



A STUDY OF VARIATIONS OF PULSE AND BLOOD PRESSURE INDICES DURING DIFFERENT PHASES OF MENSTRUAL CYCLE

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ABSTRACT **Introduction**- The most important attributes of female body which makes it possible for procreation, is menstrual cycle. In follicular phase estrogens gradually increase, causing FSH and LH to peak, whereas progesterone remains low throughout. The luteal phase is dominated by the actions of estrogen and progesterone. Reproductive hormones may modulate cardiovascular function through a number of mechanisms.

Aim of study – To assess the variation in cardiovascular function using recording of pulse and blood pressure indices in different phases of menstrual cycle in females having normal menstrual cycle.

Material And Method – 50 apparently healthy female aged between 18-25 years were selected for the study and pulse and blood pressure was recorded using automatic blood pressure monitor during the different phase of menstrual cycle as follows: a) Menstrual phase (MP) (2nd day) b) Proliferative phase (PP) (11th day) c) Secretory phase (SP) (22nd day).

Results – After statistical analysis (paired t-test) the finding of study was decrease in systolic BP and mean BP during proliferative phase as compared to menstrual phase. But there was significant decrease in diastolic BP and mean BP during secretory phase as compared to menstrual phase. Though there was no significant difference in pulse rate but significant change in pulse pressure between proliferative and secretory phase has been shown in present study

Conclusion – The effect of endogenous change in hormonal which are the physiological changes during different phases of menstrual cycle supports the result of study

KEYWORDS : Menstrual cycle, Menstrual phase, Proliferative phase, Secretory phase, Systolic BP, Diastolic BP, Pulse Pressure, Mean BP.

INTRODUCTION

Commencement of first menstrual cycle is menarche and age of menarche is usually between 12-15 years of age. Uterine or endometrial cycle and ovarian cycle are considered in a menstrual cycle which is due to two different sites of changes: in uterine endometrium and in ovaries respectively. Follicular and luteal phase are the phases of ovarian cycle. Due to change in FSH there is gradual rise in level of estrogen during follicular phase and it again shows effect on FSH and LH levels. In duration of follicular phase progesterone level remains low which increases during luteal phase of ovarian cycle but estrogen is also in action in both phases. Menstrual phase, proliferative phase and secretory phase compares endometrial cycle. Growth of endometrium during proliferative phase is mediated by estrogen. And maturation of endometrium occurs during secretory phase of endometrial cycle. At the end of cycle decreasing levels of sex steroids halt endometrial lining growth. If conception does not occur, the endometrial lining is shed and starting of the next cycle with menstrual phase occurs.¹ Because of menstrual cycle a female body has got most important attribute of procreation. It is a cycle of natural changes in uterus and ovaries and these changes are meant for sexual reproduction.^(2,3)

Co-ordinated action in hypothalamo-hypophyseal-ovarian axis regulates the biological activity of menstrual cycle.⁴ Reproductive hormones have effect on hypothalamic-pituitary-adrenal and sympatho-adrenal-medullary systems and activation of these systems modulate the cardiovascular functions. Marked decrease in total peripheral resistance and a significant decrease in mean arterial pressure in mid luteal phase is noticed.^{5,6}

Two major indicators of cardiovascular function of the body are Blood Pressure and Pulse rate. Changes in the level of reproductive hormones in different phases of menstrual cycle affects the cardiovascular functions according to the change in levels of hormones.⁷ Cardioprotective nature of estrogen is may be due to its vasodilator effect. This vasodilator actions are peripheral as well as central. Functionally competent estrogen receptors have been identified on vascular smooth muscle and endothelial cells and these are responsible for action of estrogen peripherally.⁸

Cyclical changes in sex steroid profile in females can have effect on physical capacity due to effect on cardiovascular and respiratory function.⁹

There is continuous change of endogenous sex hormones during menstrual cycle. Estrogen starts to increase in mid of follicular phase and reach to peak just before ovulation and in midluteal phase estrogen and progesterone both are elevated.¹⁰ In the follicular phase, estrogen effect on cardiovascular or myometrial receptor is up-regulation of the receptors.¹¹ The natural progestin has either neutral or depressor effect on blood pressure and decrease in blood pressure with the progression of pregnancy which has got positive correlation with increase in level of progesterone. Estrogen administration act through increase in prostacyclin and nitric oxide synthesis and promotes vasodilation.¹²

Aim:

The aim of the study is to assess the variation in cardiovascular function using recording of pulse and blood pressure indices in different phases of menstrual cycle having normal menstrual cycle.

Study Design: observational analytical study

MATERIALS AND METHOD:

The study protocol was approved by the institutional Ethics Committee with letter no. IECBMC/2021/15 date 05/03/2021.

Place Of Study – Central research laboratory situated in the department of Physiology at Bundelkhand medical college, Sagar, M.P.

Sample Size – 50 apparently healthy female aged between 18-25 years has been selected for the study.

Duration Of Study – 6-10 months

Inclusion Criteria –

1. Normal regular menstrual cycles of 27-33 days.
2. Subjects who gave consent for examination and recording of ECG in different phases of menstrual cycle.

Exclusion Criteria –

1. Subjects below 18yrs and above 25yrs of age.
2. Subjects with endocrinal & gynecological disorders, chronic diseases and allergic conditions.
3. Subjects with Diabetes mellitus and hypertension.
4. Pregnant or lactating females.
5. Subjects with irregular menstrual cycle.
6. History of drugs intake affecting menstrual cycle.

Method –

After taking approval from institutional ethical committee the participants, those who were ready to enroll for the study, were called for briefing session to explain the nature & purpose of study. Participants were instructed not to smoke or consume any alcohol, caffeine or to engage in strenuous physical activity 12 hours prior to testing. They were called according to the day of menstrual cycle. Participants were re-explained about the study and informed consents were taken. They were enquired about the history and general examination prior to recording of pulse and Blood pressure. According to the phases of menstrual cycle candidates have undergone the recording of pulse and BP.

Blood Pressure and pulse recording was done during the Phases of Menstrual cycle:

- i. Menstrual phase (MP) - (2nd day),
- ii. Proliferative phase (PP) - (11th day),
- iii. Secretory phase (SP) - (22nd day)

Recording of Blood Pressure:

Subjects were allowed to rest for 15minutes in the laboratory before taking them to the examination couch. Blood pressure and pulse were recorded by Rossmax monitoring X1 blood pressure monitor automatic thrice with interval of 5min in between and then average of readings were taken. Statistical analysis was done by using statistical online calculator using openepi.com for paired t-test and Microsoft excel to calculate mean value. The p-value of 0.05 considered statistically significant.

Observation:

Table1:

Average age (years)	Average Height (cm)	Average weight (Kg)	Average duration of Menstrual cycle (days)
20.27273	151.9091	48.04545	3-4/26-30

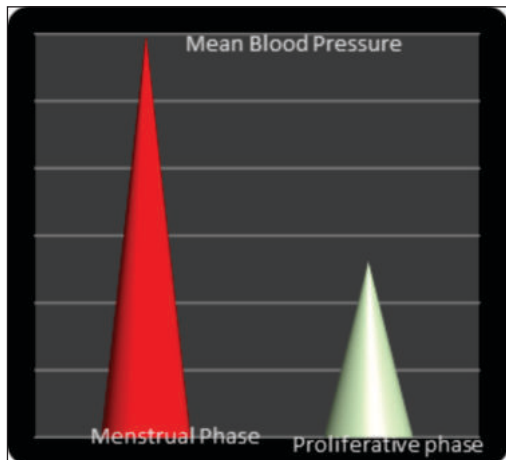
Table 2 Average Of Observations Of Different Parameters

Parameters	Menstrual phase	Proliferative phase	Secretory phase
Pulse (beats/min)	79.54	80.58	80.2
BP Systolic (mmHg)	112.2	106.36	110.5
BP Diastolic (mmHg)	72.84	70.74	69.9
Pulse Pressure (mmHg)	39.36	35.62	40.6
Mean Arterial Pressure (mmHg)	85.96	82.61333	83.43333

RESULT :-

Statistical analysis of Paired t-test of different parameters:

Table3: Menstrual Phase Vs Proliferative Phase



Parameters	Menstrual Phase (Average)	Proliferative Phase (Average)	SD (+/-)	p-value	Remark
Pulse	79.54	80.58	2.091	0.6212	
Systolic BP	112.2	106.36	1.148	0.000005763	Statistically significant
Diastolic BP	72.84	70.74	1.311	0.1156	
Pulse Pressure	39.36	35.62	0.682	0.2391	
MAP	85.96	82.61333	1.108	0.004001	Statistically significant

Table : 4 Menstrual Phase Vs Secretory Phase

Parameters	Menstrual Phase (Average)	Secretory Phase (Average)	SD (+/-)	p-value	Remark
Pulse	79.54	80.2	2.581	0.7993	
Systolic BP	112.2	110.5	1.369	0.2203	
Diastolic BP	72.84	69.9	1.535	0.0613	
Pulse Pressure	39.36	40.6	2.007	0.5395	
MAP	85.96	83.43333	1.14	0.03141	Statistically significant

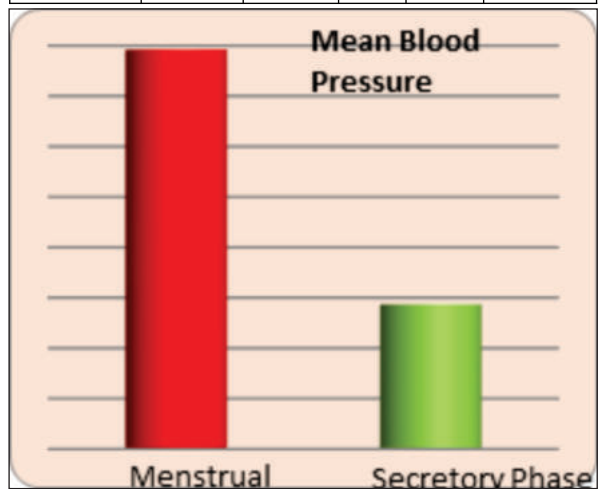
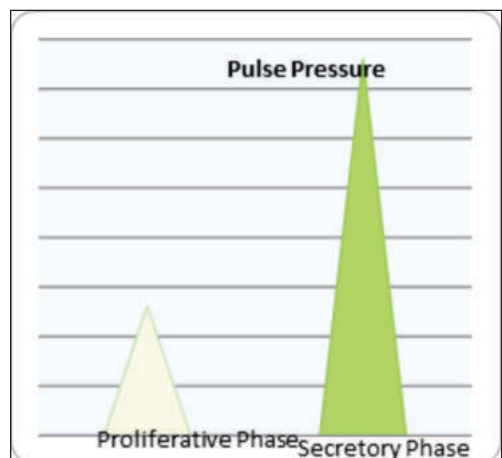


Table : 5 Proliferative Phase Vs Secretory Phase

Parameters	Proliferative Phase (Average)	Secretory Phase (Average)	SD (+/-)	p-value	Remark
Pulse (P)	80.58	80.2	2.373	0.8734	
Systolic BP (SBP)	106.36	110.5	2.056	0.0496	Statistically significant
Diastolic BP	70.74	69.9	0.822	0.3117	
Pulse Pressure	35.62	40.6	1.865	0.01026	Statistically significant
MAP	82.61333	83.43333	1.042	0.4353	



DISCUSSION

The aim of our study was to observe the effect of phases of menstrual

cycle on blood pressure indices and pulse in healthy females. These parameters are indicators of cardiac autonomic function. In our study there was decrease in systolic BP and MAP during proliferative phase as compared to menstrual phase. But there is significant decrease in diastolic BP and MAP during secretory phase as compared to menstrual phase. Though there was no significant difference in pulse rate but significant change in pulse pressure between proliferative and secretory phase has been shown in present study. Şadan Yazar didn't find any change in basalHR in follicular and luteal phase.¹⁰ Maroosha Farooq et al found a significant increase occurred in pulse rate, SBP, DBP and MAP during the luteal phase as compared to the follicular phase of the menstrual cycle¹³. Tejinder et al studied the effect of heart rate variability during different phases of menstrual cycle and they didn't find any major changes. A difference of the balance of ovarian hormones may be responsible for these changes of autonomic functions during the menstrual cycle¹⁴. In present study there was no significant difference in both systolic and diastolic blood pressure among phases of the menstrual cycle.¹⁵

CONCLUSION

The balance of ovarian hormones may be responsible for these changes of autonomic functions during the menstrual cycle. Though there are hemodynamic homeostatic mechanisms in human body but effect of endogenous change in hormonal which are the physiological changes during different phases of menstrual cycle supports the result of study. Physiologically parasympathetic activities marked in the follicular phase and sympathetic nervous activities predominate the luteal phase.

Ethical Clearance:

From Institutional Ethical committee, Bundelkhand Medical College, Sagar M.P.

Source Of Funding: self

Conflict of Interest: Nil

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