Research article

Lateral position of placenta detected on ultra-sonogram at 18 to 24 weeks of pregnancy as a predictor for development of preeclampsia

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ABSTRACT

The placenta is an important organ that connects the mother to the fetus. It is a well-known cause of pregnancy hypertension. The position of the placenta and the development of preeclampsia are linked in several studies. The purpose of this study was to determine whether the percentage delay as determined by ultrasound could be used as a predictor of the development of preeclampsia. A retrospective and prospective, and observational study was done in Choithram Hospital & Research Centre, Indore. The study was done on 130 pregnant women, out of which 62 females had laterally located placenta and 68 had centrally located placenta selected randomly from November 2015 to November 2017. Preeclampsia developed in 68.09 percent of women in the lateral placenta group. Only 31.91 percent of women in the group with the central placenta developed preeclampsia. As a result, females with a laterally positioned placenta had a 3.7 times higher risk of having PIH than those with a centrally situated placenta. With a laterally placed placenta, the overall chance of having PIH was 3.769. This study, laterally located placenta increased association of development of preeclampsia in patients than centrally located placenta which reduces the hospital burden, and long term consequences of the disease thereby reducing the huge cost of critical care for mother and newborn. Thus, making ultrasonography a cost effective, practical, painless, beneficial and reliable screening tool.

INTRODUCTION

In our country, the disease affects 5-15 percent of pregnant women, with an average mortality rate of 20 percent.[1] Preeclampsia affects about 8% to 10% of all pregnancies in India. In prim gravidae, the incidence is 10%, and in multi gravidae, it is 5%.Recent confidential enquiry in to maternal deaths in UK was found hypertensive disorder which is the 2nd leading direct cause of maternal death.[2]Preeclampsia is a disease of trophoblastic tissue.

High blood pressure in pregnancy is known to be caused by the placenta. Placental implants with abnormal trophoblastic attacks of the uterine vasculature are one of the causes of preeclampsia. The presence of trophoblastic tissue is therefore essential for preeclampsia to occur. When the placenta is located on the side, the adjacent uterine artery has a lower resistance than it's opposite, and in women with a central placenta, both arteries have the same resistance. As a

result, the rate of secretion may vary, allowing preeclampsia, FGR, or both to increase. [3, 4]

Even with extensive research and improved technology in recent decades, clinical presentation is highly variable; and before diagnosis is confirmed, disease progresses over the course of week. Diagnosing preeclampsia remains a challenge, because it is characterized by hypertension and features of multiple organ disease. As a result, there are no effective preventive or curative measures. Roll over test, isometric handgrip or cold press test, angiotensin II sensitivity test, mid-trimester mean arterial pressure, uterine artery Doppler, and nail bed test pressure stiffness the test has all been found in favour over the past decade. [5]

Weight gain also cannot predict development of pregnancy induced hypertension and excess weight gain alone does not adversely affect the outcome. [6]

A good screening test should be simple, safe, non-invasive, low-cost, dependable, simple to execute, and easy to interpret. Ultrasound has proven to be the safest, easiest, and most reliable tool for determining placental position during the last two decades. The goal of USG of the placenta in the later weeks of pregnancy is to determine the location of the placenta and identify any anomalies.[6]

The **aims and objective** of the study was the lateral position of placenta as a predictor of preeclampsia at 18 to 24 week pregnancy detected on ultra-sonogram. However, other parameters can also be combined with placental laterality, improving the sensitivity and specificity for prediction of PE.

METHODS AND MATERIAL

This study was done Retrospective and prospective, non-interventional and observational study in department of obstetrics and gynaecology, from period October 2015 to October 2017. 130 pregnant woman attending antenatal clinic, both outpatient and ward admissions, at 18 to 24 week of gestation after satisfying inclusion and exclusion criteria were included in the study and subjected to trans abdominal ultrasonography.

Inclusion criteria for retrospective study

Any pregnant woman who had attended the antenatal clinic, both outpatient and inpatient, Woman of any age, gravidity, parity, socioeconomic status and educational status, Permission will be obtained from the Medical Records Section and Ethics Committee of Choithram Hospital & Research Centre, Indore for using the medical records of these patients

Inclusion criteria for prospective study

Any pregnant woman attending antenatal clinic, both outpatient and ward admissions, Woman of any age, gravidity, parity, socioeconomic status and educational status, Woman and /or her legally acceptable representative willing to provide voluntary written informed consent

Exclusion criteria

Previous history of preeclampsia or eclampsia, Diabetic mellitus, Chronic hypertension or essential hypertension, Thyrotoxicosis, Renal disease, RH incompatibility, positive lupus anticoagulant anti-cardiolipin antibodies, Women and / or her legally acceptable representative not willing to provide voluntary written informed consent.

All women attending antenatal clinic of tertiary care hospital and ward admission were recruited in the study as per the formulated inclusion and exclusion criteria after counselling and taking written informed consent. Details of the pregnant woman were noted such as name, age, present symptoms, last menstrual period, menstrual history for menarche, her details history of clinical presentation of patient, obstetrical history, Recording of the ultrasonography report at 18 to 24 weeks, that all women with central and lateral placenta were followed up till development of preeclampsia as per ACOG guidelines and later till delivery to see outcome of pregnancy. The ultrasonologist used the WIPRO GE LOGIQ E9 USG machine to perform the ultrasound, and the placenta was described as centrally distributed evenly along the right and left sides of the uterus, except the internal, posterior, or cervical region. It was defined as the right or left placenta where 75 percent or more of the placental weight on one side of the midline. Based on location of placenta they were divided in to two groups: lateral and central placenta.

RESULT AND OBSERVATIONS

In this study 130 women were recruit in our study, majority of women were in between 21-25 years age group. Mean age group in lateral placenta was 24.77 ± 3.87 and in central placenta was 25.79 ± 3.89. Among 47 preeclampsia women, 23 (48.94%) and in normotensive women, 44 (53.01%) were in the age group 21-25 years. (Table No. 1)

In present study, maximum women were prim gravidae with preeclampsia were 33 (70.21%) were prim gravidae and with normotensive 47 (56.63%) were prim gravidae. Among prim gravidae, 46 (74.19%) were in lateral placenta and 34 (50.0%) women were in central placenta. (Graph No. 1). Among 47 women were preeclampsia, 39 (82.98%) women were in the BMI 19-25 $kg/m^{2,}$ and in normotensive women, 63 (75.90%) were in normal range (Table No. 2).

In our study 68% of cases were developed preeclampsia in 36 to 39 week of gestation age. Maximum preeclampsia cases were diagnosed in lateral location 57 (83.82%) of placenta than centrally located placenta 48 (77.42%) in the gestation week 36-39 weeks. Among 47 preeclampsia women, 44 (95.74%) were preeclampsia without severity, out of which 31 were in lateral location of placenta and 14 were in central location of placenta group. 2 (4.26%) with severity, out of which 1 were in lateral location of placenta and 1 in central location of placenta group (Table No. 3).

In this study of 130 women in total, 62 (47.7%) women had a placenta later and 68 (52.3%) had a middle placenta. Preeclampsia was present in 32 women (68.09%) with traumatic injuries, while there were 15 women (31.91%) with spinal cord injuries. Therefore, the risk of developing PIH was 3.7 times greater in women with placental abruption compared with those with central placenta. The total risk of developing PIH in the placenta was later found to be 3.769 (odds ratio) and 95% CI (1.764- 8.054) .The difference was found to be statistically significant (Table No. 4, Graph No. 2).

DISCUSSION

Preeclampsia is a multi-organ systemic clinical condition that continues to be the leading cause of maternal and neonatal mortality and morbidity. In prim gravida incidence is 10% and in multigravida is 5%. In India, the incidence of preeclampsia being 8-10% of all pregnancies. In our study, Young age female shows higher

incidence of preeclampsia as well as 82.98% were belongs to normal range of BMI (19-25 kg/m2) which was comparable to Jaiswal et al. 2015[7] study shows that 79.23% were in 18-25 (kg/m^2) group,

In present study, women developing preeclampsia had laterally situated placenta in 68.09% which was statistically significant. This suggested that 3.76 times high possibilities of development of PIH in laterally located placenta as comparison to central location placenta. In Nandanwar et al[8] and Jani PSt al [9] risk of developing PIH in laterally located placenta was 3.45 times than centrally located placenta and in Aggarwal et al[10] PIH was 3.16 times more in lateral than central located placenta.

In this study total 130 women are, 62 females had laterally located placenta and 68 had centrally located placenta. Out of the 62 women with laterally located placenta, 32 developed PIH as compared to women with centrally located placenta where 15developed PIH. So, the risk of developing PIH was 3.7 times greater for the females with laterally located placenta as compared to those with centrally located placenta. The overall risk of developing PIH with laterally located placenta was 3.769 (odds ratio) and 95 % CI (1.764- 8.054).In TABLE NO. 5our study Sensitivity 68.09%, Specificity 63.86 %, Positive Predictive Value 51.61%.Nandanwar et al (2015)[8], Bhalerao et al (2013)[11], Kakar et al (2013)[12], Kaku R et al (2017)[13] , Bhattacharjee AK at el[14]these are the studies in which lateral location of placenta were more common than central placenta. (Table No. 6).

In our study 68% of cases were developed preeclampsia in 36 to 39 week of gestation age. Maximum preeclampsia cases were diagnosed in lateral location 57 (83.82%) of placenta than centrally located placenta 48 (77.42%) in the gestation week 36-39 weeks. In Kaku et al (2017)[13] study PIH appearance was seen in 30-34 weeks, was found to be earlier as compared to our study findings.

In present study the sensitivity of placental laterality for predicting PE was 68.09%, which was comparable to study by Kofinas et al[15] in which the sensitivity for predicting PE was 73%.

In our study 68.09% women were diagnosed PIH in 36 to 40 weeks. In Kaku et al (2017)[13] PIH appearance was seen in 30-34 weeks, was found to be earlier as compared to our study findings.

CONCLUSION

According to the findings of this study, placental placement delayed in ultrasound at 18 to 24 weeks was associated with a higher risk of preeclampsia. Women with a subsequent placenta have a 3.4 times higher chance of developing PIH, so this pregnancy may require careful obstetric management to achieve a positive outcome and avoid serious maternal complications, as well as reduce maternal and perinatal morbidity and death associated with preeclampsia.

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Table No. 1 Comparison of Mean Age of Mother with Location of Placenta

Location of Placenta	N	Age		t Value	p value
		Mean	Std. Deviation		
Lateral	62	24.77	3.87	-1.495	0.137 (NS)
Central	68	25.79	3.89		

Graph No. 1: Relationship between Gravida and Location of Placenta
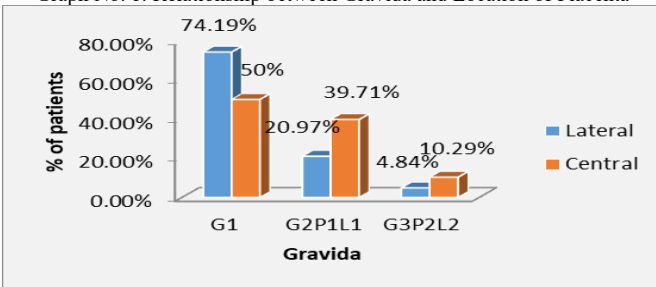
Table No. 2 Risk of Preeclampsia with BMI

BMI	Preeclampsia		Total
	Present	Absent	
≤18	0	13	13
19-25	39	63	102
26-30	6	7	12
>30	2	0	3
Total	47	83	130

Table No. 3 Risk of Preeclampsia with Gestational Weeks

Gestational weeks	Preeclampsia		Total
	Present	Absent	
≤30 weeks	3	0	3
31-35 weeks	7	0	7
36-39weeks	32	73	105
≥40 weeks	5	10	15
Total	47	83	130

Table No. 4 Risk of Preeclampsia in Relation to Location of Placenta

Location of placenta	Preeclampsia		Total
	Present	Absent	
Lateral	32	30	62
Central	15	53	68
Total	47	83	130
Odds ratio (cross product)	3.7689 [95% CI (1.764- 8.054)]		

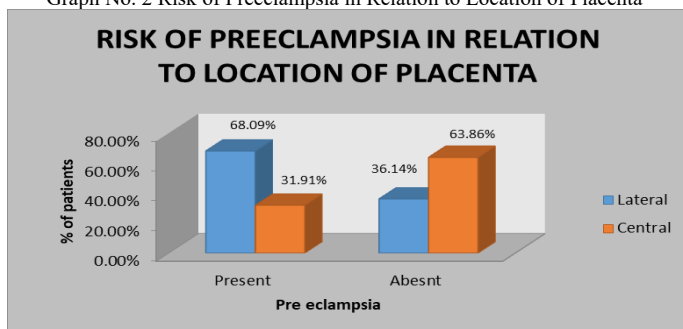Graph No. 2 Risk of Preeclampsia in Relation to Location of Placenta

Table No. 5 Sensitivity and Specificity of Preeclampsia with Relation to Lateral Location of Placenta

Statistic	Formula	Value	95% CI
Sensitivity	$\dfrac{a}{a+b}$	68.09%	52.88% to 80.91%
Specificity	$\dfrac{d}{c+d}$	63.86 %	52.57% to 74.12%
Positive Predictive Value	$\dfrac{a}{a+c}$	51.61%	43.00% to 60.13%
Negative Predictive Value	$\dfrac{d}{b+d}$	77.94 %	69.30% to 84.68%
Accuracy	$\dfrac{a+d}{a+b+c+d}$	65.38%	56.54% to 73.51%

In this study Sensitivity was 68.09%, Specificity was 63.86 %, Positive Predictive Value was 51.61%, Negative Predictive Value was 77.94 % and diagnostic accuracy was 65.38%.

Table No. 6 Distribution of ultrasound timing, location of placenta and PIH in different studies

Study	Ultrasound timing (Weeks	Placental location		PIH more in lateral than central
		Central	Lateral	
Jaiswal et al (2015)[7]	18-24	93/130(71.5%)	28.5%(37/130)	5 times
Nandanwar et al (2015)[8]	18-24	351/900 (39%)	549/900 (61%)	3.45 times
Jani et al (2015)[9]	18-24	320/400 (80%)	80/320 (20%)	3.09 times
Aggarawal et al (2015)[10]	18-24	212/475 (44.6%)	263/475 (55.4%)	3.16 times
Bhalerao et al (2013)[11]	20-24	121/463 (26.14%)	342/463(73.86%)	2.7 times
Kakar et al (2013)[12]	18-24	66/150 (44%)	84/150 (56%)	5.09 times
Kaku R et al (2017)[13]	-	154/350 (44%)	196/350 (56%)	Lateral > central
Bhattacharjee et al(2017)[14]	18-24	100/200(50%)	100/200 (50%)	3.451 times
Our study	18-24	68/130 (53.3%)	62/130 (47.7%)	3.768 times