

A STUDY ON FETOMATERNAL OUTCOME IN PREGNANCIES COMPLICATED WITH INTRAUTERINE GROWTH RESTRICTION

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Abstract

Background: Intra Uterine Growth Restricted neonates are those whose weights were below the 10th percentile for their gestational age. Some studies concluded that second trimester sonography is superior for predicting IUGR neonates. Umbilical artery doppler velocimetry is considered standard in the management of the growth restricted foetus. This study was primarily done to evaluate whether SFH and abnormal Doppler finding after 20 – 22 weeks of gestational period is useful in predicting the development of IUGR, pre-eclampsia, eclampsia, preterm delivery, NICU admission, steroid requirement. **Materials and Methods:** In our study, 60 women in gestational age after 20-22 weeks who have a reduced symphysis-fundal height found to be less than 10th percentile were selected. They were assessed with Doppler velocimetry, follow up of all patients was done until delivery. **Result:** Steroid coverage was done for all antenatal mothers with FGR. Maternal complications responsible for IUGR are Preeclampsia, Gestational Hypertension, GDM, Imminent eclampsia. Despite these complications, maternal outcome was good due to early detection of complications and timely intervention. Majority of the pregnancies has good cerebro-placental ratio. USG predicted birth weight of the foetus which had a positive correlation with actual birth weight. Majority of newborn babies had good APGAR score of 10, n=39 at one minute and n=53 at 5 minutes. Majority of the newborns required NICU admission. On pathological examination, majority of placentae had calcifications, followed by fibrinoid necrosis and villous fibrosis. Among 60 patients in this study group 20 patients delivered preterm before 36 weeks of gestation 16 of 60 mothers in this study group developed preeclampsia or pregnancy induced hypertension at some point of time in their pregnancy. Pregnant mothers included in this study group delivered around 41 babies with either SGA or IUGR. While 15 of neonates delivered required admission in NICU for some reason. Reverse, absence or slow end diastolic flow in umbilical artery was seen in 13 patients. In Middle cerebral artery the pulsatility index and if PI is less than 0.7, found in 13 of patients. Ductus Venosus assessed and If waveform is reverse, slow or absent found in no patients in our study group. **Conclusion:** Clinical examination and detection of FGR by reduced symphysis-fundal height and subjecting the pregnant woman for complete obstetric scan with BPP & Doppler velocimetry can be used in routine and used in the follow up of high-risk pregnancy suspected of FGR. Early screening of the UA Artery and MCA waveform may be performed along either uterine artery and the ductus venosus analysis as all indices have positive Co relation with maternal and neonatal outcomes. In present study, MCA PI was found to be the most sensitive and specific indicator for extent of fetal compromise in FGR. Hence if UA PI is abnormal then MCA PI should be performed to know the extent of brain sparing. Early detection and careful follow up of FGR cases with Ante natal Fetal surveillance tests like Daily fetal kick count, NST, BPP, and Doppler study along with 100% steroid coverage gave good perinatal outcome, and perinatal mortality and morbidity also reduces.



INTRODUCTION

Intra Uterine Growth Restricted neonates are those whose weights were below the 10th percentile for their gestational age. They are often designated as having FGR and were shown to be at risk for neonatal death. Tuuli and colleagues 2011,^[1] concluded that second trimester sonography is superior for predicting IUGR neonates. Umbilical artery doppler velocimetry is considered standard in the management of the growth restricted foetus. Umbilical artery doppler velocimetry abnormal findings - characterized by reversed or absent end diastolic flow - are uniquely linked with FGR. Abnormal umbilical artery doppler velocimetry was combined with foetal weight < 3rd percentile is most strongly associated with poor obstetrical outcome. Campbell and Thomas (1977),^[2] described use of Sono graphically determined circumference ratio (HC/AC) to differentiate growth restricted foetus. Umbilical artery angle independent indices like pulsatility index or systolic/diastolic (S/D) ratio decrease with increasing gestational age because of a decreased placental vascular resistance and increase in end-diastolic velocity, which occurs physiologically. In pathologic conditions like IUGR foetuses, the EDF decreased due to blood shunting to vital organs (brain, heart), the umbilical artery waveforms change and the angle-independent indices become abnormal with values above their reference ranges. These changes reflect an increased placental vascular resistance. In this study we focus our measurements pulsatility index on foetal umbilical, middle-cerebral arteries, and ductus venosus using doppler velocimetry because of their importance for detection of any abnormalities underlying IUGR. Numerous reports have described accelerated foetal lung maturity in pregnancies associated with growth restriction (Perelman, 1985). One possible explanation is that foetus responds to stressed environment by augmenting adrenal glucocorticoid secretion, which may lead to the accelerated foetal lung maturation Laatikainen, 1988.^[3] Turan and associates 2008,^[4] described the sequence of changes characteristic of mild placental dysfunction, progressive placental dysfunction, and severe early onset placental dysfunction. FGR is one of the "major obstetrical syndromes" associated with defects in early placentation Brosens 2015.^[5] Rogers and coworkers 1999,^[6] concluded that implantation site disorders may be both a cause and consequence of hypoperfusion at placental site.

Aim & Objectives of the Study

- Prediction of risk and early detection of the compromised IUGR foetus to allow for timely intervention
- To correlate clinical findings in IUGR with colour Doppler and perinatal outcome.
- To study prognostic efficacy of Doppler parameters in early detection of foetal compromise.

- To correlate villous capillary lesions of placenta with foetal outcome.

MATERIALS AND METHODS

60 singleton pregnancies detected to have IUGR beyond 20 weeks gestation were taken in the study and were examined and followed clinically along with Doppler findings until delivery. Prognostic efficacy dopplers were studied. All the pregnant women irrespective of their age and parity with clinically detected FGR included in the study. Multiple pregnancies and foetuses with congenital anomalies excluded from the study. Screening tests and diagnosis for IUGR includes:

- Accurate determination of the gestational age clinically and by USG in suspected FGR cases
- Assessment of foetal well-being when an IUGR foetus is diagnosed. This includes Doppler studies and cardiotocography monitoring.
- The collected data entered in a master sheet and analysed by IBM SPSS Version 21.0 and frequency tables.

RESULTS

Mean age of the study population was 25.47(+4.634) years with a range of 20 years (minimum age was 19 years and maximum were 39 years. Mean weight gain of the study population was 8.445(+1.17) kgs ranging from 5.5 to 11 kgs. Of the entire study population 33 were primis, 16 were G2, 9 were G3, one each were G4 & G6. At the time of termination of pregnancy 9 participants were of 40 weeks POG and 12 each were of 39- and 38-weeks POG. Only one participant had 28 weeks POG. Maternal complications responsible for IUGR are Preeclampsia 7(13%), Gestational Hypertension 7(13%), GDM 7(8.3%), Imminent eclampsia 2(0.5%). Despite these complications, maternal outcome was good due to early detection of complications and timely intervention. Out of 60 study participants, 45 had reactive non stress test and 15 had a nonreactive one. Majority of the pregnancies has good cerebro-placental ratio (n=53). Steroid coverage was done for all antenatal mothers with FGR.

Majority of the study population had vaginal delivery (45%), followed by primary LSCS (40%) and repeat LSCS (15%). Most common cause for a LSCS was severe oligo hydramnios (n=12), followed by placenta previa (n=6) and non-reactive NST (n=4). Majority of the pregnancies did not have meconium-stained liquor (n=46). On pathological examination, majority of placentae (n= 35) had calcifications, followed by fibrinoid necrosis (n=23) and intervillous fibrin (n=22). 17 had villous fibrosis. Majority of newborn babies had good APGAR score of 10, n=39 at one minute and n=53 at 5 minutes. The mean birth weight of newborn babies was 2.26 (+0.336) kgs ranging from 0.87 to 2.89 kilograms. Majority of the newborn babies were of low birth

weight (68%). USG predicted birth weight of the foetus which had a positive correlation with actual birth weight, Spearman Correlation = 0.782, which was statistically significant ($p < 0.0001$) Most of the newborn babies were female children (57%), and remaining 43% were male children. Majority of the newborns required NICU admission ($n=32$), one week admission required by 15 neonates and 10 days of admission required by 15 neonates. Majority of the newborns had neonatal jaundice ($n=32$), while most of the newborns did not have respiratory distress at birth ($n=32$) or neonatal sepsis (72%). Out of 28 NICU admissions, 11 were low birth weight and 17 were normal birth weights. Low birth weight babies had a longer duration of NICU stay if admitted when compared to normal birth weight babies which was statistically significant ($p < 0.0001$) Two deaths reported among 7 fetuses with poor CPR ratio, compared to no deaths in 53 fetuses with normal CPR ratio. Pregnancies with low cerebro-placental ratio resulted in more neonatal deaths when compared to adequate cerebro-placental ratio which was statistically significant ($p = 0.001$).

DISCUSSION

Among our patients nine among 13 mothers having persistent diastolic notch on uterine artery doppler ended up in delivering IUGR or SGA babies which was also statistically significant with odds ratio of 9.64 they had ten times higher risk. The mean difference in baby weight was compared using unpaired T test and was also significant with p value less than 0.05. Similarly, babies delivered with persistent diastolic notch in Doppler also ended up requiring NICU admission and steroid requirement, were statistically more significant with a higher odds ratio. Even the mean number of days stay in NICU was higher in patient with persistent diastolic notch. In previous research done Becker R and Vonk R, uterine artery Doppler results at 20-23 weeks of gestation and adverse obstetric outcomes were evaluated.^[7] They evaluated uterine artery impedance using the mean PI of the left and right arteries or diastolic notching as primary markers. They showed a clear relationship between the elevation of PI and the frequency of adverse pregnancy outcomes, with the frequency of complications varying from 3.2 to 38.4%. This is like our results though our study group patients were of high risk for IUGR.

We also evaluated the impact of pulsatility index of uterine artery on the foetal and maternal sequelae by two ways. First by grouping the patients with pulsatility index cut off taken as 1.45 as mean for 20-22 wks. from previous studies. To start with the gestational age at delivery, among 17 patients who had pulsatility index above 1.45 ten babies were delivered preterm. This relationship is significant with an odds ratio of 14.28 which shows babies with higher uterine artery PI has approximately 14 times higher risk of preterm delivery compared to lower

pulsatility index. We also evaluated the mean difference of gestational age in weeks using unpaired T test was also significant with P value of 0.002. Pre-eclampsia or PIH developed in 7 patients among 17 with pulsatility index more than 1.45. Though this is less in total patients with high PI, when compared to number of patients with PIH with normal UA PI, its high and statistically significant. With an odds ratio of 3.92 those mothers with higher PI have around 4 times higher risk of developing pre-eclampsia or PIH. Coming to the important aspect of our study the impact of these indices on IUGR. Among our patients 10 among 17 mothers having high PI ended up in delivering IUGR or SGA babies which was also statistically significant with odds ratio of 6.42 they had approximately 6 to 7 times higher risk. The mean difference in baby weight was compared using unpaired T test and was also significant with p value less than 0.05. Similarly, babies delivered with high pulsatility index in Doppler also ended up requiring NICU admission and steroid requirement, were statistically significant and with higher odds ratio. We also analysed the mean difference of pulsatility index numerically over the maternal and foetal outcome using unpaired T test which showed there is significant difference in the mean pulsatility index in relation to parameters like term/preterm, IUGR, requirement of NICU admission and steroid requirement all had a higher mean PI with statistical significance except for development of PIH or pre-eclampsia where it was not statistically significant with P value of 0.108.

The next analysis was done by using the Pulsatility index of middle cerebral artery where PI less than 0.7 was considered abnormal. We first analysed the gestational age at delivery, among 9 patients who had low PI, 6 babies were delivered preterm. This relationship is significant with an odds ratio of 14.14 which shows babies with low PI in MCA has around 14 times higher risk of preterm delivery compared to normal MCA-PI. Even the mean difference of gestational age in weeks compared using unpaired T test was also significant with P value of 0.004. Pre-eclampsia or PIH developed in 6 patients among 9 with low MCA-PI With an odds ratio of 10.66 mothers with MCA-PI less than 0.7 ten times higher risk of developing pre-eclampsia or PIH. Among our patients 9 among 9 mothers having persistent low MCA-PI ended up in delivering IUGR or SGA babies which was also statistically significant with a higher odds ratio of 22.7. The mean difference in baby weight was also analysed using unpaired T test and was also significant with p value less than 0.05. Similarly, babies delivered with low MCA-PI also ended up requiring NICU admission and steroid requirement, both were statistically significant with a higher odds ratio. Even the mean number of days stay in NICU was more in patient with low MCA-PI. Very minimal studies have proved that middle cerebral artery peak systolic velocity may be a better predictor of perinatal mortality in preterm IUGR than the PI, but additional study is needed to confirm this

finding.17 When there is foetal hypoxemia, there will be brain-sparing reflex, which is specified by increased end-diastolic flow velocity which is indicated by a low PI in the middle cerebral artery¹⁴. This hypothesis is what seen in our study where a low PI in middle cerebral artery has a higher impact on the maternal and foetal outcome hence showing need to evaluate the MCA using Doppler velocimetry.

Next analysis was done for umbilical artery. We analysed that the end diastolic flow in the Umbilical artery. Reverse flow, absence of flow or decreases flow were considered abnormal and was analysed. Starting with the gestational age at delivery, among 9 patients who are having abnormal UA -EDF 6 babies were delivered preterm. This relationship is significant with an odds ratio too high of 37.8 which shows babies with presence of abnormal flow in the umbilical artery has around 38 times higher risk of preterm delivery compared to mothers with normal UA-EDF. Even the mean difference of the gestational age in weeks compared using unpaired T test was also significant with P value of 0.002 where in abnormal flow patients' gestation age at delivery was earlier. Pre-eclampsia or PIH developed in seven patients among 13 with abnormal EDF, with an odds ratio of 7.46 those mothers with abnormal flow has seven to eight time's higher risk of developing preeclampsia or PIH. Among our patients 6 among 9 mothers having abnormal flow delivered IUGR or SGA babies, this was found to be statistically significant with odds ratio of 9.64 which shows they had ten times higher risk. The mean difference in baby weight was also analysed using unpaired T test and was also significant with p value less than 0.05. Similarly, babies delivered with abnormal end diastolic flow in the umbilical artery also ended up requiring NICU admission and steroid requirement, both are statistically significant with a higher odds ratio. Even the mean number of days stay in NICU was higher in patient with abnormal flow. Finally, we analysed the ductus venosus flow and reverse or slow or absent wave form were considered abnormal. Gestational age at delivery was analysed and no patients had abnormal waveform.

CONCLUSION

After analyzing results of our study we are of the conclusion that early antenatal booking ,timely investigations to predict medical complications in pregnancy and timely intervention to control the medical disorders in pregnancy greatly reduce the risk of Early FGR .clinical examination and detection of FGR by reduced symphysio-fundal height and

subjecting the pregnant woman for complete obstetric scan with BPP & Doppler velocimetry can be used in routine and also used in the follow up of high risk pregnancy suspected of FGR, it help in the management and control of FGR. Doppler ultrasound is a must to pregnant women who have any complications to detect the IUGR, thus fetal problem could be avoided. Early screening of the UA Artery and MCA waveform may be performed along either uterine artery and the ductus venosus analysis as all indices have positive Co relation with maternal and neonatal outcomes particularly FGR and a proper early diagnosis of FGR decrease the fetal morbidity and mortality rate. In present study, MCA PI was found to be the most sensitive and specific indicator for extent of fetal compromise in FGR, though ratio such as MCA PI / UA PI and UA SD (>3) where comparably specific predictors for poor perinatal outcome. Hence if UA PI is abnormal then MCA PI should be performed to know the extent of brain sparing, and thus emphasizing importance of studying vessels in Doppler. In case of abnormal Non stress test, pregnant women can be advised to get Doppler study with complete obstetric scan with BPP, its valuable test to study fetal blood supply in high-risk pregnancy. Early detection careful follow up of FGR cases with Ante natal Fetal surveillance tests like Daily fetal kick count, NST, BPP, and Doppler study along with 100% steroid coverage gave good perinatal outcome, and perinatal mortality and morbidity also reduces. These measures also reduced the need for NICU Admissions among the neonates.

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