

# Clinical Review of Peak Expiratory Flow Rate in Different Trimester of Pregnancy

Sudipta Patnaik, Rajat Mohanty

## ABSTRACT

**Introduction:** Women play a pivot role in the family and society. Pregnancy constitutes one of the most severe states of physiological adaptation. This study was carried out to assess the flow rate during pregnancy and compare with those of non-pregnant women.

**Material and methods:** In this study 120 pregnant women within the age group of 20 years to 40 years, from different trimester of pregnancy without having any cardio-respiratory diseases were selected. Forty non-pregnant women of same age group were taken as control.

**Results:** The present study clearly indicates that there is gradual decrease of peak expiratory flow rate compared with the control group, which is significantly marked from first to second trimester, but this decline is not very much marked from second to third trimester of pregnancy. This may be due to enlarging gravid uterus, increased progesterone, which cause relaxation of smooth muscle.

**Conclusion:** Thus the above informations useful for reporting of PFT, better antenatal care, assessment of fitness for anaesthesia, progress of pre-existing lung diseases which ultimately confirms diagnosis and to start treatment.

**Keywords:** PEFR, Trimester, Pregnancy, Oestrogen, Progesterone

## INTRODUCTION

Women play a pivot role in the family and society throughout the different phases of her life. Pregnancy is most crucial and severe states of physiological adaptation.<sup>1</sup> Pregnancy is an unique event in the life of a women which needs a vast physiological adjustment to meet the requirements of a new life from the day of fertilization till delivery and thereafter. Relatively less work has been done to study pulmonary function tests. Peak expiratory flow rate especially pertaining to ventilation in pregnancy is a simple non-invasive portable method of assessment of lung function.<sup>2,3</sup> Peak expiratory flow rate (PEFR) is defined as the largest expiratory flow achieved during a maximally forced effort from a position of maximal inspiration, expressed in litres per minutes.<sup>4-9</sup> Therefore the present study was undertaken with the aim to establish a complete assessment of pulmonary function test during pregnancy in different trimester and compare the results with those of non-pregnant control subjects.

## MATERIAL AND METHODS

This study was carried out in a health centre, Jobra, Cuttack from November 2017 to October 2018. The objectives of this study was to find out the pulmonary function test i.e. Peak expiratory flow rate by measuring with Wrights' Mini Peak

Flow Meter in different trimester of pregnancy in comparison with the non-pregnant women, which is useful for better antenatal care, progress of pre-existing long diseases and assessment of fitness for anaesthesia. All the recording was done in sitting position in the early evening. Subjects were advised to loosen any tight clothing, which may prevent breathing deeply. In each trimester PEFR was recorded three times and the highest of three values is taken into account.

In this study 120 healthy pregnant women within the age group of 20 years to 40 years from different trimester are selected. Forty non-pregnant women of the above same age group are taken as control cases. Subjects having cardio-respiratory abnormalities were excluded. Consent was taken from all the subjects. This study was carried out with the permission from the authority of health centre, among the women who were attending the OPD.

## STATISTICAL ANALYSIS

The statistical analysis was done using unpaired "t" test in SPSS version "21" to know the relationships between categorical variables in the study groups. t, df and P value were derived. P<0.005 was considered as statistically significant.

## RESULTS

From the table-1 it is seen that the control cases between age group of 20-30 yrs. constitutes 12.5% and the age group of 31-40 yrs. i.e. 12.5%. The study cases of age group 20-30yrs.constitute 37.5% whereas the age group of 31-40 yrs. constitutes 37.5%.

Table-2 shows the PEFR in 1<sup>st</sup> trimester of pregnancy is less than the non-pregnant group, which is statistically not significant. (P< 0.05)

From table-3 it is concluded that the PEFR is decreased in 2<sup>nd</sup> trimester in comparison to the control group, which is statistically significant. (P<0.005)

In table-4 it is seen that the PEFR is significantly decreased as the pregnancy advances to 3<sup>rd</sup> trimester in comparison to the control group. (P<0.005)

<sup>1</sup>Associate Professor, Department of Physiology, <sup>2</sup>Specialist in O & G, S.C.B.Medical College Cuttack, Odisha, India

**Corresponding author:** Dr. Rajat Mohanty, Plot No-55, Satyanagar, Bhubaneswar, Odisha, India

**How to cite this article:** Sudipta Patnaik, Rajat Mohanty. Clinical review of peak expiratory flow rate in different trimester of pregnancy. International Journal of Contemporary Medical Research 2019;6(1):A1-A3.

**DOI:** <http://dx.doi.org/10.21276/ijcmr.2019.6.1.37>

Study Subjects	No. of Subjects	Percentage (%)
Control(20-30yrs.)	20	12.5
Control (31-40Yrs.)	20	12.5
Study Cases (20-30 Yrs.)	60	37.5
Study Cases (31-40 Yrs.)	60	37.5

**Table-1:** Distribution of control and pregnant cases according to the age group

Study Subjects	No. of Cases	PEFR (Lit./Min. $\pm$ SD)	t=1.88 df=78 p<0.05
Control	40	340 $\pm$ 21.43	
First Trimester	40	333.42 $\pm$ 6.73	

**Table-2:** Comparison of PEFR between control group and first trimester of pregnancy

Study Subjects	No. of Subjects	PEFR (Lit./Min. $\pm$ SD)	t=4.010 df=78 p<0.005
Control	40	340 $\pm$ 21.43	
Second Trimester	40	325 $\pm$ 9.96	

**Table-3:** Comparison of PEFR between control group and second trimester of pregnancy

Study Subjects	No. of Subjects	PEFR (Lit./Min. $\pm$ SD)	t=5.52 df=78 p<0.005
Control	40	340 $\pm$ 21.43	
Third Trimester	40	319.85 $\pm$ 8.72	

**Table-4:** Comparison of PEFR between control group and third trimester of pregnancy

Study Cases	No. of Subjects	PEFR (Lit./Min. $\pm$ SD)	t=4.43 df=78 p<0.005
First Trimester	40	333.42 $\pm$ 6.73	
Second Trimester	40	325 $\pm$ 9.96	

**Table-5:** Comparison of PEFR between first trimester and second trimester of pregnancy

Study Cases	No. of Cases	PEFR (Lit./Min. $\pm$ SD)	t=7.75 df=78 p<0.005
First Trimester	40	333.42 $\pm$ 6.73	
Second Trimester	40	319.85 $\pm$ 8.72	

**Table-6:** Comparison of PEFR between first trimester and third trimester of pregnancy

Study Cases	No. of Cases	PEFR (Lit./Min. $\pm$ SD)	t=2.47 df=78 p<0.01
Second Trimester	40	325 $\pm$ 9.96	
Third Trimester	40	319.85 $\pm$ 8.72	

**Table-7:** Comparison of PEFR between second trimester and third trimester of pregnancy

Table-5 shows that the PEFR is decreased in 2<sup>nd</sup> Trimester in comparison to the 1<sup>st</sup>trimester, which is statistically highly significant. (P<0.005)

Observations from table-6 show that the PEFR in 3<sup>rd</sup> trimester is significantly decrease in comparison with the 1<sup>st</sup> trimester, which is statistically significant. (P<0.005)

From the table-7 it is observed that the decreased PEFR in

2<sup>nd</sup> trimester in comparison with the 3<sup>rd</sup> trimester is not so marked, which is also statistically not significant. (P<0.01)

## DISCUSSION

Pregnancy is one of the most important states of physiological stresses in the human body. So physiological adjustments are required in the circulation and respiration of the mother.<sup>3,10</sup> In our present study attempt has been made to determine the change in the pulmonary function in different trimester of pregnancy and compare with the non-pregnant subjects by measurement of peak expiratory flow rate with the help of Wrights' Mini Peak Flow Meter, which helps to observe the alternation in airflow rate during pregnancy.<sup>3,4,5-9</sup>

During pregnancy the gradual growing foetus causes an increase metabolic demand on the mother which is an important state of physiological stress. The physiological changes during pregnancy regarding breathing, lung volumes and other mechanisms of respiration are due to structural changes in the rib cage and abdominal cavity.<sup>10-15</sup> This is mainly caused by increased level of oestrogen and progesterone. Advancing gestation also causes increase in abdominal pressure which decreases chest wall compliance.<sup>12</sup> Decrease PEFR is due to lesser force of contraction of main expiratory muscles of the pregnant women as it is largely effort dependant.

The PEFR is decreased significantly during second and third trimester of pregnancy in comparison with the control group i.e. 325 lit/min and 319.85 lit/min respectively, where in first trimester it is 333.42 lit./min and in control group it is 340 lit/ min, which is also statistically significant.<sup>16-21</sup>

The gradual decrease in PEFR from 1<sup>st</sup> to 3<sup>rd</sup> trimester is highly significant confirming other studies. This may be due to restriction of diaphragmatic movement by the expanding uterus in the later months of pregnancy, which affects the abdominal components of pregnancy by decrease lung volume and capacity.<sup>6</sup> The high level of chorionic gonadotropins, oestrogen and progesterone during pregnancy may also affect the pulmonary function.<sup>17</sup> Progesterone is known to cause relaxation of smooth muscle of the body, which leads to decrease of PEFR as pregnancy advances.<sup>6</sup> The declination of PEFR in 1<sup>st</sup> trimester in compare to control group may be due to inadequate nutrition for morning sickness, muscular weakness, leading to less force of contraction of main expiratory muscle like anterior abdominal muscles and internal intercostalmuscle, though there is not much significant changes found in size of uterus.<sup>3,22,23</sup>

## CONCLUSION

The present study clearly indicates that there is gradual decrease of peak expiratory flow rate in comparison with the control group, as pregnancy advances. This is significantly marked from 1<sup>st</sup> to 3<sup>rd</sup> trimester, which may be due to enlarging gravid uterus, affecting vertical dimension by restricting diaphragmatic movement and increase progesterone level in the blood, which cause relaxation of expiratory muscles. So the above informations use full for better antenatal care, assessment of fitness for anaesthesia and to detect

the progress of pre-existing lung diseases. Thus the peak expiratory flow rate is a simple effective tool for assessment of ventilation, confirm the diagnosis, starting of treatment, control medication and monitor response to the treatment.

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**Source of Support:** Nil; **Conflict of Interest:** None

**Submitted:** 02-12-2018; **Accepted:** 11-01-2019; **Published:** 28-01-2019