Effect of premenstrual stress on autonomic function

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KEY WORDS

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ABSTRACT

Background: Premenstrual syndrome is a psychoneuro endocrine stress related disorder. **Purpose:** To study the effect of premenstrual stress on autonomic function. **Methods:** Study of autonomic function basal heart rate, basal blood pressure, systolic & diastolic response to cold stimulus was carried out in 80 Eumenorrheic females age between 18-25 yrs. during premenstrual & post menstrual phase. Subjects were divided in two groups control (n=40), premenstrual syndrome group (n=40) based on presence of symptoms. **Results:** Increased autonomic nervous activity with significantly increased heart rate, blood pressure, systolic & diastolic response to cold stimulus was observed during premenstrual phase. Difference of mean of autonomic function in pre and post menstrual phase in premenstrual syndrome group was significantly higher than control. **Conclusion:** Change in physiological response in premenstrual syndrome group is because of increased sympathetic activity resulting from modulation of neurotransmitter due to hormonal fluctuation.

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Introduction

Premenstrual Syndrome is a major clinical entity affecting large segment of female population¹ Premenstrual Syndrome is a psychoneuro endocrine disorder with biological, psychological and social component along with stress as its major cause.²⁻⁶ Premenstrual Syndrome encompasses wide variety of cyclic, recurrent, physical, emotional, behavioral symptoms occurring during late luteal phase of menstrual cycle and abating shortly following beginning of menses.²

According to Mishell⁷ majority of women experience a cacophony of mind and body in late luteal phase that is characterised by premenstrual symptomatology. More than 160 behavioral and neurological symptoms like headache, malaise, nervous irritability, emotional instability, decrease in the ability to concentrate, resulting in impaired motor coordination are reported during premenstrual phase suggesting heterogeneous diagnostic criteria and ethnic variation.^{1,4,8}

Premenstrual syndrome is a psychophysiological stress induced disorder. Stress disturbs the balance of sympathetic and parasympathetic nervous system. Changes in heart rate and blood pressure are the most important physiological response following stress⁹ cold pressor test is a standard parameter to assess the activity of sympathetic Nervous System.¹⁰ The study was carried out to assess the activity of autonomic Nervous System which plays a vital role in orchestrating. The Physiological homeostasis during different phases of menstrual cycle.

Methods

80 healthy Eumenorrheic females having regular menstrual cycle in the age group of 18-25 yrs were included in study. Premenstrual distress Questionnaire¹¹ was used to evaluate the symptoms of Premenstrual stress. On the basis of history and clinical examination the symptoms of subject were charted down and analyzed. Based on the presence or absence of symptoms, subjects were divided in two groups.

1) 40 subjects having symptoms of Premenstrual stress-

Premenstrual Syndrome group.

2) 40 subjects not possessing Symptoms of Premenstrual stress - control group.

Subjects having menstrual abnormally, acute or chronic abdominal pain related to surgical or medical illness, smokers, alcoholic, subject receiving psychiatric treatment were excluded. Oral temperature was recorded early in the morning. Experiment protocol was explained to them and informed consent was obtained. The procedure was non invasive and the study plan was approved by Institutional ethical committee. All the test were done twice.

1) In Premenstrual phase - Five days before the due date of menses.

2) In Post menstrual Phase - 5-10 days of menstrual cycle.

Subjects were asked to report at 9am. The weight of subjects was recorded. After a rest for 15 min basal heart rate, systolic and diastolic BP was recorded. Cold pressor test was done in supine posture with left hand immersed in cold water having temp. 4°C just above the wrist for 1 min. Heart rate, systolic blood pressure diastolic BP was recorded in Rt hand after 1 min and 5 min.

The maximum changes in systolic and diastolic BP from resting value during cold stimulus is defined as systolic and diastolic response.

Results

The anthropometric parameters in control were having age- 22.3 +/- 4 yr, height-153.4 +/- 0.4 cm, weight 52.5 +/- 0.8 kg, BMI 22.43 +/- 0.3 Kg/m² while premenstrual syndrome group represented the age 22.9 +/- 3yr, height - 150 +/- .6 cm, weight- 51.2 +/- 0.6 kg, BMI 22.67 +/- .2 kg/m² respectively. The statistical difference was found to be non significant.

The premenstrual symptoms observed were abdominal pain 80%, low back pain 70%, headache 15%, nausea 10%, acne 10%, heaviness in breast 7%. None of the subjects in

Table 1 : Parameters in premenstrual phase

S.No.	Parameters	Premenstrual Syndrome Group			Control		
		SBP	DBP	HR	SBP	DBP	HR
1	Basal	118 ± 10.1	82 ± 8.5	82 ± 3.5	112 ± 6.8	78 ± 4.4	79 ± 3.8
2	1 M CPT	130 ± 2.8	86 ± 4.5	90 ± 6.5	122 ± 4.5	82 ± 6.1	82 ± 4.5
3	5 M CPT	116 ± 7.5	84 ± 6.5	82 ± 2.5	108 ± 3.5	78 ± 5.4	78 ± 2.7

Table 2: Parameters in menstrual phase

S.No.	Parameters	Premenstrual Syndrome Group			Control		
		SBP	DBP	HR	SBP	DBP	HR
1	Basal	110 ± 8.9*	76 ± 6.3*	75 ± 4.7*	108 ± 8.2*	76 ± 3.8*	76 ± 3.4*
2	1 M CPT*	120 ± 3.5*	82 ± 4.7*	84 ± 6.8*	118 ± 3.4*	80 ± 5.7*	80 ± 4.8*
3	5 M CPT*	110 ± 6.3*	80 ± 5.8*	78 ± 3.6*	106 ± 2.8*	77 ± 5.1*	77 ± 2.3*

*P<0.05: P values are comparison between premenstrual phase and post menstrual phase

Difference of mean in premenstrual & post menstrual phase in Premenstrual syndrome group significantly higher than control.

Premenstrual Stress Questionnaire

Date :

Name / Age / Address :

Marital Status : Married / Unmarried

Education : Doctor / Nurse / House wife

Menarche

Age at Onset of PMS (year)

Date of Last Menstruation (LMP)

Menstrual History

Premenstrual Problems

Lower abdominal pain : Yes/ No/ Sometimes

Headache : Yes/ No/ Sometimes

Low back ache : Yes/ No/ Sometimes

Swelling in abdomen : Yes/ No/ Sometimes

Heaviness in breast : Yes/ No/ Sometimes/ Painful/ Tender/ Sore

How frequently you observe these premenstrual problems?

Every cycle / Alternate cycle / Sometimes Any other feature you want to highlight :

Psychological Symptoms

Irritability : yes/ No/ Sometimes

Anxiety : Yes/ No/ Sometimes

Lack of sleep / More sleep : Yes/ No/ Sometimes

Depression / Loneliness / crying : Yes/ No/ Sometimes

Mood swings : Yes/ No/ Sometimes

Appetite : Increased / Decreased / Normal

Constipation / Diarrhea : Yes/ No/ Sometimes

Nausea / Vomiting : Yes/ No/ Sometimes

Preference for food : Bitter / Salty / Sweet / Sour / High fat

Frequency of micturition : Yes/ No/ Sometimes

Acne Face : Yes/ No/ Sometimes

Greasiness of scalp and hair : Yes/ No/ Sometimes

premenstrual syndrome group had disruption of normal activities due to premenstrual symptomatology. Systolic blood pressure, diastolic blood pressure, Heart rate in basal condition after 1 min, 5 min cold pressor test was significantly higher in premenstrual phase as compared to post menstrual phase in premenstrual Syndrome group and control. Difference of mean of systolic BP, diastolic BP, heart rate in basal condition, after 1 min, 5 min cold pressor test in premenstrual phase and post menstrual phase in premenstrual syndrome group was significantly higher than control ($p < .05$).

Statistics

All the data was evaluated with graph pad prism-5. The results were expressed as mean $\pm$ SD. Data was analyzed by paired t test within the group and unpaired t test for comparison between two groups. Statistical significance was taken as $p < 0.05$.

Discussion

Significantly higher heart rate, systolic and diastolic BP in basal condition, after 1 min, 5 min cold pressor test in premenstrual phase is because of higher sympathetic activity due to premenstrual stress. Changes in the autonomic function may be responsible for some of the symptoms produced through endorphins and have been held responsible for behavioral changes.^{9,15} Hastup *et al*¹²⁻¹⁴ also reported the significant rise of pulse rate, systolic and diastolic BP in premenstrual phase.

Increased blood pressure due to premenstrual stress is due to increase in peripheral resistance and mediated by adrenocortical stimulation causing precapillary resistance. This could be due to increasing sympathetic activity or elevation of circulating catecholamine while other active hormone like rennin angiotensin aldosterone system also contribute. Rise in blood pressure due to stress leads to increased epinephrine secretion. Rise in blood pressure is important sympatho-adrenal response to physiological stressful experience caused by premenstrual stress.¹⁻¹⁶

According to Tamki, women with greater degree of premenstrual distress possess higher sympathetic activity in late luteal phase than women with less symptoms.¹⁷ Change in physiological response in premenstrual syndrome group is because of increased sympathetic activity resulting from modulation of neurotransmitter due to hormonal fluctuation. Altered functioning of autonomic nervous system in the Late luteal phase could be associated with diverse psychosomatic or behavioral symptoms appearing premenstrually. Relaxation technique should be recommended as an adjuvant therapy to tilt the autonomic balance to parasympathetic dominance to get relieved from premenstrual symptoms.

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