

Original article:

Impact of cyclical variations in different phases of menstrual cycle on PEFR

Sharma S, Mushtaq F M.*

¹Tutor, Department of Physiology, Dr. RKGMC Hamirpur , HP

²Tutor, Department of Physiology, GMC Anantnag , Jammu and Kashmir

Corresponding author*

Abstract:

Objectives: To assess and correlate the PEFR in pre and post ovulatory phases of menstrual cycle.

Materials and Methods: Using inclusion and exclusion criteria, a representative sample of 100 females having regular menstrual cycle were included. PEFR was assessed by using Computerized Spirometer composed by turbine flowmeter. All anthropometric parameters such as Age, height, weight were recorded and BMI was calculated. Data collected and analyzed by the SPSS Computer program. Mean and standard deviation was calculated and paired T test was used to obtain statistical significance. A p value of $p \leq 0.05$ considered statistically significant.

Results: Increase PEFR value in post ovulatory phase as compared to pre ovulatory phase of menstrual cycle was statistically Significant ($p \leq 0.05$).

Conclusion: The result indicates change in PEFR in different phases of menstrual cycle and this is more marked during post ovulatory phase.

Keywords: Peak expiratory flow rate, Basal Metabolic Rate

INTRODUCTION:

A monthly cycle which is related to ovulation and ovarian hormones and counted from the day on which menstrual bleeding begins. This cycle is generally 21-35 days long and consist of two phases (Pre and post ovulatory phase). Versatile responses are produced as the level of hormones i.e. progesterone and estrogen fluctuates in different phases of menstrual cycle. Before ovulation, the level of estrogen is high which causes cervix to become soft and wet to open up whereas in post ovulatory period there is rise in level of progesterone which causes the cervical mucus to change from being wet and lubricative to thick and sticky.^{1,2}

For assessment of pulmonary function PEFR is usually measured. Significant Increase was observed during the post ovulatory phase where the progesterone level is higher in comparison to those of pre ovulatory phase of menstrual cycle. Progesterone may also have role in decreasing the alveolar and arterial pCO_2 in post ovulatory phase of menstrual cycle and provides strength to smooth muscles by acting as a smooth muscle relaxant which ultimately causes improvement of lung functions during this phase.^{3,4}

Different observations have shown that there is no further increase in lung function parameter after addition of exogenous progesterone during the different phases of menstrual cycle.⁵ Though it is still controversial, all these changes of pulmonary parameter indicates existence of their relationships with progesterone level during luteal

phase of menstrual cycle. It has also been shown that higher level of progesterone was positively correlated with PEFR in luteal phase of menstrual cycle.

Some of the evidences proposed to supplement progesterone hormone as one of the important regimen along with other bronchodilators and they found better results infemale patients suffering from bronchial asthma with acute exacerbations.^{6,7}

However, it is still controversial that all these changes of PEFR indicate their existence during post ovulatory phase of menstrual cycle. Therefore, present study is carried out to observe the changes in PEFR during different phases of menstrual cycle in order to enlighten the health of female.

MATERIAL AND METHODS:

This is a case control study carried out in department of Physiology MMIMSR, Mullana in 2017. 100 subjects of age group above 18 years having regular menstrual cycle of 21-35 days were taken. From the date of onset of menstrual cycle, probable date of ovulation was calculated, based upon which pre and postovulatory phases were determined. Pre-ovulatory phase calculated before the ovulation, as 14th day is the ovulatory phase and postovulatory phase was calculated prior to the onset of next cycle, as the period after ovulation to next menstruation. Basal body temperature is noted by giving BBT charts to the subjects. Lung function tests will be done on

- i) On 10th day, (Pre ovulatory phase).
- ii) On 20th day, (post ovulatory Phase).

The subjects were made to undergo PEFR using computerized spirometer, Spiro-excel (Medicaid systems Chandigarh) for three times after interval of two minutes. Subjects were be informed about the whole maneuver and be encouraged to practice this maneuver before doing the pulmonary test. They were asked to take in a deep breath and then enable forcefully into the sensor as hard as possible by closing nostrils with nose clip. Three consecutive readings were taken into consideration. Data were tabulated and paired T test was used to obtain statistical significance between both phases of menstrual cycle. $P \leq 0.05$ was considered statistically significant.

Ethical consideration.

Informed and written consent of all participants was taken before conducting the study. Approval of Institutional ethics committee was also sort.

RESULTS

A total no. of 100 subjects in their regular menstrual cycle were included in the study. All the anthropometric results of subjects exhibited in table 1.

Table 1

S.NO	Parameters	Mean±SD
1.	Age (Years)	23.43±2.20
2.	Height (cms)	161.06±2.88
3.	Weight(Kg)	58.23±6.74
4.	BMI(Kg/m ²)	22.43±2.51

The mean of the measured values of PEFr in pre ovulatory phase were 5.57liters/min with standard deviation of ±0.30 in studied women respectively are shown in table 2 and fig. 1.

The mean of the measured values of PEFr in post ovulatory phase were 6.02 liters/min with standard deviation of ±0.50 in studied women are respectively shown in table 2 and fig. 1.

Table 2. PEFr in liters/sec in pre and post ovulatory phase of menstrual cycle

S.No	Parameters	Pre- ovulatory (Mean±SD)	Post- ovulatory (Mean±SD)
1.	PEFR(L/s)	5.57±0.30 (Mean±SD)	6.02±0.50 (Mean±SD)
1.	PEFR(L/s)	5.57±0.30	6.02±0.50

Table 3. Comparison of PEFr (L/s) in pre and post ovulatory phase of menstrual cycle.

S.No	Parameters	Pre- ovulatory vs. Post- ovulatory	
S.No	Parameters	Pre- ovulatory (Mean±SD)	Post- ovulatory (Mean±SD)
1.	PEFR(L/s)	5.57±0.30	6.02±0.50

1. p≤0.05 – significant

Correlation between pre ovulatory and post ovulatory phase of menstrual cycle show a significant increase in value of PEFr in post ovulatory phase with P≤0.05 are shown in table 3.

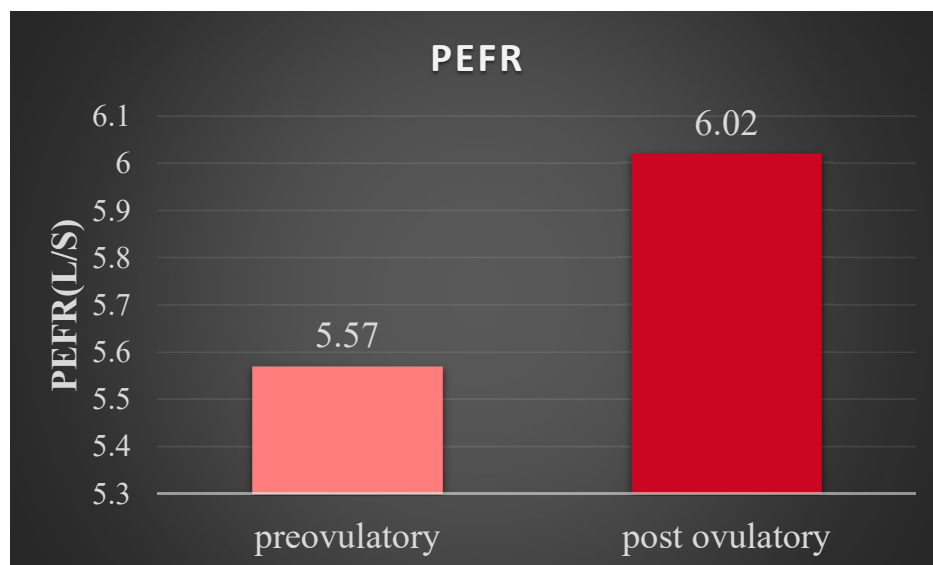


Fig 1. Bar graph showing correlation of mean PEFR(L/s) of subjects in Pre ovulatory and post ovulatory phase of menstrual cycle.

DISCUSSION:

The present study was conducted to evaluate the correlation of pre and post ovulatory phase of menstrual cycle with some aspects of pulmonary function parameter like PEFR in healthy females. As the level of progesterone is more in post ovulatory phase as compared to pre ovulatory phase. However, present study was conducted to find out the effect of different phases of menstrual cycle on PEFR. The observed improved pulmonary function in post ovulatory phase might be related to high progesterone level which induces hyperventilation by direct stimulation of respiratory center and increasing Oxygen consumption due to increased metabolic rate⁴. Moreover progesterone may potentiate prostaglandin induced relaxation of bronchial smooth muscles and its association with increased respiratory endurance. This relaxation is well marked during post ovulatory phase.^{8,9,10} Some studies showed that physiological concentration of progesterone causes increased mRNA content of progesterone receptor at hypothalamus during post ovulatory phase.¹¹ Thus the stimulatory effect on these receptors induces hyperventilation⁴ and thereby causes improvement in lung function. From these limited study no valid conclusion can be drawn. But in the present study, observed improvement of PEFR during post-ovulatory phase of menstrual cycle is most likely due to increased level of plasma progesterone.

CONCLUSION

We have concluded better results of lung functions and few of these are statistically significant in post ovulatory phase as compared to the pre ovulatory phase of our subjects shown in Bar graph (Fig.1), indicating a possible role of progesterone as it is a steroid and crosses the blood brain barrier easily and activates the central chemoreceptors to cause hyperventilation which increases the oxygen consumption.^{13,14} Further it is suggested that more such studies must be carried out on large population along with quantitative measurements of progesterone levels to correlate with respiratory functions.

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Indian Journal of Basic and Applied Medical Research; September 2020: Vol.-9, Issue- 4, P. 405 – 410
DOI: 10.36848/IJBAMR/2020/18215.56165

Date of Submission: 12 October 2020

Date of Publishing: 25 November 2020

Author Declaration: Source of support: Nil,

Conflict of interest: Nil

Ethics Committee Approval obtained for this study? YES

Was informed consent obtained from the subjects involved in the study? YES

For any images presented appropriate consent has been obtained from the subjects: YES

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DOI: 10.36848/IJBAMR/2020/18215.56165