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# SERIAL CHANGES IN PULMONARY HEMODYNAMIC DURING PREGNANCY: A NON INVASIVE STUDY USING DOPPLER ECHOCARDIOGRAPHY (RESEARCH ARTICLE)

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*Doppler Echo, pulmonary hemodynamic, pregnancy.*

## *Abstract*

**Aim:** To assess pulmonary hemodynamic changes through colour Doppl Echocardiography along with clinical profile amongst pregnant women during tl course of pregnancy.

**Materials and Methods:** Pulmonary hemodynamic parameters were longitudinal assessed in 75 women (60 pregnant and 15 non-pregnant women) attending Departme of Medicine and Department of obstetrics and Gynecology of LLRM Medical Colleg Meerut from I trimester to III trimester of Pregnancy and 6 weeks after delivery. Mea Pulmonary artery pressure was calculated from pulsed Doppler pulmonary velocitie Pulmonary flow was measured by Doppler and cross sectional echocardiography. Thes two measurements were used to calculate pulmonary vascular resistance.

**Results:** Echocardiographically, Pulmonary artery pressures revealed a moderate risir trend with advancement of pregnancy, but it was not found to reach statistic significance. Longitudinal estimation of pulmonary vascular resistance revealed fall 15% in first trimester and up to 17.5% in second trimester, with a trend of returning baseline values by the end of 6 weeks of Puerperium.

**Conclusion:** There was significant increase in mean pulmonary blood flow, significant decrease in pulmonary vascular resistance, no statistical increase in pulmonary artery pressure with advancement of pregnancy.

## Introduction

Pregnancy poses increasing metabolic demands on the mother requiring elaborate physiological adjustments in respiration and circulation. The pulmonary circulation is a low-pressure, low-resistance, high capacitance circuit that can accommodate large increases in blood flow without significant increases in pressure. Pregnancy, stress of labour followed by substantial and rapid post-partum fluid shifts further heightens cardiovascular demand.

## Aims and Objective

The present study was undertaken to assess the effect of pregnancy on pulmonary hemodynamics especially on pulmonary arterial pressures in all three trimesters including Puerperium. The clinical symptomatology and effect of elevated pulmonary arterial pressures was assessed in pregnant women and also on outcome of pregnancy.

## Materials and Methods

The present study was conducted in Medical College, Department of obstetrics and Gynecology and Medicine. 60 pregnant women from 1st trimester to 3rd trimester and 6 weeks of puerperium were included. The pregnant women were divided according to number of pregnancies (Primigravida, multigravida, elderly multigravida). Further

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subdivision was according to single or multiple gestations (single fetus, term pregnancy or multiple pregnancy)pregnant women with H/o smoking, rheumatic heart disease were excluded 15 non pregnant women of similar age group and corresponding weight and height were included as control group. All the subjects were interrogated about their complaints like excssive cough, exertional dysnea, palpitations, orthopnea, syncope, exertional chest pain, lower extremity oedema along with their duration. A complete physical examination with special emphasis pertaining to cardiovascular system was performed. All antenatal investigations, in addition renal and liver function tests were carried out.

A standard 12 lead ECG was done in all subjects serially in all 3 trimesters and puerperium 2D, M-mode and pulsed Doppler echocardiography was performed in all subjects serially in all three trimesters and puerperium for assessment of pulmonary hemodynamics specially to calculate pulmonary velocities and mean pulmonary artery pressure. Pulmonary flow was measured by Doppler and cross sectional ECHO. These two measurements were used to determine pulmonary vascular resistance.

## OBSERVATION:-

***Table: I showing distribution of pregnant women according to parity.***

| S. No. | Group | Total | Number of Primigravida women | Number of Bigravida women | Number of Multigravida women |
|---|---|---|---|---|---|
| 1. | A (18-25 yrs) | 30 | 17 (28.33%) | 6 (10%) | 7 (11.66%) |
| 2. | B (26-32 yrs) | 16 | 4 (6.66%) | 9 (15%) | 3 (5%) |
| 3. | C (33-40 yrs) | 14 | 1 (1.66%) | 11 (18.33%) | 2 (3.33%) |
| **Total** | | **60** | **22 (36.66%)** | **26 (43.33%)** | **12 (20%)** |

Table 1 shows that bigravid women outnumbered primigravid and multigravid women.

***Table: II Clinical symptomatology of studied subjects.***

| S. No. | Group | Total | Exertional Dyspnoea | Palpitation | Syncope | Chest Pain | Lower extremity oedema | Asymptomatic |
|---|---|---|---|---|---|---|---|---|
| 1. | Study Group | 60 | 21 (35%) | 24 (40%) | 0 | 4 (6.66%) | 28 (46.66%) | 22 (36.66%) |
| | A (18-25 yrs) | 30 | 14 (23.33%) | 5 (28.33%) | 0 | 2 (3.33%) | 12 (20%) | 4 (6.66%) |
| | B (26-32 yrs) | 16 | 5 (8.33%) | 5 (8.33%) | 0 | 1 (1.66%) | 10(16.66%) | 10 (16.66%) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | C (32-40 yrs) | 14 | 2 (3.33%) | 2 (3.33%) | 0 | 1 (1.66%) | 6 (10%) | 8 (13.33%) |
| 2. | Control Group | 15 | 1 (6.66%) | 2 (13.33%) | 0 | 1(6.66%) | 0 | 11 (73.33%) |

Table-II shows clinical symptomatology of studied subjects, where the commonest symptoms were palpitations (40%) exertional dyspnoea (35%) and lower extremity oedema (46.6%). Palpitations and dyspnoea were also present in control group (13.33% and 6.6% of controls respectively).

***Table: III shows the echocardiographic assessment during 1st, 2nd, 3rd trimesters and puerperium.***

| Group | Pulmonary Hemodynamics | First Trimester | | Second Trimester | | Third Trimester | | Puerperium |
|---|---|---|---|---|---|---|---|---|
| | | SG | CG | SG | CG | SG | CG | SG |
| A | PAP | 18.4 | 17.7 | 19.2 | 16.1 | 19.3 | 20.5 | 17.9 |
| | PBF | 5.18 | 5.20 | 6.73 | 5.22 | 7.54 | 5.30 | 5.27 |
| | $PVR_{ECHO}$ | 1.24 | 1.22 | 1.04 | 1.20 | 1.03 | 1.27 | 1.20 |
| B | PAP | 20.1 | 19.8 | 20.2 | 19.4 | 20.2 | 22.4 | 20.9 |
| | PBF | 5.19 | 5.11 | 6.68 | 5.23 | 7.58 | 5.10 | 5.30 |
| | $PVR_{ECHO}$ | 1.26 | 1.30 | 1.09 | 1.28 | 1.04 | 1.28 | 1.18 |
| C | PAP | 20.0 | 19.3 | 20.0 | 23.4 | 20.1 | 22.0 | 20.8 |
| | PBF | 5.18 | 4.98 | 6.65 | 5.19 | 7.53 | 5.40 | 5.41 |
| | $PVR_{ECHO}$ | 1.27 | 1.26 | 1.08 | 1.30 | 1.07 | 1.32 | 1.20 |

SG- Study Group PAP- Pulmonary artery systolic pressure PBF- Pulmonary blood flow

CG- Control Group PVR- Pulmonary Vascular Resistance.

Table –III shows that within the study group, though a trend of increasing pulmonary artery pressures was seen during pregnancy in all groups, it was not found to reach statistical significance. The estimated pulmonary blood flow increased by 28% - 30% in second trimester and upto 44% - 46% in third trimester. This rise in blood flow was ameliorated by the end of puerperium.

## Result

The present study was aimed to understand the effect of normal pregnancy on maternal pulmonary hemodynamics in healthy Indian women as there is paucity of such studies in available literature.

The large majority of cases complained pedal odema along with palpitation in all groups of studied patients. Accentuated second heart second ($P_2$) and sinus tachycardia were amongst the commonest signs. Electrocardiographic observations were normal in majority of the cases excepting sinus tachycardia in 40%, Right axis deviation in 12.3% and RBBB in 1.6% cases. In hematogram, there was fall in hemoglobin along with PCV level especially in 1st and 2nd trimesters. Urinary examination revealed mild albuminuria (1+) in 30% cases. The liver function tests were within normal limits in majority of the cases.

Echocardiographically, pulmonary artery pressures revealed a moderate rising trend with advancement of pregnancy, but it was not found to reach statistical significance. The estimated pulmonary blood flow increased by 30% in second trimester and upto 46% in third trimester, attributable to hemodilution of pregnancy, sinus tachycardia and higher capacitance of pulmonary circulation during pregnancy. This rise in blood flow was largely ameliorated by the end of 6 weeks of puerperium. Longitudinal estimation of pulmonary vascular resistance revealed fall of 15% in first trimester and upto 17.5% in second trimester. This change also followed a trend of returning to baseline values by the end of 6 weeks of puerperium. Though the pulmonary blood flow increased significantly with advancing pregnancy the mean pulmonary artery pressures remain unchanged, due to substantial fall in pulmonary vascular resistance easily in gestation. The control group did not show any significant changes in pulmonary hemodynamic parameters throughout the study.

## Discussion and Conclusion

- The following conclusions were drawn from the present study-
- Majority of pregnant women were asymptomatic. Exertional dyspnoea and palpitations were commonest symptoms whereas sinus tachycardia and accentuated second heart second were amongst commonest signs.
- There was significant increase in mean pulmonary blood flow, significant decrease in pulmonary vascular resistance with advancement of pregnancy in all cases irrespective of their age and number of gestation.
- No statistical significant increase in pulmonary artery pressures with advancement of pregnancy was observed in present study.
- The outcome of pregnancies of cases was favorable and normal irrespective of degree in increment in pulmonary flow.

## Declarations

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