

MATERNAL VENTILATORY FUNCTIONS IN PREGNANCY

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SUMMARY

The maternal ventilatory functions in pregnancy have been widely studied. But there is a divergence of the reports obtained from Western and Indian population. The latter suggests that pregnancy causes significant changes in the total and timed vital capacity while western reports dismiss such changes as insignificant. The present study was aimed at substantiating such putative racial variations. However, our results negate such possibilities, since alternations in ventilatory functions were generally insignificant as reported in Western population.

There have been a large number of studies on the maternal ventilatory functions in pregnancy. The results of most of the studies conducted on western population (Weinberger et al, 1980, Gilroy et al, 1988) indicate that vital capacity and timed vital capacity, which were earlier thought to be altered in pregnancy, are more or less unchanged throughout the course of pregnancy. Results of similar studies conducted on Indian population (Chhabra et al, 1982, Shaikh et al, 1983)

however appear to be less coherent. On the whole, such studies tend to conclude the presence of some changes in vital capacity, mostly an increase in the late stages of pregnancy and an increase in the force expiratory volume FEV_1 . The present study was taken up to investigate further into the veracity of such dichotomous observations.

MATERIAL AND METHODS

The Study was conducted on 65 pregnant women not having any antenatal obstetric or medical complications. The

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study was limited to the 2nd and 3rd trimester of pregnancy and comprised the measurements of the various ventilatory functions and anthropometric measurements. The ventilatory functions included forced vital capacity (FVC), forced vital capacity in the 1st second (FVC_1), peak expiratory flow rate (PEFR) and flow rates at 75%, 50% and 25% of forced expiration (V_{75} , V_{50} , V_{25}). There were 33 subjects in the 2nd trimester and 32 in the 3rd trimester. The measurement were made on the Autospiror Chest connected to a computerised data-processor. The anthropometric measurements included the height, weight and body surface area. The parameters of ventilatory functions were compared and analysed statistically using the unpaired-t test.

RESULTS

The results show that although the mean height (153.84 ± 0.79 cm) and weight (50.59 ± 0.86 Kg) of the subjects were considerably lower than the western standards, there were little change in the ventilatory functions in the 2nd and the 3rd trimesters of pregnancy. The FVC was 1710.9 ± 53.81 mL in the 2nd and 1766.9 ± 101.2 mL in the 3rd trimester of pregnancy. In the corresponding periods, the FFV_1 showed a marginal decrease from 1562.4 ± 54.5 mL to 1558 ± 86.7 mL. The PEFR increased from 3.3 ± 0.2 to 3.5 ± 0.3 L/s (Figure 1) and was attended with similar marginal increases in V_{75} , V_{50} and V_{25} (Figure 2). None of these changes were however significant.

DISCUSSIONS

A general consensus seems to have

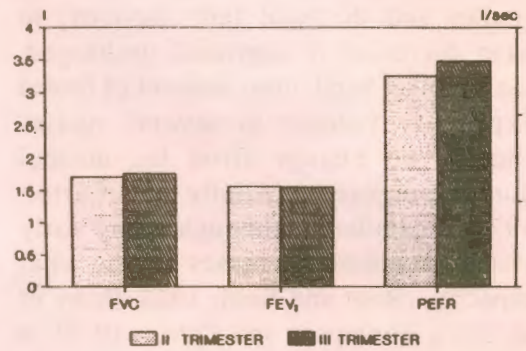


Figure 1

Fig. 1 : FVC, FEV₁ and PEFR in 2nd and 3rd Trimester of pregnancy.

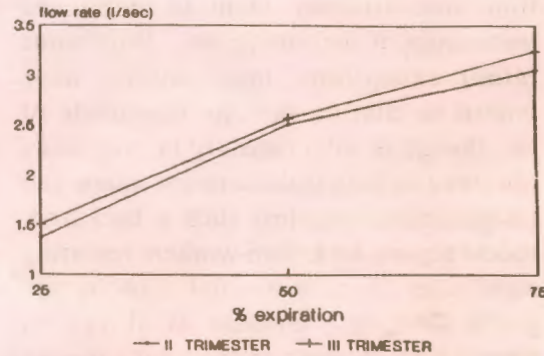


Fig. 2 : Flow rates (25%, 50% and 75% in 2nd and 3rd Trimester of pregnancy.

evolved over the last decade or so among Western workers regarding the respiratory functions which are altered in pregnancy. Most studies have concluded that the inspiratory capacity increases and the expiratory capacity decreases in pregnancy. The minute volume and the tidal volume increase with no change in the respiratory frequency. The functional

residual capacity and the residual volume were shown to be decreased in most studies and the total lung capacity, to have decreased or remained unchanged. On the other hand, measurement of forced expiratory volume in several studies showed no change from the normal during pregnancy (Allaily and Carrol, 1978). Similarly, although many early studies reported increases in the vital capacity, (Root and Root, 1923, Rowe et al, 1931, Thompson and Cohen, 1938) or a decrease in the vital capacity in the later half of pregnancy (Alward, 1930, Anthony and Hansen, 1933, Gee et al, 1967) recent works (Weinberger et al, 1980, Gilroy et al, 1988) summarily refute such observations and attribute them to antiquated techniques of measurements. With some minor exceptions, most studies have tended to confirm that the magnitude of the change in vital capacity in pregnancy observed in both directions are minor and insignificant. Against such a backdrop, recent reports by Indian workers reporting significant changes in vital capacity appears striking. Saxena et al (1979) reported an increase in the vital capacity in the second trimester but a slight decrease in the third trimester. On the other hand, Shaikh et al (1983) reported a decrease in the vital capacity. Similarly, other studies on Indian population report significant changes in vital capacity one way or the other (Chhabra et al, 1982, Dasgupta, 1973, Pandya et al, 1934). One way to reconcile much divergent observations would be to assume that pregnancy imposes a much greater stress on the respiratory functions on pregnant mothers among Indian population who are

generally anthropometrically diminutive compared to their Western counterparts. Indeed, such was the working hypothesis that we sought to verify by a study of a series of Indian mothers.

Considering that most of the reported changes in respiratory parameters were salient in the second and the third trimester, we confined our studies only to these trimesters. Although the average height of our subjects were 153.84 ± 0.79 cm and their average weight was 50.59 ± 0.86 Kg, with none of them showing any evidence of intrauterine growth retardation, our results conform to those of the Western workers. Although the present study also showed a slight decrease in the FVC in the 3rd trimester as compared to the 2nd, the decrease was not significant.

Our studies also suggest that FEV_1 and PEF_R do not change significantly in pregnancy. Indeed, the numerous studies that have examined flows throughout the course of pregnancy have consistently demonstrated no alterations in the FEV_1 or the ratio of FEV_1 to the FVC suggesting that large airway function is not impaired during pregnancy (Weinberger et al, 1980, Alaily and Carrol, 1978, Cugell et al, 1953, Rubin et al, 1956, Krumholtz et al, 1964, Gazioglu et al, 1970, Eng et al, 1975, Baldwin et al, 1977). In one such investigation by Cameron et al (Cameron et al, 1970), the 60 pregnant patients who underwent serial estimation of forced vital capacity (FVC) and FEV_1 throughout pregnancy and after delivery, none showed any significant change in their ventilatory functions. They supported the impression of other workers that

serial changes in individuals vary in both amount and direction of change. They further suggested that the maintenance of FEV₁ and FVC may be related to the variable maternal hormonal response to pregnancy. Hormonal activity may be responsible for increasing thoracic width which compensates for the rise in the level of the diaphragm which occurs as a result of the enlarging uterus.

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