

Original Research Article

Comparison of pulmonary function of women in 2nd trimester and non-pregnant women, in central Uttar-Pradesh, India

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Received: 31 May 2019

Revised: 17 June 2019

Accepted: 03 July 2019

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ABSTRACT

Background: Pregnancy is nothing but a process of maternal adaptation to meet the increasing needs of the growing foetus. Significant changes in the highly sensitive respiratory system occurs during pregnancy to fulfil increased demands as well as to combat stress of pregnancy. Although many studies have been done in India to study the Pulmonary Functions during pregnancy, but due to paucity of such study in central Uttar-Pradesh this study was planned.

Methods: This study was carried out on 353 2nd trimester pregnant women coming to ANC clinic of Obstetrics and Gynaecology Department of Uttar-Pradesh University of Medical Sciences, Saifai, Etawah, pulmonary function parameters were recorded using Computer based Digital Spirometer. Data were compared with pulmonary function parameters of age matched 353 Non-Pregnant controls. Parameters studied were FVC, FEV1, FEV1/FVC, PEFR and MVV.

Results: FVC, FEV1, FEV1/FVC and PEFR was found less in pregnant women as compared to Non-pregnant women, difference was statistically highly significant ($P < 0.01$). MVV was also found less in pregnant women but it was insignificant ($P > 0.05$).

Conclusions: All parameters of PFT are deranged in pregnancy. Matching of other attributes of cases and controls like height, pre-pregnancy weight of cases and weight of controls, Haemoglobin, BMI, could possibly further explain the established relationship of pregnancy and PFT parameter derangements. Perhaps, a longitudinal study in expectant mothers by measuring their PFT parameters in non-pregnant states and then serial follow-up PFT measurement during their pregnancy would be a better approach to look for the effects of pregnancy on PFT parameters.

Keywords: Pregnancy, Pulmonary functions, Spirometry

INTRODUCTION

Pregnancy is nothing but a process of maternal adaptation to meet the increasing needs of the growing foetus. 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. Significant changes in the highly sensitive respiratory system occurs during pregnancy to fulfil increased demands as well as to combat stress of pregnancy.

During pregnancy, in response to hormonal changes the ribcage undergoes structural changes.¹ Progressive

relaxation of the ligamentous attachments of the ribs cause the sub-costal angle of the ribcage to increase from 68° to 103° early in pregnancy before the uterus is substantially enlarged. The increased elasticity of the ribcage is probably the result of the same factors that induce changes in the elastic properties of the pelvis. One of the important mediators is thought to be the polypeptide hormone Relaxin which is increased during pregnancy. This substance is responsible for the softening of the cervix and the relaxation of the pelvic ligaments.^{2,3}

METHODS

Tool of study

In the present study, an interview of pregnant women coming to OPD of Obstetrics and Gynaecology Department was conducted. A predesigned pretested structured questionnaire was filled. In case, condition of the subject does not warrant the interview, relatives or attendants were interviewed. Prior to the interview, informed consent was taken from each participant and confidentiality of the information collected was ensured. Participants had to undergo a test of Computerized Spirometry after interview.

Study population

Healthy pregnant women of 21-40 years of age in their 2nd trimester of pregnancy attending ANC-Clinic of Department of Obstetrics and Gynaecology, and randomly selected age matched non-pregnant women from general population as controls.

Exclusion criteria

Patients of medical illnesses especially pulmonary diseases, heart diseases, anaemia, pre-ecliptic toxemia, twin pregnancy etc.

Procedure

Before recording the PFT, the procedure was explained and demonstrated in detail to the participants till proper understanding. Doubts, if any, were answered to their satisfaction. Instructions about the importance of nose clip and maintaining a tight seal with the lips around the mouthpiece while performing the tests were given. Comfort of each participant was ensured during the procedure of recording the PFTs. After a trial three satisfactory attempts were recorded, each time with adequate rest in between and result was determined from the best efforts. Parameters recorded were:

- Forced Vital Capacity (FVC)
- Forced Expiratory Volume in 1 second (FEV1)
- FEV1/FVC %
- Peak Expiratory Flow Rate (PEFR)
- Maximum Voluntary Ventilation (MVV).

RESULTS

Total number of subjects enrolled in study was 706, out of which 353 were pregnant women and 353 were age matched non-pregnant women Table 1.

Table 1: Distribution of subjects and controls.

Sr. No.	Group	No.	%
1	Pregnant women	353	50
2	Non-Pregnant women	353	50
Total		706	

Age criteria of inclusion was 21 years to 40 years, Table 2 shows Mean age of both groups are almost similar with only difference of some fraction. Mean weight of non-pregnant women were greater than 2nd trimester pregnant women, reason being different individuals acting as control Table 3.

Table 2: Distribution of subjects and controls as per their mean age.

Sr. No.	Group	Mean Age ±SD (years)
1	Pregnant women	23.83±2.540
2	Non-Pregnant women	23.67±3.021

Table 3: Distribution of subjects and controls as per their Mean Weight.

Sr. No.	Group	Mean weight ±SD (Kg)
1	Pregnant women	51.15±6.274
2	Non-Pregnant women	53.04±8.123

Mean height of pregnant women was less than mean height of non-pregnant women with SD of 4.913 in pregnant women and 4.697 in non-pregnant women Table 4.

Table 4: Distribution of subjects and controls as per mean height.

Sr. No.	Group	Mean height ±SD (cm)
1	Pregnant women	152.03±4.913
2	Non-Pregnant women	155.90±4.697

All the parameters of pulmonary functions which we assessed in this study, FVC, FEV1, FEV1/FVC, PEFR and MVV were found less in 2nd trimester pregnant women as compared to non-pregnant women. Difference of all above parameters were statistically significant (P<0.05) except the difference of MVV, which was statistically insignificant Table 5.

Table 5: Distribution of subjects and controls as per mean of variables.

Variables	Pregnant women (Mean±SD)	Non-Pregnant (Mean±SD)	[P Value	t value
FVC (L)	3.055±0.171	3.108 ±0.231	<0.01	-3.45
FEV1 (L)	2.504±0.158	2.543±0.246	<0.01	-2.52
FEV1/FVC	0.816±0.028	0.827±0.034	<0.01	-4.9
PEFR (L/sec)	5.712±0.307	5.908±0.282	<0.01	-8.84
MVV(L/min)	100.698±5.865	101.318±5.712	0.15	-1.42

Data in Mean ±SD, P<0.05: Significant; P<0.01: Highly Significant.

DISCUSSION

This study was a case control study, total number of subjects enrolled in study were 706 from 21 to 40 years of Age, out of which 353 were pregnant women taken as test subjects and 353 were age matched non-pregnant controls. Statistically significant difference in weight and Height of control and test group was present, reason being different individuals acting as controls who were probably having better socio-economical condition, the difference of their means is also significant (P<0.05).

Highly significant (P<0.05) difference in FVC was found in 2nd trimester pregnant women as compared to non-pregnant women, Santhakumari et al, showed statistically insignificant difference in FVC during 2nd trimester pregnancy as compared to non-pregnant women, Deolalikar S found statistically significant difference in FVC in 2nd trimester as compared to non-pregnant women.^{4,5}

Because of changing hormonal milieu, reduced alveolar PCO₂ (which has a broncho-constrictor effect) and reduced oxygen carrying capacity of blood in pregnancy, it is expected to have less FEV1 in pregnant women as compared to non-pregnant women and further decrease with increasing gestation. In our study also, we have found significant less FEV1 in pregnant women as compared to non-pregnant women, whereas many studies like Mohapatra S et al, Uthamarajan CS and Deolalikar S reported only insignificant reduction in FEV1 during pregnancy.^{6,7,5} In this study, authors have found significant less ratio of FEV1/FVC in pregnancy, Mohapatra S et al and C S Uthamarajan found that change in the FEV1/FVC ratio was insignificant, in Priyadarshini G et al study significant increase in ratio of FEV1/FVC reported and in Neeraj et al, study FEV1/FVC ratio were found to decline.⁶⁻⁹

PEFR, a highly dependent parameter on voluntary effort of subject is expected to decrease in pregnant women with increasing gestation due to lesser force of contraction of main expiratory muscles (anterior abdominal and internal intercostal), mechanical effect of enlarging gravid uterus on diaphragm, changing hormonal milieu, inadequate nutrition due to morning sickness and altered eating habits and reduced oxygen carrying capacity of blood with increasing gestation. Mohapatra S et al, found that PEFR decreases with

increasing gestation, C S Uthamarajan and Priyadarshini G et al, reported a highly significant decrease in PEFR during pregnancy as compared to non-pregnant women, In our study also PEFR is found to be less significantly (P<0.05) in pregnant women as compared to non-pregnant women.⁶⁻⁸

Uthamarajan CS found a highly significant change in MVV and Priyadarshini G et al reported a progressive reduction in MVV during 1st to 3rd trimester of pregnancy. In our study, non-significant difference (P>0.05) in mean of MVV in 2nd trimester pregnant women as compared to non-pregnant women was found.^{7,8}

ACKNOWLEDGEMENTS

Participation of subjects and role of every individuals in whatsoever way in this study is acknowledged.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee of Uttar-Pradesh University of Medical Sciences, Saifai was obtained

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Cite this article as: Khan H, Jaiswal K, Sant SK, Kumar S. Comparison of pulmonary function of women in 2nd trimester and non-pregnant women, in central Uttar-Pradesh, India. *Int J Res Med Sci* 2019;7:3066-9.