

## Comparison of Anthropometric and Conicity Indicators in Students with Premenstrual Syndrome

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J Babol Univ Med Sci; 21; 2019; PP: 357-63

Received: June 12<sup>th</sup> 2018, Revised: Oct 23<sup>rd</sup> 2018, Accepted: Jan 14<sup>th</sup> 2019.

### ABSTRACT

**BACKGROUND AND OBJECTIVE:** Body composition and body fat are important in the prevention of chronic diseases in people with premenstrual syndrome. This study was performed to compare the anthropometric and conicity indexes in PMS and healthy people.

**METHODS:** This cross-sectional study was performed on 92 dormitory students living in Mazandaran University of Medical Sciences over 18 years of age in two groups with premenstrual syndrome and healthy subjects. Anthropometric and conicity parameters were measured and compared in two groups.

**FINDINGS:** In this study, 46 (54.8%) patients in the PMS group with an average age of  $22.02 \pm 1.51$  years and 38 (45.2%) in the healthy group with an average age of  $21.34 \pm 2.32$  that there was no significant difference between the two groups in the test ( $p=0.08$ ). In the PMS group, this disorder was significantly different from that of the healthy group ( $p=0.0001$ ), and the anger and allergies and anthropometric indices were significantly higher in students with menstrual syndrome than in healthy subjects (see The order of  $p=0.003$ ,  $p=0.007$ ,  $p=0.001$ ,  $p=0.02$ ,  $p=0.01$ ,  $p=0.001$ ), but the two groups did not have a significant difference in terms of conicity.

**CONCLUSION:** The results of this study showed that subjects with premenstrual syndrome group had higher anthropometric indices than healthy subjects. But they do not differ in terms of conicity.

**KEY WORDS:** *Premenstrual Syndrome, Students, Conicity, Body Composition.*

### Please cite this article as follows:

Ramezani A, Hoseini SM, Chalesghar Kordasiabi M. Comparison of Anthropometric and Conicity Indicators in Students with Premenstrual Syndrome. J Babol Univ Med Sci. 2019;21: 357-63.

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## Introduction

**P**remenstrual syndrome is a psychiatric and neuroendocrine disorder characterized by periodic recurrence of physical, psychological and behavioral symptoms (1).

Symptoms appear after ovulation, and its symptoms are divided into two parts: psychological and physical and it is as a cyclic phenomenon, psychological and physical disturbances and behavioral changes during the luteal phase of the menstrual cycle (2-4). Hypotheses about the cause of this disease include increased levels of estrogen and decreased progesterone levels, changes in estrogen/progesterone ratio, vitamin B6, B1, A deficiency and minerals such as magnesium, calcium, and prolactin secretion and abnormalities of prostaglandins (5, 6).

Despite these studies, there was a significant relationship between body mass index and menstrual disorders. It seems physical activity and diet patterns and lifestyle and body mass associated with this disorder and various studies have emphasized the association between sexual hormonal disorders and the probability of this syndrome outbreak (4,7,8). Adipose tissue plays a very important role in the metabolism of sexual hormones and can even cause sexual hormones disorder (4).

Increased fat mass, especially abdominal fat mass associated with hyperandrogenism and hyperinsulinism and sexual hormonal disorders, causes premenstrual syndrome (4, 9, 10). Some studies have shown that women with premenstrual syndrome (PMS) have a higher body mass index (BMI) (11, 12). However, the positive effects of abdominal obesity are known to be one of the most important factors in the disease. The Conicity Index is the hypothesis of fat accumulation around the abdomen, which is something like a dual cone (ie, two cones that lie on the base of one on the other), people who have fewer fats in the central zone, they look like a cylinder.

Considering the role of obesity in the development of cardiovascular disease, diabetes and metabolic disorders are thought to be a conicity indicator, which is a marker of obesity and body fat distribution, and considers most of the central obesity in relation to general obesity, which can be associated with metabolic disorders (9).

However, the role of this marker in PMS is not known. Therefore, this study was conducted to compare the BMI and conicity indices in two groups of healthy students and students with premenstrual syndrome.

## Methods

This case-control study was carried out on 92 female students of Mazandaran University of Medical Sciences, after approval by the Ethics Committee of Mazandaran University of Medical Sciences at IR.MAZUMS.REC.95.1808 in spring 1396. Sample size was calculated using (p) PMS prevalence in Iran (10) and (d) accuracy of estimation. Sample size with 95% confidence and minimum loss of at least 25% of 92 individuals were determined. Accordingly, 47 patients were divided into two groups of healthy and PMS patients.

The criteria for entering the study include age over 18 years old, lack of specific disease (diabetes, kidney disorders, cardiovascular disease, metabolic syndrome, cancer, etc.), not having genital disease, and people with physical and psychological stress in three recent months, events such as death of family member or surgery, physical illness or drug use, history of mental illness, having regular exercise, any specific treatments for PMS, inappropriate completion of questionnaires, poor collaboration, and dieting were excluded from the study. In this research, the general information questionnaire and PMS diagnostic questionnaire and anthropometric questionnaire (11) were used. The questionnaire questions were completed by the researcher and using the asking from participants. Height, weight, body mass index (BMI), and waist circumference and hip circumference of the participants were determined. Body mass index (BMI) of individuals was also obtained using the formula below.

$$BMI = \frac{\text{weight(kg)}}{\text{height(m)}^2}$$

Waist to Hip Ratio (WHR) was calculated by waist circumference divided to hip circumference (WHR: Waist to Height Ratio) and by dividing the waist circumference to height. The general information questionnaire and the conicity index, which is a marker for central obesity, has also been obtained in the following way: its range from 1 (one full cylinder) to 1.73 (two cones connected from the base), increasing the rate of this index means the greater accumulation of fat in the center of the body, in fact 1.73 for this index, indicating the highest accumulation of fat in the central region of the abdomen (12).

$$0.109 \sqrt{\frac{\text{Height(m)}}{\text{Weight (Kg)}}}$$

Data were analyzed by SPSS software version 18. The Kolmogorov-Smirnov test was used to normalize the data and T-test was used to compare the mean of quantitative variables between the two groups of healthy and those with PMS and the Chi-square test was used to compare the nominal or grouped variables and  $p < 0.05$  was considered significant.

## Results

In this study, 8 people refused to continue their cooperation for personal reasons. Thus, 84 subjects participated in the study, in which 46 (54.8%) people were in the group with PMS and 38 (45.2%) people were in the healthy group. The mean age of the participants in the syndrome group was  $22.02 \pm 5.11$  and

in the healthy group was  $21.34 \pm 2.32$  years, which showed no significant difference between the two groups. Regarding the educational level in the syndrome group, 21 (45.7%) people were undergraduate, 11 (13.9%) people were masters and 14 (30.4%) people were e PhD, and in the healthy group 27 people were undergraduate (71.1%), 5 (13.2%) people were masters and 6 (15.8%) people had doctorate, but there was no significant difference between the two groups in terms of educational level. Patients with premenstrual syndrome have a significant difference in relation to the history of this disorder and allergies in their relatives (using the questionnaire) in comparison with the healthy group ( $p = 0.0001$  and  $p = 0.003$ , respectively) (Table 1) Anthropometric (BMI) indices in PMS group were significantly higher than healthy group (Table 2).

**Table1. Comparison of demographic and menstrual data in PMS and healthy students**

| Demographic information and menstruation     |         | PMS(N=46)<br>N(%) | Healthy(N=38)<br>N(%) | Total<br>N(%) | P-value |
|----------------------------------------------|---------|-------------------|-----------------------|---------------|---------|
| Nationality                                  | Kurd    | 1(2.2)            | 2(5.3)                | 3(3.5)        | 0.21    |
|                                              | Fars    | 45(97.8)          | 34(89.4)              | 79(94.1)      |         |
|                                              | Others  | 0(0)              | 2(5.3)                | 2(2.4)        |         |
| Marital status                               | Married | 10(21.7)          | 8(21.1)               | 18(21.4)      | 0.93    |
|                                              | Single  | 36(78.3)          | 30(78.9)              | 66(78.6)      |         |
| History of PMS in first degree relatives     | Yes     | 25(54.3)          | 4(10.5)               | 29(34.5)      | 0.0001  |
|                                              | No      | 21(45.7)          | 34(89.5)              | 55(65.5)      |         |
| Food allergy or seasonal                     | Yes     | 45(97.8)          | 8(21.1)               | 53(63.1)      | 0.003   |
|                                              | No      | 1(2.2)            | 30(78.9)              | 31(37)        |         |
| Pregnant and lactating                       | Yes     | 0(0)              | 1(2.6)                | 1(2.1)        | 0.26    |
|                                              | No      | 46(100)           | 37(97.4)              | 83(98.8)      |         |
| Amount of bleeding (day and pad replacement) | Medium  | 35(76.1)          | 33(86.8)              | 68(80.9)      | 0.38    |
|                                              | Intense | 11(23.9)          | 5(13.2)               | 16(19.1)      |         |
| History of infection                         | Yes     | 6(13)             | 3(7.9)                | 9(10.7)       | 0.44    |
|                                              | No      | 40(87)            | 35(92.1)              | 75(89.3)      |         |

**Table2. Comparison of BMI and conicity indices, duration of bleeding and duration of menstruation in two groups with PMS and healthy**

| Variable                             | PMS (N=46)<br>Mean±SD | Healthy (N=38)<br>Mean±SD | P-value |
|--------------------------------------|-----------------------|---------------------------|---------|
| Weight (kg)                          | 68.53±7.59            | 64.21±6.51                | 0.007   |
| Height (cm)                          | 159.951±5.22          | 162.68±6.63               | 0.035   |
| Body mass index (kg/m <sup>2</sup> ) | 26.2±2.17             | 24.2±1.21                 | 0.0001  |
| Waist (cm)                           | 99.28±11.45           | 93.05±12.64               | 0.02    |
| Hip circumference (cm)               | 106.48±13.58          | 104.61±13.51              | 0.53    |
| Waist to Caribbean (WHR)             | 0.935±0.098           | 0.89±0.027                | 0.01    |
| Waist to height (WHtR)               | 0.62±0.06             | 0.57±0.06                 | 0.001   |
| (Conicity)                           | 1.39±0.16             | 1.36±0.14                 | 0.4     |
| Bleeding period (day)                | 46.43                 | 29.32                     | 0.0001  |
| Menstrual period (day)               | 6.04                  | 6.39                      | 0.047   |

Independent t-test and significance level was  $p < 0.05$

## Discussion

This study showed that BMI and weight in PMS patients were higher than healthy subjects. In a study by Masho et al., the probability of PMS in obese women was 2.9 times higher than that of underweight (13). Bertone-Johnson et al. also found that the risk of PMS increased with increasing weight (14).

The results of these investigations were in line with our findings, because BMI and weight are a factor associated with PMS (15), while Jafarirad et al. study showed that people with PMS had less weight and hip circumference than healthy people however these findings are inconsistent with our research results, which in their study, attributed underweight to the symptoms of PMS, while those who participated in the study had a normal body mass (16).

Perhaps one of the reasons for increasing BMI in people with PMS is the presence of signs of stress, anxiety, depression and immobility (10,11,17). These factors can cause overweight and obesity (18). In agreement with the results of this study, Tolossa et al showed that there is no significant relationship between BMI, WHR and WHTR (19).

This study showed that there is a significant relationship between waist and BMI with PMS and study by Mohammadi et al. showed that there is a direct correlation between waists WHR, WHR, WHTR with PMS (10). Weight gain, and especially the increase in body fat in the central areas, disrupts the balance of sexual hormones in the body, including androgens, estrogen and sexually transmitted hormone-associated globulins (SHBGs).

Changes in (SHBG) result in changes in the secretion of androgens and estrogens in the target tissue. Obesity increases estrogen production in relation to body weight and body fat (9, 20). In fact, due to the role of ovarian steroids in the progression of PMS, abdominal fat and obesity are considered as important contributors to PMS (19). Although in many studies, there has been a relation between PMS and obesity and increased BMI, however, some studies conducted on PMS revealed the association between PMS and anthropometric indices (10,11,19, 21).

A study by Flegal et al showed that PMS symptoms are more common in obese women, which is consistent with our research results (22). However, Masho et al indicated that there is no significant difference in body

fat between healthy people and PMS patients. This finding is inconsistent with our findings (13). The findings of this study showed that patients with premenstrual syndrome disorder had significantly higher waist circumference and waist to hip ratio than healthy subjects, which was consistent with studies of Mohammadi et al. and Kondo et al. (10, 23).

In fact, the association of sexual hormones and fat mass in women has been shown in many studies (11, 14, 16, 24-26). In the present study, the conicity index, indicating central obesity and distribution of fat in the body, did not differ significantly between the two groups (22-24).

The Conicity Index has recently been proposed to examine the status of central obesity, some of which have reported its value higher than the waist circumference index, but Kim et al. showed that BMI is more valuable than Conicity for predicting cardiovascular disease (25).

In the present study, the results showed no significant difference in Conicity in both healthy individuals and individuals with PMS, despite significant weight and waist circumference between the two groups.

This indicator is more likely to be a sign of central obesity and body fat distribution, and focuses on more central obesity than general obesity, which our research found was not different in patients with PMS than in healthy subjects in terms of central obesity. While general obesity reported by body mass index is significantly higher in patients with PMS than in healthy subjects. Other findings of this study showed that there was no statistically significant difference between different ethnic groups in Kurd and Fars and other ethnic groups in terms of the presence of this disorder. This study was consistent with Tabarroki et al., Jafarirad et al. (16, 26).

Also, people with PMS in this study were suffering from food and seasonal allergies. This difference was statistically significant compared to the healthy group, consistent with the findings of Nittner-Marszalska et al. (27). In fact, fluctuations in pre-menopausal sexual hormones are responsible for the deterioration of many premenstrual symptoms, including inflammation, autoimmune conditions, allergies, menstrual periods and asthma symptoms (Premenstrual Asthma) (28).

From the limitations of the study, we can mention the low volume of samples examined and the lack of direct evaluation of fat and without fat by impedance techniques. We suggest that these weaknesses be resolved in future studies.

### Acknowledgment

This research was sponsored by the Research Council of Mazandaran University of Medical Sciences and hereby, we would like to thank all students who helped us in this investigation.

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