

ORIGINAL ARTICLE

Study of Forced Vital Capacity in Pregnant Women

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Abstract:

In the present study, Forced Vital Capacity (FVC) was estimated in 100 women in Dhaka city. For this purpose a total 100 women subjects with age ranged from 25 years to 35 years without any recent history of respiratory diseases were selected, 75 normal pregnant women as experimental group and 25 healthy non-pregnant women as control. Experimental group included 25 first trimester, 25 second trimester and 25 third trimester of pregnant women. The FVC was estimated by using a automatic spirometer during the first, second and third trimester of pregnant women and also in non-pregnant control. The mean of the measured values of FVC were analyzed statistically. The FVC was significantly lower in third trimester of pregnant women than that of non-pregnant women. Again the FVC was significantly lower in third trimester than that of first trimester of pregnant women. There were no statistically significant difference of FVC between the non-pregnant and first trimester; between the non-pregnant and second trimester; between the first trimester and second trimester; and between the second trimester and third trimester of pregnant women. It may be concluded that the causes of progressively decreased FVC throughout the pregnancy were most likely to be mechanical effects of progressively increasing uterus that progressively decrease the lung volume capacity.

Introduction:

Early in pregnancy, capillary dilatation occurs throughout the respiratory tract, leading to engorgement of the nasopharynx, larynx, trachea and bronchi, which can cause

breathing difficulties. As the uterus enlarges, the diaphragm is elevated as much as 4 cm, the rib cage is displaced upward and widens, increasing lower thoracic diameter by 2 cm and the thoracic circumference by up to 6 cm. Elevation of the diaphragm does not impede its movement. Abdominal muscles have less tone and are less active during the pregnancy causing respiration to be more diaphragmatic. Moreover, it has been seen that alterations occurring in lung volumes and capacities during pregnancy¹. Mechanical effects of progressively increasing uterus progressively decreases lung volumes and capacities by the fifth month of pregnancy, which at term are

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about 20% below those of the non-pregnant state². During pregnancy, changes in the thoracic configuration subsequent to progressive increase in the abdominal volume have a moderate effect on respiratory function³. They observed that pregnancy was associated with significant changes in respiratory function, even in healthy pregnant women^{4,5}.

On the other hand, FVC gradually decreases as pregnancy advances. After 28 weeks of gestation, FVC significantly decreases as compared with the normal values. These results suggest that FVC changes gradually during pregnancy especially after the 28th week of pregnancy⁶. Indian population showed significant changes in total and timed vital capacity. FVC was not significantly decreased in the third trimester as compared to the second trimester⁷. It was found that in airway obstruction due to any cause, FVC was also reduced⁸. It was also observed that the mean vital capacity of the women during pregnancy was significantly lower. This reduced vital capacity during pregnancy was due to a decrease in the expiratory reserve volume. The mean vital capacity in late pregnancy was significantly lower than that of non-pregnant women⁹.

So, it was important to observe the lung function assessment in pregnant women both physiologically and clinically. A few data is available on the effects of pregnancy on pulmonary function in different countries as

shown by different workers^{6,7}. But no established data is available in our country on this aspect.

Therefore, the aim of this study was to observe the normal value of FVC which is frequently used for lung function tests in different trimesters of normal pregnant women and compare them with those of healthy non-pregnant women.

Materials and method:

Forced vital capacity was measured in normal pregnant and healthy non-pregnant women. For this purpose, 100 subjects aged between 25 and 35 years were selected, in which there were 75 pregnant women at experimental group and 25 non-pregnant controls. Experimental group included 25 in first trimester, 25 in second trimester, 25 in third trimester of pregnancy. All the subjects were taken from different areas of Dhaka city inhabited by lower middle and poor socioeconomic group of people. The subjects were selected by careful history taking and physical examination to exclude evidence of past or recent significant respiratory diseases.

The spirometric measurements of FVC was done in pregnant women during their first, second and third trimester of pregnancy and also in control group. The FVC was measured by automatic spirometer. The mean of measured values of FVC were statistical analysed by unpaired Student's 't' test between and among the study groups. P value <0.05 was taken as significant.

Table -I: The mean (\pm SD) of measured values of FVC in different groups of subjects

Groups	Number	Measured value (L)
A	25	3.11 \pm 0.90
B-I	25	3.03 \pm 0.69
B-II	25	2.88 \pm 0.69
B-III	25	2.57 \pm 0.70

Table –II: The statistical analysis of mean (\pm SD) of measured values of FVC in different groups of subjects

Statistical analysis (measured value)	
Groups	P value
A vs B-I	>0.50 ^{ns}
A vs B-II	>0.10 ^{ns}
A vs B-III	<0.05*
B-I vs B-II	>0.10 ^{ns}
B-I vs B-III	<0.05*
B-II vs B-III	>0.10 ^{ns}

- A : healthy non-pregnant women (control)
- B-I : first trimester of pregnant women (experimental)
- B-II : second trimester of pregnant women (experimental)
- B-III : third trimester of pregnant women (experimental)

P values were obtained by unpaired Student's "t" test

* = significant

ns = non significant

FVC in Liter

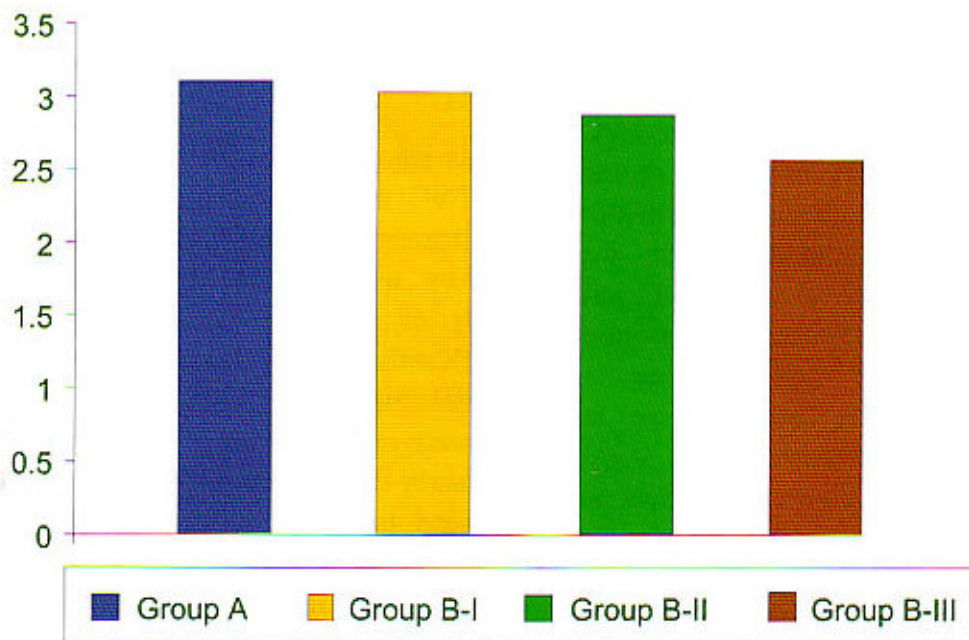


Figure-1:The mean (\pm SD) of measured values of FVC in different groups of subjects.

Results:

The mean (\pm SD) of measured values of FVC in non-pregnant and during first trimester, second trimester, third trimester of pregnant women are shown in Table-I. The FVC showed a gradually decreasing value during first trimester to third trimester in comparison to that of non-pregnant women. The FVC was significantly (<0.05) decreased during third trimester than that of non-pregnant women (Table-II). Again FVC was significantly (<0.05) decreased during third trimester than that of first trimester in pregnant women (Table-II).

There were no statistically significant difference of FVC in between non-pregnant and those in first trimester; in between non-pregnant and second trimester; in between first trimester and second trimester; and between second trimester and third trimester in pregnant women.

Discussion:

The mean (\pm SD) of measured values of FVC was significantly (<0.05) decreased during third trimester of pregnant women than that of non-pregnant women (control). Again the mean (\pm SD) of measured values of FVC was significantly (<0.05) decreased during third trimester than that of first trimester in pregnant women. These results were in agreement with other workers that a slight decrease in the FVC in the third trimester as compared to the second trimester and that the decrease was not statistically significant as hormonal activity may increase the thoracic width which compensates for the rise in the level of diaphragm occurring as a result of the enlarging uterus⁷.

The mean vital capacity in late pregnancy was significantly lower than that of non-pregnant women. This reduced vital capacity during pregnancy was due to a decrease in the expiratory reserve volume⁹.

FVC was gradually decreasing as the pregnancy advanced. After the 28th week of gestation, the vital capacity significantly decreased when compared with the normal values due to slight obstructions in the bronchial tubes. After the 28th week of gestation, it may be due to occurrence of breath short and lung infection¹⁰.

There was progressively significant or highly significant decline in FVC during different trimesters of pregnancy due to mechanical pressure of enlarging gravid uterus, elevating the diaphragm and restricting the movements of lungs, and thus hampering the forceful expiration¹¹. It was also observed that the low results of FVC had been due to low socio-economic status and poor nutrition of the subjects¹².

In this study, it may therefore be concluded that FVC was significantly decreased during third trimester of pregnancy than that in non-pregnant women (control). Again the mean (\pm SD) of measured values of FVC was significantly (<0.05) decreased during third trimester than that in first trimester. There was progressively decreased FVC throughout the pregnancy due to poor nutrition as all of them belonged to lower middle and poor socio-economic status. Poor nutritional status leads to poor growth of muscles and development of lungs and consequently decreased pulmonary functions. Due to progressive by increased uterus there was progressive decrease in lung volumes and capacities.

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