



STUDY OF ASSOCIATION OF LATERAL IMPLANTATION OF PLACENTA WITH DEVELOPMENT OF PRE-ECLAMPSIA

Obstetrics & Gynaecology

Dr. Vaishnavi Gore*

Junior Resident 3, Dept Of Obstetrics And Gynecology, BKL Walawalkar Rural Medical College And Hospital, Chiplun, Maharashtra. *Corresponding Author

Dr. Anagha Modak

HOD, Dept Of Obstetrics And Gynecology, BKL Walawalkar Rural Medical College And Hospital, Chiplun, Maharashtra.

ABSTRACT

Background: The placental position by ultrasound at 32 to 36 weeks is one of the many indicators for preeclampsia that is relatively cost-effective, noninvasive, and has a good positive predictive value. The purpose of this study was to determine if pre-eclampsia and other poor foetal and maternal outcomes may be predicted by the laterality of the placenta between 32 and 36 weeks. **Methodology:** A prospective study was conducted on 240 Primigravida women attending the antenatal clinic at 32-36 weeks of gestation without any high-risk factors who attended Antenatal OPD at BKL Walawalkar Medical College and Rural Hospital, Dervan, Ratnagiri, Maharashtra over a period of 18 months. The location of placenta by ultrasound was checked between 32 weeks and 36 weeks for all these 240 women. The placenta classified as central or lateral. Data was analysed using appropriate statistical tests. **Results:** Out of 240 patients, central placenta was more common (60%) than left lateral placenta (21.6%) and right lateral placenta (18.4%). Association between lateral location of placenta with pregnancy complication, LSCS delivery and neonatal complication was significant (P value <0.01). Out of 96 patients with lateral placenta, 38(39.58%) patients had Pre-eclampsia and out of 144 patients with central placenta, only 8(5.56%) patients had Pre-eclampsia. Association between lateral location of placenta and Pre-eclampsia was significant (P value <0.01). The Sensitivity of the lateral location of placenta in predicting pre-eclampsia was 82.61% (95% CI- 69.28, 90.91), Specificity was 70.1% (95% CI- 63.32, 76.1), Positive Predictive Value was 39.58% (95% CI- 30.38, 49.59) and Negative Predictive Value was 94.44% (95% CI- 89.42, 97.16). The Diagnostic Accuracy was 72.5% (95% CI- 66.53, 77.76). **Conclusion:** Ultrasonologically determined lateral location of placenta can be used as easy, non-invasive, cost-effective predictor of pre-eclampsia and other adverse pregnancy outcomes. These pregnancies may require careful obstetric management to achieve a more favourable outcome and decrease the maternal morbidity and mortality associated with pre-eclampsia.

KEYWORDS

Lateral Implantation of Placenta, Pre-Eclampsia, Pregnancy Outcomes, Neonatal Outcomes

INTRODUCTION:

After 20 weeks of pregnancy in a patient who was previously normotensive, pre-eclampsia is defined as an increase in blood pressure $\geq 140/90$ mm Hg with proteinuria (0.3 grammes or more protein in a 24-hour collected urine sample or 1+ or higher in a urine dipstick test). 5-7% of first pregnancies are affected by it, as are 2-10% of all pregnancies^(1,2).

A condition affecting trophoblastic tissues is pre-eclampsia. Pre-eclampsia-related quantitative investigation of trophoblast invasion has revealed little trophoblastic cell invasion^(2,3). For metabolic exchange, endocrine function, and other bodily processes, the placenta serves as the mother and foetus' essential connection⁽⁴⁾. The placental position by ultrasound at 32 to 36 weeks is one of the many indicators for preeclampsia that is relatively cost-effective, noninvasive, and has a good positive predictive value⁽⁶⁾. Placental position, uterine artery resistance, and unfavorable outcomes including preeclampsia and IUGR are all significantly correlated. The uterine artery next to the placenta exhibits less resistance than the one across from it when the placenta is positioned laterally. The uterine artery that is closest to the placenta should supply the majority of the uteroplacental blood flow, with some assistance from the other uterine artery through collateral circulation⁽⁶⁾.

When one artery provides the major supply of the intervillous space, noninvasive Doppler investigations of the uterine artery during the second trimester reveal aberrant waveforms indicative of faulty uterine perfusion caused by placental implantation⁽⁷⁾. The majority of pregnant women now receive normal prenatal care that includes ultrasound imaging. Evaluation of the foetus is the main focus of an obstetrical USG, but frequently the placenta, umbilical cord, and amniotic fluid, which are essential during gestation, are arguably not given the attention they need. Placental position, uterine artery resistance, and unfavourable outcomes like preeclampsia, IUGR, or both, are all significantly correlated. Therefore, the USG-determined placental position between 32 and 36 weeks is a non-invasive, economical, and secure predictor of pre-eclampsia.

To determine pre-eclampsia risk variables and develop a plan for practical preventative actions, the current investigation was required. Additionally, to stop and lessen maternal deaths from hypertensive diseases during pregnancy. Therefore, the purpose of this study was to determine if pre-eclampsia and other poor foetal and maternal

outcomes may be predicted by the laterality of the placenta between 32 and 36 weeks.

Objective:

To assess the development of preeclampsia and maternal outcome with Laterally and centrally located placenta.

MATERIAL AND METHODS:

A prospective study was conducted on 240 pregnant women who attended Antenatal OPD at BKL Walawalkar Medical College and Rural Hospital, Dervan, Ratnagiri, Maharashtra over a period of 18 months from January 2023 to June 2024. Primigravida attending the antenatal clinic, both outpatients and ward admissions, at 32-36 weeks of gestation without any high-risk factors included in the study. Pregnant women excluded from the study having chronic hypertension or essential hypertension, diabetes mellitus, renal disease, severe anemia, Rh incompatibility, twin pregnancy or positive VDRL test.

A written informed consent/assent was obtained and the procedure was briefly explained to the patient for their cooperation. The detailed history of the patient was taken according to the proforma. A detailed history (history of abruptio placenta, Hypertension, Preeclampsia, intrauterine death, diabetes mellitus) was taken. General physical examination including vital signs (especially Blood Pressure, weight) was done. Detailed per abdomen examination was done. The location of placenta by ultrasound was checked between 32 weeks and 36 weeks for all these 240 women. The placenta 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 the placental mass is to one side of the midline, it is classified as unilateral right or left placenta. The end point of the study was the development of hypertension as per American criteria of obstetrics and gynecology criteria of delivery.

The pregnancy outcome was assessed with respect to Incidence of pre-eclampsia with lateral location of placenta. Physical examination including vital signs (especially Blood Pressure, weight) was done. Detailed per abdomen examination was done. The location of placenta by ultrasound was checked between 32 weeks and 36 weeks for all these 240 women. The placenta classified as central when it is equally distributed between the right and left side of the uterus irrespective of anterior, posterior or fundal position. The end point of the study was the development of hypertension as per American criteria of obstetrics

and gynecology criteria of delivery. The pregnancy outcome was assessed with respect to Incidence of pre-eclampsia with lateral location of placenta.

Data was compiled using MS Excel (master chart preparation) and analysed using Statistical Package of Social Science. Data was analysed using appropriate statistical tests. Significance level was fixed at $P < 0.05$.

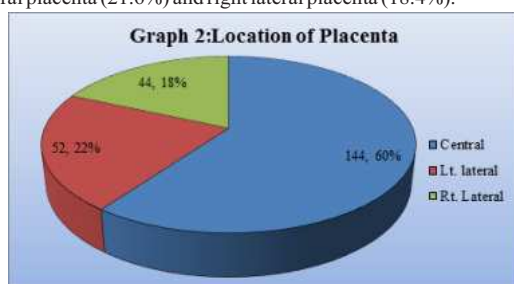
Ethical Concerns:

Consent from all the participants was taken to enroll in the study. Patients were provided standard of care treatment. Any additional expenses were borne by the researcher.

RESULTS:

Age Of The Patients: In the present study, out of 240 patients, majority, 132 (55%) were in age group between 21-25 years followed by 69 (28.8%) from 26 to 30 years. Mean age of the patients was 24.59 ± 3.67 years, ranging from 18 to 43 years.

Location Of Placenta On USG At 32-36 Weeks: In this study, out of 240 patients, central placenta was more common (60%) than left lateral placenta (21.6%) and right lateral placenta (18.4%).



Pregnancy Complications: Most common complication was Pre-eclampsia in 37 (15.4%) patients followed by IUGR in 21 (8.8%) and Gestational Hypertension in 18 (7.5%) patients. Other complications were Pre-eclampsia and IUGR in 9 (3.8%), PROM and PROM with IUGR in 2 patients each. 151 (62.9%) patients didn't have any complications.

Table 1: Association Between Location Of The Placenta (At 32-36 Weeks) And Pregnancy Complications

Pregnancy complications	Location of Placenta		Total	Chi-Square & P-Value
	Central	Lateral		
Pre-eclampsia	6(4.17%)	31(32.92%)	37(15.42%)	<0.05
Gestational HTN	6(4.17%)	12(12.5%)	18(7.5%)	
PROM	0(0%)	2(2.08%)	2(0.83%)	
PROM with IUGR	0(0%)	2(2.08%)	2(0.83%)	
Pre-eclampsia with IUGR	2(1.38%)	7(7.29%)	9(3.75%)	
IUGR	7(4.86%)	14(14.58%)	21(8.75%)	
No complications	123(85.42%)	28(29.17%)	151(62.92%)	
Total	144(100%)	96(100%)	240(100%)	

In this study, out of 96 patients with lateral placenta, 31(32.92%) had Pre-eclampsia and 12(12.5%) had Gestational HTN, and 14 (14.58%) had IUGR. But out of 144 patients with central placenta, only 6 (4.17%) had Pre-eclampsia and 6(4.17%) had Gestational HTN, and 7(4.86%) had IUGR. Association between lateral location of placenta and pregnancy complication was significant (P value < 0.01) (table 1).

Table 2: Association between Mode of delivery and Location of Placenta (at 32-36 weeks):

Mode of delivery	Location of Placenta		Total	Chi-Square & P-Value
	Central	Lateral		
LSCS	54(37.5%)	50(52.08%)	104(43.33%)	0.026
Vaginal	90(62.5%)	46(47.92%)	136(56.67%)	
Total	144(100%)	96(100%)	240(100%)	

52.08% patients having lateral placenta delivered by caesarean section while only 37.5% patients having central placenta underwent caesarean section. Association between lateral location of placenta and LSCS delivery was statistically significant (p value < 0.05)

Neonatal Outcomes:

In this study, 13.3% neonates were shifted to NICU, there was 1 Intra-uterine death and only 1 mother was shifted to ICU. 206 (85.8%) patients did not have any adverse events.

Table 2. Location of Placenta (at 32-36 weeks) and Neonatal Outcomes:

Neonatal Outcomes	Location of Placenta on USG		Total	Chi Square & P-Value
	Central	Lateral		
Neonate Shifted to NICU	13 (9%)	19(19.8%)	32 (13.3%)	9.113 0.028
Intra-uterine Death	0 (0%)	1 (1.1%)	1 (0.4%)	
Mother shifted to ICU	0 (0%)	1 (1.1%)	1 (0.4%)	
No Adverse events	131 (91%)	75 (78%)	206 (85.8%)	
Total	144 (100%)	96 (100%)	240 (100%)	

In this study, out of 96 patients with lateral placenta, 19(19.8%) neonate patients were shifted to NICU and there was one IUD and one mother was shifted to ICU. While out of 144 patients with central placenta, only 13(9%) neonate patients had shifted to NICU and no IUD were noted. Association between lateral location of placenta and adverse events was significant (P value < 0.01)

Table 3: Association Between Location Of Placenta (at 32-36 weeks) and Pre-Eclampsia:

Location of Placenta	Pre-eclampsia		Total	Chi Square & P-value
	Present	Absent		
Lateral	38(39.58%)	58(60.42%)	96(100%)	43.048 <0.01
Central	8(5.56%)	136(94.44%)	144(100%)	
Total	46(19.17%)	194(80.83%)	240(100%)	

In this study, out of 96 patients with lateral placenta, 38(39.58%) patients had Pre-eclampsia and out of 144 patients with central placenta, only 8(5.56%) patients had Pre-eclampsia. Association between lateral location of placenta and Pre-eclampsia was significant (P value < 0.01)

Table 4: Sensitivity And Specificity Of Location Of Placenta For Prediction Of Pre-eclampsia:

Parameters	Values	95% CIs
Sensitivity	82.61%	(69.28, 90.91)
Specificity	70.1%	(63.32, 76.1)
Positive Predictive Value	39.58%	(30.38, 49.59)
Negative Predictive Value	94.44%	(89.42, 97.16)
Diagnostic Accuracy	72.5%	(66.53, 77.76)

In this study, the Sensitivity of the lateral location of placenta in predicting pre-eclampsia was 82.61% (95% CI- 69.28, 90.91), Specificity was 70.1% (95% CI- 63.32, 76.1), Positive Predictive Value was 39.58% (95% CI- 30.38, 49.59) and Negative Predictive Value was 94.44% (95% CI- 89.42, 97.16). The Diagnostic Accuracy was 72.5% (95% CI- 66.53, 77.76).

DISCUSSION:

Age Groups Of The Patients:

Of the 240 patients in the current study, 132 (55%) were between the ages of 21 and 25 years, while 69 (28.8%) were between the ages of 26 and 30 years. The patients' ages ranged from 18 to 43 years old, with a mean age of 24.59 ± 3.67 years. Tani Kakkar et al⁽⁸⁾ reported similar findings, 10% patients were from age group < 20 years, 53.3% from age group 21-25 years, 32% from age group 26-30 years and 4.7% from age group > 30 years. Neetu Singh et al⁽⁹⁾ similarly found that 19.9% patients were from age group < 20 years, 39.5% from age group 21-25 years, 31.5% from age group 26-30 years and 9.2% from age group > 30 years. In all of the studies, the majority of the patients were between the ages of 21 and 25.

Location Of Placenta (At 32-36 Weeks):

Out of 240 patients in this study, the central placenta was more prevalent (60%) than the left and right lateral placentas (21.6% and 18.4%, respectively), which is comparable to the findings of study by Shagufta Yousuf et al⁽¹⁰⁾ 2016, which found that out of 201 patients, 36% had lateral placentas and 64% had central placentas. Our research differs from study by Rajeshwary Pillay et al⁽¹¹⁾ in that it found that 68% of women had a central placenta whereas 32% of women had a lateral placenta. According to our research, central placentas are more

typical than lateral placentas. Numerous more studies, including those by **Bhalerao Anuja et al**⁽¹²⁾ and **Shagupta Yousuf et al**⁽¹⁰⁾, support the notion that central placenta incidence is more prevalent.

463 pregnant women with placental localization were studied by **Bhalerao Anuja et al**⁽¹²⁾. They discovered that 73.23% of patients experienced PE with a lateral placenta. According to 150 women's studies by **Kakkar Tania et al**⁽⁹⁾, 70% of patients with lateral placentas got PE (p value less than 0.001). A total of 426 pregnant women were evaluated by **Pai Muralidhar V et al**⁽⁵⁾; 71 of these women experienced PE, and 74% of them had a unilaterally placed placenta.

Association Between Location Of Placenta (At 32-36 Weeks) And Pre-Eclampsia:

In this study, only 8 patients (5.56%) out of 144 patients with central placenta and 38 patients out of 96 patients with lateral placenta developed the condition. The relationship between the placenta's lateral position and pre-eclampsia was substantial (P value 0.01). Our study is comparable to that of **Shagufta et al**⁽¹⁰⁾, who evaluated a total of 201 patients. Of these, 130 patients had central placentas, where pre-eclampsia only occurred in 14 patients (10.77%), and 71 patients had lateral placentas, where pre-eclampsia occurred in 37 patients (52.11%).

In a 2016 study of 200 individuals, **Shailesh Janardhan Kore et al**⁽¹³⁾ found that 32 of them had pre-eclampsia, and that 19 of them (59.4%) had lateral placentas whereas only 13 (41.6%) had central placenta. Only 18% of pre eclamptic women in the **N. Sumathi et al**⁽¹⁴⁾ research had a central placenta, whereas 82% of them had a lateral placenta.

Pre-eclampsia was predicted with a sensitivity of 82.61% (95% CI: 69.28, 90.91), specificity of 70.1% (95% CI: 63.32, 76.1), positive predictive value of 39.58% (95% CI: 30.38, 49.59), and negative predictive value of 94.44% (95% CI: 89.42, 97.16) for the lateral placement of the placenta. The accuracy of diagnosis was 72.5% (95% CI: 66.53, 77.76).

According to **Pai Muralidhar V et al**⁽⁵⁾, unilaterally positioned placentas had sensitivity, specificity, positive predictive value, and negative predictive value of 73%, 86%, 51%, and 94%, respectively. The statistical significance of this investigation was quite high (P 0.0001). 300-patient research by **Alexander D. Kofinas et al**⁽¹⁵⁾ revealed that individuals with unilateral placental position had a 2.8-fold greater increase in the likelihood of PE than patients with centrally situated placentas (p value less than 0.03).

Our research closely resembles that of **Pai Muralidhar V et al**⁽⁵⁾ (2005). At between 32- and 36-weeks POG, USG determined the placental position. When the placenta is unilateral, the risk of PE is five times higher. The placental position identified by USG between 32 to 36 weeks POG is one of the many indicators of pre-eclampsia that is highly economical, non-invasive, and statistically significant.

Association Between Location Of The Placenta (At 32-36 Weeks) And Neonatal Complications

In this research, 14 (14.58%) of the 96 individuals with lateral placentas developed IUGR. However, only 7 (4.86%) of the 144 individuals with central placenta experienced IUGR. The relationship between the placenta's lateral position and IUGR was significant (P value 0.01).

An estimated foetal weight less than 10% of the gestational age is a typical criterion, while a foetal weight less than 3% is a greater indicator of perinatal death. While the degree of collateral circulation may not be the same in all women with a lateral placenta and a lack of contribution promotes the development of IUGR, both uterine arteries in women with a centrally placed placenta show comparable resistance. Our study found a substantial correlation between the laterality of the placenta and IUGR, which is analogous to studies by **Rajeshwary Pillay et al**⁽¹¹⁾, **Neetu Singh et al**⁽⁹⁾, and **N Sumathi et al**⁽¹⁴⁾.

Association Between Mode Of Delivery And Location Of Placenta (32-36 Weeks):

In this study, 52.08% patients having lateral placenta delivered by caesarean section while only 37.5% patients having central placenta underwent caesarean section. The relationship between the placenta's lateral position and LSCS delivery was statistically significant (p 0.05). In the **N. Sumathi et al**⁽¹⁴⁾ research, out of 120 patients with pre-

eclampsia, 52 underwent vaginal birth, 68 underwent caesarean surgery, and 59 (86.2%) of these 68 patients had lateral placentas.



Fig 1. Location of placenta - Right Lateral and posterior



Fig 2. Location of placenta - Right lateral

CONCLUSION

From the above study it is concluded that unilateral implantation of placenta determined by USG at 32 to 36 weeks period of gestation is associated with an increased risk of pre-eclampsia, IUGR or both. Thus, ultrasonologically determined lateral location of placenta can be used as easy, non-invasive, cost-effective predictor of pre-eclampsia and other adverse pregnancy outcomes. So, these pregnancies may require careful obstetric management to achieve a more favourable outcome and decrease the maternal and perinatal morbidity and mortality associated with pre-eclampsia.

One of the major advantages of this study is it is not an extra test. From the routine growth scan the location of placenta can be used as a predictor. Early prediction of pre-eclampsia prevents dreadful maternal complications thereby reduces maternal morbidity and mortality.

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