

STUDY ON RELATION BETWEEN PLACENTAL LATERALITY IN SECOND TRIMESTER ULTRASOUND AND DEVELOPMENT OF PREECLAMPSIA AT TERM

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ABSTRACT

OBJECTIVE

To find whether placental laterality as determined by ultrasound can be used as predictor for the development of preeclampsia.

METHODS

This prospective study was conducted on pregnant women attending the antenatal clinic of Regional Institute of Medical Sciences, Imphal, Manipur, from October 2012 till September 2014; 475 pregnant women attending antenatal clinic both OPD and IPD at 18–24 weeks of gestation without any high risk factor were subjected to ultrasound examination and placental location was determined. These cases were followed for the development of signs and symptoms of preeclampsia.

RESULT

Out of the total 475 women, 263(55.4%) had laterally located placenta and of them 45(17.1%) developed preeclampsia, while the remaining 212(44.6%) had centrally located placenta and of them 13(6.1%) developed preeclampsia. So, the overall risk of developing preeclampsia with laterally located placenta was 3.16 (odds ratio) and 95% confidence interval (1.65–6.03). The difference was found to be statistically significant, p value (0.0005) by χ^2 test.

CONCLUSION

From the above study, we concluded that females with laterally located placenta determined by USG at 18–24 weeks of gestation have greater risk of developing preeclampsia.

KEYWORDS

Placental laterality, Preeclampsia, Central placenta.

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INTRODUCTION

Hypertensive disorders complicate 5-10% of all pregnancies.¹ The presence of a placenta is necessary to cause the disorder. The placental problem appears to be a relative failure of the uteroplacental circulation owing to spiral artery disease with consequent hypoxia, oxidative stress and diminished placental function. The histological abnormalities of placenta in pregnancy are characterised by cytotrophoblast prominence and abnormalities in syncytiotrophoblast formation. Placental location has been found to correlate with fetal position and presentation, length of gestation, course of labour, presence of preeclampsia and perinatal outcome. Several methods have been used to document placental location including manual exploration of uterus, soft tissue x-ray films, ultrasonography, magnetic resonance imaging and isotropic placentography. In the past three decades ultrasonography has proved to be the safest, easiest and most accurate method of assessing placental location. In humans, both uterine arteries have a significant number of branches and that each supply the corresponding side of the uterus.

Although anastomosis between the two uterine arteries exist, there is no proof that these are functional. 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 placenta, both uterine arteries demonstrated similar resistance.² When the placenta is centrally located, the uteroplacental blood flow needs are met by equal contribution from both uterine arteries. However, when the placenta is laterally located, the uteroplacental blood flow needs are met primarily by ipsilateral uterine artery with some contribution from contralateral uterine artery via the collateral circulation.³ The degree of collateral circulation may not be the same in all patients and deficient contribution may facilitate the development of preeclampsia, intrauterine growth retardation or both. The significance of normal placentation for this cytotrophoblastic invasion is high and the cytotrophoblasts fail to adopt a vascular adhesion phenotype in preeclampsia. This may explain the reduced trophoblastic invasion in laterally situated placenta when the uteroplacental blood flow needs are mainly met by one side uterine artery.

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MATERIALS AND METHODS

A prospective study was conducted on 475 pregnant women with singleton pregnancies attending the antenatal clinic of Regional Institute of Medical Sciences, Imphal, Manipur, from October 2012 till September 2014.

Inclusion Criteria

Randomly, pregnant women with singleton pregnancy attending antenatal clinic with period of gestation ≥ 18 weeks and ≤ 24 weeks were selected.

Exclusion Criteria

Pregnant women having chronic hypertension or essential hypertension, diabetes mellitus, thyrotoxicosis, renal disease, severe anemia, connective tissue disorder, positive lupus anticoagulant anticardiolipin antibodies, RH incompatibility, twin pregnancy or positive VDRL test were excluded.

Ethical approval was taken from Institution Ethical Committee, RIMS, Imphal, Manipur, before starting the study. Informed consent was taken from all clients willing to participate before enrolling them in the study. However, patients were asked to stop participating at any time if they wished. Detailed clinical history including parity, obstetrical history was taken along with General examination, systemic examination and obstetrical examinations. All the routine investigations including complete hemogram, urine examination, liver and kidney function test, ABO grouping and Rh typing, blood sugar estimation were carried out.

Location of placenta was determined by ultrasound in 18-24 weeks of pregnancy by using SONOACE X8, Medison and NEMIO XG, Toshiba. The placenta is classified as central when placental mass is equally distributed between the right and left side of the uterus irrespective of anterior, posterior or fundal position. When more than 75% of placental mass is on one side of the midline, it is classified as unilateral right or unilateral left placenta. The end point of the study was the development of hypertension in pregnancy (As per American criteria of obstetrics and Gynaecology) or delivery.

RESULTS

Majority of the pregnant women were from the age group 21-25 years, i.e. 207(43.6%). Primipara constituted 41% of the cases. More than half of the women had lateral placenta (55.4%). Out of 475 patients, only 58(17.8%) patients develop hypertension our study showed that among women having lateral placenta 17.1% of cases developed PIH, but among women with central placenta only 6.1% of cases developed PIH. These findings were found to be statistically significant ($p < 0.05$). The odds of developing PIH were 3.16 times more among women with lateral placenta than women with central placenta ($p < 0.05$); 54.8% of mild hypertensive cases had laterally located placenta. In severe hypertensive cases, laterally located placenta was more as compared to centrally located placenta but the findings were found to be insignificant.

DISCUSSION

Preeclampsia/eclampsia is one of the 3 leading causes of worldwide maternal morbidity and mortality. The search for an ideal predictive test and preventive measure remains challenging. It has been shown that in humans, both uterine arteries have a significant number of branches and that each supply the corresponding side of the uterus. Although anastomoses between the two uterine arteries exist, there is no proof that they are functional. When the placenta is laterally located, the uterine artery closer to the placenta has lower resistance than the one opposite to it. In women with centrally located placenta, both uterine arteries have similar resistance and the uteroplacental blood flow needs are met by equal contribution from both uterine arteries.

However, when the placenta is laterally located, in majority of the cases, the uteroplacental blood flow needs are met primarily by one of the uterine arteries with some contribution from the other uterine artery via the collateral circulation. There are various methods to predict or to diagnose preeclampsia. Out of all, placental localisation in second trimester by ultrasound is very useful, easy and noninvasive method to diagnose preeclampsia. Other easy and noninvasive method to predict is Doppler study of uterine arteries in second trimester.

This cross-sectional study included 475 pregnant women attending antenatal clinic of Obstetrics and Gynaecology, RIMS, Imphal, between October 2012 to September 2014. Second trimester ultrasound was done for all the patients between 18-24 weeks and placental position is determined. Patients are followed till development of preeclampsia or till delivery. In this study majority of the women were from the age group 21-25 years (43.6%) (Table 1). Primipara constituted most of the women included in my study (41%) (Table 2). More than half of the women, in this study, had their placenta laterally located (55.4%) (Table 3). This finding is consistent with study done by Shivamurthy HM et al.⁴ and by Tania K et al.⁵ Out of total cases, 17.8% developed preeclampsia (Table 4). Out of 263 cases of laterally located placenta, 45 cases developed preeclampsia (17.1%) (Table 5), which was more than that developed among centrally located placenta cases (6.1%) (Table 5) and this finding was statistically significant ($p < 0.05$).

So development of preeclampsia is associated more with the laterally located placenta. This result is consistent with the studies by Tania K et al.⁵ Anuja VB et al.⁶ and Pai MV et al.⁷ Odds ratio in this study was 3.16 i.e., there is 3.16 times higher chances of development of preeclampsia among laterally located placenta than centrally located placenta. This finding is consistent with study by Anuja VB et al.⁶ Kofinas AD et al.⁸ and Gonser M et al.⁹ This is also comparable with the study by Tania K et al.⁵ and Seadati N et al.¹⁰ where the odds ratios were 5.09 and 5.6 respectively. In the present study, hypertension was mild in most of the cases (84.5%) (Table 6) and both mild and severe form of hypertension are more common with laterally located placenta. But, the difference between the severity of hypertension and location of placenta is not statistically significant.

CONCLUSION

From the above study, it is concluded that laterally located placenta on ultrasound done at 18-24 weeks is associated with increased risk of development of preeclampsia. Females with laterally located placenta have a greater risk of developing PIH, so these pregnancies may require careful obstetric management to achieve a more favorable outcome and decrease the maternal and perinatal morbidity and mortality associated with preeclampsia.

Disclosure of Interests

None of the authors has any financial, personal, political, academic or other relationships that could lead to a conflict of interest relevant to this article.

Contribution to Authorship

PA and TND were involved in concept and design of the study. PA performed the experiments and analysis of the data was done by PA in corroboration with KN and TND. PA and KN contributed for reagents/ materials and analysis tool. PA wrote the initial article. All authors critically reviewed the subsequent versions of the article and approved the final version.

Details of Ethics Approval

Ethical approval was taken from Institution Ethical Committee, RIMS, Imphal, Manipur in September 2012 and also the consent from all participants.

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AGE IN YEARS	NUMBER	PERCENTAGE
≤20	36	7.6
21-25	207	43.6
26-30	150	31.6
>30	82	17.2
TOTAL	475	100.0

Table 1: Distribution of respondents based on age

PARITY	NUMBER	PERCENTAGE
Nullipara	121	25.5
Primipara	195	41.0
Multipara	159	33.5
TOTAL	475	100.0

Table 2: Distribution of respondents by parity

PLACENTAL LOCATION	NUMBER	PERCENTAGE
Lateral	263	55.4
Central	212	44.6
TOTAL	475	100.0

Table 3: Distribution of respondents by placental location by ultrasound

PREECLAMPSIA	NUMBER	PERCENTAGE
Yes	58	17.8
No	417	82.2
TOTAL	475	100.0

Table 4: Distribution of respondents by development of Preeclampsia

PLACENTAL LOCATION	OUTCOME PREECLAMPSIA		TOTAL	ODDS RATIO	CHI SQUARE TEST
	YES	NO			
LATERAL	45(17.1%)	218(82.9%)	263 (100.0)	3.16 (1.65-6.03) p-0.0005	13.1972 p-0.00028
CENTRAL	13(6.1%)	199(93.9%)	212 (100.0)		
TOTAL	58 (17.8)	417 (82.2)	475 (100.0)		

Table 5: Relation between placental laterality and Preeclampsia development

SEVERITY OF HYPERTENSION	PLACENTAL LOCATION		TOTAL	FISHER EXACT TEST
	Central	Lateral		
Mild	12 (24.5%)	37 (75.5%)	49 (84.5%)	0.78 p-0.66
Severe	1 (11.1%)	8 (88.9%)	9 (15.5%)	
TOTAL	13 (22.4%)	45 (77.6%)	58 (100.0)	

Table 6: Relation between severity of hypertension and placental location