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"GENDER VARIATION EFFECT OF CHANGE IN POSTURE AMONGST HEALTHY YOUNG ADULTS"

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Abstract:

Background: Women are at less risk of coronary heart disease and of serious arrhythmias as compared to their male counterparts, with women lagging behind men in the incidence of sudden death by 20 years. This gender differences in cardiac autonomic function may be a result of a combination of factors such as developmental differences, the effect of male and/or female sex hormones etc.

Objectives: To study the variation of change in posture on comparing the young healthy males with each of the 3 different phases of menstrual cycle in females.

Material and methods: The present study was carried out on 50 healthy female and 50 healthy male subjects between the ages of 18 to 25 years. Non-invasive Sympathetic function tests were performed like postural challenge test and resting blood pressure. The results were analysed using student-t-test.

Results: In the present study, significant differences ($P<0.05$) were observed in sympathetic function tests between males and most of the phases of Menstrual Cycle in females. The males had a significantly higher resting blood pressure with less fall in blood pressure on standing as compare to females.

Conclusion: We can conclude from our study that on comparison of sympathetic function tests amongst males and females shows that males have higher sympathetic activity as compared to all the 3 phases of menstrual cycle in females of the same age group; this lower sympathetic activity in females may be the reason behind their lower cardiovascular risk as compared to males.

Keywords: Postural challenge test, blood pressure, Gender difference

INTRODUCTION

The cardiovascular responses of blood pressure, cardiac output, heart rate and other variables to change in posture differ between the sexes. The differences are related to greater decrease of thoracic blood volume with standing in women than the men [1]. A few reports on gender-related differences in cardiac autonomic modulation reveal that, in normal Population, parasympathetic tone dominates over sympathetic in women and vice versa in men [2].

Gender differences in the autonomic nervous system may be present because of developmental variations or due to the effect of varied concentrations of male and/or female sex hormones [3].

MATERIAL & METHODS

The present cross-sectional study was carried out in the Department of Physiology, M.G.M. Medical College, Indore (M.P.). A total of 50 young healthy female medical students with normal menstrual cycle and 50 young healthy male medical students in the age group of 18-25 years were selected for study. A brief explanation to subjects regarding the procedure was given and written informed consent were taken. The ethical clearance was obtained from the institutional ethical committee. Only those participants were

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taken into study that fulfilled our inclusion criteria's.

Inclusion Criteria:

Male and female subjects of 18-25 yr age group, giving consent for participation in the study.

Exclusion Criteria:

1. Subjects not giving consent for participation.
2. History of alcohol intake.
3. History of smoking, tobacco consumption.
4. History of hypertension or any other clinical signs of cardiovascular diseases.
5. Subjects receiving drugs known to affect autonomic function, for eg: Adrenergic drugs, Adrenergic blocking drugs, Cholinergic agents, Diuretics, Antihypertensive drugs.
6. Females with irregular menstrual cycle.

The history related to their present, past, family, personnel, was taken along with menstrual history in female subjects. 1-5th day, 9-12th day and 19-25th day were selected to represent the menstrual, follicular and luteal phases respectively. Physical parameters like age, height and weight were noted. All tests were carried out in the morning.

The following Sympathetic function tests were performed:

1. **Resting Blood Pressure:** The subject was asked to lie down comfortably and take rest for 10min. Then resting blood pressure was measured by auscultatory method with the help of mercury sphygmomanometer.
2. **Postural change in Blood Pressure:** The subject was asked to relax completely for a minimum of 10 min, then was asked to stand up and immediately the change in BP were noted. BP was recorded serially for 1-3 min after standing.

STATISTICAL ANALYSIS

In the present study, results were expressed as Mean±S.D. All statistical analysis was done by using SPSS software version 20. Student's unpaired-t tests were carried out to study significance of variations between males and different phases of menstrual cycle in females. P Value <0.05 is taken as significant.

RESULT:

Table 1: Comparison of Anthropometric Parameters of male and female subjects

Groups	Age(yrs)	Height(cms)	Weight(kg)	BMI(kg/m^2)
Males	19.62 ± 1.048	171.50 ± 9.748	64.88 ± 11.157	21.85 ± 3.626
Females	19.32 ± 1.150	159.16 ± 9.250	51.64 ± 8.535	20.33 ± 2.993
P-value	0.176	0.000	0.000	0.024
Level of significance	Not Significant	Significant	Significant	Significant

Table 2: Comparison of Mean and SD of Sympathetic Function Tests between males and 3 different phases of menstrual cycle in females

Parameters	Females			Males
	Menstrual Phase	Follicular Phase	Luteal phase	
Resting SBP	103.96±6.32	100.04±6.03	108.76±6.65	113.08±7.16
Resting DBP	69.04±5.20	68.32±4.74	72.08±4.65	74.20±6.74
Postural SBP	96.78±5.53	94.24±5.08	99.86±6.16	108.2±6.78
Postural DBP	62.76±3.62	62.48±2.97	63.00±3.97	68.90±6.24

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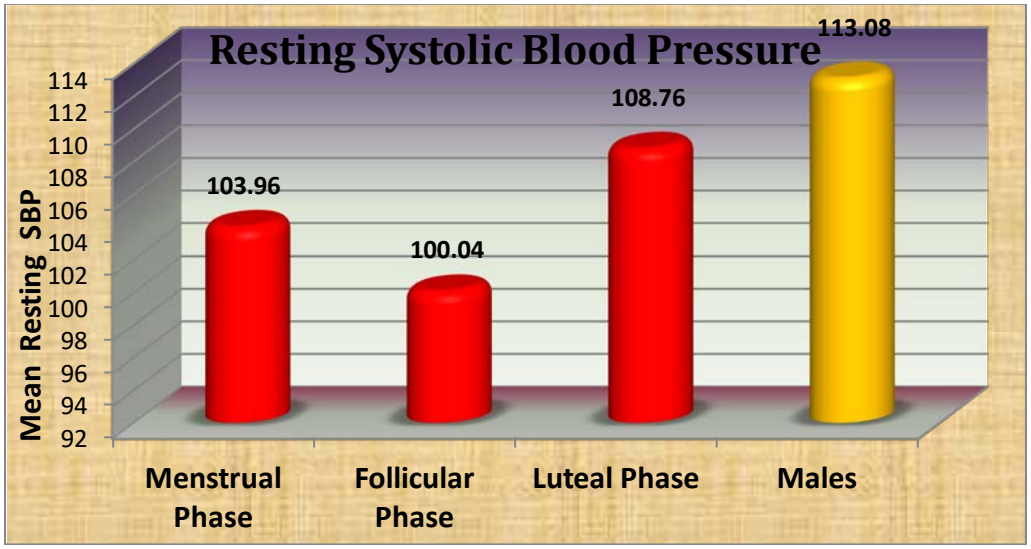

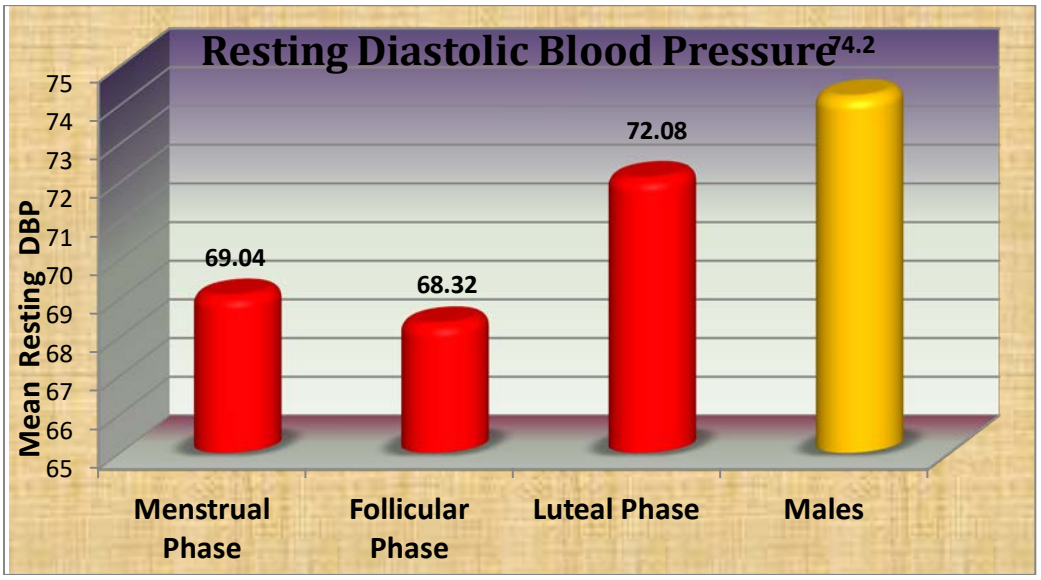

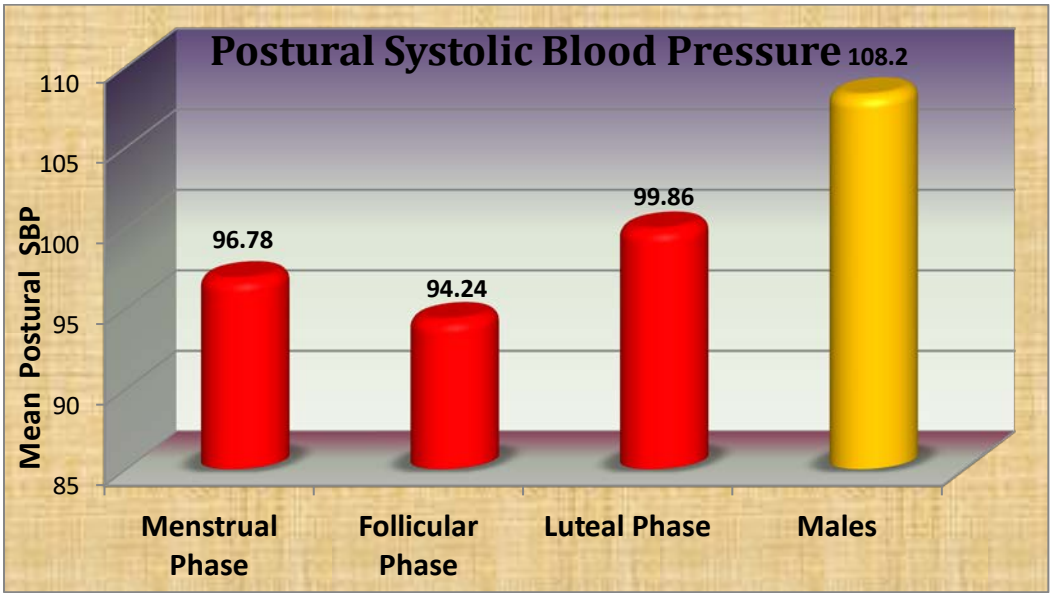

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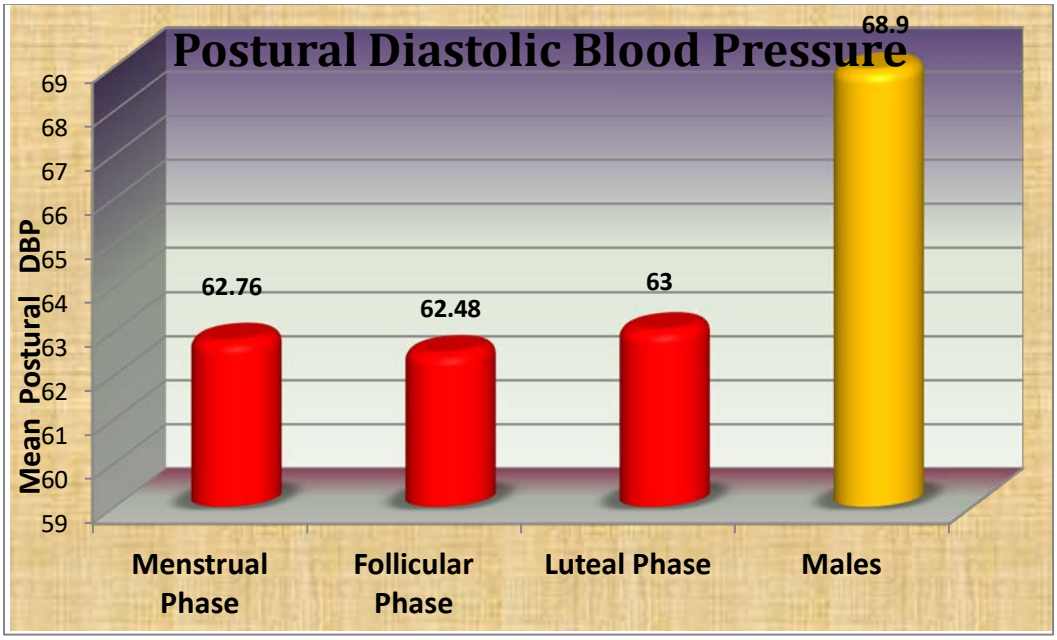

Table 3: Comparative Analysis of Sympathetic Function Tests Between males and 3 different phases of menstrual cycle in females

Parameters	Menstrual Phase vs males	Follicular Phase vs males	Luteal Phase vs males
Resting SBP	0.000	0.000	0.002
Resting DBP	0.000	0.000	0.070
Postural SBP	0.000	0.000	0.000
Postural DBP	0.000	0.000	0.000

DISCUSSION:

Resting Blood Pressure: In our study, there was a statistically significant difference ($P<0.05$) in mean resting systolic blood pressure between males and different phases of menstrual cycle in females, with higher values in males. The statistically significant differences ($P<0.05$) in mean resting diastolic blood pressure (DBP) was only between male and menstrual phase & male and follicular phase but no statistically significant differences between males and luteal phase of menstrual cycle in female, with higher values in males.

Our results were similar to the previous studies of **Prasad HT et al** [4], **Ndayisaba JP et a**l [5], **Moodithaya S et al** [2], **Akintomide AO et al** [6] which showed statistically significant difference in resting systolic and diastolic blood pressure with higher value in males as compared to females.

Males had higher resting blood pressure as compare to females. This may be due to hormonal influences or a genetic background. The effects of sex hormones on blood pressure have been widely demonstrated: oestrogens have a favourable effect, possibly as a result of a mechanism involving the renin-angiotensin system and endothelium-derived relaxing factors (i.e. nitric oxide and prostaglandins [7], the central nervous system [8], or the stimulation of natriuretic peptide production [7].While testosterone increases blood pressure levels [9]. Furthermore, it is worth noting that (at least in animal models) the Y-chromosome itself is

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involved in the genesis of hypertension because it enhances sympathetic hyperactivity, which may reinforce neurohumoral factors and structural components of the vessel wall, accelerating the development of hypertension [10].

Postural change in Blood Pressure: In our study, changes in blood pressure from supine to standing position shows that there is a statistically significant ($P<0.05$) difference in postural change of systolic and diastolic blood pressure between males and different phases of menstrual cycle in females, with higher fall in systolic and diastolic blood pressure was seen in females as compared to males.

Our results which showed the greater fall in systolic blood pressure in females as compared to males on changing position from supine to standing are similar with the studies of **Yograj S et al** [11], **Chu TS et al** [12] but not similar with the studies of **Ogunlade O et al** [13], **Ludwig DA et al** [14] who found that greater fall in blood pressure in males as compared to females on changing position from supine to standing.

Postural change in systolic blood pressure had been established as a test of cardiac autonomic function mainly evaluating the sympathetic division of the autonomic nervous system [15,16]. Autoregulatory mechanisms ensure relatively small fluctuations of blood pressure with postural changes in healthy people [17]. Assumption of upright posture from supine position results in a small but measurable decrease in SBP due primarily to a redistribution of blood volume into the lower abdomen and extremities under the effect of gravity. In most people, this decrease in blood pressure is very slight and evanescent due to mobilization of neurohumoral and baroreflex mechanisms to maintain the blood pressure [18]. The initial physiological mechanisms bring about the hypotensive systolic blood pressure response while the compensatory mechanisms bring about restoration of blood pressure. The sex difference in cardiovascular responses to postural changes were related to greater decrease of thoracic blood volume with standing in women than in men [1].

CONCLUSION

From the above study, we can conclude that gender differences exist in cardiac autonomic function and there is higher sympathetic activity in males as compared to females. This might provide an explanation for the protection against cardiovascular disease observed in females. Although it is difficult to generalise the results on the basis of above study alone. Factors responsible for differences in cardiovascular response due to gender appear to be numerous and conflicting and further study is essential to elucidate the specific mechanism.

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