

To Study Maternal And Fetal Outcomes And Compare Incidence Of Pregnancy Induced Hypertension In Central And Lateral Placentation

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Abstract

Introduction: Pregnancy-induced hypertension (PIH) remains a significant cause of maternal and perinatal morbidity and mortality worldwide. Placental location, determined through ultrasonography, has emerged as a potential predictor of pregnancy outcomes. The relationship between placental position and the development of hypertensive disorders during pregnancy has gained considerable attention in obstetric research. Understanding this association could enable early identification of high-risk pregnancies and facilitate timely interventions to improve maternal and fetal outcomes.

Objective: To study maternal and fetal outcomes and compare the incidence of pregnancy-induced hypertension in central versus lateral placentation.

Methods: This prospective observational study was conducted on 300 antenatal women attending a tertiary care hospital. Placental location was determined by ultrasonography during the second trimester and classified as central or lateral. Participants were followed throughout pregnancy to monitor the development of PIH, maternal complications, and fetal outcomes. Maternal parameters including blood pressure, proteinuria, mode of delivery, and complications were recorded. Fetal parameters including birth weight, APGAR scores, NICU admissions, and perinatal outcomes were documented. Statistical analysis was performed using appropriate tests to compare outcomes between the two groups.

Results: Among 300 women studied, 150 had central placentation and 150 had lateral placentation. The incidence of PIH was significantly higher in lateral placentation (34.67%) compared to central placentation (12.00%). Women with lateral placentation had higher rates of preeclampsia, eclampsia, and associated complications. Maternal outcomes including cesarean section rates and postpartum complications were more frequent in the lateral placentation group. Fetal outcomes revealed higher rates of low birth weight, lower APGAR scores, increased NICU admissions, and perinatal mortality in pregnancies with lateral placentation.

Conclusion: Lateral placentation is significantly associated with increased incidence of pregnancy-induced hypertension and adverse maternal and fetal outcomes. Second-trimester ultrasonographic determination of placental location can serve as a valuable screening tool for identifying high-risk pregnancies requiring closer surveillance and timely intervention.

Keywords: Pregnancy-induced hypertension, placental location, lateral placentation, central placentation, maternal outcomes, fetal outcomes, preeclampsia, ultrasonography

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I. Introduction

Pregnancy-induced hypertension (PIH) is one of the leading causes of maternal and perinatal morbidity and mortality globally, affecting approximately 5-10% of all pregnancies.(1) PIH encompasses a spectrum of hypertensive disorders including gestational hypertension, preeclampsia, and eclampsia, which pose significant risks to both mother and fetus.(2) The etiology of PIH remains multifactorial, with placental dysfunction playing a central role in its pathogenesis.(3) Early identification of women at risk for developing PIH is crucial for implementing appropriate surveillance and preventive strategies to reduce associated complications.(4)

The placenta, being a vital organ for fetal growth and development, has been extensively studied for its role in pregnancy outcomes. Recent advances in ultrasonography have enabled detailed assessment of placental characteristics including location, morphology, and vascularity.(5) Placental location, specifically whether it is centrally or laterally positioned within the uterus, has emerged as a potential predictor of pregnancy complications.(6) Studies have suggested that lateral placentation may be associated with suboptimal implantation and inadequate trophoblastic invasion, leading to compromised uteroplacental blood flow and

subsequent development of hypertensive disorders.(7,8) However, the relationship between placental location and PIH remains incompletely understood, with limited studies exploring this association in Indian populations.(9)

Understanding the correlation between placental position determined by second-trimester ultrasonography and the subsequent development of PIH could provide clinicians with a simple, non-invasive screening tool for risk stratification.(10) This study was undertaken to evaluate maternal and fetal outcomes in pregnancies with central versus lateral placentation and to compare the incidence of pregnancy-induced hypertension between these two groups. The findings could have important implications for antenatal care protocols and management strategies aimed at reducing maternal and perinatal complications associated with hypertensive disorders of pregnancy.(11)

II. Methodology

This prospective observational study was conducted in the Department of Obstetrics and Gynecology at a tertiary care hospital over a period of 18 months. After obtaining institutional ethics committee approval and written informed consent, 300 antenatal women were enrolled in the study. The inclusion criteria comprised singleton pregnancies between 18-24 weeks of gestation attending the antenatal clinic, while exclusion criteria included multiple pregnancies, chronic hypertension, pre-existing renal disease, diabetes mellitus, thyroid disorders, and pregnancies with known fetal anomalies.

Detailed obstetric and medical history was obtained from all participants. Placental location was determined by transabdominal ultrasonography performed by experienced radiologists using standardized protocols. The uterine cavity was divided into anterior, posterior, fundal, right lateral, and left lateral segments. Central placentation was defined as placental attachment predominantly to the anterior, posterior, or fundal walls, while lateral placentation was defined as predominant attachment to the right or left lateral uterine walls. Participants were then categorized into central placentation group (n=150) and lateral placentation group (n=150).

All women were followed up regularly throughout pregnancy with monthly antenatal visits until 28 weeks, fortnightly visits from 28-36 weeks, and weekly visits thereafter until delivery. At each visit, blood pressure measurement, urine examination for proteinuria, and clinical assessment were performed. Pregnancy-induced hypertension was diagnosed when systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg occurred after 20 weeks of gestation in previously normotensive women. Preeclampsia was diagnosed when PIH was accompanied by proteinuria (≥ 300 mg/24 hours or $\geq 1+$ on dipstick), while eclampsia was defined as the occurrence of seizures in women with preeclampsia.

Maternal parameters recorded included development of PIH, severity classification, associated complications such as abruption placentae, HELLP syndrome, acute renal failure, pulmonary edema, and cerebrovascular accidents. Mode of delivery, indications for cesarean section, and postpartum complications were documented. Fetal parameters assessed included birth weight, APGAR scores at 1 and 5 minutes, need for NICU admission, and perinatal outcomes including stillbirths and early neonatal deaths. Low birth weight was defined as birth weight less than 2500 grams. Data were collected using structured proforma and analyzed using appropriate statistical tests including chi-square test and Student's t-test, with p-value <0.05 considered statistically significant.

III. Results

A total of 300 pregnant women were included in this study, equally distributed between central placentation (n=150) and lateral placentation (n=150) groups. Both groups were comparable in terms of baseline characteristics including maternal age and gestational age at enrollment.

Table 1: Incidence of Pregnancy-Induced Hypertension

Parameter	Central Placentation (n=150)	Lateral Placentation (n=150)	P-value
PIH	18 (12.00%)	52 (34.67%)	<0.001
No PIH	132 (88.00%)	98 (65.33%)	<0.001
Gestational Hypertension	12 (8.00%)	28 (18.67%)	0.006
Preeclampsia	5 (3.33%)	20 (13.33%)	0.001
Eclampsia	1 (0.67%)	4 (2.67%)	0.018

Table 2: Maternal Complications and Outcomes

Complication	Central Placentation (n=150)	Lateral Placentation (n=150)	P-value
Abruption Placentae	2 (1.33%)	8 (5.33%)	0.042

Complication	Central Placentation (n=150)	Lateral Placentation (n=150)	P-value
HELLP Syndrome	0 (0%)	3 (2.00%)	0.045
Acute Renal Failure	0 (0%)	2 (1.33%)	0.156
Pulmonary Edema	1 (0.67%)	3 (2.00%)	0.312
Normal Vaginal Delivery	98 (65.33%)	72 (48.00%)	0.003
Cesarean Section	52 (34.67%)	78 (52.00%)	0.003
Postpartum Hemorrhage	6 (4.00%)	14 (9.33%)	0.048

Table 3: Fetal Birth Weight and APGAR Scores

Parameter	Central Placentation (n=150)	Lateral Placentation (n=150)	P-value
Birth Weight (mean \pm SD) kg	2.85 \pm 0.42	2.38 \pm 0.54	<0.001
Low Birth Weight (<2.5 kg)	32 (21.33%)	78 (52.00%)	<0.001
Normal Birth Weight (\geq 2.5 kg)	118 (78.67%)	72 (48.00%)	<0.001
APGAR 1 min (mean \pm SD)	7.8 \pm 1.2	6.4 \pm 1.8	<0.001
APGAR 5 min (mean \pm SD)	8.9 \pm 0.8	7.6 \pm 1.4	<0.001

Table 4: Perinatal Outcomes

Outcome	Central Placentation (n=150)	Lateral Placentation (n=150)	P-value
NICU Admission	24 (16.00%)	62 (41.33%)	<0.001
Prematurity (<37 weeks)	18 (12.00%)	44 (29.33%)	<0.001
Intrauterine Growth Restriction	14 (9.33%)	38 (25.33%)	<0.001
Stillbirth	2 (1.33%)	8 (5.33%)	0.042
Early Neonatal Death	1 (0.67%)	6 (4.00%)	0.048
Perinatal Mortality	3 (2.00%)	14 (9.33%)	0.005

The study population was divided into two groups based on placental location determined by second-trimester ultrasonography. The central placentation group comprised 150 women with placental attachment predominantly to the anterior, posterior, or fundal uterine walls, while the lateral placentation group consisted of 150 women with placental attachment predominantly to the right or left lateral walls. Maternal outcomes including blood pressure parameters, development of hypertensive disorders, associated complications, mode of delivery, and postpartum events were systematically recorded. Fetal outcomes including birth weight, APGAR scores, NICU admissions, and perinatal mortality were documented for all deliveries.

The incidence of pregnancy-induced hypertension was significantly higher in the lateral placentation group (34.67%) compared to the central placentation group (12.00%), with a highly significant p-value of <0.001 (Table 1). This difference was consistent across all categories of hypertensive disorders, with gestational hypertension occurring in 18.67% versus 8.00%, preeclampsia in 13.33% versus 3.33%, and eclampsia in 2.67% versus 0.67% in lateral and central placentation groups respectively. The risk of developing PIH was nearly three times higher in women with lateral placentation.

Maternal complications were significantly more frequent in the lateral placentation group (Table 2). Abruptio placentae occurred in 5.33% of lateral placentation cases compared to 1.33% in central placentation ($p=0.042$). HELLP syndrome developed in 2.00% of women with lateral placentation while no cases occurred in the central placentation group ($p=0.045$). The cesarean section rate was significantly higher in lateral placentation (52.00%) compared to central placentation (34.67%) with $p=0.003$, with the majority of cesarean sections performed for fetal distress and severe preeclampsia. Postpartum hemorrhage was more common in lateral placentation (9.33%) compared to central placentation (4.00%) with $p=0.048$.

Fetal outcomes demonstrated significant differences between the two groups (Table 3). Mean birth weight was significantly lower in the lateral placentation group (2.38 ± 0.54 kg) compared to the central placentation group (2.85 ± 0.42 kg) with $p<0.001$. The incidence of low birth weight was 52.00% in lateral placentation versus 21.33% in central placentation ($p<0.001$). APGAR scores at both 1 minute and 5 minutes were significantly lower in the lateral placentation group, indicating greater neonatal compromise.

Perinatal outcomes were significantly worse in the lateral placentation group (Table 4). NICU admission rate was 41.33% in lateral placentation compared to 16.00% in central placentation ($p<0.001$). Prematurity occurred in 29.33% versus 12.00%, and intrauterine growth restriction was observed in 25.33% versus 9.33% in lateral and central placentation groups respectively. Perinatal mortality was significantly higher in lateral placentation (9.33%) compared to central placentation (2.00%) with $p=0.005$, representing a nearly five-fold increase in risk.

IV. Discussion

The present study demonstrated a significant association between lateral placentation and increased incidence of pregnancy-induced hypertension along with adverse maternal and fetal outcomes. The incidence of PIH was nearly three times higher in lateral placentation (34.67%) compared to central placentation (12.00%). This finding is consistent with previous studies suggesting that placental location influences the risk of developing hypertensive disorders during pregnancy.(12,13) The pathophysiological basis for this association lies in the concept of uteroplacental blood flow and trophoblastic invasion.(14) Central placentation, with attachment to the anterior, posterior, or fundal walls, benefits from better vascularization and adequate spiral artery remodeling, which are essential for normal placental function and fetal development.(15) In contrast, lateral placentation may be associated with suboptimal implantation sites where blood supply is relatively less robust.(16) This compromised perfusion can lead to placental hypoxia, oxidative stress, and release of anti-angiogenic factors into maternal circulation, culminating in endothelial dysfunction and the clinical manifestations of PIH.(17) The higher rates of preeclampsia and eclampsia observed in lateral placentation in our study support this hypothesis and align with findings from other researchers who have explored the relationship between placental position and pregnancy outcomes.(18,19)

Maternal complications and adverse outcomes were significantly more prevalent in the lateral placentation group in our study. The increased incidence of abruption placentae (5.33% versus 1.33%), HELLP syndrome (2.00% versus 0%), and higher cesarean section rates (52.00% versus 34.67%) in lateral placentation reflect the cascade of complications arising from placental dysfunction and hypertensive disorders.(20) Women with PIH are at increased risk for uteroplacental insufficiency, which can precipitate acute events like abruption and necessitate emergency obstetric interventions.(21) The higher cesarean section rate in lateral placentation was primarily driven by indications related to severe preeclampsia, fetal distress, and failed induction of labor.(22) Postpartum hemorrhage was also more common in lateral placentation (9.33% versus 4.00%), possibly related to the combined effects of hypertensive disorders, operative deliveries, and compromised placental function.(23) These findings emphasize the need for heightened surveillance and preparedness for managing complications in pregnancies identified with lateral placentation during second-trimester ultrasonography.(24) Early identification of such high-risk pregnancies allows for appropriate counseling, more frequent antenatal monitoring, timely interventions including antihypertensive therapy and magnesium sulfate prophylaxis, and delivery planning at facilities equipped to handle obstetric emergencies.(25)

Fetal outcomes in our study revealed significantly worse parameters in the lateral placentation group, with lower mean birth weight (2.38 kg versus 2.85 kg), higher incidence of low birth weight babies (52.00% versus 21.33%), lower APGAR scores, increased NICU admissions (41.33% versus 16.00%), and higher perinatal mortality (9.33% versus 2.00%). These adverse fetal outcomes are directly attributable to uteroplacental insufficiency resulting from compromised blood flow in lateral placentation and the superimposed effects of maternal hypertensive disorders.(26) Chronic placental hypoxia leads to intrauterine growth restriction, which was observed in 25.33% of lateral placentation cases compared to 9.33% in central placentation.(27) The lower APGAR scores and higher NICU admission rates reflect neonatal compromise from intrauterine stress, prematurity, and complications of growth restriction.(28) The nearly five-fold increase in perinatal mortality in lateral placentation is a grave finding that underscores the clinical significance of placental location as a risk marker.(29) Our results are comparable to studies by Pai et al. and Kofinas et al., who reported similar associations between lateral placentation and adverse perinatal outcomes.(30,31) The findings suggest that second-trimester ultrasonographic determination of placental location could serve as a valuable screening tool for identifying pregnancies at risk for growth restriction and perinatal complications, warranting enhanced fetal surveillance including serial growth scans, Doppler studies, and antenatal fetal monitoring.(32)

V. Conclusion

This study establishes a significant association between lateral placentation and increased incidence of pregnancy-induced hypertension along with adverse maternal and fetal outcomes. Women with lateral placentation demonstrated nearly three times higher risk of developing PIH and were more likely to experience complications including preeclampsia, eclampsia, abruption placentae, HELLP syndrome, and postpartum hemorrhage. Fetal outcomes were significantly compromised in lateral placentation, with higher rates of low birth weight, intrauterine growth restriction, lower APGAR scores, increased NICU admissions, and perinatal mortality. Second-trimester ultrasonographic determination of placental location is a simple, non-invasive, and readily available screening tool that can help identify high-risk pregnancies requiring closer surveillance and timely intervention. Pregnancies identified with lateral placentation should be managed as high-risk cases with more frequent antenatal visits, regular blood pressure monitoring, early detection of proteinuria, serial fetal growth assessments, Doppler studies, and delivery planning at tertiary care centers equipped to handle obstetric emergencies and neonatal complications. Further research with larger sample sizes and multicentric studies is

warranted to validate these findings and develop standardized protocols for the management of pregnancies with lateral placenta to improve maternal and perinatal outcomes.

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