

Study of Placental Laterality as a Predictor for Development of Pre-Eclampsia at a Tertiary Care Centre

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Abstract

Introduction: Hypertensive disorders of pregnancy is the commonest medical complication. Pre-eclampsia in India is reported to be 8-10%. Out of which hypertension in pregnancy was 7.8% with pre-eclampsia in 5.4%. India has the highest number of preterm births in the World. Hypertension in pregnancy (gestational hypertension – 4.8%, eclampsia – 4.8%, chronic hypertension – 5%, & pre-eclampsia – 36%) are the major risk factors of the preterm births in India. Aims and Objectives: To evaluate placental location (by ultrasound at 18-24 weeks) & its correlation in predicting development of pre-eclampsia. **Methodology:** This prospective study on 108 low risk antenatal women with ultrasonography with documented placental location. After determining the placental location (ultrasound scanning at 18 – 20 weeks) were classified into two groups. Women having central placenta in the central region were assigned to group A & women having lateral placenta to group B. All women were observed regularly during pregnancy up to delivery. Development of signs and symptoms of pre-eclampsia were looked for. Results in 2 groups were compared for statistical significance. **Results:** Laterally placed placenta showed higher Systolic BP and Diastolic BP as compared to centrally placed placenta at every GA. But 36-37 Gestational Age only provide statistically significant results. **Conclusion:** In the present study, 61.1% women who eventually developed pre-eclampsia had a lateral placenta while 37% women had a centrally placenta. Laterally placed placenta showed higher Systolic BP and Diastolic BP as compared to centrally placed placenta which provide statistically significant results.

Keywords: DBP- Diastolic Blood Pressure, PE – Pre-Eclampsia, SBP – Systolic Blood Pressure

1. Introduction

Hypertensive disorders are the commonest medical disorder of pregnancy. The incidence of pre-eclampsia in India is reported to be 8-10% of which hypertension in pregnancy was 7.8% with preeclampsia in 5.4%¹. It is one of

the prime causes of maternal and perinatal morbidity and mortality worldwide complicating 2%-8% of pregnancies². Hypertensive disorders are a major contributor to direct cause of maternal and perinatal morbidity namely 15-20% of maternal and 20-25% of perinatal mortality³. Also ISSHP has indicated that incidence of the Hypertensive

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disorders Pregnancy continues to increase⁴. India's third National Family Health Survey (NFHS-3, 2005-06), which was based on patient-reported symptoms of pre-eclampsia and eclampsia by women who had a live birth in the previous five years, it was found pre-eclampsia and eclampsia in India might have a higher incidence than previously thought (~28% and 7.4-11.3% respectively) and higher than that worldwide⁵. The number of preterm births in India are among the highest in the World; Hypertension in pregnancy (gestational hypertension – 4.8%, eclampsia – 4.8%, chronic hypertension – 5%, & pre-eclampsia – 36%,) are the major risk factors of the preterm births in India⁶.

Decreased chorio-decidual blood flow due to inadequate trophoblastic invasion results in inadequate perfusion in the placental bed which results into the imbalance of antioxidants and oxidants⁷. Pre-eclampsia leads to preterm birth and growth restriction in the fetus. Mothers with it have increases risk of renal failure, stroke and cardiovascular disease⁸.

Preeclampsia is more likely to occur in women with previous history for pre-eclampsia, twin pregnancy, antiphospholipids antibodies, autoimmune disease, pregestational diabetes, chronic hypertension, thrombophilia, raised body mass index⁹ and pre-existing renal. Early diagnosis and risk reduction is the key to reducing the disease burden.

For identification of women at risk of pre-eclampsia several tests have been advocated. Among these, placental mapping by ultrasonographic scan at 18-24 weeks has been shown to be non-invasive, with good positive predictive value and cost-effective¹⁰.

Bilateral uterine arteries have about the same resistance index in women with centrally located placenta. The uterine artery near the placenta has lower resistance index than the opposite uterine artery when placenta is laterally located. The flow in the utero-placental circulation is predominantly one of the uterine arteries with some contribution from the contra-lateral uterine artery in laterally located placenta¹¹.

In all women the contra-lateral uterine artery contribution may not be same and reduced contribution may be the cause pre-eclampsia, IUGR or both¹². Pre-eclampsia occurs only in the presence of placental tissue. Placental mapping and uterine artery resistance index have a significant association with adverse outcomes

such as pre-eclampsia and IUGR. Among various tests for prediction of pre-eclampsia, the placental location mapping by ultrasonography at 18-24 weeks is very non-invasive, with good positive predictive value and cost-effective¹³.

2. Aims and Objectives

To evaluate placental location mapping by ultrasonography at 18 to 24 weeks of gestation and to study its correlation in predicting the development of pre-eclampsia.

3. Materials and Methods

3.1 Study Design

Observational prospective study

3.2 Study Period

from August 2018 to December 2020

3.3 Study Setting

Department of Obstetrics and Gynaecology in tertiary care centre.

3.4 Sample size

Minimum-108 of which

Group 1-Consisting of 54 subjects with central placenta

Group 2-Consisting of 54 subjects with lateral placenta

3.5 Eligibility Criteria

Inclusion criteria

All pregnant (primigravida) women coming to the antenatal clinic, both outpatient and inpatients, at 18 to 24 weeks of gestation without any factors indicating high risk were included in this study.

Exclusion Criteria

- multiple pregnancy
- uterine anomalies
- Co-morbid conditions such as, essential hypertension or chronic hypertension gestational diabetes mellitus & diabetes mellitus, thyroid disorders, h/o renal disease, severe anaemia, h/o connective tissue disorders, RH incompatibility
- positive VDRL test.

3.6 Methodology

This prospective study was carried out on 108 low risk antenatal women with ultrasonography with documented placental location. All the cases were included in the study after a written informed consent and complete history, general physical and systemic as well as obstetric examination when they had their antenatal check-up and at the time of admission.

After determining the location of placenta (by ultrasound scan at 18 – 20 weeks) were classified into two groups. Women having central location of placenta were assigned to group A & women having lateral placenta to group B.

3.7 Operational Definitions

Central placenta- the ones that were lesser than 75% on one side of midline (whether they were anterior, posterior or fundal was disregarded) formed group A

Lateral placenta- the ones that were greater than 75% on one side of midline (whether they were anterior, posterior or fundal was disregarded) formed group B.

An additional of 6 women in each group were included in the study to cover up the loss during follow up. All women were observed regularly during pregnancy up to delivery. Onset of signs and symptoms of pre-

eclampsia were looked for. Pre-eclampsia was diagnosed in accordance with American Congress of Obstetricians and Gynaecology criteria for pre-eclampsia. Women who did develop pre-eclampsia were enhanced usual care at our institute.

Results in 2 groups were compared for statistical significance. Mode of delivery and fetal outcome was noted

3.8 Statistical Analysis

The data was coded and entered into Microsoft Excel spreadsheet. Analysis was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Descriptive statistics included computation of percentages, means and standard deviations. The unpaired t test (for quantitative data to compare two independent two groups) was used for quantitative data comparison of all clinical indicators. Chi-square test was used for qualitative data whenever two or more than two groups were used to compare. Level of significance was set at $P \leq 0.05$.

4. Results

The mean systolic blood pressure and diastolic blood pressure were within the normal range (Table 1).

Table 1. Blood pressure records of the study participants

	Minimum	Maximum	Mean	Std. Deviation
GA 26-28 weeks				
SBP (mmHg)	102	160	120.70	11.660
DBP (mmHg)	60	116	78.46	9.978
GA 29-31 weeks				
SBP (mmHg)	102	170	123.30	13.653
DBP (mmHg)	60	114	80.50	9.668
GA 32-34 weeks				
SBP (mmHg)	102	164	125.94	15.582
DBP (mmHg)	62	114	82.78	11.658
GA 35-37 weeks				
SBP (mmHg)	102	170	130.56	19.286
DBP (mmHg)	60	120	85.98	14.498

(GA- Gestational Age)

Table 2. Distribution of study participants according to placental location

	Frequency	Percentage
Central	54	50.0
Lateral	54	50.0
Total	108	100.0

Table 3. Pre-eclampsia wise distribution of the study

	Frequency	Percent
No	55	50.9
Yes	53	49.1
Total	108	100.0

Table 4. BP records at GA 26-28 weeks - Pre-eclampsia Versus No Pre- eclampsia

	Pre-eclampsia	Mean	Std. Deviation	P value
SBP (mmHg)	Yes	127.02	12.383	0.001 (S)
	No	114.62	6.699	
DBP (mmHg)	Yes	82.91	11.112	0.001 (S)
	No	74.18	6.351	

Table 5. BP records at GA 29-31 weeks - Pre-eclampsia Versus No Pre- eclampsia

	Pre-eclampsia	Mean	Std. Deviation	P value
SBP (mmHg)	Yes	131.96	13.787	0.001 (S)
	No	114.95	6.450	
DBP (mmHg)	Yes	85.96	9.628	0.001 (S)
	No	75.24	6.200	

Table 6. BP records at GA 32-34 weeks - Pre-eclampsia Versus No Pre- eclampsia

	Pre-eclampsia	Mean	Std. Deviation	P value
SBP (mmHg)	Yes	138.30	12.486	0.001 (S)
	No	114.04	6.055	
DBP (mmHg)	Yes	91.13	9.564	0.001 (S)
	No	74.73	6.835	

Table 7. BP records at GA 35-37 weeks - Pre-eclampsia Versus No Pre- eclampsia

	Pre-eclampsia	Mean	Std. Deviation	P value
SBP (mmHg)	Yes	147.32	12.643	0.001 (S)
	No	114.40	6.434	
DBP (mmHg)	Yes	97.70	10.425	0.001 (S)
	No	74.69	6.877	

Table 8. Placenta and Pre-eclampsia wise distribution of the study

No			Pre-eclampsia		Total
Yes					
Placenta	Central	N	34	20	54
		%	63.0%	37.0%	100.0%
	Lateral	N	21	33	54
		%	38.9%	61.1%	100.0%
Total		N	55	53	108
		%	50.9%	49.1%	100.0%

P value=0.01 (S)

Both groups had equal number of participants (Table 2)

Laterally placed placenta showed higher SBP and DBP as compared to centrally placed placenta at every GA. But 36-37 GA only provide statistically significant results.

Table 9. Placental location and GA wise distribution of the study

	Placenta	Mean	Std. Deviation	P value
GA 26-28				
SBP (mmHg)	Central	119.04	11.345	0.13
	Lateral	122.37	11.836	
DBP (mmHg)	Central	77.56	10.084	0.34
	Lateral	79.37	9.881	
GA 29-31				
SBP (mmHg)	Central	121.33	13.559	0.13
	Lateral	125.26	13.589	
DBP (mmHg)	Central	79.30	9.350	0.19
	Lateral	81.70	9.916	
GA 32-35				
SBP (mmHg)	Central	123.19	14.858	0.06
	Lateral	128.70	15.935	
DBP (mmHg)	Central	80.26	10.844	0.02 (S)
	Lateral	85.30	11.995	
GA 35-37				
SBP (mmHg)	Central	126.63	18.729	0.03 (S)
	Lateral	134.48	19.203	
DBP (mmHg)	Central	82.74	14.303	0.02 (S)
	Lateral	89.22	14.086	

6. Discussion

In our study, women with laterally situated placenta who subsequently had pre-eclampsia were 61.1% compared to women who had centrally located placenta 37% (Table 8). Kore SJ (2016)¹⁴ *et al.*, found that 59.38% women with laterally located placenta developed pre-eclampsia compared to 40.62% women with centrally located placenta. Jani PS (2015)¹⁵ *et al.*, found that out of the 80 women 28(35%) with laterally located placenta developed pre-eclampsia.

Yousuf S (2016)¹⁶ *et al.* found that out of a total of 201 subjects, 71 (24.5 %) with laterally located placentas and

130 (75.5 %) patients with centrally located placentas. Out of 71 subjects with laterally located placenta, 37 (52 %) developed pre-eclampsia, and out of 130 subjects with centrally located placentas, just 14 (10.8 %) developed pre-eclampsia. The difference was statistically significant ($p=0.001$).

Muralidhar PV and Pillai J (2005)¹⁷ found that out of 426 women, 324 central and 102 lateral placentas were identified. 71 women developed pre-eclampsia of which 52 (74%) had lateral placenta. The relationship was statistically significant $p < 0.0001$. Priyadarshini A (2019) *et al.* was noticed that out of 48 patients who developed pre-eclampsia 33 (68.75%) had lateral placenta and 15

(31%) had centrally placenta. According to Vaillant P, 52(73.2 %) had lateral placenta and 19(26.76%) had central placenta¹⁸.

The results of our study were also compares to Kalanithi LE (2007)¹⁹ *et al.* the results of which showed PIH and IUGR was nearly fourfold more in lateral placenta (Table 8).

In a study conducted in Manipur, 17.1% of laterally located placenta developed pre-eclampsia while only 6.1% of centrally located developed pre-eclampsia²⁰.

Out of 59 women with lateral placenta, 29(49.2%) developed pre-eclampsia while in women central placenta only 19 (7.88%) developed pre-eclampsia. So, 29/48 (60.4%) women developing pre-eclampsia had a laterally situated placenta while 19/48 (39.6%) had a centrally situated placenta ($p < 0.001$)²¹.

Ahuja P and Saxena U (2020) found that women developing pre-eclampsia had laterally situated placenta in 60.4% which was statistically significant. The sensitivity and specificity of placental laterality in predicting PE was higher in women in younger age group and primigravida. This observation was similar to a study where PE developed in 80.7% women with laterally located placenta and primigravidas had a significantly higher probability of developing PE compared to multigravida²².

In the present study, we have found significant results with gestational age and pre-eclampsia (Table 4, 5, 6, 7 & 9). The study did not support Gupta A (2020) *et al.* and Salamo (2018)²³ *et al.*

In the study, laterally placed placenta showed higher SBP and DBP as compared to centrally placed placenta which provide statistically significant results (Table 4, 5, 6 & 7). Gupta A (2020)²⁴ *et al.* observed pre-eclampsia in 65.5% women with laterally located placenta and 24.1% women with centrally located placenta developed (p value < 0.001).

Kakkar T (2012)²⁵ *et al.*, who concluded that 66.6% women with lateral placenta and 36.3% with central placenta developed pre-eclampsia. Similar results were depicted from study concluded by Ambastha (2018)²⁶ *et al.*

7. Conclusion

It is concluded that ultrasound demonstrated laterally located placenta were associated with increased risk

of development of pre-eclampsia. Placental location on ultrasonography is a simple, non-invasive, cost-effective predictive screening test for the prediction of pre-eclampsia. We recommend that if lateral placenta is detected on ultrasound, one should be vigilant and provide enhanced care to achieve a more optimal outcome to prevent some of the life-threatening complications hence decreasing the maternal and perinatal morbidity and mortality.

The authors feel more multicentric randomised trials are necessary to confirm the association.

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