COMPARISON OF CEREBRO-PLACENTAL RATIO AND CEREBRO-UTERINE RATIO IN PREDICTING NEONATAL OUTCOME IN PRE ECLAMPTIC PREGNANT WOMEN

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ABSTRACT
AIM: To assess if cerebrouterine ratio would be complementary to cerebroplacental ratio in predicting adverse neonatal outcome in preeclamptic pregnant women
MATERIALS AND METHODS: This research was conducted at the Department of Obstetrics and Gynecology, with clearance from the institute's ethical committee. 100 pre eclamptic pregnant women between 34 to 37 weeks of gestation were included in the study. Cerebroplacental ratio(CP) and cerebrouterine(CU) ratio via latest Doppler USG before delivery was calculated. Patients were followed up till delivery and perinatal outcome was analyzed.
RESULTS: Abnormal CU ratio was seen in 45 cases and CP ratio was seen in 40 cases CU ratio showed statistical significance for preterm births (p=0.002), fetal hypoxia (0.02),NICU admission (p=0.006) .CP ratio showed statistical significance for preterm births (p<0.001), low APGAR (0.015),adverse perinatal outcome (p=0.05)
Sensitivity for pre term of CU ratio was 71.1% and CP ratio was 72%, for fetal hypoxia sensitivity of CU ratio was 20% and CP ratio was 10%, for low APGAR sensitivity of CU ratio was 77.7% and CP ratio was 77.5%, for low birth weight sensitivity of CU ratio was 60% and CP ratio was 65%, for NICU admission sensitivity of CU ratio was 88.8% and CP ratio was 65% and for adverse perinatal outcome (IUD) sensitivity of CU ratio was 57.7% and CP ratio was 60%.
CONCLUSION: Diagnostic accuracy of CP ratio was almost similar (78%) as compared to CU ratio (75%) in diagnosing the perinatal outcome and was only better than 3%. However, the combined Doppler results were more sensitive to abnormal outcome.

INTRODUCTION
Pre-eclampsia, one of the leading causes of maternal and fetal morbidity and mortality, affecting 2-5% of pregnancies, is a specific syndrome characterized by reduced organ perfusion secondary to vasospasm and endothelial pathophysiology.
Doppler velocimetry of multiple feto-placental vessels is a noninvasive technique that evaluates abnormal fetal hemodynamics that take place in response to changes in placental resistance, can be used to monitor compromised fetus predicting adverse perinatal outcome and assisting in optimal time of delivery. Doppler of uteroplacental circulation plays a significant role in management of high-risk pregnancies. It helps one to identify the fetus at risk and also helps to time the delivery. Fetal Middle Cerebral Artery (MCA) resistance in combination with Umbilical Artery (UA) resistance as the Cerebroplacental Ratio (CPR) is more reflective of fetal hypoxia and acidemia, and therefore better prediction of perinatal outcome which also aid in the prediction of both SGA and adverse perinatal outcome.
Uterine artery Doppler might be expected to reflect placental perfusion, while umbilical Doppler reflects placental pathology, therefore The Cerebrouterine Ratio (CU Ratio) could have a better predictive value for unfavorable outcome

MATERIALS AND METHODS:
This research was conducted at the Department of Obstetrics and Gynecology, with clearance from the institute's ethical committee. 100 pre eclamptic pregnant women between 34 to 37 weeks of gestation were included in the study. Cerebroplacental ratio(CP) and

cerebrouterine(CU) ratio via latest Doppler USG before delivery was calculated. Patients were followed up till delivery and perinatal outcome was analyzed.

METHODOLOGY:

A well informed written consent was taken.A detailed history was taken for the demographic details, obstetric history, menstrual history, past medical or surgical history. General physical and obstetric examination was done.

Serial scans by transabdominal route were performed if the patient was admitted for safe confinement for interval growth and doppler parameters. The last doppler values before the delivery were considered for this study.

Cerebroplacental ratio and cerebrouterine ratio via latest Doppler USG was calculated at 34-37 weeks for the eligible candidates. Cerebrouterine (CU) ratio was plotted on the chart; <5th percentile was considered as decreased or abnormal.

Cerebroplacental (CP) ratio was considered as abnormal when ratio was <1.08. Patients were followed up till delivery and perinatal outcome was analyzed.

Newborns were assessed based on following factors:

1. Gestational age at birth
2. Birth weight
3. 5 minute APGAR score
4. Mode of delivery
5. NICU admission and the indication if applicable

Women with labor pain, presence of congenital anomalies in the fetus, pregnancies with Rh incompatibility or women with any underlying cardiovascular/metabolic disease were excluded from the study.

Investigations:

Umbilical artery Doppler study

Fetal Middle Cerebral artery Doppler study

Uterine artery doppler study

STATISTICAL ANALYSIS:

Student t test (two tailed, independent) was used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test was used to find the significance of study parameters on categorical scale between two or more groups. A statistically significant p-value of 0.005 was used.

Diagnostic accuracy of CP ratio and CU ratio for predicting various neonatal outcomes was calculated by sensitivity, specificity, positive predictive value and negative predictive value using following formulas.

RESULTS:

Table 1: Final outcome of CU and CP ratio

Parameter	CU ratio	CP ratio
Abnormal	45	40
Normal	55	60
Total	100	100

On final outcome, abnormal CU ratio was seen in 45 cases and CP ratio was seen in 40 cases.

Table 2: Comparison between CP and CU ratios in predicting perinatal outcomes

Outcome	CU ratio			CP ratio		
	Abnormal	Normal	P value	Abnormal	Normal	P value
Pre term	32	24	0.002	36	10	<0.0001
Fetal hypoxia	20	03	0.02	19	04	0.5
Low APGAR	30	32	0.1	38	24	0.15
Very low birth weight	28	20	0.2	32	16	0.48
NICU admission	37	17	0.006	35	22	0.07
Perinatal outcome	6	2	0.32	5	3	0.05

CU ratio showed statistical significance for preterm births (p=0.002), fetal hypoxia (0.02), NICU admission (p=0.006).
CP ratio showed statistical significance for preterm births (p<0.001), low APGAR (0.015), adverse perinatal outcome (p=0.05) .

Here Fetal hypoxia was said to exist antenatally, whenever there was absent end diastolic flow or reversal of flow in the umbilical artery, suboptimal NST, and intranatally, when there was thick meconium staining of the amniotic fluid and ominous cardiotocographic changes (persistent and prolonged bradycardia, loss of beat to beat variability, etc.).

Table 3: Overall performance of CU and CP ratios in predicting perinatal outcome

Outcome	CU ratio					CP ratio				
	Sensitivity %	Specificity %	PPV %	NPV %	A %	Sensitivity %	Specificity %	PPV %	NPV %	A %
Pre term	71.1	56.3	57.1	70.4	63	72	60.3	62.8	71.8	64
Fetal hypoxia	20	74.5	39.13	53.2	50	10	68.3	17.3	53.2	45
Low APGAR	77.7	32.7	48.6	64.2	53	77.5	31.6	43	67.8	50
Very low birth weight	60	32.7	42.1	50	45	65	36.7	40.6	61.1	48
NICU admission	88.8	40	54.7	81.4	62	65	21.6	35.6	48.1	49
Adverse Perinatal outcome (IUD)	57.7	89.1	57.1	56.9	75	60	90	40	60	78

Sensitivity for pre term of CU ratio was 71.1% and CP ratio was 72%, for fetal hypoxia sensitivity of CU ratio was 20% and CP ratio was 10%, for low APGAR sensitivity of CU ratio was 77.7% and CP ratio was 77.5%, for low birth weight sensitivity of CU ratio was 60% and CP ratio was 65%, for NICU admission sensitivity of CU ratio was 88.8% and CP ratio was 65% and for adverse perinatal outcome (IUD) sensitivity of CU ratio was 57.7% and CP ratio was 60%.

DISCUSSION:

Present study showed that majority 84% were in age group of 21 to 30 years, 10% were <20 years, and only 6% were >30. Study by Mahale N et al [(5)] showed that the mean maternal age was

27.24 years. Nalini YL et al [8] in their study showed that majority were in age group of 21 to 25years. Present study showed that 60% were primipara and 40% were multipara. Study by Mahale N et al [5] showed that the majority 66% were primipara and 34% were multipara. Present study showed similar results. Average period of gestation was 35.34 ± 1.2 weeks. Range being 34 to 37 weeks. 85% were in range of 34 to 36 weeks, and only 15% were more than 36 weeks. Average period of gestation was 35.34 ± 1.2 weeks. On final outcome, abnormal CU ratio was seen in 45 cases and CP ratio was seen in 40 cases. Study by Adiga et al [81] showed that CU ratio was better in predicting adverse event than CP ratio.24% had a vaginal delivery and 76% underwent LSCS.

Neonatal parameters :

On APGAR score, where 62% had ≤7 and 38% had >7 score. 57% were admitted in NICU and 43% did not need admission. Study by Mahale N et al [5] showed that 76% of the newborn were admitted to NICU and 24% were normal. Similar findings were seen in present study. Nalini YL et al [8] in their study showed that 40% of newborn had NICU admission. Study by Rekha BR et al [79] showed that 77.8% were admitted to NICU. Study by Adiga et al [81] showed that 50.5% babies required NICU admission64% had no complication, 20% had hyperbilirubinemia, and 18% had fetal hypoxia, 12% had acidemia and 2% polycythemia. Study by Mahale N et al showed that [5] 36% had hyperbilirubinemia followed by hypoglycemia in 12%, 4% had hypothermia and 4% had thrombocytopenia. Similar findings were seen in present study. Study by Adiga et al [81] showed that 10.5% had academia, 34.7% had hyperbilirubinemia, 1.05% had neonatal seizures.

In the present study, 92% birth were alive and only 8% had an IUD. Study by Mahale N et al showed that [5] the on perinatal outcome 14% died and 86% were alive and discharged in good health.Study by Adiga et al [81] showed that 5.2% had IUD.

48% had weight <2 kg. 40% had >2 kg. to 3 kg and 12% had >3 kg. Average birth weight was 1779.96±512.2. Study by Mahale N et al [5] showed that maximum of babies had birth weight between 1 to 15 kg at birth. 2 babies weighed less than 1 kg. Nalini YL et al [8] in their study showed that 4% had low birth weight. Study by Rekha BR et al [79] showed that majority 91.7% were having birth weight in range of 1.5 to 2.5 kg. Study by Gyawali M et al [80] showed that mean birth weight was 2.1 kg with a range of 1.45kg to 3.75 kg. Similar findings were seen in present study.. Majority of newborn were alive and only 12.06% died.

In the present study CU ratio showed statistical significance for preterm births (p=0.002), fetal hypoxia (0.02), NICU admission (p=0.006) .CP ratio showed statistical significance for preterm births (p<0.001), low APGAR (0.015),adverse perinatal outcome (p=0.05).

Study by Adiga et al [81] showed similar results. Their study showed significance for preterm, academia, fetal hypoxia, low APGAR and perinatal outcome for CU ratio and for CP ratio in preterm, academia, low APGAR, HMD and perinatal outcome. Simanaviciute and Gudmundsson found significant correlation with SGA newborn independently with abnormal CP ratio and found no significance for low APGAR [100].

In present study Sensitivity for pre term of CU ratio was 71.1% and CP ratio was 72%, for fetal hypoxia sensitivity of CU ratio was 20% and CP ratio was 10%, for low APGAR sensitivity of CU ratio was 77.7% and CP ratio was 77.5%, for low birth weight sensitivity of CU ratio was 60% and CP ratio was 65%, for NICU admission sensitivity of CU ratio was 88.8% and CP ratio was 65% and for adverse perinatal outcome (IUD) sensitivity of CU ratio was 57.7% and CP ratio was 60%.

Study by Adiga et al [81] showed that Sensitivity for pre term of CU ratio was 54.5% and CP ratio was33.3%, low APGAR of CU ratio was 62.5% and CP ratio was 56.3%

Diagnostic accuracy of CP ratio is good (78%) as compared to CU ratio (75%) in diagnosing the perinatal outcome.

Study by Adiga et al [81] showed that CP ratio gives good diagnosis as compared to CU ratio.

CONCLUSION:

Diagnostic accuracy of CP ratio was almost similar (78%) as compared to CU ratio (75%) in diagnosing the perinatal outcome and was only better than 3%. However, the combined Doppler results were more sensitive to abnormal outcome.

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