

ROLE OF PLACENTAL LOCALISATION IN DETERMINING PREGNANCY OUTCOME

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Abstract

Background: The localisation of placenta in mid trimester has been theorised to have effect on pregnancy (Antenatal/ Intranatal/ post-natal). The objective is to assess the association of placental location with Feto-maternal outcome. **Materials and Methods:** It was a prospective observational, time bound, Cohort study conducted between September 2020 and May 2021 at a tertiary care hospital. 402 Pregnant women meeting the inclusion criteria were divided as per placental location noted between 18-24 weeks of gestation by ultrasound (where $\geq 75\%$ of placenta is located), into four groups as Anterior, Posterior, Fundal, Lateral. All the women were followed till delivery. The Outcomes were noted in terms of Antenatal complications, Gestation at delivery, Mode of delivery, Intranatal events, Postpartum complications and Neonatal Outcomes. **Result:** Out of 402 pregnancies, 172(42.8%) had anterior, 108(26.9%) had fundal, 31(7.7%) had lateral 91(22.6%) had posterior placenta. Pre-eclampsia (23%) and IUGR (19.4%) were more common in laterally implanted placenta. The incidence of Preterm premature rupture of membranes was found to be higher among fundal placenta (3.7%). Regarding Mode of delivery, 51.6% women with lateral placenta had emergency LSCS. **Conclusion:** Most common site of placentation is Anterior. Among all the sites of implantation, Lateral and fundal location of placentation are associated with adverse pregnancy events like Pre-eclampsia, IUGR, Emergency LSCS and PROM and PPROM respectively.

INTRODUCTION

The Placenta plays a decisive role in smooth progress of pregnancy as well as in its outcome. It is a vital vascular link between mother and fetus, which reflects intrauterine milieu.^[1] Thus site of implantation is hypothesised to have a bearing on quality of placentation thereby playing a role on outcome of pregnancy. Proper implantation is essential for healthy gestation, and location of the placenta has a bearing on the quality of implantation thereby playing a role in pregnancy outcome. As in today's era Ultrasonography imaging has become an integral component of routine prenatal medical care and Ultrasound plays a key role in identifying the location of placenta, also it's the safest and cheapest method to locate placenta.

Thus, USG Examination of Placenta during Pregnancy can be vital aid to Pregnancy

management. Therefore, Placental implantation in 2nd trimester can be used in the assessment of pregnancies and to label them as being "at risk". Taking into consideration all the above points, we took up a prospective study to find out the correlation between placental site implantation and pregnancy outcome (Antepartum/intrapartum events/Postpartum events) and thus evaluate its role in predicting adverse pregnancy outcome.

MATERIALS AND METHODS

Prospective observational time bound Cohort study done from September 2020 to May 2022 at a tertiary care hospital. Sample size was decided based on estimation of proportion.

Formula used is:

$$N \geq (p(1-p))/(ME/z\alpha)^2$$

Where $Z\alpha$ is value of Z at two sided alpha error of 5%, ME is margin of error and p is proportion of patients with adverse outcome. Pregnancies with following features were excluded- multiple gestation, Chronic medical illness like CRF, Chronic Hypertension, overt diabetics, uterine anomalies, low-lying placenta, Fetus with structural abnormality.

Prior to enrolment of patients, ethical committee clearance was obtained.

Four hundred and two single-ton pregnant women were enrolled after taking informed consent in the language they understood, and were explained the purpose of study.

Baseline demographic information- maternal age, parity and medical history, previous obstetric history was noted using a structured proforma. Complete general physical, systemic and obstetric examination were performed.

Gestational age was calculated using last menstrual period when known or using ultrasound dates (1st trimester scan).

Placental location as per scan done between 18th to 24th week was noted and further categorized as anterior, posterior, fundal, or lateral depending on where $\geq 75\%$ of placental mass is situated. Women were followed up till delivery.

The Outcome variables included Pre-eclampsia or eclampsia, gestational diabetes mellitus (GDM), Intrahepatic cholestasis of pregnancy (IHCP), Intrauterine Growth restriction (IUGR), Large for gestation, Antepartum haemorrhage (APH), Oligohydramnios, Polyhydramnios, Anaemia, Preterm Prelabor rupture of membranes (PPROM), Prelabor rupture of membranes (PROM), Preterm labour, gestation at delivery, Abnormal lie/presentation, Intrauterine fetal demise, Mode of delivery (vaginal /elective or emergency LSCS), PPH, MROP and Neonatal outcomes like: mean birth weight, Apgar @ 1min or 5 min, ICU admission, Early neonatal mortality.

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean \pm SD and median. Qualitative variables were associated using Chi square test/Fisher's Exact test. A p value < 0.05 will be considered as statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

RESULTS

Out of 402, 172(42.8%) had anterior, 108(26.9%) had fundal 31(7.7%) had lateral, 91(22.6%) had posterior placenta. [Figure 1]

Among all Antenatal complications noted GDM was most common followed by PROM. [Table 1]

Preeclampsia (23%) and Intrauterine growth retardation (19.4%) were more common in laterally situated placenta and the result was statistically significant. Whereas PROM(20.4%)/PPROM(5.6%) were more commonly seen in fundal placenta and these findings were statistically significant. [Table 2]

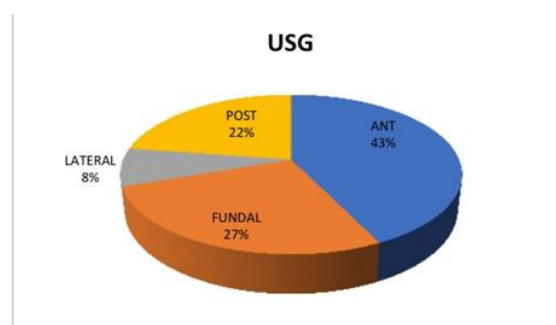


Figure 1: Location of placenta Frequency Percentage

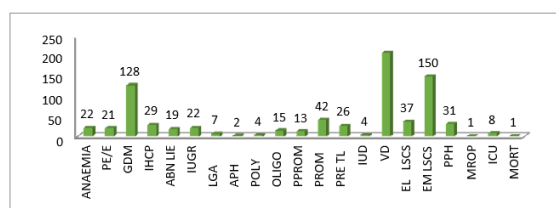


Figure 2: Antenatal complications and other observations

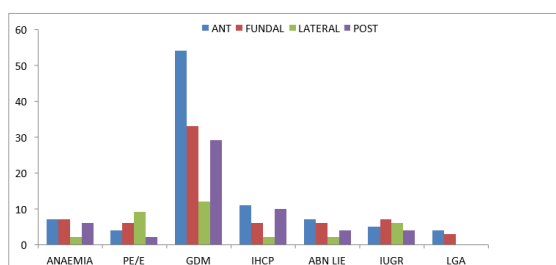


Figure 3: Antenatal complications and placenta location

Table 1: ?

Antenatal complications	Frequency	%
Anaemia	22	5.5
PE/E	21	5.2
GDM	128	31.8
IHCP	29	7.2
ABN lie	19	4.7
IUGR	22	5.5
LGA	7	1.7
APH	2	0.5
POLYHYDRAMNIOS	4	1.0

OLIGOHYDRAMNIOS	15	3.7
PPROM	13	3.2
PROM	42	10.4
PRETERM LABOR	26	6.5
IUD	4	1.0

Table 2: Antenatal Complications and Placental location

Antenatal complications	Location of placenta				Total(%)	p-value
	Anterior n(%)	Fundal n(%)	Lateral n(%)	Posterior n(%)		
ANAEMIA	7(4.1)	7(6.5)	2(6.5)	6(6.6)	22(5.5)	0.766
PE/E	4(2.3)	6(5.6)	9(23)	2(2.2)	21(5.2)	0.00
GDM	54(31.4)	33(30.6)	12(38.7)	29(31.9)	128(31.8)	0.856
IHCP	11(6.4)	6(5.6)	2(6.5)	10(11)	29(7.2)	0.461
ABN LIE	7(4.1)	6(5.6)	2(6.5)	4(4.4)	19(4.7)	0.906
IUGR	5(2.3)	7(6.5)	6(19.4)	4(4.4)	22(5.5)	0.003
LGA	4(2.3)	3(2.8)	0(0.0)	0(0.0)	7(1.7)	0.364
APH	1(0.6)	0(0.0)	0(0.0)	1(1.1)	2(0.5)	0.709
POLY	0(0.0)	3(2.8)	1(3.2)	0(0.0)	4(1.0)	0.053
OLIGO	9(5.2)	4(3.7)	1(3.2)	1(1.1)	15(3.7)	0.414
PPROM	4(2.3)	6(5.6)	3(3.7)	0(0.0)	13(3.2)	0.024
PROM	10(5.8)	22(20.4)	4(12.3)	6(6.6)	42(10.4)	0.001
PRE TL	12(7)	10(3.3)	1(3.2)	3(3.3)	26(6.5)	0.319
IUD	1(0.6)	0(0.0)	1(3.2)	2(2.2)	4(1.0)	0.232

Table 3: Mode of delivery and placental location

Mode of delivery	Location of placenta				Total(%)	p-value
	Anterior n(%)	Fundal n(%)	Lateral n(%)	Posterior n(%)		
VD	98(57)	58(53.7)	12(38.7)	41(45.1)	209(52)	0.036
EL LSCS	12(7)	15(13.9)	2(6.5)	8(8.8)	37(9.2)	
EM LSCS	61(35.5)	35(32.4)	16(51.6)	38(41.8)	150(37.3)	

Incidence of abnormal lie (6.5%), Polyhydramnios (3.2%), IUD (3.2%), GDM (38.7%) were higher in lateral placental although findings were statistically insignificant. Anaemia (6.6%) and IHCP (11%) and APH (1.1%) were more commonly seen in posterior placenta but there were no statistically significant association. Oligohydramnios (5.2%) and preterm labor (7%) were more common in anterior, and

LGA in fundal placenta, however these findings were statistically not significant. Out of total cases, 209 delivered vaginally, while 150 underwent emergency LSCS and 37 elective LSCS. Vaginal delivery was most common in patients with anterior placenta (57%) followed by fundal (53.7%). Among laterally placed Emergency LSCS is the most common mode of delivery. Among 31 patients with

lateral placenta 16 had emergency LSCS (51.6%) and results were statistically significant. [Table 3]

A total of 31 patients had postpartum hemorrhage (PPH), of which 11 had fundal placenta followed by anterior placenta although it was statistically non-significant. Manual removal of placenta was done only in 1 patient with fundal placenta and results were non-significant. Fetal complication like ICU admissions, low APGAR scores and neonatal mortality were studied. There was only 1 neonatal death associated with posteriorly implanted placenta. Among 8 neonates admitted in NICU, 6.5% had lateral placenta in the antenatal period although nonsignificant. Persistent low APGAR scores were noted in neonates of mothers having lateral placenta in 2nd trimester scans. However, results were not statistically significant.

APGAR scores were noted in neonates at 1 and 5 minutes. Majority of neonates had APGAR score more than 8 at 1 and 5 minutes irrespective of placental location. However, persistent low APGAR (score of less than 8 at 1 and 5 minutes) was noted among neonates of mothers with lateral placenta but it was statistically non-significant.

DISCUSSION

The purpose of our study was to find out any correlation between placental location and pregnancy outcome and hence its role in predicting pregnancy outcome.

Placenta is a vital link between mother and fetus for metabolic exchange, endocrine and other body functions and is critical for maternal and neonatal wellbeing. It reflects the intrauterine milieu and influences the fetomaternal outcome. It is a vascular organ that obtains its blood supply from two distinct circulatory systems: maternal-placental and fetoplacental. The blood supply of placenta is not uniformly distributed and hence various determinants like size of placenta and its location have a role in success of pregnancy.^[1] The birth of a healthy infant depends upon a coordinated series of events in the development of placenta and the fetus. Detailed analysis of gross placental structure can provide biologically relevant information regarding placental growth, development, and their potential consequences.^[2]

In our study majority 42.8% had Anterior placenta and 7.7% had lateral placenta which is similar to study conducted by V.V Nair,^[3] where frequency of central placenta (83.8%) was more than lateral (16.2%). Singh et al⁽⁴⁾ also showed incidence of anterior placenta (61.82%) more common than lateral placenta(38.1%).

In our study we found that anterior placenta was found more common in younger age group while fundal in older age groups (although statistically non-significant) which was similar to the findings in studies conducted by Zia et al, Torricelli et al and K.D Seckin et al.^[4-7]

In the current study, among primigravida lateral placentation was more common, out of 31 cases with lateral placenta 22(71%) were primigravida. This finding may be linked to the fact that preeclampsia is more common in primigravida.

In this study we observed that height, weight and BMI were comparable among all the locations of placenta, they were found to be statistically non-significant. Height, Weight, BMI none of them had any significant correlation to different placental correlation nor did other studies find such association.

In the present study, Pre-eclampsia was more common among laterally implanted placenta. Similar inference was drawn from the studies conducted by V.V Nair et al,^[3] by Bhalerao et al,^[8] that showed lateral placentation had 2.7 times more pre-eclampsia whereas Fung et al showed 2 times and Kakkar et al showed 2 fold increase in risk of pre-eclampsia.^[9,10] In lateral wall of uterus, uterus receives blood supply from one side of uterus, increasing resistance in placental vascular bed in current study, we found a significant association between IUGR and lateral placenta with p value <0.05. Similar inference was found by Kalanithi et al,^[11] IUGR pregnancies are nearly 4 fold more likely to have lateral placentation. Study by V.V Nair et al,^[3] five cases of left lateral placenta were associated with IUGR and abnormal doppler (10.2%) with p value of 0.007.

Also K.D seckin et al,^[7] found incidence of IUGR was 13.5% in lateral placenta group, p value <0.05. In the present study among 31 patients with laterally implanted placenta 9 had P.E and 6 had IUGR comprising 23% and 19.4% consecutively making a statistically significant data.

Possible explanation for increase incidences of IUGR among laterally placed placenta as grounded in prior studies demonstrating differential placental blood flow according to placental location. Prior studies have suggested, using Doppler velocimetry, an association between unilaterally-located placentas and abnormal uterine artery flow velocity.^[12]

The maternal blood supply to the placenta derives mainly from the uterine arteries, with additional supply from the ovarian arteries. The right and left uterine arteries each have many branches that supply the ipsilateral side of the uterus.^[13] In some patients, arcuate branches of the right and left uterine arteries cross to the contralateral side and create major anastomoses.^[14] In pregnancies with unilateral placentas, uterine artery resistance is lower in the ipsilateral vs. contralateral uterine artery, while in pregnancies with centrally located placentas resistance is similar between the two uterine arteries (15–17). Ito et al. interpreted this finding in the context of an electrical equivalent circuit model of uteroplacental circulation and suggested that the decreased placental-side uterine artery resistance may reflect decreased uteroplacental blood flow volume in unilaterally situated placentas.^[15-18]

Kofinas further,^[15] suggested an anatomic mechanism by which decreased blood flow to a unilaterally located placenta could occur. Perhaps centrally located placentas receive adequate blood flow from both uterine arteries by virtue of their position. In contrast, unilaterally located placentas may depend on a high degree of anastomosis between the ipsilateral and contralateral uterine arteries in order to receive adequate blood supply. Therefore, any deficiency in collateral circulation could lead to decreased blood flow, and, therefore, a higher risk of growth restriction, in pregnancies with unilateral placentas.

In our study, PPROM was more commonly seen among fundal placenta group (3.7%) with p value <0.05. Study conducted by Hadley et al,^[19] also found fundal placenta as a risk factor for PPROM. Contrary to the study by K.D Seckin,^[7] in which 3% of cases with lateral placenta had PPROM which was more in comparison to centrally located placenta, although not statistically significant. In the present study, we have observed among 13 cases of PPROM, 6 had fundal placenta followed by anterior which were 4. In the current study incidence of PROM was more associated with fundal placenta. Among 42 patients 22 had fundal placenta. They supposed that fundal implantation sets a weak point of membranes above the cervical and increases risk of premature rupture of membranes with all of the associated consequences.

In our study we also studied association between placental location and antenatal complications like: anaemia, GDM, IHCP, Abnormal lie LGA APH, Polyhydramnios, Oligohydramnios, Preterm labour, incidences of IUD, but the finding did not have any statistical value.

A total of 31 patients had postpartum hemorrhage (PPH), of which 11 had fundal followed by anterior placenta which were 9, although it was statistically non-significant. Manual removal of placenta was done only in 1 patient with fundal placenta, results were non-significant. On the contrary a study conducted by Torricelli et al,^[6] found that incidence of PPH was substantially higher (p=0.02) among patients with anterior placentation. While Seckin et al,^[7] and Michaela et al,^[20] found that lateral placentation had more incidence of PPH.

After delivery of placenta, uterine contractions make anterior and posterior wall of uterus appose, which is important to achieve hemostasis. Ultrasound of uterus in postpartum period showed that most of the uterus was contracted well, however the myometrium situated behind the placenta remained non-contracted.^[21]

Regarding mode of delivery, in our study laterally implanted placental group had increased incidence of Emergency LSCS (51.6%). Similar association was found in a study by Valliant et al.^[17]

There was no association found in between mean birth weight and placentation, nor did other studies find such associations. In our study mean birth weight was between 2.5-2.85 kg and this had no

association with location of placenta, the findings were statistically non-significant.

In this study, among 8 neonates admitted in NICU 6.5% had lateral placental implantation antenatally although not statistically significant. Similar finding was noted in Seckin et al,^[7] in which NICU admission were 18% among cases with laterally located placenta with p value<0.05. In a study by V.V Nair⁽³⁾, number of central placenta having NICU admissions were 16.4% and number of laterally placed placenta with NICU admission were 26%, among total cases, p value 0.05. While studies conducted by Zia et al and Michaela et al found no association with placental location and NICU admissions.^[5,20]

In our study we also noted comparatively low APGAR with lateral placenta. Frequency of patients showing low APGAR at 1min and 5 min were 13.3% and 3.3% respectively among laterally placed placenta. Though it is not statistically significant but it was consistent with the studies conducted by Seckin et al and Magaan et al.^[7,22]

CONCLUSION

1. Most common site of placentation was Anterior.
2. Lateral Implantation of placenta was associated with antenatal complications like Pre- eclampsia, IUGR.
3. Fundal Implantation of placenta was associated with PPROM, PROM.
4. Laterally implanted placenta showed more incidences of Emergency LSCS.

REFERENCES

1. Kay HH, Nelson DM, Wang Y. The Placenta: From Development to Disease. The Placenta: From Development to Disease [Internet]. 2011 Mar 21 [cited 2021 Sep 14]; Available from: <https://onlinelibrary.wiley.com/doi/book/10.1002/9781444393927>
2. Coall DA, Charles AK, Salafia CM. Gross placental structure in a low-risk population of singleton, term, first-born infants. *Pediatric and Developmental Pathology*. 2009 May;12(3):200–10.
3. Nair V v., Nair SS, K. R. Study of placental location and pregnancy outcome. *Int J Reprod Contracept Obstet Gynecol* [Internet]. 2019 Mar 26 [cited 2021 Sep 15];8(4):1393–7. Available from: <https://www.ijrcog.org/index.php/ijrcog/article/view/6235>
4. Singh N GR. To study second trimester placental location as a predictor of adverse pregnancy outcome. *Int J Reprod Contraception*. 2016;22(4):152–5.
5. Zia S. Placental location and pregnancy outcome. *J Turk Ger Gynecol Assoc* [Internet]. 2013 Dec [cited 2021 Sep 24];14(4):190. Available from: <http://pmc/articles/PMC3935544/>
6. Torricelli M, Vannuccini S, Moncini I, Cannoni A, Voltolini C, Conti N, et al. Anterior placental location influences onset and progress of labor and postpartum outcome. *Placenta*. 2015 Apr 1;36(4):463–6.
7. Seckin KD, Cakmak B, Karsli MF, Yeral MI, Gultekin IB, Oz M, et al. Is lateral localisation of placenta a risk factor for adverse perinatal outcomes? <http://dx.doi.org/103109/0144361520151007343> [Internet]. 2015 Oct 3 [cited 2021 Sep 24];35(7):696–8. Available from:

- <https://www.tandfonline.com/doi/abs/10.3109/01443615.2015.1007343>
8. Bhalerao A, Kulkarni S. Lateral Placentation by Ultrasonography: A Simple Predictor of Preeclampsia. *Journal of South Asian Federation of Obstetrics and Gynaecology*. 2013 Aug;5(2):68–71.
 9. Fung TY, Sahota DS, Lau TK, Leung TY, Chan LW, Chung TKH. Placental site in the second trimester of pregnancy and its association with subsequent obstetric outcome. *Prenat Diagn [Internet]*. 2011 Jun 1 [cited 2021 Sep 24];31(6):548–54. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1002/pd.2740>
 10. Kakkar T, Singh V, Razdan R, Digra SK, Gupta A, Kakkar M. Placental Laterality as a Predictor for Development of Preeclampsia. *J Obstet Gynaecol India [Internet]*. 2013 [cited 2021 Sep 24];63(1):22. Available from: <https://pubmed.ncbi.nlm.nih.gov/2471491/>
 11. Kalanithi LEG, Illuzzi JL, Nossov VB, Frisbæk Y, Abdel-Razeq S, Copel JA, et al. Intrauterine Growth Restriction and Placental Location. *Journal of Ultrasound in Medicine [Internet]*. 2007 Nov 1 [cited 2021 Sep 24];26(11):1481–9. Available from: <https://onlinelibrary.wiley.com/doi/full/10.7863/jum.2007.26.11.1481>
 12. LE K, JL I, VB N, Y F, S AR, JA C, et al. Intrauterine growth restriction and placental location. *J Ultrasound Med [Internet]*. 2007 [cited 2021 Sep 15];26(11):1481–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/17957042/>
 13. Moore, K.L. and D. No Title. 1999. 1164pp p.
 14. J I, ES L, JM B. Arterial anastomosis in the pregnant human uterus. *Obstetrics and Gynecology [Internet]*. 1980 Jan 1 [cited 2021 Sep 24];55(1):67–71. Available from: <https://europepmc.org/article/med/7352063>
 15. Kofinas AD, Penry M, Swain M, Hatjis CG. Effect of placental laterality on uterine artery resistance and development of preeclampsia and intrauterine growth retardation. *Am J Obstet Gynecol*. 1989 Dec 1;161(6):1536–9.
 16. Ito Y, Shono H, Shono M, Muro M, Uchiyama A, Sugimori H. Resistance index of uterine artery and placental location in intrauterine growth retardation. *Acta Obstet Gynecol Scand [Internet]*. 1998 Apr 1 [cited 2021 Sep 15];77(4):385–90. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1034/j.1600-0412.1998.770405.x>
 17. P V, MC B, E C, G D. [Pathological Doppler uterine readings when the placenta is laterally situated]. *J Gynecol Obstet Biol Reprod (Paris) [Internet]*. 1993 Jan 1 [cited 2021 Sep 17];22(3):301–7. Available from: <https://europepmc.org/article/med/8345154>
 18. Huikeshoven F, Coleman TG, Jongsma HW. Mathematical model of the fetal cardiovascular system: the uncontrolled case. <https://doi.org/10.1152/ajpregu.1980.239.3.R317> [Internet]. 1980 [cited 2021 Sep 21];8(2). Available from: <https://journals.physiology.org/doi/abs/10.1152/ajpregu.1980.239.3.R317>
 19. Hadley CB, Main DM, Gabbe SG. Risk Factors for Preterm Premature Rupture of the Fetal Membranes. *Am J Perinatol [Internet]*. 2008 Mar 4 [cited 2021 Sep 24];7(04):374–9. Available from: <http://www.thieme-connect.com/products/ejournals/html/10.1055/s-2007-999527>
 20. Granfors M, Stephansson O, Endler M, Jonsson M, Sandström A, Wikström AK. Placental location and pregnancy outcomes in nulliparous women: A population-based cohort study. *Acta Obstet Gynecol Scand*. 2019 Aug 1;98(8):988–96.
 21. Hoogland HJ, de Haan J. Ultrasonographic placental localization with respect to fetal position in utero. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 1980 Sep 1;11(1):9–15.
 22. Magann EF, Doherty DA, Turner K, Jr GSL, Morrison JC, Newnham JP. Second trimester placental location as a predictor of an adverse pregnancy outcome. 2007;(September 2006):9–14..