

PREDICTION OF PREGNANCY INDUCED HYPERTENSION BY USG GUIDED PLACENTAL LOCALIZATIONJyoti Jaiswal¹, Anand Jaiswal², Tripti Nagaria³, Abhishek Ramteke⁴**HOW TO CITE THIS ARTICLE:**

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ABSTRACT: OBJECTIVE: To assess the incidence of placental laterality in second trimester and the incidence of hypertensive disorders in laterally situated placenta in comparison to centrally situated placenta. **MATERIAL & METHOD:** It was an observational randomized study which was conducted between July 2013 to Sept. 2014 at Pt. JNM Medical College, Raipur. Participant were uncomplicated pregnant women having 18-24weeks gestation attending antenatal clinics who underwent obstetric sonography including placental localization. Women were observed till delivery. Analysis was done for site of implantation of placenta and its correlation with PIH or associated complication if any. **RESULTS:** Total of 130 women considered for the study, 93/130(71.5%) had central implantation of placenta and 37/130(28.4%) have lateral type of placentation. The ratio was almost same in primi as well as in multigravida. Incidence of hypertensive disorder in pregnancy in selected cohort was 28/130(21.5%). High incidence of Pregnancy induced hypertension was associated with lateral placenta i.e. 51.3% (19/37) as compared to central placenta i.e. 9.7% (9/93) (P value <0.0001). This suggests more than 5 times high possibilities of development of PIH in laterally situated placenta in comparison to central implantation. **CONCLUSION:** Laterally located placenta is associated with increased risk of development of preeclampsia. Prediction of preeclampsia by second trimester USG guided placental localization is simple, cheap, noninvasive, safe and effective screening method. **KEYWORDS:** Placental laterality, Preeclampsia, PIH, GHTN.

INTRODUCTION: Preeclampsia is a multisystem disorder of unknown etiology and is a principal cause of maternal & perinatal mortality and morbidity. The exact etiology is unknown but failure of trophoblast invasion and vascular endothelial damage appear to be an important etiopathological factor.¹ when the placenta is laterally located, the uterine artery closer to the placenta has lower resistance than the one opposite to it. In patients with centrally located placentas, both uterine arteries demonstrate similar resistance.² Noninvasive Doppler velocimetric studies of the uterine arteries in the second trimester also reveal the abnormal wave forms indicating defective uterine perfusion, is primarily a consequence of placental implantation when one uterine artery is the dominant supply of the inter villous flow.^{3,4}

There is continuous search for effective means of predicting and preventing preeclampsia which has a good sensitivity, specificity and predictive value. The present study of placental localization by ultrasound at 18-24wks. as a predictor of hypertensive disorders was done to find out incidence of laterally situated placenta in a selected cohort, its association with hypertensive disorders in pregnancy so that early identification and timely management of cases can be done wherever possible.

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MATERIAL & METHODS: All women having 18-24wks. uncomplicated pregnancy undergoing obstetrics ultrasonography in Obs. and Gyn. Department, Pt. J.N.M. Medical College Raipur (C. G.) during July 2013 to December 2014 were considered for study. After careful screening through inclusion and exclusion criteria, 130 women were selected for study and site of implantation of placenta was categorized as central and lateral placenta after sonography. Placenta was classified as central when it was between Right and Left side of uterus and as lateral when 75% or more of placenta was on one side of midline.

Women were excluded from the study if they were having chronic hypertension or essential hypertension, Diabetes mellitus, thyrotoxicosis, renal disease, severe anemia, connective tissue disorder, Rh incompatibility, twin pregnancy, positive VDRL test and not willing for follow up etc.

AIMS & OBJECTIVES: The main objective of study was to find out the incidence of placental laterality and its association with development of PIH. Secondary objectives were to know any association with specific type and severity of PIH, incidence of operative interference, association of PIH with maternal BMI and neonatal outcome etc.

ANALYSIS OF RESULTS: Statistical significance of the result was evaluated by using various statistical techniques like percentage, mean, standard deviations, Z test, t test, test of significance X^2 which ever were found necessary. A value of $P < 0.05$ was considered statistically significant.

OBSERVATION AND RESULTS: All the basic parameters like age, gravidity parity and gestational age at the time of USG examination were matched for the two groups to prevent errors in results. (Table-1)

Central site of implantation of placenta was more common i.e. 71.5% (93/130) than lateral site of implantation of placenta which was 28.5%(37/130) (Figure-1). This pattern was found in both primi as well as multipara. (Table-2).

Incidence of hypertensive disorders in pregnancy (PIH) in selected cohort of 130 women was 21.5% (28/130). Central placenta group, showed high incidence of normal blood pressure at the time of delivery i.e. 90.3% (84/93) Vs. lateral placenta group i.e. 48.6% (18/37). (Figure 2).

High incidence of Pregnancy induced hypertension was associated with lateral placenta i.e. 51.3% (19/37) as compared to central placenta i.e. 9.7% (9/93), this difference is statistically significant (p value < 0.0001). (Figure -2).

When PIH was taken as basic parameter and its association with site of implantation of placenta was compared then it was found that it was more associated with lateral placenta comparatively, (p value -0.0001).

Looking at the type of PIH, GHTN were more common followed by preeclampsia and eclampsia in both the groups but comparatively incidence of GHTN were more with central placenta while eclampsia were more associated with lateral placenta. (Figure -3).

Apart from type of hypertensive disorder, severity of hypertension was also observed in relation to placental localization. All cases of hypertension were divided in mild, moderate and severe category according to Guideline development group (GDC) criteria 2009. Mild verity was commonest followed by moderate and severe hypertension in both the groups.

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Out of 28 hypertensive cases, nine were belonging to central placenta group of which no case had severe hypertension while from 19 cases of PIH in lateral placenta group, 3 had moderate and 2 went in severe hypertension category.

On comparing both the groups, lateral placenta was significantly associated with higher incidence of moderate and severe hypertension as compared to central placenta group which is statistically highly significant (Figure -4).

Association between BMI and HTN was also analyzed and data suggests that even with normal BMI, if a women had lateral placentation, she had a high chance of developing PIH and even if the women is overweight or obese but having Central placentation then the chances of developing PIH is appear to be less. (Table- 3).

In present study we had only 2 cases of obesity from which one had grade I obesity (BMI <35) and another had grade, grade III (BMI >40) obesity. Both cases had central placenta and none had developed PIH.

Prediction of PIH in relation to laterally situated placenta was calculated in terms of sensitivity, specificity, positive predictive value and negative predictive value which was 67.8, 82.3, 51.3 and 90.3 respectively. (Table- 4).

Majority of cases, 84.6% (110/130) reached at term while 8 cases (6.1%) crosses their expected date of delivery and delivered postdated. 12 cases (9.2%) delivered as preterm. Mean GA at the time of delivery was 38.6+0.8 and 39.1+1.1 wks.

On comparatively analyzing mode of delivery, it was found that vaginal delivery was more common mode in central placenta group i.e. 76.3% (71/93) Vs. 54%(19/37) while caesarean section specially emergency LSCS were more common in lateral placenta group. High incidence of caesarean section was seen with lateral placenta i.e. 45.9% (17/37) Vs. 23.6% (22/93) which is statistically significant (p value - 0.013). (Figure- 5)

Total 39 out of 130 cases had undergone caesarean section due to various indication. Out of these 39 cases of LSCS, 11(28.2%) had Fetal distress, 11 cases (28.2%) had H/O previous section and other obstetrics complication, 06(15.4%) cases had CPD, 05 (12.8%) cases had PIH, 02(5.1%) cases had oligohydramnios, 01(2.6%) case each for IUGR, Obstructed labour, cord prolapse and APH.

Specifically the Incidence of PIH as indication for caesarean section was higher in lateral placenta group as compared to central placenta i.e. 18.7%(3/16) cases as against 8.7%(2/23) cases.

Perinatal outcome was almost same for both the group and was not statistically significant. Mean value for gestational age in weeks, birth weight in kgs, Apgar score at 1 and 5 minutes were almost similar for both central as well as lateral placentation, but mean duration of stay of baby in NICU was more in lateral placenta group i.e. 6 days Vs 4 days. The majority of cases (57.7%) had birth weight between >2.5-3.5kg. Mean birth weight was 2.5±0.5 and 2.7±0.5kgs in central and lateral group respectively. Overall weight distribution was almost similar in central as well as lateral placenta cases. APGAR at 1 min was 9.3±1.7 and 9.3±2.4, APGAR at 5 min was 9.7±1.4 and 9.4±2.3 and stay in NICU was 4±1.8 and 6±2.6 days respectively in central and lateral placentation. All these parameter were statistically non-significant.

DISCUSSION: The clinical course of pregnancy induced hypertension (PIH) is progressive and is characterized by continuous deterioration that ultimately resolves only by delivery.

In lateral placenta, uterine artery closer to it has lower resistance than the one opposite to it while in central placenta both uterine arteries demonstrate similar resistance so the uteroplacental

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blood flow needs are met by equal contribution from both uterine arteries⁵. However when the placenta is laterally located the uteroplacental blood flow needs are met primarily by one of the uterine arteries with some contribution from the other uterine arteries via the collateral circulation in the majority of cases.⁶ The degree of collateral circulation may not be the same in all patients & deficient contribution may facilitate the development of preeclampsia.⁷

The significance of normal placentation for this cytotrophoblastic invasion is high and the cytotrophoblasts fail to adopt a vascular adhesion phenotype in preeclampsia. Quantitative analysis of trophoblast invasion in preeclampsia had shown restricted invasion of the trophoblastic cells in preeclampsia. This may explain the reduced trophoblastic invasion in laterally situated placenta when the uteroplacental blood flow needs are mainly met with by that side uterine artery.⁶

For present study, basic demographic parameters were taken into account for both the groups which were almost same with the study of Kakkar Tania et al.⁷ Gravity and parity parameters were coinciding with study of Pai M et al.¹

To know the position of placenta is important as lateral placentation is more prone to development of pregnancy induced hypertension.¹ Various studies shown that there is significant association between lateral placenta & development of preeclampsia.

Second trimester USG scanning is routinely being done for anomaly scan and other obstetrics purposes which can be easily used for placental localization also so we have considered cases between 18-24 wks. of gestation.

Present study suggested that central placenta is more common than lateral being 71.5% Vs 28.5%. It is statistically significant (p value <0.001). Many of the other authors like Pai M et al,¹ Patel A et al,² Liberti et al,⁸ Bhalerao et al,⁹ Magann et al,¹⁰ Kartika Devrajan et al,¹¹ also suggested that central placenta is more common. However various other studies found lateral placenta to be more common like Kofinas et al,⁵ Liberti et al,⁸ kakkar, and Elena contro et al.¹² These differences may be due to differences in criteria defining central and lateral placenta. Criteria of present study and study of Bhalerao A V et al,⁹ and results were same as in this study.

In present study, PIH cases had more lateral placenta than central, which is statistically significant (p value=0.0071). In other words it can be said that when placenta is lateral, there is high possibility of PIH (51.3%) as compared to central placenta (9.7%) which is about 5 times higher. (P value=0.0001). Other authors like Pai M et al,¹ Patel et al,² Kofinas et al,⁵ Kakkar Tania et al,⁷ Bhalerao et al,⁹ and Seadati N et al,¹³ also had found increased incidence of PIH when the placenta was laterally situated. (Table- 5)

There are so many potential screening tests for preeclampsia which have different sensitivity, specificity and predictive values. In present study we found that placental laterality has a sensitivity of 67.9% which is much better than most study with other predictors of PIH. Besides that, it has a very good specificity of 82.3% and negative predictive value of 90.3%. Although its positive predictive value is low i.e. 51.3% but so is the case with most others tests.

From the present study, it can be clearly visualize that overall development of hypertension is more common with lateral placenta and even if hypertension develops with central placenta, the chances of preeclampsia and eclampsia are low which is more common with lateral placenta. All 4 cases (100%) of eclampsia had lateral placentation. Similarly with central placenta, chances of development of hypertension are comparatively very less and even if hypertension develops, most of the time it is of mild type while in lateral placentation, over all chances of development of PIH is very high as compared to central placentation (P value<0.0001) of which some of the cases may have

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moderate to severe type of hypertension which can lead to more complication and poor prognosis as well. The results are in accordance with the study of Kakkar Tania et al.⁷

High BMI is assumed to be a additional risk factor for PIH so its correlation if any, was also noted and data suggest that even with normal BMI, if a women had lateral placenta, she had a high chances of developing PIH while if the placenta is central than even overweight cases had low chances of developing hypertension. Meher-un-nisa et al,¹⁴ suggested significantly increased risk in overweight and obese cases for gestational diabetes, preeclampsia, cesarean delivery, and delivery of a macrocosmic infant.

Other outcome like higher incidence of caesarean section with lateral placentation may be due to high operative interference related to PIH. Fetal outcome in terms of gestational age, birth weight, APGAR at 1 and 5 minutes was almost similar in both the groups. Fetal outcome in terms of weight was AGA in 86 cases, SGA in 30 cases and LGA in 9 cases and results were in accordance with the study of Liberti et al,⁸ Anuja V Bhalerao⁹ Magann et al,¹⁰ Devaranjan et al¹¹ and Elena contro et al.¹²

CONCLUSION: Prediction of preeclampsia by second trimester USG guided placental localization is simple, cheap, noninvasive, safe and effective screening method. Laterally situated placenta is associated with high risk of development of PIH.

Placental laterality can be used as a predictor of PIH with good specificity and negative predictive value. Large studies are required to further firmly conclude in this direction.

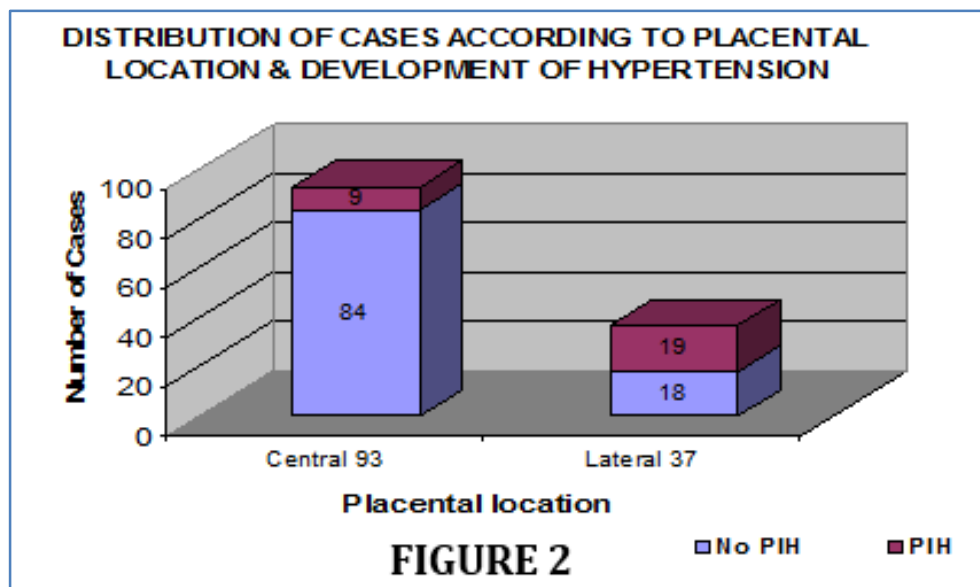
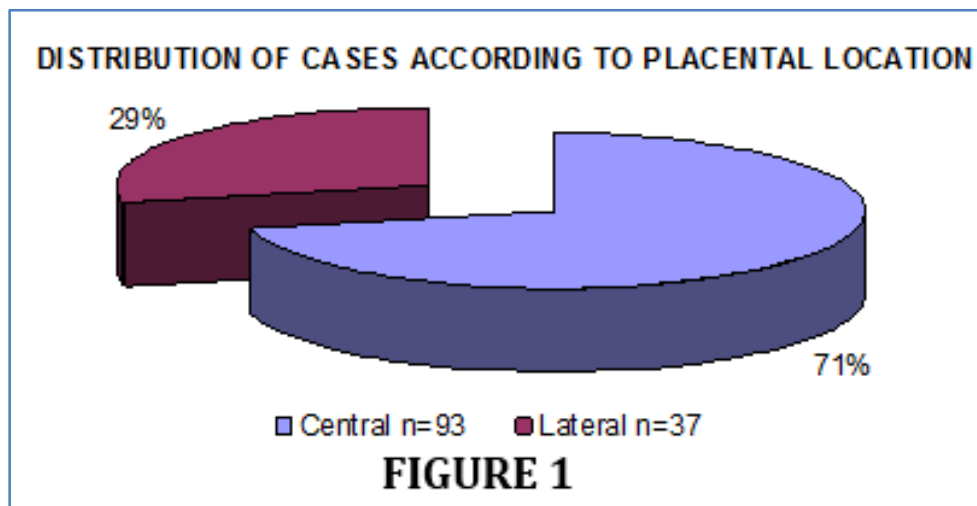
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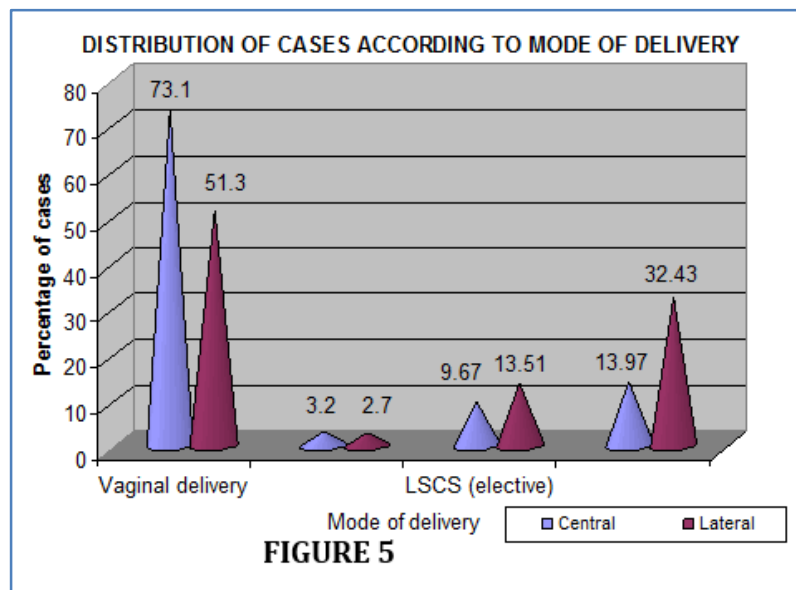
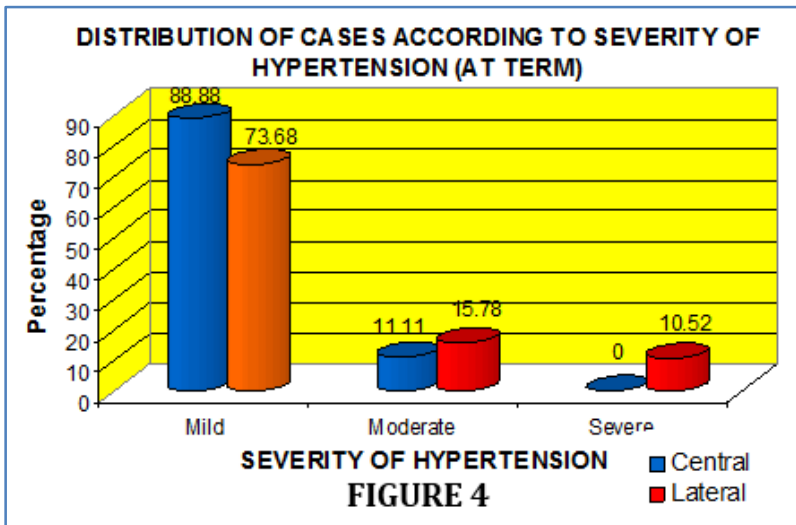
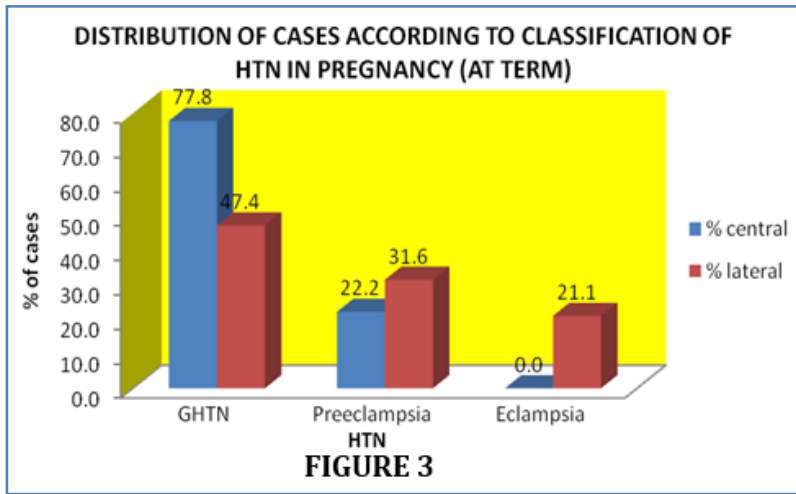
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OBSERVATION TABLES AND FIGURES:



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Sl. No.	Study Variable	Placental Location	Mean	Std. Deviation
1	Age	Central	23.4	3.1
		Lateral	24.2	4.2
2	Gravidity	Central	1.8	0.3
		Lateral	1.3	0.6
3	Parity	Central	0.7	0.7
		Lateral	0.6	0.7
4	GA at the time of USG	Central	21.2	2.1
		Lateral	20.9	1.9
5	BMI	Central	21.6	3.8
		Lateral	23.4	2.5

Table 1: Epidemiological Statistics

GA = Gestational Age in wks.

BMI = Body Mass Index

Sl. No.	Gravidity	Placenta location		P. VALUE
		Central n=93 (71.5%)	Lateral n=37 (28.5%)	
1	Primi (n=51)	36	15	0.8
2	Multi (n=79)	57	22	0.8
Total 130		93	37	

Table 2: Distribution of Placental Location in Relation to Gravidity

Sl. No.	BMI	No. of Women	Placental Location	No. PIH	PIH
1	< 18	12 (9.23%)	Central -11	11 (10.78%)	0 (0%)
			Lateral -1	01 (0.98%)	0 (0%)
2	18 – 25	103 (79.23%)	Central -73	63 (61.76%)	09 (32.14%)
			Lateral -30	15 (14.70%)	16 (57.14%)
3	26 – 30	13 (10%)	Central -07	08 (7.84%)	0 (0%)
			Lateral -06	02 (1.96%)	03 (10.71%)
4	> 30	02 (1.53%)	Central -02	02 (1.96%)	0 (0%)
			Lateral -00	0 (0%)	0 (0%)
Total		130	130	102	28

Table 3: Distribution of Cases According to BMI

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Test Result	Percentage
True positive	19
False positive	18
True negative	84
False negative	9
Sensitivity	67.86
Specificity	82.35
Positive predictive value	51.35
Negative predictive value	90.32

Table 4: Predictive Value Of Lateral Placentation For PIH

Study	Sample size	Ultrasound timing (Weeks)	Placental location	Outcomes	
				IUGR/SGA	PIH
Kofinas ⁵ (1989)	300 total	24-40	Cen. 46% Lat. 54%	IUGR 2.7 fold more in lat. Pla.	PIH 2.8 fold more in lat. Pla.
Liberti ⁸ (1997)	732 total 481 lat,251 Cen.	22-24	Lat. 65.71% Cen. 34.28%	No signi. asso.	No signi. asso.
Pai M ¹ (2005)	426 total 324 Cen,102 Lat.	20-24	Cen. 76.05% Lat. 23.94%	-	2.7 times more in lat.pla.
Kakkar Tania ⁷ (2006)	150 Total 66 Cen, 84 Lat.	18-24	Lat. 56% Cen. 44%	-	PIH 2 folds more in lat. Pla.
Magann ¹⁰ (2007)	3336 total 2914 fundal, 328 Lat,93Low	14-40	Lat. 9.8%	No signi. asso.	No signi. asso.
Devarajan ¹¹ (2009)	799 total 133 Lat,663 Cen.	20-24	Lat. 16.62% Cen. 82.87%	No signi. asso.	No signi. asso.
Elena Contro ¹² (2010)	131 total 67 Cen, 64 Lat.	20-22	Lat. 51.14% Cen. 48.85%	No signi. asso.	No signi. asso.
Patel ² (2012)	200 total 160 Cen,40 Lat.	18-22	Lat. 20% Cen. 80%	-	More common with lat. Pla.

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Seadeti N ¹³ (2012)	250 total, 149 high, 101 Low 163 ant., 87 post.	< 40	-	Increase risk of IUGR in low & lat. Pla.	increase risk with unilateral implantation
Bhalerao ⁹ (2013)	463 total, 342 Cen. 121 Lat.	20-24	Lat. 26.13% Cen. 73.86%	No signi. asso.	2.7 times increased risk of in lat. Pla.
Present Study	130 total 93 Cen. 37 Lat.	18-24	Cen. 71.53% Lat. 28.46%	No signi. asso.	PIH were 5 folds more in lat. pla.

Table 5: Comparison Of Studies Of Placental Location & Its Relative Outcome Among Different Resources & Present Study

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