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Research Article

**DIAGNOSTIC ACCURACY OF DOPPLER  
ULTRASONOGRAPHY IN DIAGNOSIS IUGR THROUGH  
CEREBRO PLACENTAL RATIO.**<sup>1</sup>Dr. Reema Abdul, <sup>2</sup>Waseem Iqbal, <sup>3</sup>Dr. Neelam Raza<sup>1</sup>Medical officer, Civil hospital singal ghizer.<sup>2</sup>THQ HOSPITAL MURREE<sup>3</sup>House officer, DHQ Hospital Rawalpindi**Article Received:** May 2020**Accepted:** June 2020**Published:** July 2020**Abstract:**

**Introduction:** In obstetrics the complex and common problem in modern era is considered IUGR. The common methods used to identify the IUGR were NST and BPP but their results are not sensitive to manage the perinatal results. Cerebro placenta ratio is most accurate, specific, and sensitive and best predictor for the high risk pregnancies like IUGR. Cerebro placental ratio is calculated by umbilical artery and pulsatility index of middle cerebral artery.

**Method:** The study was conducted in the Radiology Department of Lahore General Hospital. The sample size was 50 women who were suspected clinically for having IUGR and were referred to Radiology Department for Doppler Ultrasonography for better evaluation of the IUGR suspects. From the Doppler US the velocity waveform of the fetal middle artery and umbilical artery was collected. In each case the cerebro placental ratio and pulsatility index ratio was evaluated. Cerebro placental ratio (CPR) is defined abnormal when it is less than 1.08 and this is also considered cut of value. The co relation of the ratio is associated with perinatal outcome.

**Results:** From the total antenatal sample 63% of the babies born have weight less than 2.5 kg. The live births were 44 and the intrauterine deaths were 6. The neonates who were admitted to NICU were 10. The neonates who were born with emergency cesarean were 12. From the IUDS cases the two babies have absent diastolic flow and four babies have reversal of blood flow from umbilical artery. After diagnosis the IUDs occurred within a week.

**Conclusion:** Doppler sonography in the identification of IUGR by cerebro placental ratio is considered accurate, specific and sensitive which can help to reduce the mortality rate among the child and mother.

**Keywords:** IUDs, IUGR, Cerebro placental ratio,, Pulsatility index, Doppler sonography

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**INTRODUCTION:**

Intrauterine growth restriction is also known as fetal growth restriction is mostly performed with ultrasound in order to measure the estimated fetal weight which is less than the 10<sup>th</sup> percentile of the fetal gestational age. This condition is considered common among the maternal population and can affect up to 15 % of the population (1). This is high risk condition in pregnancy and can cause neurological development impairment, morbidity and mortality in neonates (2). The technology has become blessing in disguise and before the advancement of technology the assessment of IUGR was mostly done by the uterine size measuring and palpating the fetus size and observes the infant after delivery. Advancement in technology has helped to measure the fetomaternal circulation and fetal hemodynamic with the help of Doppler velocimetry. It is accurate, sensitive and non-invasive tool which has helped to improve maternal health by better treatment plan. If the fetal, uterine and placental circulation results are not in satisfactory level it will bring worse perinatal results. For the fetal well-being the most common evaluation is based upon the Doppler scan for umbilical artery (UA). This test helps in both way as diagnostic tool and also as prognostic tool for assessing the intra uterine growth restricted fetus. (3). If the waveform produced in doppler sonography from umbilical artery is abnormal (reversed diastolic flow or either absent) it shows that the fetal is under stress. It can be identified two weeks prior before the fetal start deteriorating with the help of Doppler scan. (4). The extended fetal hypoxia in pregnancies can cause the blood volume redistribution towards the main and important organs of body like spleen, kidney, heart, adrenal glands and towards brain, can cause the enhanced diastolic flow resulting in vasodilatation of the middle cerebaro artery. It will reduce the pusatility index (PI). When the IUGR is unbalanced it will cause the high umbilical artery pulsatility index and it will result the low cerebro placental ratio (CP) than normal fetus growth. The low CP ratio is observed in retarded fetus growth. In the last ten weeks of gestation period the cerebro placental ratio remains constant therefore it is accurate measurement to evaluate the fetus growth with the obtained from MCA and UA. Table 1 shows the distribution of the sample according to their gestational age.

Table 1

Gestational age	N	Percentage
30-33 weeks	22	40%
34-36 weeks	12	24%
37-40 weeks	16	36%
Total	50	100%

From the above table 1 it is clear that 40 % of the women were in gestational age of 30 to 33 weeks of pregnancy and the 24% of the women were in the gestational age of 34 to 36 week of pregnancy and the remaining 36 percent were from the last month of pregnancy.

help of changing cp ratio. (8). The purpose of the study is to analyze the accuracy of Doppler scan in identifying the IUGR for better perinatal outcome with the help of cerebro placental ratio. Objective of the study is to confirm the color Doppler sonography role in the prediction of IUGR in pregnancies with the help of umbilical artery and middle cerebro artery indices by velocimetry of Doppler scan.

**METHODOLOGY:**

The cross-sectional observational study was conducted in the Radiology Department of Lahore General Hospital from the period of January 2019 to September 2019. The sample size was 50 pregnant women with singleton pregnancy and also, they were clinically suspected for having IUGR. They were referred to Radiology Department for Doppler Sonography to diagnose their IUGR. The gestation age of the fetal was from 30 to 40 weeks.

Examination of each patient was performed two or three times with multi frequency convex probe and following observation of each patient was recorded.

- Pulsatility index of umbilical artery and middle cerebro artery was observed
- Middle cerebro artery and pusatility index ratio was calculated
- If the umbilical artery pulsatility index (UA PI) was greater than 95<sup>th</sup> percentile for the gestational age it was considered abnormal and also middle cerebro artery pulsatility index (MCA) was less than 5<sup>th</sup> percentile for gestational age it will also be considered abnormal.
- MCA/UA pulsatility index ratio less than 1.08

**RESULTS AND DISCUSSIONS:**

The sample size 50 pregnant women who were suspected IUGR in clinical examination and their gestational age was ranging from 30 to 40 weeks and have previous history of child birth with retarded growth, High BP, low abdominal fundal height with respect to gestational age and anemia. Those patients were completely screened with the help of Doppler sonography by measuring the velocity waveform which was

Table 2 is about the no of parity the pregnant women were falling in the sample.60 percent of the pregnant women were having first baby and the 40 % of the pregnant women have multiple births.

Table 2

Parity	N	Percentage
Multi para	30	60%
Primi para	20	40 %

Table 3 is about the other additional health problems observed in the sample pregnant women.

Additional health issues	N	Percentage
Pregnancy induced hypertension	36	72%
Diabetes Mellitus	6	12%
Anemia	12	24%
Renal issue	2	4%

From the ultrasound it was observed that placental maturity of grade II was in 24% of the cases and the placental maturity of Grade III was observed in 76% of the cases. From the ultrasound it was also observed that the amniotic fluid was normal among 28 % of the patients and among 78 % of the patients it was oligohydroamnios.The Doppler scan results are shown in table 4.

Table 4

Indicators	N	Percentage
Amniotic fluid Normal	14	28%
Oligo hydroamnios	36	72%
Grade II placental maturity	12	24%
Grade III placental maturity	38	76%

Following table 5 is about the adverse outcomes of the IUGR cases. From the 50 cases the intra uterine death was observed in 12 % and the emergency c section was performed on the 24 % of the patients and the live birth babies the birth weight was less than 2.5 kg in 60 % of the infants. After delivery 20 % of the infants were shifted to the NICU. Low APGR score was observed in 12% o the cases.

Table 5

Peri natal Outcome	N	Percentage
Intra uterine deaths	6	12%
Emergency c section	12	24%
Low birth weight	30	60%
NICU admission	10	20%
APGR low score	6	12%

In the cases where intra uterine death was observed the scan results confirmed that among 8%(4 infants) of the babies diastolic flow reversal was observed and among 6%(2) babies the diastolic flow was absent. Due to diastolic reversal flow the fetus IUD took place within a week from the gestational age of less than 33 weeks. The sensitivity of the Doppler sonography for cerebro placental ratio was 94%, specificity was 89 %.The diagnostic accuracy was calculated was 92% which is more as compared to the umbilical artery PI ratio and the middle cerebro artery PI ratio. When both the ratios were used to find the cerebro placental ratio it has increased the diagnostic accuracy and has helped to avoid the adverse results of IUGR. The accurate diagnosis has helped to reduce the mortality and morbidity among the infants and in mothers.

Table 6

Results	Umbilical Artery PI	Middle cerebro artery PI	CPR (MCAPI/UAPI)
Sensitivity	88%	81%	94%
specificity	80%	72%	89%
Diagnostic accuracy	80%	72.4%	92%

As the gestational age in normal pregnancy increases the PI index decreases. In the case of IUGR the Umbilical artery diastolic flow decreases because of increased resistance in arterioles of tertiary villi and in small artery. This enhances PI of umbilical artery and S/D ratio. The adverse placental insufficiency causes the decrease in diastolic flow, this decrease become absent and then reverse flow pattern is observed. (12, 13).The 7 % of the cardiac output in the pregnancy is because of low resistance circulation of fetal MCA in the whole pregnancy. The pulsatility decreases as the diastolic blood flow increases due to ischemia and fetal hypoxia (15, 16). When the fetus is compromised brain sparing occurs. The worse outcomes have been observed due to fetal hypoxia.

Cerebro placental ratio provides information about the insufficiency in circulation of umbilical waveform of placenta but it also provides information about the changes resulting in the MCA S/D ratio. Cerebro placental ratio provides information about the fetal response and placental status. Therefore Doppler sonography velocimetry is considered accurate, non invasive diagnostic tool for the fetomaternal wellbeing in high risk pregnancies. The sample size was 50 IUGR suspected women and the born neonates were low birth weight less than 2.5 kg to 1.5 kg. The abnormal UA and cerebro placental ratio are good indicators of forecasting worse outcomes of IUGR.

### CONCLUSION:

Diagnostic accuracy of Doppler ultrasound through cerebro placental ratio in IUGR is a good predictor for fetomaternal health and should be used in routine evaluation for high risk pregnancies in order to enhance the perinatal outcomes.

In IUGR the cerebro placental ratio helps to identify placental circulation insufficiency and the changes which are observed in MCA, therefore, it is valuable, widely available and non-invasive technique to improve maternal health.

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