

**STUDY OF TRIPLE VESSEL WAVE PATTERN BY DOPPLER STUDIES IN LOW RISK AND HIGH RISK PREGNANCIES AND PERINATAL OUTCOME**Kondareddy Narasappagari Srilakshmi<sup>1</sup>, Raghavendra<sup>2</sup>, A. A. Khazi<sup>3</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT:** Role of Triple vessel umbilical, middle cerebral and uterine artery wave pattern by color Doppler study in low and high risk pregnancies in relation to perinatal outcome was studied. Fifty (50) patients with gestational age between 31-40 weeks who were diagnosed to have severe preeclampsia, preeclampsia with IUGR were studied and subjected to color Doppler ultrasonography. Findings of Doppler studies were correlated with the adverse perinatal outcomes. Acceptable wave forms were obtained from uterine artery, MCA and UA in all these cases. All the cases were followed up for the perinatal outcome. Cerebro placental ratio had higher sensitivity (95%) and NPV (85%) than UAPI (Sensitivity 66.66%, NPV 79.40%) and MCA PI (Sensitivity 83.33%, NPV 77.27%), UAPI had higher specificity (93.10%) and PPV (87.5%) compared to cerebro placental ratio (Specificity 87%, PPV 88%) and MCAPI (Specificity 85%, PPV 89.28%).

**KEYWORDS:** High risk pregnancy; severe preeclampsia, IUGR and Triple vessel, Doppler study, perinatal outcome.

**INTRODUCTION:** Pre-eclampsia is one of the leading causes of maternal and fetal morbidity and mortality. It affects 2-5% of pregnancies and is principally disease of first term pregnancy.<sup>1</sup> Pre eclampsia is a specific syndrome characterized by reduced organ perfusion secondary to vasospasm and endothelial pathophysiology. Almost all the morbidity being due to multisystemic manifestations in many organs including brain, liver, kidney and placenta.

IUGR is a common complication of pre-eclampsia and is due failure of normal placental invasion and development. As a result of impaired uteroplacental blood flow manifestations of pre-eclampsia may be seen in fetoplacental unit. These include IUGR, oligohydramnios, placental abruption, fetal hypoxia, perinatal death and non-reassuring fetal status found on antepartum fetal surveillance by Doppler ultrasound.<sup>2,3</sup>

Recent studies indicate that the cerebroplacental ratio of pulsatility index of MCA and UA is the most sensitive Doppler index for predicting perinatal outcome in fetuses with IUGR.<sup>4,5</sup> In the majority of the severely growth retarded fetuses, sequential deterioration of arterial and venous Doppler precedes biophysical profile score deterioration. At least one third of fetuses show early signs of circulatory deregulation 1 week before biophysical profile deterioration, and in most cases, Doppler deterioration preceded biophysical profile deterioration by 1 day.<sup>6</sup> This indicates the significance of Doppler study in these patients for early detection of fetal compromise.

**METHODOLOGY:** The study was conducted on fifty women with high risk pregnancies with inclusion criteria and fifty women with low risk pregnancies. Singleton pregnancies with history and physical

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findings suggestive of Severe preeclampsia, IUGR (EFW < 10TH percentile for gestational age), Severe preeclampsia plus IUGR.

The pregnancies with Cardiovascular disease, Multiple gestations, Fetuses with congenital anomalies, Renal disease, Essential hypertension prior to pregnancy and other high risk pregnancies conditions were excluded. Doppler US results were analyzed for prediction of perinatal outcome. Pregnancy was considered to have "Adverse outcome" if Birth Weight is less than 10th percentile, Perinatal death, Emergency CS for fetal distress, Low APGAR score (5 min APGAR score-less than7), Admission to NICU for complications of Low Birth Weight.

Pregnancy outcome was considered to be Uneventful or Favorable when the above complications were absent. The outcome for each pregnancy was obtained by examining the labor ward records and neonatal intensive care unit records wherever appropriate. The UA Pulsatility index ratios were considered abnormal if the value was above the 95th percentile values for gestational age.<sup>7</sup> The MCA pulsatility index was considered abnormal if the value was below the 5th percentile of previously published values for gestational age.<sup>22</sup> The MCA/UA PI ratio (cerebroplacental ratio) is considered abnormal when it is less than 1.08 as given by the Gramellini D et al.<sup>8</sup>

**STATISTICAL ANALYSIS:** Statistical analysis was done by using proportions. The sensitivity, specificity, positive predictive value, negative predictive Value and diagnostic accuracy were determined for all Doppler measurements

Gestational age (Wk)	Study Group	Control Group
31 -32	9	0
33 -34	5	1
35 -36	10	3
37 -38	19	37
39 -40	7	9

**Table 1: Gestational Age Distribution in study group and control group**

Amniotic Fluid	Doppler Normal	Doppler Abnormal	Total
Oligo	2	13	15
Normal	17	18	35
<b>Total</b>	<b>19</b>	<b>31</b>	<b>50</b>

**Table2: Amniotic Fluid distribution in the study group**

30% (n=15) had oligohydramnios and 70% (n=35) had normal amniotic fluid.

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Maternal Complications	Number of Cases	Percentage
IUGR	22	44
ANAEMIA	8	16
PREVIOUS LSCS	2	4
HELP SYNDROME	3	6

**Table 3: Maternal complications of study group**

Mode of delivery	Normal Doppler	Abnormal Doppler
Elective LSCS	1	0
EmLSCS	4	10
Normal vaginal delivery	13	22
<b>Total</b>	<b>18</b>	<b>32</b>

**Table 4: Mode of Delivery**

$\chi^2 = 26.94$ ,  $DF=2$ ,  $P<0.001$ , There was significant association between abnormal Doppler and caesarean section Delivery

Pregnancy outcome	No. of cases	Percentage
	<b>Study group</b>	<b>Study group</b>
	<b>Control group</b>	<b>Control group</b>
Adverse	42 10	84 20
Uneventful	8 40	16 80
<b>Total</b>	<b>50 50</b>	<b>100 100</b>

**Table 5: Pregnancy Outcome in the study group**

84 % (n=42) fetuses had at least one abnormal outcome and remaining 8 fetuses had normal outcome.

Pregnancy outcome	No. of cases		Percentage	
	Study group	Control group	Study group	Control group
EmLSCS	15	9	30	18
Low Apgar Score	8	0	16	0
NICU Admission	19	0	38	0
Neonatal Death	8	0	16	0
Low Birth Weight	35	7	70	14
Preterm Delivery	24	3	48	6

**Table 6: Adverse outcome Parameters in Study and Control Groups**

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70% of neonates (n=35) had birth weight of less than 2.5 kg. Of the 50 neonates, 19 neonates were admitted to NICU, 8 neonates had 5 min Apgar score of less than 7 and 15 babies were born by emergency caesarean section for fetal distress.

	Abnormal		Normal		Total	
	No. of cases	percentage	No. of cases	percentage	No. of cases	percentage
1-1.50	11	78.50	3	21.50	14	100
1.51-2	11	68.50	5	31.25	16	100
2-2.50	7	46.60	8	53.30	15	100
2.50-3	1	25	3	75	4	100
>3	0	0	1	100	1	100
<b>Total</b>	<b>30</b>	<b>60</b>	<b>20</b>	<b>40</b>	<b>50</b>	<b>100</b>

**Table 7: Birth weight distribution in study group**

$\chi^2 = 25.96$ , DF=4, P<0.001, Doppler results considered for umbilical and middle cerebral arteries together are significantly associated with birth weight.

**DISCUSSION:** Umbilical artery and middle cerebral artery Doppler ultrasound clearly depicts the information about placental resistance and the changes in the fetal hemodynamic in response to it. Middle cerebral artery Doppler has enabled the confirmation of brain sparing effect in IUGR. It is possible to use a single cut off value for cerebroplacental ratio after 30th week because cerebral-umbilical Doppler ratio does not vary significantly between 30th and 40th weeks as reported by Waldimir off et al<sup>9</sup> who observed a significant differences in cerebroplacental ratio only between weeks 26-38.

After 26th week, the statistical comparison showed no significant differences between the intervals considered. Arbeille<sup>11</sup> et al also found the cerebral-placental ratio constant during the pregnancy and suggested 1 as the cut off value and all values below 1 were considered abnormal. We considered the study of Gramellini et al<sup>8</sup> that cerebroplacental ratio less than 1.08 as abnormal. We have studied about 50 pregnancies with preeclampsia and clinical suspicion of IUGR.

70% of neonates (n=35) had birth weight of less than 2.5 kg. Of the 50 neonates, 19 neonates were admitted to NICU, 8 neonates had 5 min Apgar score of less than 7 and 15 babies was born by emergency caesarean section for fetal distress. There were 8 neonatal deaths. Of the 8 neonatal deaths, 1 case had reversal of diastolic flow and 5 had absent diastolic flow.

Out of 50 cases studied, 34 (68%) showed positive Doppler indices in any of the three vessels studied. The remaining 16 (32%) cases showed normal Doppler indices in all the three vessels studied. Among abnormal 34 cases, 29 (85 %) cases, 25 (74%) cases and 15 (44%) had abnormal Middle cerebral artery, uterine artery and umbilical artery Doppler indices respectively. Maximum number of abnormal cases (95.7%) were induced and delivered.

Babies of 19 cases (55%) with abnormal Doppler indices had NICU stay whereas 4 babies (8%) of the cases with normal Doppler indices had NICU stay? Among abnormal cases, 8 babies (24%) had APGAR score <7 compared to 1 baby (3%) in normal cases (p<0.001). 36% of normal

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cases and 45.5% of abnormal cases had babies with birth weight in the range of 1.5 to 1.99 Kg. 5 babies (14%) of abnormal cases had <1 kg birth weight and none of the babies of normal cases had <1 kg birth weight.

In 5 patients with AEDV there were 2 still born, 3 neonatal deaths and 1 case with REDF had early neonatal death accounting for 100 % perinatal mortality in both AEDV REDF. Thus triple vessel Doppler study is very useful in predicting high risk pregnancies with adverse perinatal outcome when the Doppler velocimetry is abnormal

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