at menarche and longer symptoms duration (Table 2).

In patients with MetS, it was found that patients with moderate-to-severe PMS have longer waist circumference, higher triglycerides levels, higher diastolic blood pressure and higher number of MetS criteria (Table 3).

Multivariate logistic regression analysis identified age at menarche [OR (95% CI): 0.7 (0.55–0.9), p = 0.005], PMS symptoms duration [OR (95% CI): 4.45 (3.0–6.6), p < 0.001] and MetS [OR (95% CI): 1.67 (1.34–2.53), p = 0.017] as significant predictors of moderate-to-severe PMS (Table 4).

Discussion

PMS particularly its severe form is a challenging clinical condition. Available treatment options frequently fail to achieve satisfactory clinical response. Integrated approach for management of the condition requires identification of possible risk factors. Considering the high prevalence of MetS and its relation to many morbidities, the present study aimed to assess the clinical significance of MetS in PMS patients and its relation to its severity.

Many previous studies identified some MetS components as risk factors for PMS. In the study of Masho and colleagues [24], the authors concluded that obesity is

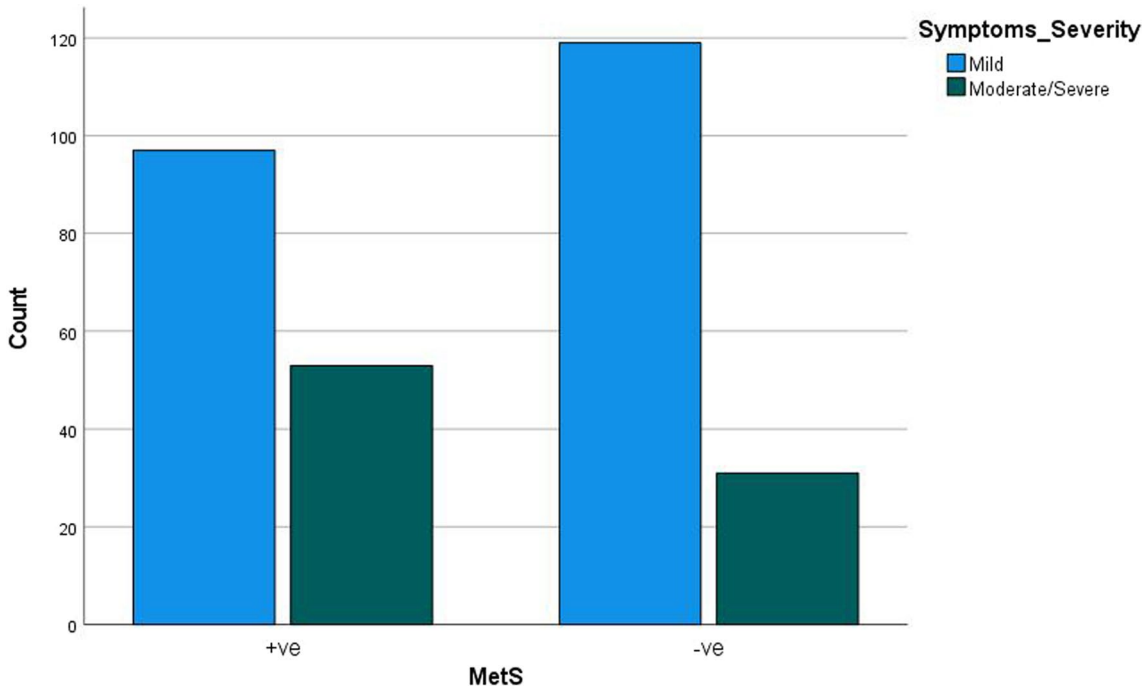

Fig. 1 PMS severity in women with MetS and women without

Table 2 Relation between PMS severity and clinical data in the studied groups (n = 300)

	MetS + ve (n = 150)		p value	MetS -ve (n = 150)		p value
	Mild PMS n = 97	Moderate-to-severe PMS n = 53		Mild PMS n = 119	Moderate-to-severe PMS n = 31	
Age (years) mean ± SD	20.9 ± 1.8	21.2 ± 1.8	0.37	21.0 ± 1.9	20.5 ± 1.9	0.24
BMI (Kg/m^2) mean ± SD	29.9 ± 2.9	31.6 ± 2.8	< 0.001	25.4 ± 3.8	24.5 ± 1.6	0.07
Marital status n (%)						
Married	8 (8.2)	4 (7.6)	0.88	13 (10.9)	4 (12.9)	0.76
Unmarried	89 (91.8)	49 (92.4)		106 (89.1)	27 (87.1)	
Residence n (%)						
Urban	78 (80.4)	38 (71.7)	0.22	100 (84.0)	25 (80.7)	0.65
Rural	19 (19.6)	15 (28.3)		19 (16.0)	6 (19.3)	
Education n (%)						
Elementary	26 (26.8)	14 (26.4)	0.89	39 (32.8)	9 (29.0)	0.31
Secondary	54 (55.7)	28 (52.8)		60 (50.4)	13 (42.0)	
University	17 (17.5)	11 (20.8)		20 (16.8)	9 (29.0)	
Age at menarche (years) mean ± SD	12.1 ± 1.4	11.5 ± 1.2	0.007	11.8 ± 1.4	11.3 ± 1.1	0.035
Cycle length (days) mean ± SD	31.6 ± 2.2	31.0 ± 2.4	0.14	31.5 ± 2.4	32.2 ± 1.8	0.42
Symptoms duration (days) mean ± SD	4.1 ± 0.8	5.0 ± 0.9	< 0.001	3.0 ± 0.8	4.5 ± 1.3	< 0.001

BMI body mass index, *MetS* metabolic syndrome, *PMS* premenstrual syndrome

Table 3 Relation between PMS severity and MetS components in MetS patients

	Mild PMS n = 97	Moderate-to-severe PMS n = 53	p value
Waist circumference (cm) mean ± SD	91.2 ± 7.6	94.5 ± 7.5	0.011
Triglycerides (mg/dL) mean ± SD	142.0 ± 31.9	153.6 ± 26.6	0.019
HDL (mg/dL) mean ± SD	40.5 ± 2.4	40.1 ± 2.5	0.31
DBP (mmHg) mean ± SD	82.6 ± 5.3	84.7 ± 3.5	0.004
SBP (mmHg) mean ± SD	128.7 ± 7.9	130.8 ± 6.7	0.11
FBG (mg/dL) mean ± SD	100.5 ± 11.9	97.5 ± 13.2	0.17
MetS criteria count mean ± SD	3.8 ± 0.7	3.0 ± 0.0	< 0.001

BMI body mass index, *DBP* diastolic blood pressure, *FBG* fasting blood glucose, *HDL* high-density lipoprotein, *MetS* metabolic syndrome, *PMS* premenstrual syndrome, *SBP* systolic blood pressure

strongly associated with PMS. Likewise, the study of Bertone-Johnson and colleagues [25] noted a significant linear relation between increased BMI and incident PMS. In contrast, the study of Sharifan and colleagues [26] found no relation between BMI and severity of PMS. In another study, increased cholesterol level was reported as a risk factor for PMS [27].

Interestingly, the current study noted patients with MetS experienced significantly severe form of PMS. Previous studies identified as association between MetS and some elements of severe PMS. For example, the association between MetS and sleep troubles was reported in younger [28] and older [29] women and in the general population [30]. Moreover, it was found that MetS patients significantly higher frequency of severe joint aches. While none of the studied patients

Table 4 Predictors of moderate-to-severe PMS in the studied patients

	Univariate analysis		Multivariate analysis	
	OR (95% CI)	p	OR (95% CI)	p
Age	1.0 (0.87–1.15)	0.99	–	–
BMI	1.098 (1.032–1.17)	0.003	1.078 (0.98–1.19)	0.12
Age at menarche	0.75 (0.61–0.9)	0.003	0.7 (0.55–0.9)	0.005
PMS symptoms duration	3.96 (2.8–5.6)	< 0.001	4.45 (3.0–6.6)	< 0.001
MetS	2.097 (1.25–3.52)	0.005	1.67 (1.34–2.53)	0.017

BMI body mass index, *MetS* metabolic syndrome, *PMS* premenstrual syndrome, *SBP* systolic blood pressure

had clinical diagnosis of joint pathologies, the association between MetS and inflammatory joint diseases is well-documented [31].

Our study recognized patients age at menarche, symptoms duration and MetS as significant independent predictors of PMS severity. The relation between older age and severity of PMS was previously reported [32]. The association between MetS and severity of PMS may be explained by the inflammatory background of both conditions. PMS is characterized by elevated levels of proinflammatory cytokines [33]. The low-grade inflammation in MetS can produce augmented release of many proinflammatory cytokines like tumor necrosis factor α and interleukin 6 [34]. Of note, the recent study of Ter Horst and colleagues [35] suggested that women with MetS may also have lower expression of the anti-inflammatory adipokine adiponectin.

Conclusions

MetS is associated more severe form of PMS. It's recommended to conduct interventional study to assess if control of MetS components can affect PMS symptoms. Conclusions of the present study may be limited by its cross-sectional design. Probably, longitudinal studies assessing the relation between changes in MetS components and PMS symptoms may provide better approach to judge the relation between MetS and severity of PMS symptoms.

Abbreviations

BMI	Body mass index
DBP	Diastolic blood pressure
FBG	Fasting blood glucose
HDL	High-density lipoprotein
HJSS	Harmonized Joint Scientific Statement
MetS	Metabolic syndrome
PMS	Premenstrual syndrome
PSST	Premenstrual Symptoms Screening Tool
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology

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Author contributions

Conceived and designed the experiments: MBY, MAS, SS, MOAA, NE, enrolled the patients: SKG, MEH, WAK, Performed the experiments: MA, MAAS, EGR, data management and analysis: HMH, SHM, AMA and Contributed reagents/materials/analysis tools: SaSa, MBY, MAS, SS, MOAA, NE, prepared the manuscript: SKG, MEH, WAK, read and approve the manuscripts: MA, MAAS, EGR, HMH, SHM, AMA. All authors read and approved the final manuscript.

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Data availability

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the ethical committee of Al-Azhar University Faculty of Medicine on June, 1, 2022. Informed written consent was obtained from all the patients enrolled in this study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Informed consent

Written informed consent was obtained from all patients or their legal guardians before enrollment in the study.

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