Original Research Article

Examination of the relation of localization of placenta at 18-24 weeks of gestation by ultrasonography with the development of preeclampsia later in pregnancy

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ABSTRACT

Background: The aim of the study was to examine the relation of localization of placenta at 18-24 weeks of gestation by ultrasonography with the development of preeclampsia later in pregnancy.
Methods: Hospital based Prospective observational Cohort study at department of Obstetrics and Gynecology, Dr. BSA Hospital Delhi. 150 pregnant women of gestational age18-24 weeks attending ANC clinic were enrolled for ultrasound examination and on the basis of ultrasonography (USG) findings placenta was classified as Group-A (patient found to have laterally located placenta). And Group-B (patients found to have centrally located placenta). All women in both the group were followed up regularly till term. Study duration was 1 year, June 2017-June 2018.
Results: The overall risk of developing Preeclampsia with a late rally located placenta was 8.5(odds ratio) with 95% confidence interval (4.0339 to17.9108). This difference was highly statistically significant (p<.0001). Placental laterality has a sensitivity of 77.27%, beside that it has a good specificity of 71.43% and negative predictive value of 80%. Lateral localization of placenta by ultrasonography at mid trimester can be used as a screening test. The presence of urine albumin in group A was found in 70.67% as compared to 13.33% in group B. This difference was statistically significant. (p=0.0001). Around 72% of total complications were seen in Group-A as compared to 28% in Group-B. This difference was found to be statistically significant (p=0.028).
Conclusions: Significant correlation exists between placental laterality and the development of preeclampsia and thus placental localization by ultrasonography in midtrimester (at 18-24 weeks) can be used for prediction of development of preeclampsia later in pregnancy.

Keywords: Placental laterality, Preeclampsia, Ultrasound.

INTRODUCTION

Preeclampsia is a multisystem disorder of unknown etiology and is a principal cause of maternal and perinatal morbidity and mortality.[1] Preeclampsia is best described as a pregnancy specific syndrome that can affect virtually every organ system.[2]

Diagnostic criteria of preeclampsia on the basis of American College of Obstetrician and Gynaecologist (2013b) is preeclampsia is diagnosed when a pregnant woman develops: hypertension≥140 mmHg systolic or ≥90 mmHg diastolic on two separate readings at least six hours apart in a patient with previously normal blood pressure after 20 weeks of gestation and proteinuria≥0.3 grams (300 mg) or more of protein in a 24-hour urine sample or a spot urinary protein to creatinine ratio ≥0.3 or urine dipstick reading of 1+or more persistent.[2] or thrombocytopenia– platelets<1,00,000/μl Renal insuffi ciency– Creatinine>1.1 mg/dl or doubling of baseline.

Liver involvement- serum transaminase levels twice normal and cerebral symptoms– headache, visual disturbances, convulsions, pulmonary edema.

The source of blood supply for the placenta are the two uterine arteries. There is a poor evidence of efficient functional collateral anastomosis between two uterine vessels. So, in a centrally located placenta, the blood flow will be abundant from both uterine arteries. But a laterally implanted placenta (which is diagnosed if 75% or more is to one side of the uterine cavity) gets its blood only from one uterine artery which is insufficient for adequate placental perfusion. A deficient perfusion of placenta will impede proper trophoblastic invasion of spiral arterioles which is primary inciting factor in development of preeclampsia.[3]

So, we intended our study to assess the relationship of localization of placenta by USG with the development of preeclampsia later in pregnancy. By doing this, we will be able to screen patients at risk of developing preeclampsia and keep them under close surveillance to manage them timely. Hence the severity of preeclampsia can be minimized and fetomaternal outcome can be improved to its best possible.

METHODS

This study was carried out in Department of Obstetrics and Gynaecology, Dr. BSA Medical College and Hospital, New Delhi. This was a prospective observational cohort study. A total of 150 pregnant women satisfying the inclusion and exclusion criteria were recruited for the study. After taking consent from each participant detailed history was taken and clinical examination was done. These cases were subjected to ultrasonography at 18-24 weeks of gestation to localize the placenta and classified into 2 groups– Group A with laterally located placenta and group B with centrally located placenta, having 75 cases in each group.

Exclusion criteria

Exclusion criteria for the selection were pregnant women with multiple pregnancy, with known uterine anomalies, pregnant women with medical disorders like chronic hypertensions, chronic renal disease, diabetes mellitus, pregnant women with previous history of preeclampsia or eclampsia.

Enrolled population

Population which were obtained by applying exclusion criteria over eligible populations.

Statistical analysis

The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean±SD and median. Normality of data was tested by Kolmogorov Smirnov test. If the normality was rejected then non parametric test were used. Statistical tests applied were as follows- quantitative variables were compared using Unpaired t-test/Mann-Whitney Test (when the data sets were not normally distributed) between the two groups, qualitative variable were compared using Chi-Square test /Fisher's exact test. P value of <0.05 was considered statistically significant.

RESULTS

The cases in group A (laterally located placenta) were compared with cases in group B (centrally located placenta). The maternal (age, weight, height, gravidity) and demographic profile (socioeconomic status, residential area) were comparable, in laterally located (group A) and centrally located placenta (group B) groups. (Table 1).

Table 1: The maternal and demographic profile.

Variables	Group		P value
	A	B	
Age			
Sample size	75	75	
Mean±SD	23.91±3.14	24.16±3.29	
Median	24	24	0.583
Min-max	19-32	19-35	
Inter quartile range	22- 25.750	22-26	
Weight			
Sample size	75	75	
Mean±SD	59.17±9.13	56.68±8.16	
Median	58	56	0.08
Min-max	45-79	42-78	
Inter quartile range	52 - 65	50.250 - 62	

Continued.

Variables		Group		P value
		A	B	
Height				
Sample size		75	75	
Mean±SD		1.56±0.04	1.56±0.03	
Median		1.55	1.56	0.468
Min-max		1.5-1.69	1.5-1.62	
Inter quartile range		1.540 -1.580	1.540 -1.580	
Gravida				
G1		51 (68.00%)	46 (61.33%)	
G2		9 (12.00%)	12 (16.00%)	
G3		7 (9.33%)	5 (6.67%)	0.381
G4		5 (6.67%)	3 (4.00%)	
G5		1 (1.33%)	6 (8.00%)	
G6		2 (2.67%)	3 (4.00%)	
Residential area				
Rural/ urban	R	35 (46.67%)	35 (46.67%)	1.000
	U	40 (53.33%)	40 (53.33%)	
Socioeconomic status				
SES	Lower	18 (24.00%)	14 (18.67%)	
	Middle	56 (74.67%)	60 (80.00%)	0.727
	Upper	1 (1.33%)	1 (1.33%)	

Table 2: The overall risk of developing preeclampsia with a laterally located placenta.

		Group		Total (%)	P value
		A (%)	B (%)		
Preeclampsia	No	24 (32.00)	60 (80.00)	84 (56.00)	<0.0001
	Yes	51 (68.00)	15 (20.00)	66 (44.00)	
Total		75 (100.00)	75 (100.00)	150 (100.00)	

Table 3: Prediction of preeclampsia in relation to laterally situated placenta.

		Group		Total (%)	P value	Odds ratio	95% CI
		A (%)	B (%)				
Preeclampsia	No	24 (32.00)	60 (80.00)	84 (56.00)	<0.0001	8.500	4.0339 to 17.9108
	Yes	51 (68.00)	15 (20.00)	66 (44.00)			
Total		75 (100.00)	75 (100.00)	150 (100.00)			

Table 4: Comparison according to severity of preeclampsia.

		Group		Total (%)	P value
		A (%)	B (%)		
Pre-eclampsia	Nonsevere	37 (72.55)	11 (73.33)	48 (72.73)	1.000
	Severe	14 (27.45)	4 (26.67)	18 (27.27)	
Total		51 (100.00)	15 (100.00)	66 (100.00)	

Table 5: The presence of urine albumin.

		Group		Total (%)	P value
		A (%)	B (%)		
Urine Albumin (dipstic)	1+	29 (38.67)	4 (5.33)	33 (22.00)	
	2+	15 (20.00)	3 (4.00)	18 (12.00)	
	3+	9 (12.00)	3 (4.00)	12 (8.00)	<.0001
	Nil	22 (29.33)	65 (86.67)	87 (58.00)	
Total		75 (100.00)	75 (100.00)	150 (100.00)	

Table 6: Complications of preeclampsia.

		Group		Total (%)	P value
		A (%)	B (%)		
Complications	No	57 (76.00)	68 (90.67)	125 (83.33)	
	Yes	18 (24.00)	7 (9.33)	25 (16.67)	0.028
Total		75 (100.00)	75 (100.00)	150 (100.00)	

Table 7: Comparison according to most common complications.

		Group		Total (%)	P value
		A (%)	B (%)		
Complications	APH	9 (12.00)	3 (4.00)	12 (8.00)	
	ECLAMPSIA	4 (5.33)	1 (1.33)	5 (3.33)	0.099
	PPH	5 (6.67)	3 (4.00)	8 (5.33)	

In our study 51 out of 75 cases i.e. (68.00%) in group A developed preeclampsia as compared to 15 out of 75 cases i.e. (20.00%) in group B. The overall risk of developing Preeclampsia with a late rally located placenta was 8.5 (odds ratio) with 95% confidence interval (4.0339 to17.9108). This difference highly statistically significant (p<0.0001). (Table 2).

In our study, Prediction of preeclampsia in relation to laterally situated placenta was calculated in terms of sensitivity, specificity, positive predictive value and negative predictive value which was 77.27%, 71.43%, 68% and 80% respectively. We found that placental laterality has a sensitivity of 77.27% Beside that it has a good specificity of 71.43% and Negative predictive value of 80%. Laterally localization of placenta by ultrasonography at mid trimester can be used a screening test. But we accept that larger studies are required to further firmly conclude in this direction (Table 3).

When cases in both the groups were compared according to severity of preeclampsia; both the groups had more cases of non-severe preeclampsia i.e. 37 out of 51cases of preeclampsia in group A i.e (72.55%) and 11out of 15 cases of Preeclampsia in group B i.e (73.33%) respectively. Although the number of cases having severe preeclampsia were more in group A, 14 out of 51 cases of preeclampsia i.e. (27.45%) as compared to 4 out of 15 cases of preeclampsia in group B i.e. (26.67%), This result was not found to be statistically significant (p=1.000) (Table 4).

The presence of urine albumin in group A was found in 53 out of 75 cases i.e. (70.67%) as compared to 10 out of 75 cases in group B i.e. (13.33%). This difference was statistically significant. (p=0.0001), indicating more association of preeclampsia with lateral localization of placenta and thence more proteinuria in these group of patients (Table 5).

Out of the total 150 cases, 25 patients developed complications and that too more in group A. Around 72%

(18 out of 25) of total complications were seen in group A as compared to 28% (7 out of 25) in group B. This difference was found to be statistically significant (p=0.028). The reason might be more incidence of preeclampsia in laterally located placenta make these patients more prone to develop complications (Table 6).

In our study most common complication was ntepartum haemorrhage (APH), 9 out of 75 cases i.e (12.00%) in group A vs 3 out of 75 cases i.e (4.00%) in group B. Although a greater number of APH cases were found in group A vs group B, the result was statistically not significant (p>0.05) The development of postpartum hemorrhage (PPH) was comparable in both the groups. (6.67% vs 4.00%). In our study only 4 out of 75 cases developed eclampsia in group A i.e. (5.33%) as compared to only 1 case i.e (1.33%) in group B. Though a greater number of cases of eclampsia were seen in group A as compared to group B, the difference was not found to be statistically significant (p=0.719) (Table 7).

DISCUSSION

Preeclampsia is a complex clinical syndrome involving multiple organ systems. Many inroads have been made in reducing the perinatal impact of preeclampsia. However, when overt preeclampsia emerges, it carries with it significant maternal and fetal risk. From the stand point of prevention, preeclampsia has remained a constant challenge to the obstetrician. Prevention not only requires knowledge of pathophysiologic mechanism of this disease, but also methods of its early prediction.[4] For this we need a screening test which would help to make an early diagnosis and thence to decrease the overall maternal and fetal complications.

The present study was conducted in department of obstetrics and gynecology, Dr Baba Saheb Ambedkar Hospital Delhi over a span of 1year. The purpose of the study was to find out the correlation of localization of placenta with the development of preeclampsia later in pregnancy. 150 pregnant women satisfying the inclusion

and exclusion criteria were subjected to ultrasonography at 18-24 weeks of gestation to localize the placenta and classified into 2 groups with 75 cases in each group. The cases in group A (Laterally located placenta) were compared with cases in group B (centrally located placenta) for various parameters. Results so obtained is discussed below.

In our study the mean age of cases in group A was 23.91±3.14 years and in group B was 24.16±3.29. Both groups were comparable. Most of the patients were in the age group 21-25 years in both the groups similar to previous studies done by Shivmurthy et al (mean age 23.9±3.9 vs 23.4±4.3), and Jyoti Jaiswal et al (mean age 24.2±4.2 Vs 23.4±3.1).[5,6]

Both the group were comparable according to residential area and socioeconomic status. Number of cases belonging to Lower middle class were higher in both the groups i.e .around 116 out of 150 cases i.e 77.33% of total cases were from lower middle class. This reflects that in our institute being a tertiary level centre, we mainly deal with women who belong to both rural and urban area and predominance of lower middle class.

Height and weight distribution were also similar in both the groups in our study. mean height was 1.56±0.04 in group A and 1.56±0.03 in group B, thus the distribution was similar. Mean weight was 59.17±9.13 in group A and 56.68±8.16 in group B. The distribution was same as in previous study done by Kanika et al (mean weight 58.16±8.1vs 56.32±5.8 in group A and B respectively.[7]

In our study maximum number of cases were primigravida in both the groups. 68.00 % in group A and 61.33% in group B. Distribution of gravidity was similar in both the groups and the result was not found to be statistically significant (p>0.05). This is in accordance with the previous study done by Shivmurthy et al where they found 68.5% cases of primigravida in group A vs 60.3% in group B.[5]

In the present study, 51 out of 75 cases i.e 68% in group A (with laterally located placenta) developed Preeclampsia as compared to15 out of 75 cases i.e. 20% in group B (with centrally located placenta). So, the risk of developing Preeclampsia was 8 times greater in women with a late rally located placenta. The overall risk of developing Preeclampsia with a late rally located placenta was 8.5 (odds ratio) with 95% confidence interval (4.0339 to 17.9108). This relationship was statistically highly significant (p<0.0001). This result was similar to previous study done by Kakkar et al where they found 5 times greater risk of developing Preeclampsian in cases with laterally located placenta.[8] (odds ratio 5.09 with 95% confidence interval 2.40-10.88).This result was also comparable to study done by Walia et al where they found 10 times increased risk of development of preeclampsia in women with laterally located placenta.[9] (odds ratio 10.33; 95% CI 2.40-10.88). Other studies

done by Kofinas et al, Fung et al, Shivamurthy et al, Rajashree et al, Kanika Chandra, Sandhya et al, Seckin et al also had found increased risk of development of Preeclampsia when the placenta was located laterally.[5,7,10-17] However study done by Little and Friedman, Salvatore et al did not find any significant correlation between laterally located placenta and the development of preeclampsia.[15,16]

Here, (Table 8) showing comparison amongst various studies regarding association of development of Preeclampsia in laterally located placenta.[8-10,12,15,16]

In our study, Prediction of preeclampsia in relation to laterally situated placenta was calculated in terms of sensitivity, specificity, positive predictive value and negative predictive value which was 77.27%, 71.43%, 68% and 80% respectively. We found that placental laterality has a sensitivity of 77.27% which is much better than most study with other predictors of Preeclampsia.[17] Beside that it has a good specificity of 71.43% and Negative predictive value of 80%.although its positive predictive value is less 68% only but so is the case with most other tests.[6,18] This result was comparable to study done by Jyoti jaiswal et al where they found sensitivity of 67.9%, specificity of 82.3% , PPV 51.3% and NPV of 90.3% .Our result was in accordance with the study done by Walia M et al too.[6,9] Thus with above results though we conclude that placental laterality can be used as a predictor of preeclampsia with good sensitivity, specificity and negative predictive value; But large studies are required to further firmly conclude in this direction.

Table 8: Comparison amongst various studies regarding association of development of preeclampsia in laterally located placenta.

Study	Development of preeclampsia in laterally located placenta
Little et al[15]	No significant association
Kofinas et al[10]	2.8 fold more in lateral placenta.
Kakkar et al[8]	5 times more in lateral placenta
Rajashree et al[12]	3.45 fold more in lateral placenta
Salvatore et al[16]	No significant association
Walia et al[9]	10 fold increased incidence in lateral placenta
Present study	8 times more in lateral placenta

When cases in both the groups were compared according to severity of preeclampsia; both the groups had more cases of non-severe preeclampsia i.e. 37 out of 51 cases of preeclampsia in group A i.e (72.55%) and 11out of 15 cases of Preeclampsia in group B i.e (73.33%) respectively. Although the number of cases having severe preeclampsia were more in group A, 14 out of 51 cases of preeclampsia i.e. (27.45%) as compared to 4 out of 15

cases of preeclampsia in group B i.e. (26.67%), This result was not found to be statistically significant (p=1.000). This result was contrary to the result found in study done by Kakkar et al where they found 5.58 % of cases having severe preeclampsia in laterally located placenta group and no case of severe preeclampsia in centrally located group, this difference was found to be statistically significant.[8] The reason might be ours was a prospective study, so cases were monitored in both the groups under close surveillance, and thence standard management protocols followed for management of these patients so that the preeclampsia in patients does not reach to the severity level.

The presence of urine albumin in group A was found in 53 out of 75 cases i.e. (70.67%) as compared to 10 out of 75 cases in group B i.e. (13.33%). This difference was statistically significant. (p=0.0001), indicating more association of preeclampsia with lateral localization of placenta and thence more proteinuria in these group of patients. This result was similar to study done by Kanika et al where they found 40% patients of preeclampsia who were having proteinuria had lateral location of placenta. Thus, there seems to be good relationship between urinary albumin level with placental location.[7]

Out of the total 150 cases, 25 patients developed complications and that too more in group A. Around 72% (18 out of 25) of total complications were seen in group A as compared to 28% (7 out of 25) in group B. This difference was found to be statistically significant (p=0.028). The reason might be more incidence of preeclampsia in laterally located placenta make these patients more prone to develop complications.

In our study most common complication was APH 9 out of 75 cases i.e (12.00%) in group A vs 3 out of 75 cases i.e (4.00%) in group B. Although more number of APH cases were found in group A vs group B, The result was statistically not significant (p>0.05) similar to previous study done by Seckin et al where they found 3.8% vs 3.3% cases of APH in group A and group B respectively. But contrary to study done by Shaweez et al where they found statistically significant result with respect to the development of APH in laterally located placenta group (19.7% vs 8.2%).[14,19]

The development of PPH was comparable in both the groups. (6.67% vs 4.00%). In our study only 4 out of 75 cases developed Eclampsia in group A i.e. (5.33%) as compared to only 1 case i.e (1.33%) in group B, the difference was not found to be statistically significant (p=0.719) .With respect to the development of eclampsia our study had similar result like previous study done by Kakkar et al where no case of eclampsia was reported in either groups.[8]

CONCLUSION

From the present study it can be concluded that a significant correlation exists between placental laterality and the development of preeclampsia. Patients with a lateral placenta are at greater risk of developing preeclampsia. More careful obstetric surveillance may be required in these pregnancies to achieve a more favourable maternal and perinatal outcome. So, it can be concluded from the present study that ultrasonographic localization of the placenta in mid trimester (18-24 weeks of gestation) seems to be a simple, easy and non-invasive test to perform for prediction of preeclampsia so that close surveillance and early detection of pre-eclamsia can be done to improve overall maternal and fetal outcomes.

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