

Pulmonary Function Tests in Different Phases of Menstrual Cycle in Young Girls of Kanyakumari District.

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Abstract

Objectives: To compare the pulmonary function tests parameters in follicular phase and luteal phase of menstrual cycle. **Methods:** 100 healthy medical students of SreeMookambika Institute of Medical Sciences, with regular menstrual cycle were consented for this cross sectional study. Detailed history including height and weight are recorded in a separate form. Pulmonary function tests were done in follicular phase and luteal phase of menstrual cycle using Spiro excel (Medicaid systems, Chandigarh) computerized programme in the research laboratory of Department of Physiology. The parameters taken were FVC(L), FEV1(L), FEV1/FVC(%), PEFR (L/sec) and MVV(L/min). **Results:** Pulmonary function tests parameters were found to be significantly higher in luteal phase of menstrual cycle compared to follicular phase. **Conclusion:** The increase in pulmonary function tests parameters in luteal phase could be due to the bronchial relaxation effect of progesterone.

Keywords: pulmonary function tests, follicular phase, luteal phase, menstrual cycle

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I. Introduction

Menstrual cycle is a physiological cycle occurring monthly in the life of women. It is the time between first day of one menstrual cycle and the first day of next menstrual cycle¹. Latin the word menstrual means mensis, a month². The average duration of the menstrual cycle is 28 days³. The different phases of menstrual cycle are follicular phase and luteal phase⁴. Rhythm of menstrual cycle is controlled by hypothalamo pituitary ovarian axis¹. GnRH, FSH, LH, female sex hormones oestrogen and progesterone regulates the menstrual cycle⁴. The phase between onset of menstrual bleeding and ovulation is called as follicular phase. In this phase one of the follicle becomes dominant follicle and attains full maturation⁴. Ovulation occurs between follicular phase and luteal phase around fourteenth day of menstrual cycle⁵. The phase between ovulation and next menstrual bleeding is called as luteal phase. During this phase corpus luteum is formed in the ovary which secretes progesterone and oestrogen. Progesterone concentration in follicular phase is 0.9ng/ml and in luteal phase is 18ng/ml⁴. During each menstrual cycle there is fluctuation in progesterone level⁶. Variations in hormonal levels causes differences in functional parameters of different systems including respiratory system in the body^{7,8}. Progesterone is a smooth muscle relaxant in gut, genitourinary tract, vascular tree and bronchial smooth muscles⁸. Progesterone stimulates pulmonary ventilation by stimulating the medullary respiratory centers⁴.

Some female asthmatics develop exacerbation of asthma symptoms during perimenstrual phase. This is called as perimenstrual asthma⁹. Along with other bronchodilators some investigators have proposed to add progesterone hormone as one of the important regimen for perimenstrual asthma¹⁰. Various studies done previously have suggested difference in ventilation throughout normal menstrual cycle¹¹. Thus the purpose of the present study is to compare the pulmonary function tests in follicular and luteal phase of menstrual cycle and to find whether there is any change in pulmonary function tests parameters in different phases of menstrual cycle.

II. Materials And Methods

This cross sectional study was carried out in the Department of Physiology, SreeMookambika Institute of Medical Sciences, Kulasekharam, KanyaKumari District.

The study was done to compare the pulmonary function test parameters in follicular phase and luteal phase of menstrual cycle in 100 medical students of SreeMookambika Institute of Medical Sciences, Kulasekharam, KanyaKumari District.

Protocol of the study was approved by Institute’s Ethical Committee. Written informed consent was obtained from all the subjects recruited in the study. Young girls between the age group 18-23 years were included in the study. Detailed history including last menstrual period, height, weight were recorded in a separate form.

Exclusion criteria

1. History of respiratory disease.
2. History of irregular menstrual cycle.
3. History of premenstrual syndrome like headache, irritability and edema.
4. History of dysmenorrhoea.

Calculation of follicular phase and luteal phase From the date of onset of menstrual cycle duration of different phases of the cycle were determined. Pulmonary function tests were done between 9th to 11th day of menstrual cycle to know the lung function in follicular phase and between 19th to 23rd day of the menstrual cycle to know the lung function in luteal phase.

Pulmonary function tests

Pulmonary function tests were done by using Spiro excel (Medicaid systems, Chandigarh) computerized programme. The parameters studied were FVC (Forced Expiratory Vital Capacity) in litres, FEV₁(Forced Expiratory Volume in 1 Second) in litres, FEV₁/ FVC % (FEV1 as a percentage of FVC),PEFR (Peak Expiratory Flow Rate) in litres per second andMVV (Maximum Voluntary Ventilation) in litres per minute. All the tests were done in sitting position in the research laboratory of Department of Physiology. To maintain uniformity in recording standards the tests were done in the same time of the day between 3.30pm - 4.30 pm. During the tests each subject was encouraged to perform at their maximum ability and a noseclip was applied during the entire procedure. Each test was done three times with a gap of two minutes in between and the best of the three was taken for analysis. If the corresponding study date was on holiday tests were performed on the next cycle. The mouthpiece was sterilized with spirit after use by each student.

Statistical Analysis

Statistical analysis was done using SPSS(scientific package for social sciences) software version 17. Student’s t test (paired) was used to find the statistical significance between the two phases of menstrual cycle. P value < 0.05 was considered as statistically significant.

II. Results

On analysis of hundred female subjects the average age (years) was 18.54± 0.52, the average weight (kg) was 56.51±3.70 and the average height (cm) was 159.32± 2.97 and is shown in table 1. Mean± Standard Deviation of FVC (L), FEV1 (L), FEV1/FVC(%), PEFR (L/sec) and MVV (L/min) in follicular phase and luteal phase of menstrual cycle were shown in table 2. All the parameters were found to be statistically highly significant in luteal phase of menstrual cycle.

Table 1 Physical characteristic of the subjects

Physical Characteristics	Mean ± SD
Age (Yrs)	18.54 ± 0.52
Weight (Kg)	56.51 ± 3.70
Height (cm)	159.32 ± 2.97
BMI	22.26 ± 1.33

Table 2 Pulmonary function parameters in different phases of menstrual cycle

Parameter	Follicular phase	Luteal phase
FVC(L)	2.55± 0.16**	2.70± 0.17**
FEV1(L)	2.25±0.18**	2.49±0.19**
FEV1/FVC (%)	88.17±4.09**	91.78±3.43**
PEFR(L/sec)	4.80±0.50**	5.08±0.50**
MVV(L/min)	73.90 ± 3.92**	77.91 ±4.1**

**P value <0.01 highly significant

IV. Discussion

This study was done in apparently healthy young girls with regular menstrual cycle whose mean BMI was within normal range (Table 1). This was in par with a study done by Mannan et al¹⁰. In our study the FVC in luteal phase was significantly higher compared to follicular phase. This could be due to the increase in progesterone in secretory phase of menstrual cycle. Mannan SR et al also found a similar result of increase in FVC in secretory phase of menstrual cycle. This was related to the increase in progesterone in luteal phase of menstrual cycle which stimulates the respiratory center by acting through central steroid receptor

mediated mechanism¹⁰. In our study the FEV1 in luteal phase was significantly higher compared to follicular phase. Vishruta et al also showed a similar finding of increase in FEV1 in luteal phase of menstrual cycle¹². This increase in FEV1 was related to the relaxation of bronchi caused by progesterone by enhancing the effect of prostaglandins in luteal phase of menstrual cycle¹⁰.

In our study the FEV1/FVC in luteal phase was significantly higher compared to follicular phase. Nandhini et al have shown a similar result of increase FEV1/FVC in luteal phase of menstrual cycle. This was related to the hyperventilation effect of progesterone¹³. In our study the PEFr in luteal phase was significantly higher compared to follicular phase. This was in par with the study done by Dabhoiwala which showed an increase in PEFr in luteal phase of menstrual cycle⁷. This was related to the decrease in airway resistance by progesterone in luteal phase¹². In our study the mean value of MVV in luteal phase was significantly higher compared to follicular phase. Karadkhedkar et al also found an increase in MVV in luteal phase of menstrual cycle compared to follicular phase. This was related to the beta adrenergic stimulation effect of progesterone in luteal phase of menstrual cycle¹⁴.

V. Conclusion

The pulmonary function tests parameters were increased in the luteal phase of menstrual cycle. This could be due to increase in progesterone during the luteal phase of menstrual cycle. Increase in progesterone during luteal phase causes bronchial relaxation and also stimulates the respiration.

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