

Prospective study of the utility of Placental Laterality and Uterine Artery Doppler abnormalities as a Predictor for Development of Preeclampsia.

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DOI: <https://doi.org/10.17511/joog.2022.i02.01>

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Introduction: According to WHO's systemic review on maternal mortality worldwide, the hypertensive disease remains a leading cause of direct maternal mortality. Hypertension, hemorrhage and infections form the deadly triad for morbidity and mortality during pregnancy and childbirth. Effective prediction of preeclampsia remains a mainstay in the field of modern obstetrics; location of placental implantation can therefore be used as a predictor for the prevention of preeclampsia. **Objectives:** The current study was conducted to find out whether placental laterality and uterine artery doppler findings can be used as a predictor for the development of preeclampsia. **Methods:** A prospective study was carried out in the department of obstetrics and gynaecology at Krishna institute of medical sciences karad for 18 months. ANC patients meeting the inclusion criteria were examined at 18-24 weeks of gestation, concerning the location of the placenta. **Results:** In the present study it was seen that of the total cases with lateral placenta, 23 patients developed Doppler changes and those when followed up were seen to develop the hypertensive disorder. While 44 patients had normal Doppler parameters, of which only 19 patients developed a hypertensive disorder during pregnancy. It was therefore observed that there was a significant association between Doppler changes and severity of preeclampsia. **Conclusions:** Essential preventive measures and monitoring the patients with the lateral placenta can be useful in reducing the complications associated with hypertensive disorders and thereby reducing maternal and perinatal morbidity and mortality.

Keywords: Maternal mortality, Preeclampsia, pregnancy-induced hypertension, ANC care

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How to Cite this Article

Shruti Nair, Anjali Patil, Manisha Laddad, Prospective study of the utility of Placental Laterality and Uterine Artery Doppler abnormalities as a Predictor for Development of Preeclampsia.. Obs Gyne Review J Obstet Gynecol. 2022;8(2):6-11.

Available From

<https://obstetrics.medresearch.in/index.php/joog/article/view/153>

To Browse



Manuscript Received
2022-04-07

Review Round 1
2022-04-09

Review Round 2
2022-04-16

Review Round 3
2022-04-23

Accepted
2022-04-30

Conflict of Interest
Nil

Funding
Nil

Ethical Approval
Yes

Plagiarism X-checker
18%

Note



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Introduction

"Pregnancy and motherhood are the most beautiful and significantly life-altering events that a woman ever experiences. To be pregnant is to be vitally alive, thoroughly women and distressingly inhabited, making pregnancy a time of transition, growth and profound beginnings." [1]. Preeclampsia occurs only in the presence of the placenta. [2]. The human placenta is a complex organ and plays a key role during pregnancy. Implantation in the endometrium occurs around 6-7 days after conception, and normally the blastocyst implants in the upper portion of the uterus. Pre-eclampsia occurred significantly more common in the group with an abnormal ultrasound examination at 16-22 weeks of gestation, in comparison to pregnancies with normal ultrasound findings; Uterine artery PI >1.45 can provide further information for the prediction of these adverse outcomes, to conduct appropriate clinical interventions, to avoid perinatal morbidity.[3]. Preeclampsia represents the most common medical complication of pregnancy affecting between 7% and 15% of all gestations and accounts for approximately a quarter of all antenatal admissions. [4]

According to WHO's systemic review on maternal mortality worldwide, the hypertensive disease remains a leading cause of direct maternal mortality. Hypertension, hemorrhage and infections form the deadly triad for morbidity and mortality during pregnancy and childbirth. [5] Preeclampsia is responsible for not only maternal deaths but also substantial morbidity for pregnant women. One-third of severe maternal morbidity was a consequence of hypertensive conditions in the United Kingdom. [6] Effective prediction of preeclampsia remains a mainstay in the field of modern obstetrics; the location of placental implantation can therefore be used as a predictor for the prevention of preeclampsia.

Aims and objectives

Aim: To find out whether placental laterality and uterine artery doppler findings can be used as a predictor for the development of preeclampsia.

Objectives: To assess the lateral location of the placenta as a predictor of preeclampsia. To assess the doppler findings of uterine artery resistance in correlation with severity of preeclampsia, and to

Find out the maternal and neonatal outcome in cases of the lateral placenta and abnormal Doppler studies.

Material and Methodology

Study setting: A prospective study was carried out in the department of obstetrics and gynecology at Krishna institute of medical sciences, Karad for 18 months. After the approval from the Institutional Ethics committee was obtained ANC patients meeting the inclusion criteria were examined at 18-24 weeks of gestation, concerning the location of the placenta Study subjects were divided into two groups' lateral placenta and placenta at other sites they were followed up further during their pregnancy.

Sample size: The current study was conducted among 150 study subjects fulfilling the set inclusion criteria. The universal sampling method was used in the current study.

Inclusion criteria: All pregnant women attending the antenatal clinic, both outpatient and ward admissions, primigravida and multigravida women with singleton pregnancies, at 18-24 weeks of gestation without any high-risk factors.

Exclusion criteria:

- All pregnant women attending the antenatal clinic at 18-24 weeks with known comorbidities like chronic hypertension, diabetes mellitus, severe anaemia, connective tissue disorders, etc.
- Pregnant women will be excluded from the study if they are having chronic hypertension or essential hypertension, diabetes mellitus, thyrotoxicosis, renal disease, severe anemia, connective tissue disorder, positive lupus anticoagulants anticardiolipin antibodies, RH incompatibility, twin pregnancy, or positive VDRL test.

Data collection procedure: The patients presenting with lateral placenta were further subjected to Doppler studies. The subjects with the lateral placenta and abnormal Doppler were considered as high risk and were meticulously followed up for changes of any preeclampsia.

Ethical considerations: The current study was conducted after getting approval from the institutional ethical committee and written informed consent from the study participants.

Statistical analysis: Results were entered using MS excel software, and analyzed using SPSS version 20. Following which mode of delivery and neonatal outcome were studied. The frequencies and proportions were studied using tables and charts. Chi-square test and independent two-sample t-test.

Observation and results

In the current study, 150 study subjects were examined at 18-24 weeks and were subjected to routine ultrasound examination, placental location of all the subjects was documented for further classification and analysis, the current study out of the total 150 patients, 67 of them had lateral placenta while 83 of them had other types (Fundoanterior, Fundoposterior, Placenta previa, Anterior, Posterior). (Table 1)

Table 1: Placental Position.

Placental Position	Number of Patients	Percent age
Lateral (Anterolateral, Posterolateral, Fundolateral)	67	44.67%
Other (Fundoanterior, Fundoposterior, Placenta previa, Anterior, Posterior)	83	55.6%
Total	150	100.00%

In the current study, of the total cases studied, when the patients had placenta placed laterally it was observed that out of a total of 67 patients, 42 patients developed hypertensive disorder while 25 patients did not have any hypertensive changes during the pregnancy and were considered as statistically significant. (Table 2)

Table 2: Hypertensive disorders in the case of Lateral Placenta.

Lateral Placenta	Number of Patients	Percentage
With hypertensive disorder	42	63.00%
Without Hypertensive Disorder	25	37.00%

In the present study, of the total patients, 83 of them had placenta attached on other sites of which 23 patients developed hypertensive disorder while 60 patients did not have hypertensive disorder during the pregnancy. (Table 3)

Table 3: Hypertensive disorders in other placental sites.

Other placental sites	Number of Patients	Percentage
With hypertensive disorder	23	28.00%
Without Hypertensive Disorder	60	72.00%

When the test of significance was applied to the above observation, it was seen that there was a significant association between the lateral placenta and the development of the hypertensive disorder. (Table 4)

Table 4: Association between placental position and hypertensive disorder of pregnancy (Severe Preeclampsia).

Placental Position	Hypertensive disorder during pregnancy		Total
	Yes	No	
Lateral	42	25	67
Other	23	60	83
Total	65	85	150

Significance: The chi-square statistic is 18.4691. The p-value is .000017. Significant at $p < .05$

In the present study, it was seen that of the total cases with lateral placenta, 23 patients developed Doppler changes and those when followed up were seen to develop the hypertensive disorder. While 44 patients had normal Doppler parameters, of which only 19 patients developed a hypertensive disorder during pregnancy. It was therefore observed that there was a significant association between Doppler changes and severity of preeclampsia. (Table 5)

Table 5: Doppler findings in case of Lateral Placenta.

Lateral Placenta	Number of Patients	Developed hypertensive disorder
Normal Doppler parameters	44 (65%)	19 (43%)
Doppler changes (Raised RI, PI Values in uterine artery Doppler)	23 (35%)	23 (100%) (11 nonsevere preeclampsia 12 severe preeclampsia)

Discussion

Obstetricians have long searched for methods of early predictions of hypertensive disorders; several tests have been proposed to identify women at risk of developing preeclampsia. The ideal method should be less expensive, repeatable, and reliable without causing much inconvenience to the patient. It should be specific and sensitive. It should not have any harmful effects on the growing fetus. Ultrasonography is one such investigation which is done in routine practice in all trimesters for assessment of various other factors.

In the current study, 150 study subjects were examined at 18-24 weeks and were

Subjected to routine ultrasound examination, placental location of all the subjects was documented for further classification and analysis, the current study out of the total 150 patients, 67 of them had lateral placenta while 83 of them had other types (Fundoposterior, Fundoanterior, Placenta previa, Anterior, Posterior).

In the present study out of a total of 150 patients, 45% of patients had lateral placenta while 55% of patients had placenta located on other sites. These results were almost coinciding with the Ambika R [6], Arjumand Bano [7] and Kofinas [10]. However, the results from other studies were not coinciding.

When the patients had placenta placed laterally it was observed that out of a total of 67 patients, 42 patients developed hypertensive disorder while 25 patients did not have any hypertensive changes during the pregnancy which was considered statistically significant. In the present study, of the total patients, 83 of them had placenta attached on other sites of which 23 patients developed hypertensive disorder while 60 patients did not have hypertensive disorder during the pregnancy. When the test of significance was applied to the above observation, it was seen that there was a significant association between lateral placenta and development of hypertensive disorder. In the present study it was seen that of the total cases with lateral placenta, 23 patients developed Doppler changes and those when followed up were seen to develop the hypertensive disorder. While 44 patients had normal Doppler parameters, of which only 19 patients developed a hypertensive disorder during pregnancy. It was therefore observed that there was a significant association between Doppler changes and severity of preeclampsia.

The results however were statistically significant with all the studies mentioned in the above table which suggested that placental location can be used as an effective predictor of the development of hypertensive disorders. Studies of Ambika rai [6], Arjumand Bano, [7] Kakkar [8] Vidhu [9] Kofinas[10] and A.bhalerao [11] showed similar results as to our present study. In their research, Annet Thatal et al discovered that 69 of the 106 patients evaluated had a central placenta and 37 had a lateral placenta. Preeclampsia struck 17 patients, 12 of whom had a laterally placed placenta. With a p-value of 0.001, this discovery was statistically significant. This research

Found a higher risk of preeclampsia in individuals with a laterally positioned placenta, which assists in the prevention and treatment of preeclampsia. [12].

In their research, Kakkar T et al discovered that out of the total 150 women investigated, 84 (56%) had a laterally situated placenta and 56 (66.6%) had preeclampsia, whereas the remaining 66 (44%) had a centrally located placenta and 24 (36.3%) developed preeclampsia. [8].

In their research, Aggarwal Preeti et al discovered that out of 475 women, 263 (55.4 percent) had a laterally situated placenta and 45 (17.1 percent) experienced preeclampsia, whereas the remaining 212 (44.6 percent) had a centrally located placenta and 13 (6.1 percent) got preeclampsia. As a result, the total risk of having preeclampsia with a laterally positioned placenta was 3.16 (odds ratio) with a 95 percent confidence range of 1.65–6.03. [13].

Ananya Priyadarshani found 68 occurrences of the lateral placenta and 32 cases of the central placenta in her research of 100 patients. She discovered that 48.5 percent of lateral placenta patients and 46.9 percent of central placenta patients suffered preeclampsia. There was a substantial link discovered between placental laterality and the development of PIH. The laterally placed placenta is linked to a higher risk of preeclampsia. Looking for placental laterality during a necessary prenatal ultrasound exam (level II) may thus serve as a non-invasive diagnostic to predict pre-eclampsia. [14].

Articles	Lateral placenta	Other sites
Present Study	67	83
Ambika rai [6]	37	69
Arjumand bano [7]	14	37
Kakkar [8]	84	66
Vidhu [9]	73	377
Kofinas [10]	147	153
A.bhalerao [11]	121	342

In the comparison groups, there was no statistical relationship between the mode of delivery and neonatal outcome.

Conclusion

Ultrasonography is simple, non-invasive, easy to perform, and cheap, and is a diagnostic method to identify high-risk patients. In the present study, it was seen that the women underwent ultrasonography at 16-22 weeks of gestation

And these patients were further followed up till full-term and further up to delivery. It was observed that the current study settings in comparison with the previously referred articles showed that patients who had placenta located when followed up for further Doppler analysis and reported an abnormal Doppler finding in the uterine arteries had significantly higher chances of developing hypertensive disorders of pregnancy. Placental location can therefore be used as an effective tool in the prediction of hypertensive disorders. The patients having placenta located laterally in mid-trimester ultrasonography should be carefully monitored and advised Doppler study. These patients in case develop high resistance flow in the uterine arteries or increased pulsatility in the uterine arteries should be further evaluated and considered as a high risk for the development of hypertensive disorders.

What does this study add to existing knowledge?

Essential preventive measures and monitoring the patients with the lateral placenta can be useful in reducing the complications associated with hypertensive disorders and thereby reducing maternal and perinatal morbidity and mortality.

Authors Contribution: SN: Data collection, data entry and data analysis, AP: Manuscript preparation, review of literature, ML: Article review, revisions, Data analysis.

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