EFFECT OF PREGNANCY ON PULMONARY VENTILATION

by

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Introduction

In recent years there has been a considerable increase in the use of pulmonary function tests for the assessment of the cardiopulmonary mechanism in the patients with pulmonary disability. Hence it was thought worthwhile to study the pulmonary functions in pregnancy and compare the results with those of non-pregnant females by utilising the various parameters like, Minute Volume (MV), Maximal Voluntary Ventilation (MVV) and Peak Flow Rate (PFR).

Material and Method

A total of 185 female subjects in child bearing age (16 to 30 years) were selected at random for present study. The subjects were grouped as under:

Group I. 65 Non-pregnant subjects. They were taken from amongst the student nurses of the Civil Hospital and acted as control.

GroupII: 120 pregnant subjects in III trimester of pregnancy. They were taken from those attending antenatal clinic of the Civil Hospital Solapur to study the changes in lung function during pregnancy. Of the 120 subjects 50 were followed up (called as group II postnatal) in the 1st week of postnatal period and were studied to find out whether the changes occuring in lung functions during pregnancy have come back to normal.

Most of the subjects, belonged to poor socio-economic status and were undernourished. Minute Volume (MV) and Maximal Voluntary Ventilation (MVV) were recorded on a Benedict Roth type of spirometer as per the method devised by Comroe *et al* (1955). For estimations of Peak Flow Rate (PFR), the individual was asked to expire as forcefully and as fast as she can into a Wright's peak flow meter. The results of PFR were directly read from the instrument.

Results and Discussion

It is revealed from Tables I, II and III that in pregnancy there is a significant increase in MV, and a significant decrease in MVV and PER.

MV

Cugell *et al* (1953), Iherman (1960), Saxena *et al* (1979), Das (1979) and Dawn (1971) observed an increase in the minute volume during pregnancy which is very much similar to the findings in the

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Accepted for publication on 28-6-82.

TABLE I

MV in Non-pregnant (Group-I), Pregnant (Group-II) and Postnatal (Group-II postnatal) conditions

Group	No. of Subjects	MV in Lit/Min	Remarks
I	65	6.6 ± 2.7	(1) Difference between I and II is statistically significant.
II	120	10.7 ± 2.6	(2) Difference between II and II postnatal is statistically not significant.
II Postnatal	50	10.3 ± 2.8	

TABLE II

MVV in Non-pregnant (Group-I), Pregnant (Group-II) and Postnatal (Group-II postnatal) conditions

Group	No. of Subjects	MV in Lit/Min	Remarks
I	65	68.5 ± 16.19	(1) Difference between I and II is statistically significant.
II	120	48.85 ± 13.24	(2) Difference between II and II postnatal is statistically not significant.
II Postnatal	50	53.80 ± 13.54	

TABLE III

PFR in Non-pregnant (Group-I) Pregnant (Group-II) and Postnatal (Group-II postnatal) conditions

Group	No. of Subjects	MV in Lit/Min	Remarks
I	65	368.23 ± 37.75	(1) Difference between I and II is statistically significant.
II	120	283.71 ± 35.66	(2) Difference between II and II postnatal is statistically not significant.
II Postnatal	50	289.00 ± 45.00	

present study. Increased MV of pregnancy is due to the hyperventilation in pregnancy as produced by the increased circulating levels of progesterone which has a stimulatory effect on respiratory centre (Pande *et al* 1973). Besides an increase in frequency of respiration may be due to the increased metabolic rate in pregnancy. (Rubin A. 1953, and Rowe *et al* 1931).

MVV

The ability to reach a high MVV depends upon the muscular force available, on the compliance of the thoracic walls and lungs, and the airway resistances set up. The decrease in MVV in our study may be explained by overstretching of muscles of anterior abdominal wall leading to decreased force of

contraction of anterior abdominal wall muscles available for expiration. Also the enlarged uterus may push the diaphragm up leading to a decreased intrapleural pressure which will affect the amount of air drawn in the lungs in a single respiration.

PFR

The significant decrease in peak flow rate may be attributed to a lesser force of contraction of main expiratory muscles viz. anterior abdominal muscles and internal intercostal muscles.

In postnatal period the MV shows a fall, and the MVV and PFR show a slight increase as compared to that in pregnancy None of these changes are significant statistically. As such MV will be expected to fall immediately during postnatal period because the circulating progesterone is no more at a higher level. But the respiratory centre which was set at a higher level may take a little more time to settle down at normal level and hence the change in MV is likely to be gradual in postnatal period.

MVV and PFR certainly will take more time to come to normal because the anterior abdominal wall muscles remain lax for a pretty long time and so also the force of contraction in these muscles is very weak.

Hence it is suggested that gradual and graded active exercises for increasing the strength of the muscles of anterior abdominal wall should be given as a routine in postnatal period for an early recovery of respiratory functions.

Summary

Pulmonary Ventilation Studies have been performed in a total of 185 females (65 non-pregnant and 120 pregnant in III trimester of pregnancy) in the child bearing age.

A follow up study has been done in postnatal period in 50 of the pregnant subjects. It is found that MV increases, and MVV, and PFR decrease in pregnancy. These changes in pulmonary ventilation do not come back to normal in one week after delivery.

Acknowledgement

The authors extend their gratitude to the Dean Dr. V. M. Medical College, Solapur for giving necessary facilities to carry out this work. The authors are thankful to the subjects who have volunteered in the present work.

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