

Placental Laterality by Ultrasound and Its Correlation to Development of Pre-Eclampsia

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Abstract: We studied 100 pregnant women with lateral lying placenta and 100 pregnant women with centrally located placenta to assess the correlation of placental location and development of pre-eclampsia. The study was carried out in Obstetrics and Gynaecology department, Gauhati Medical College and Hospital from 1st June, 2016 to 31st May, 2017. Placental location was determined by real-time ultrasonography and the patients were followed up till term to determine the correlation between pre-eclampsia. We found that out of the 100 women with laterally located placenta, 66 (66 %) developed Pre-eclampsia, while 36 women (36%) out of the remaining 100 women with centrally located placenta developed Pre-eclampsia. So, the risk of developing Pre-eclampsia was five times greater in the females with laterally located placenta as compared to those with centrally located placenta (p 0.01). We conclude that the presence of lateral lying placenta predisposes women to develop pre-eclampsia more frequently and location of placenta can be used as an indicator for future development of pre-eclampsia.

Keywords: Placenta, preeclampsia, placental laterality, central placenta

INTRODUCTION

Hypertensive disorders in pregnancy are amongst the commonest medical disorders in pregnancy and are a major cause of maternal and perinatal morbidity and mortality worldwide. Pre-eclampsia is a multisystem disorder of pregnancy which is characterized by new onset hypertension (systolic and diastolic blood pressure of more than or equal to 140 and 90 mm Hg, respectively, on two occasions, at least 6 hours apart) and proteinuria (protein excretion of more than or equal to 300 mg in a 24-hour urine collection, or a dipstick of more than or equal to 2+), that develops after 20 weeks of gestation in previously normotensive women[1].

Presence of placenta is essential for development of pre-eclampsia[2]. Several tests have been proposed to identify pre-eclampsia based on the pathophysiologic changes that occur in pre-eclampsia. A few examples of these tests include cold pressor test, isometric hand grip test and the roll over test. Biochemical alterations like serum calcium can also be used as a predictor for pre-eclampsia. A review of the literature indicates considerable disagreement regarding the sensitivity and predictive values of the various tests mentioned. The reported differences in the predictive values of these tests may be attributed to one or more of the following: populations studied, definition and prevalence of the disorder, techniques and methodology used in performing these tests etc. Placental location by ultrasound during 18 to 24 weeks of gestation can be used as a cost effective and non-invasive method for prediction of development of pre-eclampsia. Placental location has been found to correlate with fetal position

and presentation[3,4], length of gestation[5], course of labour[6], presence of preeclampsia[7,8] and pregnancy outcome[9]. Among the various predictors for preeclampsia, the placental location by ultrasound at 18 to 24 weeks is very cost effective, noninvasive, and has a good positive predictive value[1]. There is a significant association between placental location and uterine artery resistance and adverse outcomes such as preeclampsia and IUGR[10].

In the India, screening ultrasounds of a large proportion of pregnant women are undertaken and they generally receive at least one obstetric ultrasound for gestational age, amniotic fluid volume, fetal anatomic survey and placental location. With the exception of the identification of a low-lying or a placenta previa, the other implantation sites are noted and then no further attention is paid to those sites. This study aims to find

the relevance of location of placenta and its correlation to development of pre-eclampsia.

MATERIAL AND METHODS

The present study was a prospective observational study. The study was carried out in Obstetrics and Gynaecology Department, Gauhati Medical College and Hospital from 1st June 2016 till 31st May 2017. Total number of cases were 200, which were divided into two groups on the basis of the method of location of placenta as determined by USG during 18 – 24 weeks gestation, Group A and Group B. Group A consists of cases whose placenta was centrally located as detected by USG. It included 100 cases. While Group B consists of cases whose placenta lies laterally as detected by USG. It also included 100 cases.

INCLUSION CRITERIA

All pregnant women at 18 to 24 weeks of gestation without any high risk factors (Included in exclusion criteria), attending Antenatal OPD, Gauhati Medical College and Hospital and admitted in Antenatal ward, Gauhati Medical College and Hospital were included in the study.

Exclusion Criteria

Pregnant women were excluded from the study if they had any of the following - Chronic hypertension/Essential hypertension, Diabetes Mellitus, thyrotoxicosis, renal disease, severe anaemia, connective tissue disorder, positive lupus anticoagulant, Positive anti-cardiolipin antibodies, Rh incompatibility, twin pregnancy, uterine anomalies, previous history of pre-eclampsia/eclampsia, previous caesarian section, history of smoking or unwilling to follow up.

All the patients included in the study were subjected to a thorough clinical examination comprising of history taking, general and systemic examination and ultrasonography. The location of placenta was determined by ultrasound at 18 to 24 weeks in all the selected women and followed subsequently for the

development of preeclampsia. The placenta is classified as central when it is equally distributed between the right and left side of the uterus irrespective of anterior, posterior or fundal position. When more than 75% of placental mass is to one side of the midline, it is classified as unilateral right or left placenta.

Preeclampsia was diagnosed on the basis of the American Congress of Obstetricians and Gynecologists criteria for preeclampsia. The patients were treated according to the severity of the disease.

RESULTS

The maternal age was divided into five groups which were ≤20, 21-25, 26-30, 31-35 and >35 years. Among 200 total cases, majority of women were between 21 - 25 years. This could be probably due to early age at marriage and child bearing in most of the Indian women. There were cases with age >35 years. Mean age of the patients in the study group was 23.63± 4.123 S.D. years, ranging from 18 years to 36 years. The mean age (in Years) of Group A was 23.08 ± 4.06 S.D. and in Group B was 24.14 ± 4.18 S.D. which has a *p* value of 0.2053 considered not significant. Amongst 200 cases, 67.5% were Hindu by religion and rest was Islamic. Although majority was Hindu by religion, the distribution of cases in both the groups according to religion came out to be non-significant with a *p* value of 0.221. 77 percent women belonged to rural population, while rest belonged to urban community. The distribution among both the groups is shown in the table. The distribution between the two groups was insignificant (*p*=0.234).

Out of the 100 women with laterally located placenta, 66 (66 %) developed Pre-eclampsia, while 36 women (36%) out of the remaining 100 women with centrally located placenta developed Pre-eclampsia. So, the risk of developing Pre-eclampsia was five times greater in the females with laterally located placenta as compared to those with centrally located placenta.

Table-1: Showing Association of Placental Location with Pre-Eclampsia

Placental Location	Normotensive		Pre eclampsia		Total
	Number	Percentage	Number	Percentage	
Central	66	66	34	34	100
Lateral	36	36	64	64	100

The overall risk of developing PIH with laterally located placenta was 3.451 (Odds Ratio) and 95% Confidence Interval (1.52 to 7.85). The difference

was found to be statistically significant, *p* value (0.01) by chi-square test.

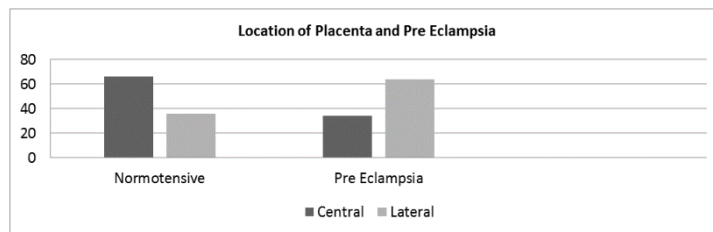


Fig-1: Showing distribution of cases according to their placental location and development of Pre-Eclampsia

Out of the total 200 cases, 50 developed mild Pre-eclampsia. Out of these 50 cases, 24 had centrally located placenta and 26 had laterally located placenta. 52 women developed severe Preeclampsia and out of

these 12 had centrally located placenta and 40 had laterally located placenta. No case of eclampsia was reported.

Table-2: Showing association of Placental Location with severity of Pre-Eclampsia

Severity	Central		Lateral		Total
	Number	Percentage	Number	Percentage	
Mild	24	23	26	52	50
Severe	12	48	40	76.9	52

Majority of the cases of severe preeclampsia were 40% who were having proteinuria (>1+) had lateral location of placenta. There seems to be a good relationship between urinary albumin level with placental location. Higher level of urinary albumin indication more lateral placental location where as low levels of urinary albumin associated with central placental location.

DISCUSSION

Preeclampsia is a complex clinical syndrome involving multiple organ systems and still remains the principal cause of maternal and perinatal mortality and morbidity[11]. It has been shown that in humans, both uterine arteries have a significant number of branches and each supply the corresponding side of the uterus. Although anastomoses between the two uterine arteries exist, there is no proof that these are functional. When the placenta is laterally located, the uterine artery close to the placenta has lower resistance than the one opposite from it. In patients with centrally located placenta, both uterine arteries demonstrate similar resistance[9,11,12].

When the placenta is laterally located, in the majority of the patients, the utero-placental blood flow needs are to be met primarily by one of the uterine arteries, with some contribution by the other uterine arteries, with some contribution by the other uterine artery via collateral circulation. This degree of collateral circulation, however, may not be the same in all patients and deficient contribution may facilitate the development of preeclampsia, IUGR or both[13].

The age group, parity and gestational age were comparable in both the groups in the present study. The majority of patients in the study group were young with

the mean age of 23.63 ± 4.123 years, ranging from 18-36 years. Forty-eight percent patients belonged to age group 21-25 years. While Bhalerao AV *et al.* had comparable mean ages of 24 ± 6.1 years and 23 ± 6.3 years in both the groups[14]. Similarly in a review by Kakkar *et al.* the mean age was more than between 20 - 25 years. Sixty-four percent women were Hindu by religion and rest belonged to Islamic religion in the study sample. However, the distribution was comparable in both the groups.

In the present study, out of 200 women, 100 females had laterally located placenta and 100 had centrally located placenta. Out of the 100 women with laterally located placenta, 66 (66 %) developed Pre-eclampsia as compared to 100 females with centrally located placenta where 36 (36 %) developed Pre-eclampsia. So, the risk of developing Pre-eclampsia was five times greater for the females with laterally located placenta as compared to those with centrally located placenta. The overall risk of developing Pre-eclampsia with laterally located placenta was 3.451 (Odds Ratio) and 95% Confidence Interval (1.52 to 7.85). The difference was found to be statistically significant, p value (0.01) by chi-square test. This result is in accordance with Kofinas *et al.*[15]. Who concluded that in women with unilateral placenta, the incidence of pre-eclampsia was 2.8-fold greater than those with centrally located placenta. The results of the present study were also comparable to those of Muralidhar *et al.*[16]. In his study, a total of 426 unselected singleton pregnant women were included. Out of 426 women, 324 had centrally located placenta and 102 had unilateral placenta. A total of 71 women developed pre-eclampsia of which 52 (74 %) had unilaterally located placenta. The relationship was found to be statistically significant p\0.0001.

In this study, out of the total 200 cases, 50 developed mild Pre-eclampsia. Out of these 50 cases, 24 had centrally located placenta and 26 had laterally located placenta. 52 women developed severe Preeclampsia and out of these 12 had centrally located placenta and 40 had laterally located placenta. No case of eclampsia was reported. The study by Kakkar *et al.* states twenty-eight women developed moderate PIH (D.B.P 100–109 mmHg). Out of these 28 cases, 8 had centrally located placenta, while 20 women had laterally located placenta. Thirteen women developed severe PIH (D.B.P 110 mmHg) and all these had laterally located placenta. No case of eclampsia was reported.

Majority of the cases of severe preeclampsia were 40% who were having proteinuria (>1+) had lateral location of placenta. There seems to be a good relationship between urinary albumin level with placental location. Higher level of urinary albumin indication more lateral placental location where as low levels of urinary albumin associated with central placental location. The study by Kanika *et al.* [17] has comparable results. The study shows a significant relationship between proteinuria and preeclampsia.

CONCLUSION

Placental implantation at 18 to 24 weeks can be used in the evaluation of pregnancies to categorize them as being at risk for an adverse antepartum, intrapartum and neonatal outcome. The current study proves that lateral location of placenta is associated with five times more chances of development of pre-eclampsia. Future investigations will need to confirm the findings of this investigation. To conclude, if these observations remain valid in future investigations, then the placental implantation site on the second trimester targeted ultrasound can be used to label a pregnancy as 'at risk' and follow-up ultrasounds or other surveillance techniques might be used to ensure the best pregnancy outcome.

Conflict of Interest

The authors declare no conflict of interest.

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