Pulmonary Functions in Pregnant Sri Lankan Women

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Abstract

The objective of this study is to determine the changes in vital capacity and peak expiratory flow rate during the course of pregnancy in Sri Lankan women. This is a cross-sectional study done on 238 pregnant women recruited from antenatal clinics at different periods of gestation. Subjects were divided into eight groups according to their period of gestation. In each subject the vital capacity was obtained by using the vitalograph and PEFR by blowing into the peak flow meter, three times and the best value obtained. Predicted value for vital capacity and PEFR of each mother was calculated by using the regression equation for the Sri Lankan women using the height and age of each mother. For each group mean predicted value and the mean observed value were calculated and the difference in these two values were compared among groups. Also the mean FEV_1 and FEV_1/FVC ratio was determined for each group. There was no significant difference in FVC, FEV_1/ FVC and PEFR among the eight groups depending on the period of gestation. Therefore, FVC and PEFR are two useful lung function tests, which can be performed on pregnant women throughout the course of pregnancy, as performed in the non-pregnant state for early diagnosis of pulmonary dysfunction.

Introduction

The results of most of the studies done on western populations indicate that vital capacity and peak expiratory flow rate do not change significantly throughout the course of pregnancy (Weinberger et al. 1980, 559-577; Gilory et al 1988, 669-672). Similar studies done on Indian populations show that the vital capacity and peak expiratory flow rate tend to increase in the later stages of pregnancy (Chhabras et al. 1982: 56-60; Shaikh 1983:(459-499). A previous study done on a Sri Lankan population comparing lung function tests on a group of pregnant women at a gestation of 36-40 weeks, with a group of non pregnant women showed that forced vital capacity was low in the pregnant group, but there was no change in the peak expiratory flow rate (Jayawardene 1992: 21-25).

In view of these conflicting results the present study was undertaken to study the changes of these two parameters in Sri Lankan women during pregnancy.

Methodology

The study group consisted of 238 pregnant women at different periods of gestation. Only women with clinically normal respiratory and cardiovascular systems were selected for the study. Women with a past history of wheezing in childhood, bronchial asthma and those with antenatal obstetric complications were excluded from the study. Women were recruited to the study from antenatal clinics in the Piliyandala area during a three-month period beginning from April 1997.

Their age, height, weight, period of gestation, and symphysio-fundal height were recorded and instructions in the use of peak flow meter and vitalograph were given. Each mother was made to sit comfortably on a chair and was asked to blow three times into the peak flow meter with maximum effort and the values were recorded. The best of the three recordings was used for calculation of peak expiratory flow rate. The forced vital capacity and FEV_1 was measured using the vitalograph and FEV_1/ FVC ratio was calculated. The

subjects were allowed three trials and the best value was taken for data processing. Then these matters were divided into 8 groups according to the period of gestation. Group 1 consisted of women with a period of gestation between 9-12 weeks, group 2 – a period of gestation between 13-16 weeks, group 3 – a period of gestation between 17-20 weeks, group 4 – a period of gestation between 21- 24 weeks continuing up to group 8 – a period of gestation between 37-40 weeks. FVC and PEFR of these groups have also been compared.

Results

Expected value for the vital capacity of each mother was calculated by the regressior equation for the Sri Lankan women using the height and age of each mother (Udupihille. 1995: 53-58).

VC=-1.42 + 0.028 Ht - 0.012 Age ± 0.4207

For each subject, expected VC and the best value obtained by using the vitalograph were calculated and the difference in these two values were obtained. FEV_1 and FEV_1 /FVC ratio was obtained for each subject. The mean value for each group was determined and is shown in Table 1 for the 8 considered groups. Expected value for PEFR for each woman was calculated by the regression equation for the Sri Lankan women using the height and age of each mother (6).

Table I: Mean deviation from expected FVC (1) and FEV1/FVC (%)

Group	Gesta-tion (weeks)	No. of women	Mean deviation from expected FVC (1)	SD	FEV1/ FVC (%)
1	9-12	28	0.341	0.435	84
2	13-16	29	0.392	0.358	80
3	17-20	32	0.357	0.488	81
4	21-24	30	0.264	0.296	82
5	25-28	31	0.267	0.265	79
6	29-32	31	0.283	0.325	76
7	33-36	30	0.339	0.273	83
8	37-40	27	0.315	0.352	78

F statistic -0.49
P value - 0.8442

For each subject the difference between the expected value and the obtained value was determined and the mean value for each group was calculated and these are shown in Table II. The statistical analysis was performed using F statistics.

Table II - Mean deviation from expected PEFR (1/ml) in 8 groups.

Group	Gestation (weeks)	No. of women	Mean deviation from expected PEFR (1/ml)	SD
1	9-12	28	137	37.86
2	13-16	29	138	43.68
3	17-20	32	142	35.61
4	21-24	30	138	42.31
5	25-28	31	148	29.33
6	29-32	31	147	38.25
7	33-36	30	149	29.96
8	37-40	27	140	33.52

F statistic -0.54
P value -0.8049

Discussion

In Sri Lanka pulmonary function testing is increasingly being used in the management of respiratory illnesses. In this paper we studied the FVC and PEFR changes during pregnancy as these two parameters are considered relatively good indicators for early detection of deteriorating ventilatory capacity (Shaikh et al 1983:495-499). Since these tests are easily done and are fairly repeatable they can be used in antenatal clinics to assess the ventilatory capacity of pregnant mothers (Puranil et al, 1995:137). As there is no consensus of opinion in most of the western and Indian studies done on airway function in pregnant women the present study was undertaken to study these parameters in Sri Lankan pregnant women.

Analysis of data in this study shows that FVC and PEFR do not change significantly in pregnancy. As pregnancy state is associated with complex physiological and anatomical changes, maintenance of FVC and PEFR may be related to these changes (Milne et al, 1977:448-451).

Hormonal alternation in pregnancy causes a reduction in the tracheo-bronchial smooth muscle tone and the increasing thoracic width may be compensating for the rise in the level of the diaphragm which occurs as a result of the enlarging uterus (Singh et al, 1995: 162). Therefore, results of this study show that a large airway function is not impaired throughout the course of pregnancy and FVC and PEFR are two useful lung function tests to assess ventilatory capacity in pregnant women as it is used in the non-pregnant state for the diagnosis of pulmonary dysfunction.

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