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The Correlation Between Some Body Composition Indices and Premenstrual Syndrome in Young Females

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Abstract

Background: Different body composition indices may indicate various physiological statuses.
Objectives: The current study aimed at investigating the correlation between body composition indices (body mass index (BMI), body fat percentage (BFP), and abdominal fat) as well as physical and psychological symptoms of premenstrual syndrome (PMS).
Methods: The current cross sectional study was conducted on 60 voluntary female students of Shiraz University (age: 18 - 25 years) in December 2016. Inclusion criteria were regular menstrual cycles, being single, no pregnancy, and no history of thyroid disease, polycystic ovaries, cancer, diabetes, and diagnosed psychiatric complications. Subjects completed Moos Menstrual Distress Questionnaire. Weight and height of subjects were recorded to calculate BMI, BFP and abdominal fat were calculated using the body composition analyzer. The Pearson correlation coefficient and regression analysis were used to analyze the data.
Results: The results of the current study revealed significant and positive correlation between BMI and physical symptoms of PMS ($P = 0.045$), BMI and psychological symptoms ($P = 0.024$), BFP and physical symptoms ($P = 0.019$), BFP and psychological symptoms ($P = 0.023$), abdominal fat and physical symptoms ($P = 0.017$), and abdominal fat and psychological symptoms of PMS ($P = 0.049$).
Conclusions: The higher level of body composition indices were related to higher PMS symptoms and abdominal fat was the most important predictor for PMS symptoms.

Keywords: Premenstrual Syndrome, Body Mass Index, Body Fat Percentage, Abdominal Fat

1. Background

Premenstrual syndrome (PMS) has a wide variety of physical and psychological symptoms that occur in the week prior to the beginning of menstruation and alleviate with the onset of it (1). Irritability, mood swings, anxiety, and depression are the most common psychological symptoms of PMS. Physical symptoms of PMS are also breast tenderness, abdominal swelling, and edema of extremities, dizziness, and gastrointestinal disorders (2).

Fatness, which is measured through various indices such as body mass index (BMI), body fat percentage (BFP), and abdominal fat, can probably affect PMS. It is demonstrated that females with PMS have higher BMI values (2). Plasma levels of sex hormones may be impaired in females with PMS (2). Besides, adipose tissue and steroid hormones are directly correlated and sex steroid hormones are involved in metabolism, storage, and distribution of fat tissue (3). However, obesity indices vary and are various indicators of body fat distribution and may differently correlate to hormonal status. It is observed that 17-beta-estradiol affects the number of fat cells in the abdominal subcutaneous (4). BMI reflects the ratio of overall body weight including visceral and subcutaneous fat and nonfat tissue weight to height. Therefore, stature of body can affect this measure. It was observed that PM symptoms were higher in females with obesity (5). However, another study revealed no significant difference in the amount of body fat between healthy females and the ones with PMS (1). Accordingly, different fatness indices may be a cause of discrepancies, since body composition indices may not be correlated (6).

2. Objectives

The current study aimed at investigating the association of BMI, BFP, and abdominal fat with physical and psychological symptoms of PMS among university students.

3. Methods

The current descriptive correlational study employed convenience sampling method, and the statistical popula-

tion of the study included female students of Shiraz University, Iran, in December 2016.

The sample size was calculated using the following formula (7):

$$The\ standard\ normal\ deviation\ for\ \alpha\ = Z_{\alpha} = 1.960$$

$$The\ standard\ normal\ deviation\ for\ \beta\ = Z_{\beta} = 0.674$$

$$C\ = 0.5 \times ln\left[\frac{(l+r)}{(l-r)}\right] = 0.365$$

$$Total\ sample\ size\ = N = \left[\frac{(Z_{\alpha}+Z_{\beta})}{C}\right] 2 + 3 = 55$$

Announcement for study participation was placed in public places of Shiraz University. Among all female students, 96 students volunteered to participate in the study and 60 of them that met the study criteria were selected. The inclusion criteria were regular menstrual cycles, being single, no pregnancy, and no history of thyroid disease, polycystic ovaries, cancer, diabetes, diagnosed psychiatric complications (1), no consumption of contraceptives or medications affecting hormonal levels, and no severe PMS in mother or sister(s) (2). Exclusion criteria were not completing the questionnaire or not participating in the study measurements. Participants signed written informed consent approved by Institutional and Ethics Committee of Shiraz University. The Persian version of modified Moos Menstrual Distress Questionnaire (MDQ) was used to measure PMS symptoms (8); the validity and reliability of the questionnaire was previously confirmed by Qorbanalipour et al. (9). The questionnaire includes 20 items about physical and psychological symptoms of PMS scored based on a five-option Likert scale (0 = no symptoms to 4 = severe symptoms). The subjects were asked to complete the questionnaire according to the severity of symptoms. These signs should begin during a week before initiation of menstruation and disappear during the first two days of onset of menstruation. Average scores of physical and psychological symptoms of PMS in two consecutive menstrual cycles were considered.

Height and weight were measured in standard position and BMI was calculated as: weight (kg)/height^2 (m^2) (1). BFP and abdominal fat were calculated using the body composition analyzer.

Data were analyzed with SPSS version 16 using statistical methods of Pearson correlation coefficient and regression analysis. A P value of < 0.05 was considered the level of significance.

4. Results

Participants of the study were 60 female students (mean age = 20.83 $\pm$ 2.10 years, BMI = 21.22 $\pm$ 2.47 kg/m^2, BFP = 27.05% $\pm$ 5.27%, abdominal fat = 7.54 $\pm$ 2.12 kg). According to Table 1, there was a significant and positive correlation between: BMI and physical symptoms (P = 0.045, r = 0.260), BMI and psychological symptoms (P = 0.024, r = 0.291), BFP and physical symptoms (P = 0.019, r = 0.302), BFP and psychological symptoms (P = 0.023, r = 0.294), abdominal fat and physical symptoms (P = 0.017, r = 0.307), abdominal fat and psychological symptoms (P = 0.049, r = 0.255). Moreover, among the above variables, abdominal fat was the most important predictor for psychological (β-value = -0.63) and physical (β-value = -0.46) symptoms of PMS (Tables 2 - 4).

5. Discussion

Results of the current study revealed a significant and positive correlation between BMI, BFP, abdominal fat, and physical and psychological symptoms of PMS and abdominal fat was more decisive than BFP and BMI in the prediction of PMS symptoms.

Some previous studies also indicated that higher level of BMI correlated with higher PMS symptoms (10). According to other findings of the current study, BFP was significantly and positively correlated with symptoms of PMS. Some other studies also showed that females with overweight or obesity had more PMS symptoms (11). However, the results of some studies showed no significant differences in the amount of body fat between healthy females and the ones with PMS (12). Different research design, subjects, methods, and questionnaires may have caused inconsistency of the current and some previous results.

The current study also showed a significant and positive correlation between abdominal fat and symptoms of PMS. But, according to previous studies, this correlation was rarely investigated. Bertone-Johnson et al. found no significant correlation between central fat (waist circumference and waist-to-hip ratio) and PMS (10).

Interactions of sex hormones with the neural mediators are the mechanisms proposed for PMS (5). The increase of body fat levels may alter neurotransmitter function through its effect on estrogen and progesterone. The increase of adiposity may also interfere in PMS symptoms by disrupting the regulation of the renin-angiotensin-aldosterone system (10). Moreover, it is documented that females with obesity have more hormonal abnormalities, insomnia, and stress that all of them are the common PMS symptoms (5). Limitations of study were selection of the subjects from the available participants and not selecting

Table 1. Correlation of the Matrix of Study Variables

	BMI, kg/m^2	BFP, %	Abdominal Fat, kg	Physical Symptoms	Psychological Symptoms
BMI, kg/m^2					
Pearson Correlation	1				
P value					
BFP, %					
Pearson Correlation	0.837[a]	1			
P value	0.000				
Abdominal fat, kg					
Pearson Correlation	0.945[a]	0.907[a]	1		
P value	0.001	0.0001			
Physical symptoms					
Pearson Correlation	0.260[b]	0.302[b]	0.307[b]	1	
P value	0.045	0.019	0.017		
Psychological symptoms					
Pearson Correlation	0.291[b]	0.294[b]	0.255[b]	0.439[a]	1
P value	0.024	0.023	0.049	0.001	

[a] P value of < 0.01 was considered as the level of significance (2-tailed).
[b] P value of < 0.05 was considered as the level of significance (2-tailed).

Table 2. Multiple Regression Results for the Correlation of BMI, BFP, and Abdominal Fat in Relation to Physical and Psychological Symptoms of PMS

	Physical Symptom			P Value	Psychological Symptom			P Value
	Unstandardized Coefficient	(SE)*	Standard Coefficient		Unstandardized Coefficient	(SE)*	Standard Coefficient	
BMI	-5.426	8.119	-0.260	0.507	12.266	8.667	0.546	0.163
BFP	0.978	2.980	0.100	0.744	4.389	3.181	0.416	0.173
Abdominal fat	11.222	12.305	0.462	0.366	-16.684	13.135	-0.639	0.209

Table 3. Multiple Regression Results to Predict Physical Symptoms of PMS

	Physical Symptom					
	F	P	R	R^2	ß	P
BMI	2.178	0.101	0.323	0.104	-0.260	0.507
BFP					0.100	0.744
Abdominal fat					0.462	0.366

Table 4. Multiple Regression Results to Predict Psychological Symptoms of PMS

	Psychological Symptoms					
	F	P	R	R^2	ß	P
BMI	2.513	0.068	0.344	0.119	0.546	0.163
BFP					0.416	0.173
Abdominal fat					-0.639	0.209

them randomly and also not controlling their psychological stress, which may affect PMS.

In summary, results of the current study revealed that BMI was significantly associated with PMS. It seems that

especially abdominal fat is an important factor related to PMS. Thus, these potential risk factors should be considered when physicians and researchers discuss PMS incidence, diagnosis, and prevention.

Footnotes

Authors' Contribution: Ensieh Shahrjooye Haghighi: study design, data collection and analysis, and writing of the manuscript; Maryam Koushkie Jahromi: study design and supervision, data analysis, and writing of the manuscript.

Conflict of Interests: Authors declared no conflict of interest.

Ethical Considerations: The study protocol was approved by Ethics Committee of Shiraz University.

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