

## Original Article

### Association of Serum Electrolytes Level with Premenstrual Syndrome

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#### Abstract

**Background:** Premenstrual syndrome (PMS) is a significant health condition that affects a significant portion of the female population. Due to the ovarian hormone, changes in serum electrolyte levels can happen in the late luteal period of the menstrual cycle.

**Methods:** A cross-sectional study was conducted to find out the association of serum electrolytes levels of 30 young unmarried women with PMS from July 2016 to June 2017 in the Department of Physiology, Sir Salimullah Medical College, Dhaka, Bangladesh.

**Results:** The mean age of both groups of young unmarried women was 20.30±1.15 years and 20.53±1.17 years. The mean serum sodium level was 139.97±1.30 and 140.93±1.68 mmol/L, and the serum potassium level was 4.20±0.32 and 4.17±0.31 mmol/L. The mean serum sodium level was significantly higher in group B in comparison to group A ( $p<0.05$ ). Premenstrual scores of irritability, abdominal bloating, backache, depression, fatigue, breast tenderness, headache, and anxiety were significantly higher in comparison to those of postmenstrual scores in the PMS group ( $p<0.05$ ).

**Conclusion:** These study results acclaimed that serum sodium levels influence the physical and psychological symptoms of women with PMS.

**Keywords:** PMS, young unmarried women, serum sodium, serum potassium.

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#### Introduction

Premenstrual syndrome (PMS) is a chronic condition impacted by the presence of physical, psychological, and behavioral symptoms. It occurs during the luteal phase of the menstrual cycle and goes away after menstruation. Approximately, 8-15% of women of reproductive age suffer from PMS.<sup>1-3</sup> Progesterone is present in high concentrations during the postovulatory period of the cycle, which occurs between ovulation and the start of menstruation. The increase in progesterone after ovulation appears to be followed by a compensatory rise in aldosterone concentration because progesterone is considered to have a natriuretic effect.<sup>4,5</sup> The findings reveal that ovarian hormones may affect the metabolism of calcium, magnesium, sodium, and potassium during different menstrual cycle stages.<sup>2,6-8</sup> The level of serum sodium was significantly decreased but no significant

difference in potassium was found in the luteal phase as compared to those follicular and menstrual phases.<sup>2,9,10</sup> Again, the level of serum sodium was significantly decreased, whereas serum potassium was significantly increased in the secretory phase.<sup>6,11</sup>

PMS is a common, mild to moderate psychological and physical symptoms that develops in the menstrual cycle's late luteal phase.<sup>12</sup> It can be diagnosed if the patients report at least 1 affective symptom (depression, angry outbursts, irritability, anxiety, confusion, or social withdrawal) and somatic symptom (breast tenderness, abdominal bloating, headache, or swelling of the extremities) during the 5 days before menstruation in each of the 3 prior menstrual cycles. These symptoms are relieved within 4 days of the onset of menstruation. More severe symptoms include irritability, dysphoria and mood liability.<sup>13</sup>

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However, there is currently no published data on the rhythmic variation in ovarian hormone levels, the alteration in serum electrolyte levels during the late luteal phase, or their relationship to PMS in young unmarried women in our country. The current research has been conducted as an outcome.

**Methods**

**Study design and settings**

This cross-sectional study was done to find out the association of serum electrolytes of young unmarried women with premenstrual syndrome from July 2016 to June 2017 in the Department of Physiology, Sir Salimullah Medical College, Dhaka 1000, Bangladesh.

**Sample selection criteria**

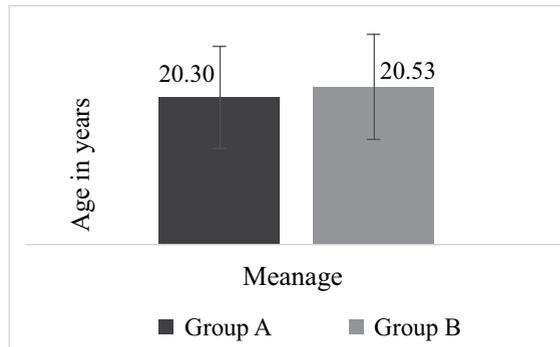
Participants were purposively selected 60 young unmarried women with an age range of 18-25 years with a regular menstrual cycle of 28±3 days for at least 6 months. Participants have divided into two groups equally, 30 women in each group. Group A (Non-PMS group) was the young unmarried woman without premenstrual syndrome, and Group B (PMS group) was the young unmarried woman with premenstrual syndrome for at least 3 consecutive symptomatic cycles before starting treatment. The woman who had a history of having any chronic or systemic diseases, known thyroid dysfunction, adrenocortical dysfunction, any other gynecological disorder, psychiatric disorder and prescribed medicine user (Diuretics, Calcium, Magnesium, and OCP) was excluded from this study. To measure the serum electrolyte levels, serum sodium and potassium were estimated by integrated multi-sensor technology (IMT), in the Department of Biochemistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.

**Data collection procedures**

The data were checked and cleaned after the completion of data collection. All data were computed and analyzed through IBM SPSS v22. Both descriptive and inferential statistics were carried out. Descriptive statistics such as mean, standard deviation and percent were computed for continuous variables of the participants. Unpaired ‘t’ test and Pearson’s correlation coefficient test were done to assess the significance of associations. A p-value of <0.05 at a 95% confidence interval was taken as significant. The results were presented in tables and charts.

**Ethical consideration**

Informed written consent was obtained from each participant. The study was validated by the ‘Institutional Ethics Committee’ of Sir Salimullah Medical College, Dhaka 1000, Bangladesh. (Reference: SSMC/2017/40)



**Figure 1:** Age of the women (n=60)

**Results**

Figure 1 denotes the mean age of the young unmarried woman of Group A was 20.30±1.15 years and Group B was 20.53±1.17 years. The values were almost similar within the groups and no statistically significant difference was found within the age (p= 0.438).

**Table 1:** Serum electrolytes level of the women (n=60)

Parameters	Group A	Group B	p value
	(n=30)	(n=30)	
	Mean± SD	Mean± SD	
Serum sodium (mmol/L)	139.97±1.30	140.93±1.68	0.016*
Serum potassium (mmol/L)	4.20±0.32	4.17±0.31	0.714

Unpaired ‘t’ test was done, \*Statistically significant value

Table 1 represents denotes the serum electrolytes level of the women. The mean serum sodium level was 139.97±1.30 and 140.93±1.68 mmol/L, and serum potassium level was 4.20±0.32 and 4.17±0.31 mmol/L in groups A and B respectively. The mean serum sodium level was significantly higher in group B in comparison to group A (p=0.016).

**Table 2: Premenstrual syndromes in PMS group (n=30)**

Symptoms	Frequency	Percent
Abdominal bloating	20	66.7
Irritability	20	66.7
Backache	18	60.0
Depression	13	43.3
Fatigue	13	43.3
Breast tenderness	12	40.0
Headache	8	26.7
Anxiety	4	13.3
Food craving	3	10.0
Cramp	2	6.7
Difficulty in concentrating	2	6.7

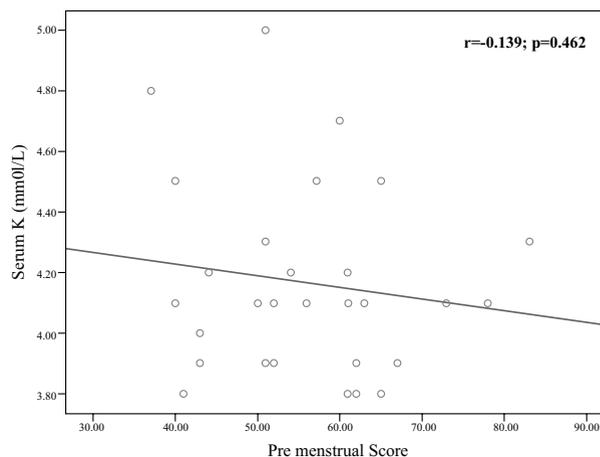
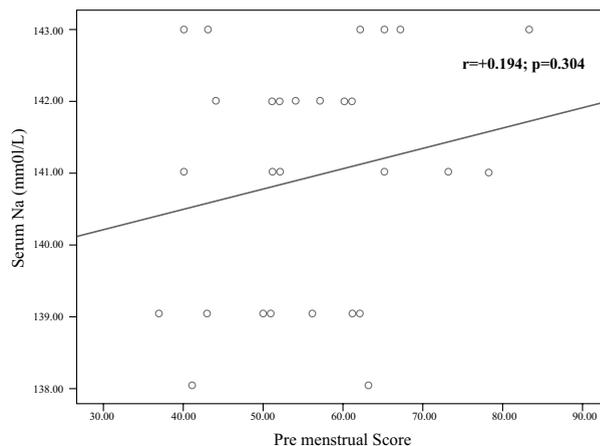
Table 2 demonstrates that among the PMS group, the majority had complaints of abdominal bloating and irritability (66.7%), backache (60.0%), depression and fatigue (43.3%), and breast tenderness (40.0%).

**Table 3: Pre- and post-menstrual scores of PMS in the PMS group (n=30)**

PMS symptoms	Pre-menstrual scores	Post-menstrual scores	p value
	Mean± SD	Mean± SD	
Irritability	10.60±7.75	1.90±2.38	*0.001
Backache	9.27±7.83	0.53±1.22	*0.001
Abdominal bloating	9.37±6.92	0.43±1.17	*0.001
Depression	6.67±7.86	0.33±1.03	*0.001
Fatigue	6.10±7.13	1.50±2.51	*0.001
Breast tenderness	6.33±7.90	0.17±0.65	*0.001
Headache	3.37±5.81	1.00±1.80	*0.004
Anxiety	1.73±4.57	0.17±0.65	*0.049
Food craving	1.33±4.10	0.27±1.01	0.095
Cramp	0.53±2.03	0.10±0.55	0.172
Difficulty in concentrating	0.70±2.67	0.23±0.90	0.165

Unpaired ‘t’ test was done, \*Statistically significant value

Table 3 interprets the pre- and post-menstrual scores of PMS symptoms in the PMS group. Premenstrual scores of irritability, abdominal bloating, backache, depression, fatigue, breast tenderness, headache, and anxiety were significantly higher in comparison to those of postmenstrual scores in the PMS group (p<0.05).



**Figure 2: Correlation of serum sodium and potassium levels with PMS scores (n=30)**

Figure 2 interprets that there was no significant correlation between serum sodium (r= +0.194, p= 0.304) and potassium (r= -0.139, p= 0.462) levels with PMS scores in the PMS group.

**Discussion**

In the current study, the mean age of the young unmarried women with the premenstrual syndrome was 20.30±1.15 and 20.53±1.17 years in groups A and B. The values were almost similar within the groups and no statistically significant difference was found within the age.

The present study revealed that the mean serum sodium level was 139.97±1.30 and 140.93±1.68 mmol/L, and serum potassium level was 4.20±0.32 and 4.17±0.31 mmol/L in groups A and B. The mean serum sodium level was significantly higher in group B in comparison to group A (p<0.05). This observation was almost consistent with those studies.<sup>14,15</sup> They suggested that women experiencing PMS during the luteal phase tend to consume more foods rich in sodium; this increased desire for salty foods may be the cause of higher sodium levels.<sup>14,16</sup>

In the present study, the majority of the participants had complaints of abdominal bloating and irritability (66.7%), backache (60.0%), depression and fatigue (43.3%) and breast tenderness (40.0%). The mean of the premenstrual symptoms scores for irritability, abdominal bloating, backache, depression, fatigue, breast tenderness, headache, anxiety, food craving, cramp and difficulty in concentrating was  $10.60 \pm 7.75$ ,  $9.37 \pm 6.92$ ,  $9.27 \pm 7.83$ ,  $6.67 \pm 7.86$ ,  $6.10 \pm 7.13$ ,  $6.33 \pm 7.90$ ,  $3.37 \pm 5.81$ ,  $1.73 \pm 4.57$ ,  $1.33 \pm 4.10$ ,  $0.53 \pm 2.03$  and  $0.70 \pm 2.67$ . The mean of the postmenstrual symptoms scores for irritability, abdominal bloating, backache, depression, fatigue, breast tenderness, headache, anxiety, food craving, cramp and difficulty in concentrating was  $1.90 \pm 2.38$ ,  $0.43 \pm 1.17$ ,  $0.53 \pm 1.22$ ,  $0.33 \pm 1.03$ ,  $1.50 \pm 2.51$ ,  $0.17 \pm 0.65$ ,  $1.00 \pm 1.80$ ,  $0.17 \pm 0.65$ ,  $0.27 \pm 1.01$ ,  $0.10 \pm 0.55$  and  $0.23 \pm 0.90$ . Premenstrual scores of irritability, abdominal bloating, backache, depression, fatigue, breast tenderness, headache, and anxiety were significantly higher in comparison to those of postmenstrual scores in the PMS group ( $p < 0.05$ ). Similar types of findings were observed in these studies.<sup>17,18</sup> Serum sodium and potassium levels showed no correlation ( $p > 0.05$ ) with PMS scores in the PMS group. Chocano-Bedoya et al. (2013) observed no association between dietary intake of sodium and PMS.<sup>16</sup>

### Conclusion

The study revealed that alteration in serum sodium level occurred in young unmarried women with PMS. These findings suggest that dietary minerals may be useful in preventing PMS.

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**Conflicting interests:** All the authors declared no competing interest.

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