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A COMPARATIVE STUDY OF DYNAMIC RESPIRATORY FUNCTIONS IN TERM PREGNANT WOMEN.

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Abstract :
In pregnancy, the enlarging uterus and the hormonal effects alter the lung volumes and capacities. Pulmonary function test is an important tool to assess the respiratory functions of an individual. Aim of the study was to evaluate the changes in dynamic respiratory functions in term pregnant women and to compare parameters of study group with that of control group. 30 adult female primi, in their third trimester pregnancy (36- 38 weeks) selected from the Department of Obstretics and Gynaecology, RSRM, Stanley Medical College Hospital were chosen after institutional ethical committee approval. PFT was performed using SPIROLAB II, in the sitting posture in the morning and compared with age matched controls chosen from the Master Health Check-up Clinic, Stanley Medical College Hospital. Data collected was analyzed statistically by unpaired student t test using SPSS version 15.0. Of the total 30 subjects in study group, the mean ages in years was 23.87 2.98 and mean BMI was 25.29 2.67 and that of control group the mean ages in years was 24.53 2.61 and mean BMI was 22.14 3.57. On comparing PFT parameters among study and control group we observed FVC (2.06 0.30), FEV1 (2.03 0.29), FEV1 FVC (0.98 0.02) of study group and that of control group FVC (2.10 0.46), FEV1 (2.08 0.46) and FEV1 FVC (0.99 0.02) there was no significant change. PEF (4.29 1.15) among study group when compared to that of control group PEF (5.23 1.28) was highly significant with P value 0.004. MVV (56.54 15.91) of study group when compared to that of control group MVV (73.02 27.01) was highly significant with P value 0.006. Thus pregnancy is characterized by sequence of dynamic physiological changes that impact on multiple organ system functions and is associated with various changes in pulmonary anatomy and physiology. Hence from this study we conclude that assessing pulmonary function test in third trimester pregnancy invariably

shows us significant respiratory compromise.

Keyword :pulmonary function test, pregnancy, respiratory compromise.

INTRODUCTION:

Pregnancy causes visible and invisible changes in body. In pregnancy, the enlarging uterus and the hormonal effects alter the lung volumes and capacities. Clinical evaluation of lung function and the study of static lung mechanics begin with the measurement of lung volumes and the factors that determine these volumes. Pulmonary function test (PFT) is used to assess severity, functional impairment or disability, follow response to therapy, and determine further treatment goals, estimate prognosis and referral for surgery [1].Pulmonary function test is an important tool to assess the respiratory functions of an individual. This test is a non invasive simple procedure easily done to test patients and an early detector of respiratory compromise. In clinical practice, while performing the pulmonary function test, along with the measurement of the various volumes and capacities, other parameters that is determined is forced vital capacity (FVC) and forced expiratory volume (FEV). FVC is the maximum amount of air that is forcefully breathed out after inflating the lung to the maximum by maximum inspiration. The volume of air that can be forcibly expired in the first second is called FEV_1 and the volume that can be expired in 2 second is called FEV_2 and the volume expired in 3 second is called FEV_3. Normally the entire vital capacity can be forcibly expired in 3 seconds. In normal individuals FEV_1/ FVC is approximately 0.8, which means that 80% of the vital capacity can be forcibly expired in the first second. FVC and FEV_1 are helpful in the diagnosis of lung disease. FEV_1/ FVC can be used to differentiate between various types of diseases. For instance, in obstructive lung disease like asthma both FEV_1 and FVC are decreased, but FEV_1 is decreased more than FVC. In fibrosis of lung, which is a restrictive lung disease, both FEV_1 and FVC are decreased, but FEV_1 is decreased less than FVC. Thus in fibrosis FEV_1/ FVC ratio actually increases [2- 4].

II. AIM

To evaluate the changes in dynamic respiratory functions in term pregnant women using SPIROLAB –II and to compare parameters of study group with that of control group.

III. MATERIALS AND METHODOLOGY

1. *Sample size: 30*

Inclusion criteria:

Primi pregnant women in their third trimester of pregnancy (36- 38 weeks). Non- pregnant, age matched controls chosen from Master Health Check-up Clinic.

Exclusion criteria:

Pregnant females with any co morbid illness like asthma, diabetes, hypertension renal and hepatic insufficiency.

Multiparity, twin pregnancy, pregnancy induced hypertension, high risk pregnancy and pregnancy with bad obstetric history.

Parameters studied:

I. Forced Vital Capacity (FVC) in (lit).

II. Forced Expiratory Volume in 1st second (FEV_1) as (%).

III. FEV_1/FVC.

IV. Peak Expiratory Flow Rate (PEFR) as (lit/min) and

V. Maximum Voluntary Ventilation (MVV) as (lit/min).

*5. **Pre- requisites:***

· The subjects were instructed to avoid beverages before recording PFT. · The subjects were made to get accustomed to research laboratory. · The procedure was explained in their own language. · The subjects were properly instructed and motivated.

6. Methodology:

30 adult female primi, in their third trimester pregnancy (36- 38 weeks) selected from the Department of Obstretics and Gynaecology, RSRM, Stanley Medical College Hospital were chosen after institutional ethical committee approval. Proper information and explanation to the study group was given and written consent obtained. A brief history including personal history, family history, and history of any previous illness of respiratory diseases or treatment for respiratory diseases was noted. General examination included recording of pulse rate, blood pressure, respiratory rate, chest and abdominal circumference. Abdominal examination by inspection and palpation was done. PFT was performed using SPIROLAB –II, in the sitting posture in the morning and compared with age matched controls chosen from the Master Health Check-up Programme, Stanley Medical College. Data collected was stored and analyzed statistically by unpaired student t test using SPSS version 15.0. The Data is expressed as mean ± standard deviation. Statistical significance was tested using p value.

IV. RESULTS

The baseline characteristics of the study group and control group are shown in table 1. Of the total 30 subjects in study group, the mean ages in years was 23.87 ± 2.98 and mean BMI was 25.29 ± 2.67 and that of control group the mean ages in years was 24.53 ± 2.61 and mean BMI was 22.14 ± 3.57. From table 2, on comparing PFT parameters among study and control group we observed FVC (2.06 ± 0.30), FEV_1 (2.03 ± 0.29), FEV_1/ FVC (0.98 ± 0.02) of study group and that of control group FVC
(2.10 ± 0.46), FEV_1 (2.08 ± 0.46) and FEV_1/ FVC (0.99 ± 0.02) there was no significant change. PEF(4.29 ± 1.15) among study group when compared to that of control group PEF (5.23 ± 1.28) was highly significant with P value 0.004. MVV (56.54 ± 15.91) of study group when compared to that of control group MVV (73.02 ± 27.01) was highly significant with P value 0.006.
Table 1: Showing basic parameter comparison between control and study group:

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Basic parameters	Study group Mean ± SD	Control group Mean ± SD	P Value
Age in years	23.87 ± 2.98	24.53 ± 2.61	0.360
BMI	25.29 ± 2.67	22.14 ± 3.57	0.001**

** P Value < 0.010 is highly significant

Table 2: Showing comparison of PFT parameters between control and study group:

Parameters Studied	Study group n= 30 Mean ± SD	Controls n = 30 Mean ± SD	P Value
FVC(L)	2.06 ± 0.30	2.10 ± 0.46	0.708
FEV_1(L)	2.03 ± 0.29	2.08 ± 0.46	0.583
FEV_1/ FVC	0.98 ± 0.02	0.99 ± 0.02	0.120
PEF(L/ S)	4.29 ± 1.15	5.23 ± 1.28	0.004**
MVV(L/ M)	56.54 ± 15.91	73.02 ± 27.01	0.006**

** P Value < 0.010 is highly significant

DISCUSSION:

Objective of this study was to assess PFT in term pregnant women compared to non pregnant women. There is no statistically significant reduction in FVC, FEV_1, and FEV_1/FVC with highly significant change in PEF and MVV. In studies conducted by Milne et al, Mokkapatti et al, Monga et al, they found a statistically significant reduction in PEFR values in their study involving pregnant women [5- 7]. Lata et al in their study found that enlarging breast, growing gravid and fear of complications arising at term due to abdominal pressure required to forcefully inspire and expire for executing flow rates which could render lowered values during pregnancy. These effects cause relatively adaptive changes in pulmonary mechanics [8]. PEFR decrease states that it might be caused by upward displacement of diaphragm, reduced strength of expiratory muscles and mechanical effect of growing uterus. In a study by Hemant et al, they found that in first and second trimester of pregnancy the lung functions are relatively normal, while in third trimester the pulmonary function gets compromised with decrease in PEFR [9]. Grindheim et al, in their study found that, there was a progressive increase in PEF after 14- 16 weeks of gestation which was due to physiological mechanisms of bronchodilatation in pregnancy [10]. Pregnancy - induced reduction in pulmonary vagal efferent activity and progesterone mediated alteration in airway smooth muscle tone may separately or in combination be responsible [11- 15]. MVV decrease during pregnancy indicates mechanical inhibition of chest and also due to increased oxygen per unit of work done in the respiratory muscles. Other factors as morning sickness, lack of motivation and resistance to exertion contribute in decreasing MVV [8]. Thus pregnancy is characterized by sequence of dynamic physiological changes that impact on multiple organ system functions and is associated with various changes in pulmonary anatomy and physiology [16].Three important changes in the configuration of the thorax that occur during pregnancy were an increase in anteroposterior and the transverse diameters, elevation of the diaphragm upto 4 cm to 5 cm and a 50% widening of the costal angle [17- 19]. These changes peak around the 37th week of pregnancy and normalize within 6 months after delivery.Pulmonary function is affected by changes of the airway, thoracic cage, and respiratory drive. Additionally,

capillary engorgement throughout the respiratory tract results in mucosal edema and hyperaemia [20,21]. Multiple biochemical alterations like increase in progesterone, estrogen, prostaglandins, corticosteroid and cyclic nucleotide levels occur concomitantly during the course of pregnancy.

CONCLUSION:

Hence from this study we conclude that assessing pulmonary function test in third trimester pregnancy invariably shows us significant respiratory compromise. When a significant change in PFT during third trimester if observed the women can be given extra care and monitored efficiently to prevent complications during labour or surgery and during post partum. Pulmonary breathing exercises like deep inhalation and exhalation done during second trimester till delivery and postnatal period helps to improve patient's oxygen saturation and oxygen carrying capacity of mother during labour. This also minimizes foetal hypoxic events in antepartum and intrapartum period and helps the pregnant women to bear down during labour. Limitation of this study was that follow up of the study subjects after delivery or surgery was not feasible as the study subjects moved to their native place after delivery.

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