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AIRWAY FUNCTIONS IN PREGNANT INDIAN WOMEN

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Abstract: The airway functions in pregnancy have been widely studied but reports obtained from Western and Indian population show divergence. While the Indian populations show significant changes in total and timed vital capacity (FVC and FEV_1), the Western counterparts dismiss such changes as insignificant. Our results show insignificant alteration in airway function and support the results reported for Western population.

Key words: vital capacity flow rate pregnancy

INTRODUCTION

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 (1, 2) indicate that vital capacity and timed vital capacity, which were earlier thought to be altered during pregnancy, are more or less unchanged through out the course of pregnancy. Results of similar studies conducted on Indian population (3, 4) however, appear to be less consistent. If anything, these studies tend to point out the occurence of changes in the vital capacity, mostly an increase in the late stages of pregnancy and an increase in the FEV_1. The present study was taken up to investigate further into the validity of such conflicting observations.

METHODS

The study was conducted on 65 pregnant women (mostly multipara) not having any antenatal obstetric or medical complications. The study was limited to the 2nd and 3rd trimester of pregnancy: there were 33 subjects in the 2nd trimester and 32 in the 3rd trimester. The study comprised the measurements of the various ventilatory functions (made on the Autospiror Chest connected to a computerised data processor) and anthropometric measurements like height (cm), weight (kg), body surface area (sqm).

The subjects were made to sit comfortably on a chair and were asked to breathe through the mouth-peice of the Autospiror Chest. They were allowed 3 to 4 trials of maximal inspiratory and expiratory efforts and only the highest readings were taken for data processing. The ventilatory functions included forced vital capacity (FVC), forced vital capacity in the 1st second (FVC_1), % forced expiratory volume (%FEV), peak expiratory flow rate (PEFR) and flow rates at 75%, 50% and 25% of forced expiration (V_{75}, V_{50}, V_{25}). 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), weight (50.59 ± 0.86 kg) and body surface area (1.46 ± 0.09 m^2) of the subjects were considerably lower than the western standards (5, 6), there were small changes in certain ventilatory functions like FVC, FEV_1, and PEFR. The FVC was

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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 FEV_1 showed a marginal decrease from 1562.4 ± 54.5 mL to 1558 ± 86.7 mL. The PEFR increased from 3.3 ± 0.2 mL to 3.5 ± 0.3 L/s (Fig.1). There was marginal increase in V_{75}, V_{50} and V_{235} (Fig. 2) in the 2nd trimester, their values in 2nd trimester being 3.24 ± 0.25, 2.56 ± 0.27 and 1.50 ± 0.98 and in 3rd trimester, 3.05 ± 0.17, 2.50 ± 0.17 and 1.37 ± 0.09 respectively. None of these changes were however, statistically significant.

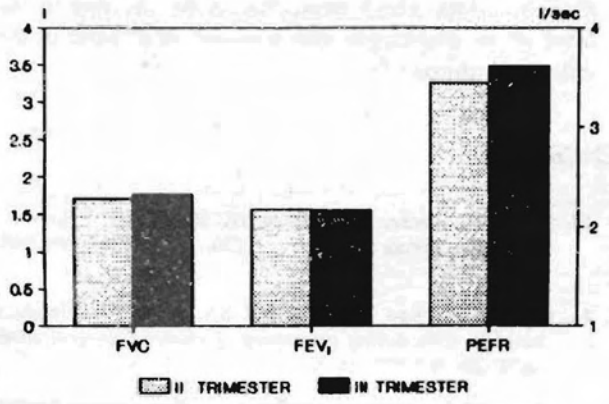

Fig. 1: The forced vital capacity (FVC) timed vital capacity (FEV_1) and peak expiratory flow rate (PEFR) in the 2nd and 3rd trimesters of pregnancy. FVC and FEV_1 are drawn to the left ordinate scale (litres) and PEFR is drawn to the right ordinate scale (litre/sec).

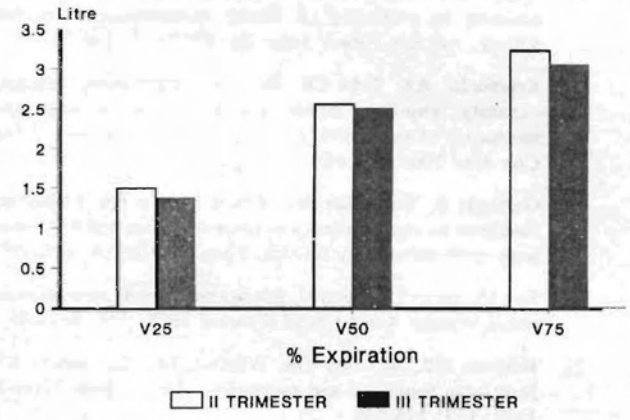

Fig. 2: The flow rates at 25%, 50% and 75% of forced expiration (V_{25}, V_{50} and V_{75}) in the 2nd and 3rd trimesters of pregnancy.

DISCUSSION

A general consensus seems to have evolved over the last decade or so among Western workers regarding the respiratory functions which are altered in pregnancy. It is concluded that the inspiratory capacity increases and the expiratory capacity decreases in pregnancy (6). The minute volume and the tidal volume increase with no change in the respiratory frequency (1, 7). 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 (6). Similarly, although many early studies reported increases in the vital capacity, (8, 9, 10) or a decrease in the vital capacity in the later half of pregnancy (11, 12, 13) recent works (1, 2) summarily refute such observations and attribute them to variability in techniques of measurements. With some minor exceptions, most studies have tended to confirm that the magnitude of 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 (14) reported an increase in the vital capacity in the second trimester but a slight decrease in the third trimester. On the other hand, Saikh et al (4) reported a decrease in the vital capacity. Similarly, other studies on India population report significant changes in vital capacity one way or the other (3,15,16). One way to reconcile such divergent observations would be to assume that the fetal bulk imposes a greater restriction on breathing pregnant women 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 on a group of Indian mothers.

Considering that most of the reported changes in respiratory parameters were observed in the second and the third trimester (6, 14), 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. It may also be interesting to note that the forced vital capacity recorded in our study (1710.9 and 1766.9 in the second and third trimesters) are lower than those recorded in other Indian studies: 1844.6 to 1997.7 (3) and 2542.2 to 2521.3 (14).

Our studies also suggest that FEV_1 and PEFR do not change significantly in pregnancy. Indeed, the numerous studies that have examined flow-rates 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 (1, 5, 6, 17-21). In such investigation by Cameron et al (7), the 60 pregnant patients who underwent serial estimation of forced vital capacity (FVC) and FVC_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 FEV_1 and FVC may be related to the variable maternal hormonal response to pregnancy (22). Hormonal activity may be responsible for increasing thoracic width which compensates for the rise in the level of the diaphargm which occurs as a result of the enlarging uterus (2).

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