A Comparative Study on Autonomic Function Tests in Pre Menstrual Syndrome and Healthy Control Females

Diya P. D[1], Dr. J. K. Mukkadan[2]

[1]Department of Physiology, Little Flower Institute of Medical Sciences and Research, Angamaly, Kerala, India

[2]Research Director and Professor, Department of Physiology, Little Flower, Institute of Medical Sciences and Research, Angamaly, Kerala, India

Abstract: *The present study was undertaken to compare the autonomic function tests between PMS and control group. Premenstrual syndrome (PMS) is characterized by the cyclic occurrence of psychological, physiological and behavioral symptoms. Autonomic functions are altered in people with these symptoms. Autonomic activity both sympathetic and parasympathetic higher in PMS. A total 30 females with premenstrual syndrome and 30 age matched non PMS females was recruited in the study. The sympathetic activity was assessed by blood pressure response to cold pressor test. And parasympathetic activity assessed by blood pressure response to supine to standing position test. The study shows that there is significant increase in the systolic and diastolic blood pressure before and after the autonomic function test within the group but between the group the blood pressure changes were not significant.*

Keywords: Premenstrual syndrome (PMS), Autonomic nervous system (ANS), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Body mass index (BMI), Autonomic function tests.

1. Introduction

The Autonomic Nervous System is one of the part of the nervous system. It is responsible for maintaining constant internal environment or homeostasis along with the help of Endocrine and Immunological systems. The ANS is very important in daily life.[1,2] Which act as a major coordination center for different systems in human body.[3] The autonomic nervous system regulate blood pressure, temperature, respiration, heart rate, gastrointestinal, bladder, sexual function in the body .[4]

Menstrual cycle is simple and most complex process. Average cycle length is 28 days. It has 3 phases, menstrual, follicular and lutealphase. [5]According to National Institute of Mental Health, premenstrual syndrome is defined as "the cyclic occurrence of symptoms that are of sufficient severity to interfere with some aspect of life and which appear with consistent and predictable relationship to menses". [6]Premenstrual syndrome (PMS) is characterized by the cyclic occurrence of psychological, physiological and behavioral symptoms. These symptoms are appearing mainly during luteal phase and it disappearing after menstrual phase.[7,8] In premenstrual phase more than 160 behavioral and neurological symptoms are also reported. It includes headache, malaise, nervous irritability, emotional instability, decrease in the ability to concentrate, resulting in impaired motor coordination .[9,10,11]Autonomic functions are altered in people with psychosomatic symptoms such as depression, anxiety, or chronic fatigue, due to the potential association of PMS and autonomic nervous system activity.[12,13,14] Premenstrual syndrome is a disorder caused by psycho physiological stress. Stress disturbs the balance between sympathetic and parasympathetic nervous system. This psycho physiological stress change the heart rate and blood pressure .[15]The autonomic activity- both sympathetic and para sympathetic are higher in PMSgroup duringfollicular phase. Parasympathetic activity is lower in luteal phase.[16]Autonomic parameters are greater during premenstrual phase compared post-menstrual phase due to sympathetic dominance.[17]

Autonomic system both sympathetic and parasympathetic disorders assessed by using the autonomic function tests.[18]cold pressor test, supine to standing position test were used to assess the autonomic function.[19]cold pressor test is a standard parameter to assess sympathetic Nervous System activity.[20]

The present study aimed to observe comparison between autonomic function tests in premenstrual syndrome and healthy controls.

2. Materials and Methods

The present case control study was conducted in Department of Physiology, Little Flower Institute of Medical Sciences and Research, Angamaly, Kerala, during July to October 2018.The present study was approved by institutional ethical committee of Little FlowerHospital and Research Centre, Angamaly.

Participants
A total 30 females with premenstrual syndrome and 30 age matched non PMS females was recruited in the study after obtaining written informed consent. The willing participants were screened for premenstrual syndrome by using standard PMS questionnaire [21,22,23]. Participants were selected by stratified random sampling .

Inclusion Criteria
- Healthy females with PMS (PMS will be screened by using PMS questionnaire[21,22,23]) having regular menstrual cycle.
- Healthy females without PMS having regular menstrual cycle.

- Age group is between18-25.
- Willing participants.

Exclusion Criteria
The participants with any physical problem, psychiatric problem or on medication including contraceptives will be excluded from the study.

Methods

The participants were familiar with the experimental procedures before 2 days of the study. After recording the baseline data all parameters are recorded in PMS(7 days before menstruation) and control group. The following parameters used to asses the autonomic functions:
1) **Cold Pressor test:** After recording the resting blood pressure subjects were asked to dip left arm in the cold water (temp at 2-4^0) for 1 minutes and blood pressure was recorded from right arm.[24]
2) **Blood pressure from supine to standing position**: The subjects were asked to lie down quietly for10 minutes, and stand quietly within 5 seconds and remain standing quietly for 1minute, the systolic and diastolic blood pressure was measured at the end of 1minute.[24]

Statistical Analysis
Descriptive statistics used to assess the demographic characteristics of the data. Quantitative variables presented as mean and standard deviation and qualitative variables presented as percentages. Paired sample t test and independent sample t test used for the comparison of BP within group and paired sample t test used for comparison between the groups. Data was entered in excel and analyzed with SPSS 20.0 version. P value is <0.05 considered as statistical significance.

3. Results

Table 1: Demo graphical characteristics of the PMS and control groups

Parameters	Control group (n=30)	PMS group (n=30)
	Mean± SD	Mean± SD
Age (yrs)	20.3±2.33	20.9±2.38
Height(cm)	156.9±6.59	159.5±5.13
Weight(kg)	53.9±9.97	53.2±8.35
BMI	21.9±4.15	20.90±3.24

The above table shows the basic demo graphical data of PMS and control groups presented in mean± SD.

Table 2: Comparison of SBP&DBP changes during autonomic function tests in control group

Parameters		Mean± SD	t value	P value
Cold pressor test SBP	Resting SBP	101.1±12.8	6.32*	P<.0001
	After test SBP	114.4±14.4		
Cold pressor test DBP	Resting DBP	62.7±12.6	5.34*	P<.0001
	After test DBP	76.63±13.9		
Supine to standing SBP	Resting SBP	106.3±13.5	4.45*	P<.0001
	After test SBP	100.6±11.2		
Supine to standing DBP	Resting DBP	71.2±13.5	6.04*	P<.00001
	After test DBP	76.5±13.2		

** Independent sample t-test,* paired t- test

The table shows the comparison of SBP&DBP changes during autonomic function tests in control group. The mean and SD column shows the average and standard deviation of SBP and DBP before and after the test. Mean and SD of cold pressor test SBP are 101.1±12.8 and 114.4±14.4 (resting SBP & after test SBP).The SBP increased from resting BP .The P value is <.0001 and it is highly significant at P<.05.Mean and SD of cold pressor test DBP are 62.7±12.6 and 76.63±13.9 (resting DBP &after test DBP). DBP is increased from resting BP.The P value is <.0001 and it is highly significant at P<.05. Mean and SD of supine to standing position test test SBP are 106.3±13.5 and 100.6±11.2(resting SBP & after test SBP). SBP is decreased from resting BP.The P value is <.0001 and it is highly significant at P<.05.Mean and SD of supine to standing position test DBP are 71.2±13.5 and 76.5±13.2 (resting DBP &after test DBP).DBP is increased from resting BP. The P value is <.00001 and it is highly significant at P<.05.

Table 3: Comparison of SBP&DBP changes during autonomic function tests in PMS group

Parameters		Mean± SD	T value	P value
Cold pressor test SBP	Resting SBP	108.6±12.9	5.1549*	P = .00002
	After test SBP	116.8±10.9		
Cold pressor test DBP	Resting DBP	67.03±10.4	5.8487*	P<.00001
	After test DBP	76.4±10.4		
Supine to standing SBP	Resting SBP	104.4±11.4	2.6011*	P=0 .01447
	After test SBP	107.7±11.6		
Supine to standing DBP	Resting DBP	66.7±8.73	5.1536*	P=0.00002
	After test DBP	71.4±8.68		

**independent sample t-test,* paired t- test

The table shows the comparison of SBP&DBP changes during autonomic function tests in PMS group. The mean and SD column show the average and standard deviation of SBP and DBP before and after the test. Mean and SD of cold pressor test SBP are 108.6±12.9 and 116.8±10.9 (resting SBP & after test SBP). SBP is increased from resting BP. The P value is .00002 and it is highly significant at P<.05.Mean and SD of cold pressor test DBP are 67.03±10.4 and 76.4±10.4 (resting DBP &after test DBP). DBP is increased from resting BP. The P value is <.00001 and it is highly significant at P<.05. Mean and SD of supine to standing position test SBP are 104.4±11.4 and 107.7±11.6 (resting SBP & after test SBP). SBP is increased from resting BP. The P value is .01447 and it is significant at P<.05.Mean and SD of supine to standing position test DBP are 66.7±8.73 and 71.4±8.68 (resting DBP &after test DBP).DBP is increased from resting BP. The P value is .00002 and it is highly significant at P<.05.

Table 4: Comparison of resting SBP and DBP of cold pressor test between PMS and control group

		Mean	Standard deviation	Mean	t value	P value
SBP	Control	101.1	12.8	7.47	2.05057	0.04943
	PMS	108.6	12.9			
DBP	Control	62.7	12.6	4.3	1.0477	0.15041
	PMS	67.03	10.4			

The table shows the comparison of resting SBP and DBP of cold pressor test between PMS and control group. The mean and SD column of t test table shows the average and SD of SBP in control and PMS group(101.1±12.8&108.6±12.9) and

average and SD of DBP in control and PMS group(62.7±12.6&67.03±10.4). Mean difference of SBP and DBP in two group is 2.05&1.04. P value is 0.04943 in SBP and 0.15041 in DBP. The difference between control and PMS group in both SBP were significant at P is<0.05&DBP were not significant at P>0.05.

Table 5: Comparison of SBP and DBP after cold pressor test between PMS and control groups

		Mean	Standard deviation	Mean	t value	P value
SBP	Control	114.4	14.4	2.97	0.6725	0.50657
	PMS	116.8	10.9			
DBP	Control	76.6	13.9	-0.2	-0.0636	0.9467
	PMS	76.4	10.4			

The table shows the comparison of SBP and DBP after cold pressor test between PMS and control group. The mean and SD column of t test table shows the average and SD of SBP in control and PMS group(114.4±14.4&116.8±10.9) and average and SD of DBP in control and PMS group(76.6±13.9&76.4±10.4).Mean difference of SBP and DBP in two group is 2.97&-0.2. P value is 0.50657 in SBP &0.94967 in DBP. The difference between control and PMS group in both SBP&DBP were not significant at P>0.05.

Table 6: Comparison of resting SBP and DBP of supine to standing position test between PMS and control group

		Mean	Standard deviation	Mean	t value	P value
SBP	Control	106.3	13.5	-1.93	-0.6751	0.50492
	PMS	104.4	11.4			
DBP	Control	71.2	13.5	-4.53	-1.6540	0.10891
	PMS	66.7	8.73			

The table shows the comparison of resting SBP and DBP of supine to standing position test between PMS and control group. The mean and SD column of t test table shows the average and SD of SBP in control and PMS group(106.3±13.5&104.4±11.4) and average and SD of DBP in control and PMS group(71.2±13.5&66.7±8.73).Mean difference of SBP and DBP in two group is -1.93&-4.53. P value is 0.5492 in SBP & 0.10891 in DBP. The difference between control and PMS group in both SBP&DBP were not significant at P>0.05.

Table 7: Comparison of SBP and DBP after supine to standing position test between PMS and control group

		Mean	Standard deviation	Mean	t value	P value
SBP	Control	100.6	11.2	7.1	2.4634	0.01993
	PMS	107.7	11.6			
DBP	Control	76.5	13.2	-5.1	-1.8588	0.07322
	PMS	71.4	8.6			

The table shows the comparison of resting SBP and DBP of supine to standing position test between PMS and control group. The mean and SD column of t test table shows the average and SD of SBP in control and PMS group(100.6±11.2&107.7±11.6) and average and SD of DBP in control and PMS group(76.5±13.2&71.4±8.6).Mean difference of SBP and DBP in two group is 7.1&-5.1. P value is 0.01993 in SBP &0.07322 in DBP. The difference between

control and PMS group in both SBP is significant at P<0.05 &DBP were not significant at P>0.05.

4. Discussion

The present study undertaken to compare the autonomic function tests between PMS and control groups. It shows that there is statistically significant increase of blood pressure during autonomic function tests within the groups. But between the PMS and control group the blood pressure changes during autonomic function tests are not statistically significant.

Premenstrual syndrome (PMS) is characterized by the cyclic occurrence of psychological, physiological and behavioral symptoms. These symptoms are appearing mainly during luteal phase and it disappearing after menstrual phase.[7,8]

The autonomic activity- both sympathetic and para sympathetic are higher in PMS group during follicular phase. Parasympathetic activity is lower in luteal phase but the sympathetic activity is higher during this phase. The increased sympathetic activity with decreased parasympathetic activity may be responsible for the psychological and physiological symptoms in women during premenstrual syndrome. [16]

A study designed to assess the sympathetic function tests during the three phases follicular, luteal and menstrual phases in normal healthy eumenorrheic females shows that blood pressure in the resting state and during the stressful maneuvers like cold pressor test, isometric handgrip exercise and standing from lying posture was highest during luteal phase of the menstrual cycle and lowest in the follicular phase. This correlates the neural and hormonal basics for PMS symptoms.[24]In the present study shows that the resting blood pressure is increased after the cold pressor and supine to standing position test. Within the groups BP changes are statistically significant but between the groups the change in blood pressure are not statistically significant.

5. Conclusion

The present study was undertaken to compare the autonomic function tests between PMS and control groups. We conclude that there is statistically significant increase in the blood pressure in both systolic and diastolic BP after the autonomic function tests. Within the groups the blood pressure changes are statistically significant. But between the PMS and control group the blood pressure changes were not statistically significant.

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