

## Original Research Article

**To compare the pulmonary function tests in different phases of menstrual cycle****Manish Goyal<sup>1</sup>, Jyoti Shrivastava<sup>2</sup>, Ajit Singh Rajput<sup>3</sup>, Milind Shiralkar<sup>4</sup>, Ashish Shrivastava<sup>5</sup>**<sup>1</sup>Assistant professor, Department of Physiology, Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh, India<sup>2</sup>Resident, Department of Physiology, Gajra Raja medical College, Gwalior, Madhya Pradesh, India,<sup>3</sup>Associate Professor, Department of Physiology, Gajra Raja medical College, Gwalior, Madhya Pradesh, India<sup>4</sup>Professor, Department of Surgery, S.S. medical College, Rewa, Madhya Pradesh, India<sup>5</sup>Assistant Professor, Department of Surgery, Gajra Raja medical College, Gwalior, Madhya Pradesh, India**\*Corresponding author**

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**Abstract:** Variation in the levels of different sex hormones have been claimed to affect the pulmonary function tests in different phases of menstrual cycle. The present study is an attempt to verify the same. This was a longitudinal study which was done on 78 regularly menstruating young girls of 18-24 years age. The lung function tests were recorded in different phases of menstrual cycle after taking detail history and consent. The values of lung function tests i.e. FVC, FEV<sub>1</sub> and PEFr were significantly higher in secretory phase as compare to menstrual and proliferative phase. The values of FEV<sub>1</sub>/FVC% did not show significant variation among different phases of menstrual cycle. Result of our study may be attributed to cyclical changes in the levels of hormones i.e. estrogen and progesterone in the different phases of menstrual cycle.**Keywords:** Pulmonary function test, different phases of menstrual cycle

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**INTRODUCTION**

Menstrual cycle is a physiological phenomenon occurring in women which is an integral part of their lives. The dynamic cyclical changes in the levels of these hormones during different phases of menstrual cycle are known to affect functioning of different systems of the body including the respiratory system [1]. Studies suggest that progesterone and estrogen levels strengthen the respiratory musculature and increase the relaxation of bronchial smooth muscles. Variations in the levels of estrogen and progesterone in the different phases of menstrual cycle have been cited as the cause of the changes in lung function [2]. There are only few studies from India on pulmonary function tests in different phases of menstrual cycle. So the present study is an attempt to compare the pulmonary function tests in different phases of menstrual cycle in apparently healthy young girls 18-24 years of age. Menstrual cycle can be divided into menstrual, proliferative and secretory phases. The levels of estrogen and progesterone are negligible in the menstrual phase. The level of estrogen predominates in proliferative phase while the level of progesterone predominates in secretory phase.

**MATERIAL AND METHODS**

The present study was conducted on 78 young girls of 18-24 years of age of Gajra Raja Medical College, Gwalior. All girls were healthy having regular menstrual cycle of 26-30 days without having history of hormone replacement therapy, oral contraceptive pills, chronic obstructive pulmonary disease, restrictive lung disorders. Height and weight were recorded and body mass index was calculated using values.

After obtaining written consent all the subjects provided proforma to fill the particulars, with specifically detailed menstrual history.

Pulmonary function tests were performed in 3 phases namely menstrual phase, proliferative phase and secretory phase. Subjects were called three times on the 2<sup>nd</sup> or 3<sup>rd</sup>, 10<sup>th</sup> - 12<sup>th</sup> and 20<sup>th</sup> - 22<sup>nd</sup> days of their menstrual cycle, which were deduced from proforma filled by them. Before performing test each subject was thoroughly instructed and demonstrated.

The subject was asked to exhale into the mouthpiece of Spiro Excel machine (Medicaid System, Chandigarh) as forcefully as possible after maximal inspiration.

The results were expressed as mean± standard deviation. Statistical analysis was done through Graph pad Prism. Comparison of pulmonary function parameters in different phases of menstrual cycle was done by using one way ANOVA (Analysis of variance) by bonferroni post-hoc test.

Subjects having mean age, height, weight, BMI of 19.67±1.35 years, 154.26±6.11 cm, 49.72±8.83 kg and 20.85±3.28 kg/m<sup>2</sup> respectively, undergone pulmonary function testing in 3 different phases of menstrual cycle.

The comparison of lung function values in all three phases is shown in table 1,2,3.

**RESULTS**

**Table-1: Lung function parameters in different phases of menstrual cycle (n=78)**

Parameters (Mean ± SD)	Menstrual Phase	Proliferative Phase	Secretory Phase
FVC (L)	2.59 ± 0.32	2.68 ± 0.31	2.82 ± 0.34
FEV <sub>1</sub> (L)	2.41 ± 0.29	2.49 ± 0.28	2.60 ± 0.30
FEV <sub>1</sub> /FVC (%)	93.09 ± 3.83	92.97 ± 3.97	92.42 ± 3.99
PEFR (L/Sec.)	5.77 ± 0.76	6.04 ± 0.72	6.49 ± 0.81

**Table-2: Lung function parameters in menstrual and secretory phase (n=78)**

Parameters (Mean ± SD)	Menstrual Phase	Secretory Phase	p-Value	t-Value
FVC (L)	2.59 ± 0.32	2.82 ± 0.34	< 0.001***	15.70
FEV <sub>1</sub> (L)	2.41 ± 0.29	2.60 ± 0.30	< 0.001***	15.29
FEV <sub>1</sub> /FVC (%)	93.09 ± 3.83	92.42 ± 3.99	> 0.05	1.65
PEFR (L/Sec.)	5.77 ± 0.76	6.49 ± 0.81	< 0.001***	10.94

\*\*\*Highly significant

**Table-3: Lung function parameters in proliferative and secretory phase (n=78)**

Parameters (Mean ± SD)	Proliferative Phase	Secretory Phase	p-Value	t-Value
FVC (L)	2.68 ± 0.31	2.82 ± 0.34	< 0.001***	9.16
FEV <sub>1</sub> (L)	2.49 ± 0.28	2.60 ± 0.30	< 0.001***	8.67
FEV <sub>1</sub> /FVC (%)	92.97 ± 3.97	92.42 ± 3.99	> 0.05	1.35
PEFR (L/Sec.)	6.04 ± 0.72	6.49 ± 0.81	< 0.001***	6.85

\*\*\*Highly significant

**DISCUSSION**

In the present study differences in the mean values of FVC, FEV<sub>1</sub> and PEFR were significantly higher during secretory phase as compared to proliferative and menstrual phase with p value < 0.001. Since plasma progesterone level is known to be higher in secretory phase as compared to menstrual and follicular phase [3].

So we can assume that the progesterone can be cause for higher values of pulmonary function tests in secretory phase as compared to other phases. Our findings are in accordance with results shown in other studies [1,2,4,5]. Better lung function values in secretory phase can be attributed to the bronchodilating effect of progesterone by non genomic action [6]. Also, respiratory centre stimulation by progesterone can be a mechanism of higher results in secretory phase [7].

Improvement in lung function during follicular phase is on par with a study done by Chandler MH *et*

*al.* who found improvement in lung functions to be associated with increased levels of estrogen [8].

During premenstrual exacerbation of asthma intramuscular injections of progesterone ameliorated the symptoms which had not responded to the conventional treatment, including high doses of corticosteroids. Progesterone also reduced need of daily doses of bronchodilators in those patients [9].

This is in conformation with studies in which beneficial role of these hormones either separately or in combination or as an OCP in ameliorating asthma exacerbation which occur premenstrually i.e. premenstrual asthma [10].

On the above background our study also suggests possible role of progesterone in treating asthmatic females or at least reduction in the doses of bronchodilating can be done while concomitantly using progesterone.

## CONCLUSION

Four lung function parameters i.e. FVC, FEV<sub>1</sub>, FEV<sub>1</sub>/FVC% and PEFR were recorded in the different phases of menstrual cycle i.e. menstrual phase, proliferative phase and secretory phase. All lung function parameters except FEV<sub>1</sub>/FVC% were least in menstrual phase and highest in secretory phase with in between values in proliferative phase. The values were significantly different among the three phases. FEV<sub>1</sub>/FVC% values were maximum in menstrual phase, lowest in secretory phase with intermediate values in proliferative phase but the values were not significantly different among the three phases.

On the above background, our study also suggests possible role of sex hormones specially progesterone in treating asthmatic females or at least reduction in the doses of bronchodilators can be done while concomitantly using progesterone.

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