RESEARCH

A PROSPECTIVE STUDY ON PLACENTAL LOCATION DURING 18-24 WEEKS OF GESTATION AND ITS PREGNANCY OUTCOME

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Abstract

Background: The placenta serves as the fetus's and mother's interface by secreting hormones that support pregnancy, carry nutrition, eliminate foetal waste, and avoid immunological rejection. The placenta grows from two sources: the maternal component comes from decidua basalis, and the main component is foetal, which develops from chorionic frondosum. There have been numerous research using placental location throughout the past few decades. The aim is to study placental location during 18-24 weeks of gestation in women between 18-35 years of reproductive age. **Materials and Methods:** The present study was a prospective observational study conducted in the Department of Obstetrics and Gynecology. 450 pregnant women were recruited into the study and were divided into three groups based on placental location at 18- 24 weeks of grstation ultrasonography by excluding the placental implantation on lower segment (placenta previa) i.e; anterior, posterior and lateral. **Result:** Out of 450, there were 205 (45.6%) of anterior placenta, 181 (40.2%) of posterior placenta, 64 (14.2%) of lateral placenta. These pregnancies were measured for the pregnancy complications and continued till the end of the pregnancy. The complications like: preterm labour, gestational diabetes, gestational hypertension, preeclampsia, fetal growth restriction and abruption placenta. The baseline characteristics like age did not show any significance. There were 54.2% of multigravidas compared to 45.8% of primigravia in the present study. In the present study, lateral placental group is associated with delivery at early gestational age and low birth weight. Lateralised placenta is associated with increased risk of LSCS whereas anterior placenta are associated with more vaginal deliveries. There were also about 5.4% of instrumental vaginal deliveries. On comparing the overall complications, lateral placenta group has increased risk of developing preterm labour, gestational hypertension, preeclampsia and fetal growth restriction. Gestational diabetes did not have any association with the site of placental implantation. In our study, the total incidence of abruption placenta is 0.6% of all the pregnancies. **Conclusion:** This study concluded that lateralised placenta plays a role in the uteroplacental circulation insufficiency which leads to the great obstetrical syndromes associated with placentation disorders like - Preterm labour, PIH, Preeclampsia and fetal growth restriction.

INTRODUCTION

Placenta is an interface between mother and fetus which secretes hormones to sustain pregnancy, transfer nutrients, disposes fetal wastes and prevents immune rejection. Placenta develops from two sources, the principal component is fetal which develops from chorionic frondosum and the maternal component is from decidua basalis. Over the past decades, there are significant studies based on placental location. Previously, many old methods like manual exploration, soft tissue x- ray films, isotopic placentography were used. Now obstetrical ultrasonography plays an important role in assessing placental implantation and location during pregnancy. And ultrasonography is said to be safe and accurate method to study placental location.

In 20th century there were extensive studies done on low lying placenta implantation due to the presence

of placenta previa. There are studies on placental position and its association with fetal position, blood supply to the fetus etc. Then in the past two decades there are studies based on lateral placental implantation and its relation associated with development of preeclampsia. Based on this, it can be inferred that site of implantation and placental location helps in assessing placental blood flow and as a result affects pregnancy outcome.[1]

Very few studies have been conducted on other aspects of placental location and its affect on pregnancy outcome. In the past there were studies conducted on placental position and its pregnancy outcome like preeclampsia, intrauterine fetal growth restriction and preterm delivery in separate studies. In North India, a study was conducted on placental location during second trimester and multiple pregnancy outcomes are measured. In this study, which was done by Singh N et al,[2] has shown that laterally located placenta have shown increased risk for preeclampsia and intrauterine fetal growth restriction and posteriorly located placenta have increased risk for preterm delivery.

There is a relative paucity of data regarding placental location and the pregnancy outcomes. Furthermore, studies of its association with specific obstetrical complications have not reached a proper conclusion, and in South India, So, this study was conducted to find if whether different sites of placental location have any role in influencing some pregnancy complications that may be more closely associated with one site rather than another site.

MATERIALS AND METHODS

A prospective, hospital-based case study will be conducted on pregnant women of reproductive age 18-35 years in outpatient clinics of department of Obstetrics and Gynaecology at MGM Hospital during May 2017 to May 2018 for a period of 12 months. 450 pregnant women are recruited. Inclusion criteria were that women aged between 18-35 years of reproductive age. Women between 18-24 weeks of gestation with singleton pregnancy. Exclusion criteria were that patients with multiple pregnancy, placenta previa, Women with medical comorbidities like chronic hypertension, diabetes, rheumatic heart disease and chronic illness. Women with fetal anomalies on second trimester ultrasonography. To locate the placenta, the probe was placed over the abdomen perpendicular to the skin and placenta was traced from the suprapubic region upto epigastrium. This is repeated in midline and on both lateral sides. The placenta was identified as a hyperechoic area separated from fetus by a hypoechoic area of amniotic fluid. About a sample of 450 women with singleton pregnancy was considered. In our hospital we advise a routine ultrasonography after 18 weeks till 24 weeks gestation for all the pregnant women. In this ultrasonography, the placental location was noted by the radiologist apart from other parameters. Placenta is divided in three categories as anterior, lateral (right and left) and posterior. Anterior placenta is the one occupying the anterior part of body of uterus and extending to the fundus. Posterior placenta is the one occupying the posterior part of the body of uterus and extending to the fundus. Lateral placenta is the one with > 2/3rd of placental width lateral of midsagittal line. All the study groups were divided into the above categories and followed up and monitored with blood pressure, blood sugar with glucose tolerance test and measured the following outcomes: Preterm labour: labour pains associated with uterine contractions and with progression of cervical changes <37 weeks period of gestation. Gestational diabetes with abnormal glucose tolerance test during pregnancy >140 mg/dl. Gestational hypertension is defined as blood pressure >140/90mmHg after 5th month of gestation with 2 readings 6 hours apart. Preeclampsia is defined as blood pressure >140/90 mmHg after 5th month of gestation and associated with proteinuria. Abruptio placenta is retroplacental collection seen ultrasonographically or clinically diagnosed. Intrauterine fetal growth restriction is birth weight less than 10th percentile of gestational age with or without an abnormal Doppler. A written consent was taken from all the subjects after explaining them regarding the study and then they were included in the study. Confidentiality was maintained. Pregnant women fulfilling the following inclusion and exclusion criteria were taken for the study and were selected among the women visited the antenatal clinic. A detailed obstetric history, physical examination and obstetrical examination was taken. Maternal age, gravidity were also recorded. Routine blood investigations like were performed. Ultrasonography was done for all the 450 women between 18-24 weeks of gestation for placental location. Obstetrical ultrasonography was performed with Toshiba ultrasound scanner using a 3.5MHz convex probe. Glucose tolerance test is done with 75gm glucose and 2hr blood sugar >140mg/dl as per DIPSI was taken as abnormal to consider them under gestational diabetes. All the parameters were recorded and the subjects are followed till the end of the pregnancy and the maternal and felt outcomes are measured. All the analysis was done using SPSS version 18. Continuous variables were expressed as absolute numbers and analysed by ANOVA test when appropriate. Categorical variables were expressed as percentage and analysed through the Chi Square ($\chi 2$) test when appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Four hundred and fifty pregnant women during May 2017 to May 2018 are included in the study and results are as follows

[Table 1] shows that among 450 patients, there are 205 (45.6%) anterior placentas, 181 (40.2%)

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posterior placenta and 64 (14.2%) lateral placenta cases. When the maternal age and placental location were compared, there was no statistically significant difference (P value was 0.33) present in mean maternal age at various placental location groups. Among all the 450 pregnant women, 206 (45.8%) are primigravida, and 244 (54.8%) are multigravida.

[Table 2] shows that the mean gestational age at delivery was lowest for lateral placental position (37.14 weeks, p = 0.001) which was statistically significant. Preterm deliveries are more significant in the lateral placenta position with about 26.6% among all the placenta groups which was also statistically significant (p < 0.001).

[Table 3] shows that different modes of delivery are compared with various placental location groups. On comparing NVD and LSCS, lateral placenta position has highest percentage (51.6%) of LSCS and lowest percentage of NVD (46.9%) among all the placental groups.

[Table 4] shows that the mean GTT values among all the placental groups has no significant p value (p value = 0.477). Gestational diabetes did not show any statistical significance with placental groups. (p value = 0.13). Out of 31 cases of gestational hypertension, pregnant women with laterally located placenta have more risk with gestational hypertension i.e, about N= 16 cases with 25% which shows a statistical significance. (p value < 0.001). Out of 15 cases of preeclampsia, it was observed that lateral placenta group has N=10 cases with 15.6% and has shown a statistically significant value. (P value was <0.001).

[Table 5] shows that the mean birth weight of the fetus is lowest (2.67 kg) in lateral placenta group which has shown a statistical significance (p value < 0.001). Out of 41 cases of diagnosed IUGR, about N = 14 cases with about (21.9%) are seen with lateral placental group with a statistical significance (p value < 0.001). Out of 3 cases of abruption placenta, placental location did not show any statistical significance with a p value 0.634.

[Table 6] shows that in overall complications, lateral placenta had 68% of complications with a statistical significant value of <0. 001.Among all the placental groups, preterm labour, gestational hypertension, preeclampsia and intrauterine fetal growth restriction shown risk for lateral placenta with a statistically significant value (p value < 0.001).

Table 1: Distribution of placental location, mean maternal age according to placental location and distribution based on parity.

Placental location	**Number**	**Percentage**
Anterior	205	45.6%
Posterior	181	40.2%
Lateral	64	14.2%
Placental location	Age in years (Mean, SD)	Number
Anterior	25.25, 4.39	205
Posterior	24.73, 4.26	181
Lateral	25.55, 4.33	64
Gravidity	Number	Percentage
Multigravida	244	54.2%
Primigravida	206	45.8%

Table 2: Mean gestational age at delivery and placental location and incidence of preterm labour in placental groups.

Placental location	**Mean gestational age (Mean, SD)**	**Number**
Anterior	38.07, 1.89	205
Posterior	38.11, 1.80	181
Lateral	37.14, 1.93	64
Placental location	Preterm labour (Absent)	Preterm labour (Present)
	Number, %	Number, %
Anterior	190, 92.7%	15, 7.3%
Posterior	161, 89%	20, 11%
Lateral	47, 73.4%	17, 26.6%

Table 3: Comparison of mode of delivery with placental location,

Mode of delivery	**Placental Location**					
	Anterior		**Posterior**		**Lateral**	
	N	**%**	**N**	**%**	**N**	**%**
Hysterectomy	1	0.5%	0	0.0%	0	0.0%
IVD	1	0.5%	6	3.3%	1	1.6%
LSCS	64	31.2%	53	29.3%	33	51.6%
NVD	139	67.8%	122	67.5%	30	46.9%

Table 4: Comparison of glucose tolerance test (GTT), gestational diabetes (GDM), gestational hypertension (GHTN), preeclampsia (PE) with placental location.

Placental location	**GTT (Mean, SD)**	**Number**
Anterior	122.32, 27.73	205
Posterior	120.88, 23.49	181
Lateral	117.83, 26.51	64
Placental location	GDM (Absent)	GDM (Present)

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	Number, %	Number, %
Anterior	156, 76.1%	49, 23.9%
Posterior	149, 82.3%	32, 17.7%
Lateral	55, 85.9%	9, 14.1%
Placental location	GHTN (Absent)	GHTN (Present)
	Number, %	Number, %
Anterior	202, 98.5%	3, 1.5%
Posterior	169, 93.4%	12, 6.6%
Lateral	48, 75%	16, 25%
Placental location	PE (Absent)	PE (Present)
	Number, %	Number, %
Anterior	202, 98.5%	3, 1.5%
Posterior	179, 98.9%	2, 1.1%
Lateral	54, 84.4%	10, 15.6%

Table 5: Comparison of mean birth weight of fetus, IUGR, abruptio placenta with placental location,

Placental location	**Birth Weight (Mean, SD)**	**Number**
Anterior	3.04, 0.51	205
Posterior	3.02, 0.49	181
Lateral	2.67, 0.56	64
Placental location	IUGR (Absent)	IUGR (Present)
	Number, %	Number, %
Anterior	194, 94.6%	11, 5.4%
Posterior	165, 91.2%	16, 8.8%
Lateral	50, 78.1%	14, 21.9%
Placental location	AP (Absent)	AP (Present)
	Number, %	Number, %
Anterior	204, 99.5%	1, 0.5%
Posterior	180, 99.4%	1, 0.6%
Lateral	63, 98.4%	1, 1.6%

Table 6: Maternal and fetal complications.

		Placental location						**P-value**
		Anterior		**Posterior**		**Lateral**		
		N	**%**	**N**	**%**	**N**	**%**	
OVERALL COMPLICATIONS	Absent	130	63.4%	118	65.2%	20	31.2%	<0.001; Sig
	Present	75	36.6%	63	34.8%	44	68.8%	
PTL	Absent	190	92.7%	161	89.0%	47	73.4%	<0.001; Sig
	Present	15	7.3%	20	11.0%	17	26.6%	
GDM	Absent	156	76.1%	149	82.3%	55	85.9%	0.137; NS
	Present	49	23.9%	32	17.7%	9	14.1%	
G.HTN	Absent	202	98.5%	169	93.4%	48	75.0%	<0.001; Sig
	Present	3	1.5%	12	6.6%	16	25.0%	
PE	Absent	202	98.5%	179	98.9%	54	84.4%	<0.001; Sig
	Present	3	1.5%	2	1.1%	10	15.6%	
AP	Absent	204	99.5%	180	99.4%	63	98.4%	0.634; NS
	Present	1	0.5%	1	0.6%	1	1.6%	
IUGR	Absent	194	94.6%	165	91.2%	50	78.1%	<0.001; Sig
	Present	11	5.4%	16	8.8%	14	21.9%	

DISCUSSION

Placenta is the least understood human organ and arguably one of the important, not only for the health of the woman and her fetus during pregnancy but also for lifelong health of both. Placental dysfunction affects the fetus causing prematurity and fetal growth and neurodevelopmental abnormalities. There are various studies explained about the placental vascularity and the pregnancy complications. Also there is a hypothesis about the unequal distribution of blood supply to the uterus by uterine vessels. On comparison of Doppler studies, it proved the importance of uterine artery Doppler and its association with preeclampsia and IUGR.[3] In the past decades there were lot of research studies conducted on low implantation of placenta and placenta previa. However there are very less data available on the association of placental location, excluding placenta previa, and pregnancy complications and the maternal and fetal outcome. In Emily L et al,[3] and Magann EF et al,[4] studies, explained that there is association of placenta position with hypertension, IUGR and preeclampsia. As uterine artery Doppler with resistance has shown risk of developing preeclampsia and IUGR, probably the placenta location can be affected by the uterine blood flow distribution and predispose to pregnancy complications.[5] In the present study, comparison of placental location can imply that unequal distribution can affect the pregnancy and may lead to complications. As these five complications have a significant effect on the maternal and perinatal outcomes, the need for studying the cause of the

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condition and associated factors is necessary. In the present study, with a sample of 450 singleton antenatal pregnancies and their pregnancy complications were measured. [Table 1] shows that there are 45.6% of anterior placenta, 40.2% of posterior placenta and 14.2% laterally located placenta. Among all the women, 54.2% were primigravida whereas 45.8% were multigravida. In the study there were no differences between the baseline characteristics like maternal age among the three placental groups. The mean maternal age of all the subjects among all the groups with the lowest value was 24.73 ± 4.26 years. there is no statistical significance of mean maternal age with the different placental location groups. The mean gestational age at delivery was lowest in lateral placenta group (37.14±1.93 weeks) with a highly significant p value (p <0.001). In study conducted by Zia et al6, the mean maternal age was lowest in anterior placental group (31.8±5.2) years and the mean gestational age at delivery was lowest in anterior placental group (37.2±2) weeks with a non-significant p value. the mean GTT values among the placental groups was highest in the anterior placenta group i.e, 122.32± 27.73 mg/dl with doesn't show statistical significance (p value= 0.477). On comparing mode of delivery among various placental groups, there were increased rates of caesarean section (51.6%) and decreased rates of normal vaginal delivery (46.9%) in the lateral placental group. The mean birth weight of the fetus among all the placental groups is lowest in lateral placenta (2.67± 0.56)kgs with highly statistical significant value (p < 0.001). Among the continuous variables like the mean maternal age, mean gestational age at delivery, mean birth weight of the fetus and the mean GTT values among the placental groups, maternal age and GTT values showed a non-significant value and did not show any association with the placental groups. Among the categorical variables like gravidity and mode of delivery, the mode of delivery has shown increased percentage of caesarean section and decreased percentage of normal delivery in the lateral placental group. In the present study, it was found that preterm labour is more in the lateral placental group with N= 64 and present in 14 cases i.e, 26.6% which has shown a statistical significance (p value < 0.001). Contrarily, to the present study it was found that posterior placenta has got significant correlation with preterm delivery in other studies. In a study by Hadley et al,[7] it was found that fundal location of the placenta are significantly increased risk for premature rupture of membranes. Another study by Singh N et al,[2] found that posteriorly located placenta is associated with preterm labour. . In study results by Zia S,[6] has shown that posterior placenta location groups is associated with preterm labour. In a study by Misra et al8, which was conducted included a sample of 523 pregnant women.it concluded that women who delivered preterm had their mean uterine artery resistance higher while the mean umbilical artery resistance index (RI) decreased significantly more slowly than other counterparts. It explains that pregnancies with either higher uterine or umbilical artery RI across gestation are more likely to be affected by preterm delivery suggesting that disordered placentation resulting in compromised placental blood flow may be an important pathway for preterm delivery. However, in the present study it did not show any risk for preterm labour in posterior placenta group. In the present study we found that gestational diabetes was present more in association with anterior placenta (23.9%). However it did not show any statistical significance (p = 0.137). Similar to the present study, the study of Zia. S6 also found that anterior placenta are more associated with gestational diabetes. It can be explained that placental location may be associated with alterations in its anatomy and physiology. However, there are no available studies in relation to placental location with gestational diabetes. In the present study, it showed that there are 31 cases of gestational hypertension with more percentage of cases present in association with the lateral placenta (25%) group, which show a statistical significance (p value< 0.001). Similar to the present study, another study by Nandanwar et al,[5] has found that there is significant relationship between laterally located placenta and development of gestational hypertension. They also said that there is three times risk in development of PIH for laterally located placenta. In the present study, there were 15 cases of preeclampsia, with highest (15.6%) in lateral placenta group with a statistical significance.[8] It can be inferred from this that preeclampsia is more in lateral placenta groups compared with other groups. K.D. Seckin et al,[9] Magann EF et al,[4] Aggarwal P et al,[10] studies were based on lateralisation of placenta for prediction of preeclampsia. Similar to the present study, a study conducted by Yousuf S,[11] also has shown that pregnant women with lateral placenta women has increased risk for developing preeclampsia. But they have compared lateral placenta alone and lateral placenta with Doppler and found that lateral placenta with abnormal Doppler waveform group is at increased risk of developing preeclampsia than lateral placenta group alone. Joni et al. also reported similar findings. They observed that out of 400 cases enrolled 80 (20%) cases had lateral placenta on ultrasound examination done at 18- 24 weeks of gestation. Out of the 80 women with laterally located placenta, 28 (35%) developed preeclampsia which was statistically significant. Alpesh et al. observed that 14(35%) out of 40 subjects having lateral placenta developed preeclampsia. (p < 0.001). Out of all 40 pateints having lateral placenta who underwent colour Doppler, 13 subjects had raised uterine artery resistance (p < 0.001). They concluded that lateral placenta can be used as a predictor of preeclampsia. In the present study, we found that there is a correlation between laterally located placenta and development of IUGR in the fetus. Out of 41 cases of IUGR, 14 (21.9%) cases with laterally located placenta has increased risk of developing fetal growth

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restriction. In a study by Lucy et al,[3] the results are consistent with present study. A retrospective study done by Lucy et al. has found that unilateral placenta are more associated with IUGR pregnancies. In that study with about 327 pregnancies dividing into cases and controls, and distributed the placenta location groups into anterior, posterior, fundal and low lying placenta. In literature, they found a statistical significance with odds ratio 4.6, 95% confidence interval 1.6-13.5. In literature, this study, also monitored the delivery outcomes and found a statistical significance with increased need for antenatal corticosteroids, LSCS, preterm delivery, low birth weight, low APGAR and neonatal ICU admission. Contrarily, study done by Karthika et al.[12] did not find any association of mean birth weight among placental location groups. There are several theories explaining that there is some pathology in lateral implantation of uterus which makes fetal growth less favourable than comparing with the other sites. This study also explains that uterine arteries branch into arcuate and radiate arteries and supply ipsilateral side of the uterus. In some patients, these arcuate arteries branch and cross to opposite side and anastomose with contralateral branches as observed in Itskovitz J et al,[13] study. Additionally, this study also found marked difference in incidence of maternal hypertension in pregnancy and low APGAR scores in IUGR groups. Kofinas et al,[14] conducted a study on the effect of placenta location with regard to velocity waveforms in the uterine arteries. In their study it was also explained that there may be some anatomical mechanism due to which there is decreased blood flow to lateral side of the uterus. The present study results are also in parallel with other few studies.[11] In the present study there are 3 cases of abruption placenta, of which 1 with posterior placenta and 2 cases with left lateral placenta. However, it is difficult to compare because of an insufficient number of abruption. It requires more number of cases with abruption to compare.

CONCLUSION

This study compared the placental position in the upper segment and complications like preterm labour, gestational hypertension, preeclampsia, fetal growth restriction, gestational diabetes and abruption placenta. It was found that lateralised placenta is at increased risk of developing preterm labour, preeclampsia and fetal growth restriction. The etiology can be explained by the abnormal invasion of the trophoblasts and the inadequate blood supply of the uterus on the either of lateral side. This helps that pregnant women with lateralised placenta can be followed up and advise them prophylactic measures like prescribing aspirin, regular growth monitoring of the scans and the Doppler which might decrease the pregnancy complications.

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