

Original article

Effect of different phases of menstrual cycle on pulmonary functions

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Abstract

Hormonal changes during different phases of menstrual cycle, especially progesterone may affect the bronchial muscle tone and hence the pulmonary functions. This study was undertaken to study the effects on the pulmonary functions.

Materials and methods: 58 girls in age group of 18-20 years were selected. Their pulmonary functions were assessed during the three phases of menstrual cycle with the help of a computerized spirometer, medspiror in the department of physiology. The data was collected and analysed statistically.

Keywords: menstrual cycle, lung functions, progesterone

Introduction:

Menstrual cycle is an integral part of a woman's life. Menstrual cycle is divided into three phases i.e. menstrual, follicular and luteal phase. During these different phases, rhythmic changes occur in the levels of ovarian hormones especially progesterone and estrogen. These changes are responsible for various physiological changes in our body. The variation in the pulmonary functions during different phases of menstrual cycle follows a cyclical pattern which could be due to the action of various hormones. After ovulation, corpus luteum is formed which releases progesterone. Levels of progesterone are low during the preovulatory or follicular phase. Progesterone causes relaxation of smooth muscle and relaxation of bronchial smooth muscle may have a beneficial effect on the airway functions. ⁽¹⁾This study was undertaken to study the effect of different phases of menstrual cycle on lung functions.

Materials and Methods:

The study has been permitted by the institutional ethical committee. The study was conducted on first

year medical girl students studying in PIMS Jalandhar. A total no of 58 students having regular menses were selected for study. All were having regular menstrual cycle. Girls with irregular periods, on certain drugs like steroids or anti tubercular drugs or having chronic diseases like asthma, PCOD, Diabetes etc were excluded from the study. Girls were not taking any contraceptive pills. A detailed questionnaire was used to know the menstrual cycle pattern, last menstrual period, etc. The girls were instructed to come to the department of Physiology on 2nd-4th day, 10th-12th day and 22nd-24th day of their menstrual cycle, these being the days in their menstrual phase, follicular phase and secretory phase respectively. The phases were estimated according to their menstrual history and date of last menstrual period. An informed consent was taken from each subject and procedure was explained to them. Their height, weight and age were noted. Pulmonary function tests were performed on the subjects using Medspiror computerized spirometer. The subjects were asked to relax. Tests were

performed with their nose clipped. FVC, FEV1, MVV were recorded. The subjects were asked to make three attempts with a five minute interval in between. The tests were performed at approximately the same time of the day. The results were collected and recorded. The data was statistically analysed using paired t test.

Observations and Results:

Pulmonary functions were performed in 58 subjects. The mean age was 18.86±0.953 years. The mean weight was 61.10±5.594t kg and the mean height was 160.41±5.810 cm. The mean value of FVC in secretory phase was 3.25±0.58 litres, in menstrual

phase it was 2.52±0.53 litres and in follicular phase it was 2.99±0.65 litres. On statistical analysis, the FVC in secretory phase was significantly higher than that in menstrual and follicular phase.

The mean value of FEV1 in secretory phase was 3.07±0.71 litres, in menstrual phase it was 2.34±0.50 litres, in follicular phase it was 2.49±2.43 litres. On statistical analysis it was found that FEV1 in secretory phase was significantly raised as compared to menstrual and follicular phase. MVV in secretory phase was 99.91±27.75 litres, in menstrual phase it was 85.22±20.67 litres, in follicular phase it was 91.53±25.04 litres.

On statistical analysis, MVV in secretory phase was found to be significantly higher than in menstrual and follicular phase.

Parameter	Secretory phase	Menstrual phase	Follicular phase	S/M P value	S/F P value
FVC (litres)	3.25±0.58	2.52±0.53	2.99±0.65	< 0.05 (S)	< 0.05 (S)
FEV1(litres)	3.07±0.71	2.34±0.50	2.49±0.43	< 0.05 (S)	< 0.05 (S)
MVV(Litres)	99.91±27.75	88.35±17.35	86.94±18.49	< 0.05 (S)	< 0.05 (S)

S= secretory phase, M= menstrual phase, F= follicular phase, (S) = significant

Thus we see that values of FVC, FEV1 and MVV in secretory phase were higher as compared to those in follicular and menstrual phase.

Discussion:

The results obtained in this study match with results obtained in other studies. Dimple Arora et al, in their study observed that mean value of FVC and FEV1 were significantly higher in secretory phase, followed by follicular phase and least in menstrual phase.² The results are also consistent with study by Raksha Hebbar K.³ It is also in consistence with study by Shahin Dabhoiwala et al which showed a significantly higher FVC, FEV1 and PEFr in secretory phase as compared to other two phases.⁴ Johansson M. , Mannan et al, Rajesh CS ,Elena Saprova et al have also shown similar results.^{5,6,7,8} We know that progesterone levels are increased during the secretory

phase of menstrual cycle. Progesterone is known to be a smooth muscle relaxant and may cause bronchodilation. This effect was demonstrated by Beynon et al who studied the effects of IM progesterone on patients with asthma. It was seen that dose of bronchodilator drug was reduced in patients receiving progesterone.⁹

Low levels of progesterone in premenstrual phase may cause relative decrease in the values of lung volumes and capacities as measured by the spirometer. Also, premenstrual exacerbation of asthma in premenstrual phase has been reported by Gibbs CJ.¹⁰ A subset of women with asthma reported worsening of their symptoms few days before menses

and improvement in the symptoms with the abatement of menses each month¹¹. Thus the diagnosis of premenstrual asthma is made upon the demonstration of significant variation in airway function during the period just prior to the onset of menses¹². A significant increase in pulmonary functions has been reported in females taking oral contraceptives and these drugs may prevent the exacerbation of asthma as suggested by R Hebbar in her study.³ Pardeep et al have also suggested that hormone pills containing progesterone decrease the resistance offered by small bronchioles.¹³ It is known that the asthma incidence is greater in boys during childhood and in girls during adolescence. It may be due to a difference in their hormones.¹⁴ Some studies have shown that some other mediators like prostaglandins may affect the bronchial tone.¹⁵

Also, perimenstrual shift in Type1/Type 2 cytokine balance has been implicated in exacerbation of symptoms of asthma.¹⁶

These aspects also need to be studied in further detail. But progesterone does contribute at a much larger scale towards this aspect.

Conclusions:

It was seen that pulmonary functions significantly improved in the luteal or secretory phase of menstrual cycle, probably because of bronchodilator effect of progesterone. Clinicians treating female asthmatic patients may keep this in mind while prescribing bronchodilator drugs. Further studies are recommended to study the effect of hormones and other mediators like prostaglandins and cytokines also on bronchial smooth muscle.

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