e-ISSN: 2319-9865
p-ISSN: 2322-0104

RESEARCH AND REVIEWS: JOURNAL OF MEDICAL AND HEALTH SCIENCES

Cardiovascular Parasympathetic Functions in Different Phases of Menstrual Cycle: A Prospective Observational Study.

Ashwini N Nilekar*, Kiran D Thorat, and Mangala Vatve.

Hi-Tech Medical College, Bhubaneswar, Odisha, India.

Research Article

Received: 04/06/2014
Revised: 25/06/2014
Accepted: 27/06/2014

***For Correspondence**

Flat--F3-101, Indu Aaranya
Pallavi Apartments
Bandalaguda Road, Nagol,
Hyderabad—500068.
Mobile: +91 99899646804.

Keywords: Autonomic nervous system, menstrual cycle, cardiovascular, Parasympathetic.

ABSTRACT

Many studies suggest that all types of hormonal changes and a regular fluctuation in numerous functions affecting all body systems in women especially during menstrual phases including physical, psychological or behavioral is the result of disturbed autonomic nervous system (ANS) .In a present study the cardiovascular parasympathetic functions were assessed during various phases of menstrual cycle in 50 healthy, volunteers with no irregular menses, menorrhagia and oligo-menorrhoea. Parasympathetic functions were evaluated by Heart rate response, E: I Ratio and Valsalva Ratio tests in pre and post menstrual phases with statistically insignificant results ($p>0.05$), on comparison between the two phases. The study concludes that there were no statistical significant responses to any of the parasympathetic test on comparison between premenstrual phase and post menstrual phase of menstrual cycle, reflecting no change in the parasympathetic activity during the different phases of menstrual cycle.

INTRODUCTION

The literature reveals that all types of hormonal changes and a regular fluctuation in numerous functions affecting all body systems in women especially during menstrual phases including physical, psychological or behavioral. Mandler (1975) presented the view that it is the autonomic nervous system (ANS) which provides the physiological background for the perceived changes. Many of the usual physical symptoms described are those which are thought to be manifestations of autonomic disturbances. The premenstrual syndrome (PMS) was described by Frank many years ago and subsequently by others. These changes might be due to one or more variables like hormonal levels, physical as well as mental stress, personality characteristics, genetic determinants and social factors which may contribute directly or indirectly. Most often the cumulative physiological effect of stress causes disruption of the natural rhythms and balancing mechanism of female hormones, there by compromising overall health as well as sexual and reproductive health. Hormonal imbalance affects not only physical health but also psychological health, manifesting as problems ranging from depression to panic disorders.

During the perimenopasual period and early menopause, there is a progressive hormonal imbalance which might help to explain the characteristics “hot flushes” and so called climacteric depression. The behavioral and psychological changes in response to hormonal imbalance during menstrual phase, and menopause involve limbic system and hypothalamus. Most of the behavioral and emotional patterns are exhibited through ANS. Therefore, it is worthwhile to assess autonomic functions during various phases of menstrual cycle. It will also help to interpret the test results such as whether these changes are within physiological limit or not. These would also help to predict any existing autonomic dysfunction during various phases of menstrual cycle. Therefore the present study was planned out in order to evaluate cardiovascular parasympathetic functions during different menstrual phases.

e-ISSN: 2319-9865
p-ISSN: 2322-0104

MATERIALS AND METHODS

The present study of assessment of parasympathetic functions in different phases of MC was conducted in the Department of physiology Rural Medical College Loni, Maharashtra, India. History taking and medical examination was carried out. The nature of the test was explained to the subjects.

Inclusion criteria

For the study, total 50 healthy female volunteers, between 18-25 years, from among the students of Rural Medical College Loni, were selected.

Exclusion criteria

Subjects less than 18 years & more than 25 years, suffering from any major illness, with irregular menses, menorrhagia and oligo-menorrhoea were excluded from study. Special emphasis was given in history for finding out any symptoms suggestive of autonomic neuropathy.

All the volunteers were assessed for parasympathetic functions during premenstrual phase i.e. around 25^{th} -26^{th} day of menstrual cycle and during postmenstrual phase i.e. on 6^{th} -7^{th} day of menstruation. Physical parameters like age in years & weight in Kgs were noted in each volunteer. Electrocardiogram (ECG-CARDIART 108T-British physical laboratories India limited) recordings were carried out in Lead II. All the following tests for assessment of cardiovascular parasympathetic functions were carried out in the morning and afternoon hours with the consent of volunteers.

Tests for parasympathetic functions

Heart rate response

Procedure: The subject was asked to lie down comfortably and the heart rate was recorded. Then the subject was asked to stand up and immediately the heart rate was recorded. The heart rate was calculated with the help of R-R interval. Response was taken as a difference between the heart rate in supine and standing positions.

Result: Normally heart rate should increase at least by 10 beats per minute in standing position. The absence of increase in heart rate during standing position has been interpreted as an impairment of autonomic function of heart.

Expiratory: Inspiratory ratio: (E: I ratio)

Procedure: The subject was asked to lie down comfortably and was asked to take deep breaths slowly in and out, approximately at 6 breaths per minute i.e. 5 seconds inspiration and 5 seconds expiration. The maximum and minimum R-R intervals during each phase of respiration were recorded. The heart rate was calculated and the variation during respiration was observed.

Result: E:I ratio is taken as the ratio of longest R-R interval during expiration to the shortest R-R interval during inspiration. E:I <1.2 is abnormal.

Valsalva ratio

Procedure: The subject was asked to take deep breaths with closed nostrils and puff the cheeks simultaneously for 15 seconds and then was asked to release the strain by doing forceful expiration. The heart rate was recorded and calculated during the strain and after release of strain.

Result: Normally heart rate is increased during the strain and this raised heart rate is due to baroreflex stimulation to the fall in the blood pressure seen as a result of increased intrathoracic pressure (decreased venous return). On release of strain the cardiac output is restored and there is an increase in blood pressure.

Valsalva ratio is taken as the ratio of longest R-R interval after release of strain to the shortest R-R interval during strain. It is used as an index of cardiac vagal function. A ratio of < 1.2 is abnormal.

e-ISSN: 2319-9865
p-ISSN: 2322-0104

OBSERVATIONS

Table No.1: Comparison of mean values of parasympathetic functions:

	Premenstrual (LL)Phase (n=50) Mean ±SD	Postmenstrual (EL)phase (n=50) Mean ±SD	'Z' value	'p' value	Result
Heart Rate Response	16.46 ± 4.92	16.62 ± 5.31	0.16	p>0.05	Not significant
Expiratory: Inspiratory Ratio	1.43 ± 0.23	1.40 ± 0.29	0.45	p>0.05	Not significant
Valsalva Ratio	1.15 ± 0.065	1.16 ± 0.08	1.16	p>0.05	Not significant

The statistical analysis for parasympathetic tests was carried out separately in premenstrual and postmenstrual phases by applying "unpaired t test". After analyzing cardiovascular parasympathetic functions were compared between premenstrual and postmenstrual groups by applying the statistical significance test ('p' value). It was observed that heart rate response, E:I Ratio and Valsalva Ratio tests were statistically not significant (p>0.05), on comparison between premenstrual phase and post menstrual phase of menstrual cycle. Thus, it was observed that there were no variation in parasympathetic activity during this period.

DISCUSSION

In the present study the premenstrual phase was taken as late luteal (LL) phase of menstrual cycle and postmenstrual phase as an early follicular (EL) phase of menstrual cycle. The hormonal changes to regulate the menstrual cycle were associated with physiological and psychological changes in women. This can be explained on the basis that-female reproductive steroids are modulators of HPA axis, which in association with ANS, form the stress system which regulates homeostatic mechanisms of the body. This HPA axis that is CRH induced proopiomelanocortin peptide, inhibits GnRH secretion from hypothalamus which in turn affects the ovarian estrogen and progesterone levels [2]. The gonadal hormones fluctuation during the menstrual cycle is associated with significant changes in multiple neurohumoral homeostatic mechanisms of the body [10]. A large number of studies in relation to the menstrual cycle were carried out by earlier workers but no consistent picture could be emerged [1,3,5,6,8]. An excellent review of different studies of physical and psychological changes throughout the menstrual cycle in three forms, namely the behavioural, autonomic and cortical was done[3]. Some studies used different variables for testing the autonomic functions than that of the present study but the results were consistent in both the studies, though the autonomic variables studied in present study were different from other studies.

The autonomic variables like sublingual temperature, diastolic blood pressure, palmar and volar conductance and salivary output were studied. It was observed that during menstrual, follicular and ovulatory phases responses were higher, showing a parasympathetic dominance. In contrast to present study, some studies found no differences in autonomic reactivity in different phases of menstrual cycle [7,9]. It was found that there were no changes in parasympathetic reactivity in the premenstrual phase [4,11] and this difference in result may be because of a single autonomic variable like only heart rate or skin potential or skin conductance was tested in other studies, while in the present study, multiple variables were tested.

SUMMARY AND CONCLUSION

The present study evaluates parasympathetic functions in different phases of menstrual cycle and concludes that there were no statistical significant responses to heart rate response, E: I Ratio and Valsalva Ratio tests on comparison between premenstrual phase and post menstrual phase of menstrual cycle, reflecting no change in the parasympathetic activity during the different phases of menstrual cycle. So There is no significant parasympathetic activity responses during menstrual phases and further study is required to correlate ANS functions with hormonal imbalance showing significant fluctuation in reproductive steroids. e.g. in anovulatory menstrual cycle, menorrhagia and risk pregnancy.

REFERENCES

1. Anjali Nadir Bhat: Autonomic function in different phases of menstrual cycle. Indian J Physiol Allied Sci. 2000;54(4): 184-190.
2. George P, Chrousoss GP, Tropy DJ et al. Interactions between the hypothalamic pituitary–adrenal axis and the female reproductive system: Clinical implications. Ann Inter Med. 1998;129:229-240.

3. Janowsky DS et al. Correlations between mood, weight and electrolytes during the menstrual cycle-A rennin angiotensin-aldosterone hypothesis of premenstrual tension: Psychosom Med. 1973: 34; 143-54.
4. Little BC and Zahan TP. Changes in mood and autonomic functioning during the menstrual cycle. Psycho Physiol. 1974; 11: 579-B-590.
5. Mehta V. Autonomic function in different phases of menstrual cycle. Indian J Physiol Pharmacol. 1993, 37: 56-58.
6. Kondo M, Hirano T, Okamura Y. Changes in autonomic nerve function during the normal menstrual cycle measured by the coefficient of variation of R-R interval. Nihon Sanka Fujinka Gakkai Zasshi. 1989;41(5):513-8.
7. Seward GH. The female sex rhythm. Psychol Bull. 1934; 81: 153-B-192.
8. Sommer B. The effect of menstruation on cognitive and perceptual motor behaviour. Review. Psychosom Med. 1973; 35: 515-24.
9. Strauss B et al. Autonomic reactivity in the premenstrual phase. Br J Clin Psychol. 1983; 22; 1-9.
10. Watts JF, Butt WR et al. Hormonal studies in women with premenstrual tension. Br J Obstet Gynecol. 1985; 92:247-55.
11. Zimmerman E and Parlee MV. Behavioural changes associated with menstrual cycle. An experimental investigation. J Appl Soc Psychol. 1973; 3: 335-44.