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FETO-PLACENTAL INTERRELATIONSHIP THROUGH ULTRASONOGRAPHY AND PATHOLOGY, EMPHASISING ON LOW BIRTH WEIGHT INFANTS

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ABSTRACT

This study was done to evaluate the histomorphology of the placenta and to correlate this with placental sonological features and Doppler study of the uterine and umbilical arteries of low-birth-weight babies compared with normal birth weight babies. Due to varied perinatal outcome of LBW infants, we planned to observe the feto-placental interrelationship through both imaging and pathology. Accordingly our study was planned so that it may help create a better understanding of the diagnostic variables involved & help formulate management protocol for a better prognosis of babies born with low birth weight. It was a Prospective analytical study ,Detailed history taken as per study format physical and obstetric examination of the mother done followed by USG for placental profile and Doppler study then examination of placenta, grossly and microscopically after delivery .

INTRODUCTION

Placenta is the most accurate record of the infant,sprenatal experience [1]. Transfer of oxygen and metabolites between the maternal and fetal blood is a critical feature of its function. The ratio of placental weight to birth weight has been described as a marker of fetal growth and was found to be associated with altered fibrinogen and raised blood pressure in adult life[2]. Sir Barker and colleagues study suggested an association between a raised ratio of placental weight to birth weight and a decreased ratio of head circumference to fetal birth length, and it was therefore inferred that the increased ratio of placental weight to birth weight may be a marker of intra uterine growth restriction[2].Placental ultrasound can identify arange of features which are related to specific placental pathologies.

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These include various pathologies like anomalies of placenta, abnormalities of placental site and cord insertion, specific placental lesions such as subchorionic and intervillous thrombi, or chorioangiomata and umbilical and uterine artery blood flow in growth restriction.

Due to varied perinatal outcome of these infants, we planned to observe the feto- placental interrelationship through both imaging and pathology. Accordingly our study was planned so that it may help create a better understanding of the diagnostic variables involved & help formulate management protocol for a better prognosis of babies born with low birth weight.

AIMS AND OBJECTIVES

To evaluate the histomorphology of the placenta and to correlate this with placental sonological features and

Doppler study of the uterine and umbilical arteries of low birth weight babies.

MATERIAL AND METHODS

Study Setting

Dept of Gynaecology and Obstetrics, IPGME&R &SSKM Hospital, Kolkata. These patients came from in and around Kolkata. Since this is a tertiary care referral centre, patients also came from rural areas.

Inclusion Criteria

a) Singleton, live pregnancy.
b) Placentae of infants weighing between 500 and 2499 grams delivered
between 1stMay2012 to 30th April 2013 were included as cases.
c) Placentae of infants weighing 2500gms during same time period and
more for control.

Exclusion Criteria

Multiple pregnancies
Intra Uterine Fetal Death

Sample Size

An estimated 46 placentae of LBW babies as cases were studied.
Control- 46 placentae of normal weight babies as Controls were taken.

Type Of Study

A) Prospective analytical study.
B) Sources of data collection-1)Detailed history as per study format and 2) data collection from ,hospital records; the attending notes from the labour room admissions; labour records and paediatrician,s new born assessment sheet (i.e. demographic and baseline variables of age, occupation, gravida, parity, any medical or surgical disease of the mother and complications during pregnancy, gestational age by obstetric information and birth weight).
C) Physical and obstetric examination of the mother after admission for delivery.
D) USG for placental profile and Doppler study upto one week prior to delivery.
E) Examination of new born immediately after birth to note body weight of baby, birth asphyxia, congenital anomaly.
F) Examination of placenta, grossly and microscopically.
The ultrasonic measurements were made with 2D real time ultrasound. The transducer used was a curvilinear transducer of frequency of 2.5 to 3.5 Mega Htz. IUGR was diagnosed when fetal abdominalcircumference was more than two standard deviations below the mean for
gestational age and also confirmed by the serial assessment of fetal growth parameters.
Doppler studies were performed within last week before delivery using the 3.5 Mhtz transducer, colour flow mapping, and a 50 Hz high pass filter. HistomorphologyAll of the samples were stained withhaematoxylin and eosin. The delivered placenta was stored in formalin.

Table 1. Comparison of distribution of umbilical artery Doppler findings (condensed table) Fisher's exact test 2-tailed p value < 0.001 This table shows umbilical artery Doppler was abnormal in 39.13% cases in LBW group compared to 0.00% in NBW group. This is statistically highly significant.

	Umbilical artery Doppler(normal)	Umbilical artery doppler (abnormal)	Row Total
LBW	28	18	46
Row%	60.87	39.13	
NBW	46	0	46
Row%	100.0	0.00	
Total	74	18	92

Table 2. Odd's ratio for Umbilical artey abnormality

OR -60.37 (95% CI, 3.50 to1041.7) This table shows that if umbilical artery Doppler is abnormal there is 60.37 times risk of LBW fetus**.**

	LBW	NBW
Abnormal	18	0
Normal	28	26

Table 3. Relationship of abnormal umbilical artery Doppler with placental histopathology

OR – 21.42,(1.24 to 369.60, p -0.03)

	Abnormal UA doppler	Normal UA Doppler
Abnormal HPE	18	47
Normal HPE	0	27

Above table shows that there is significant association ($p<0.05$) between abnormal umbilical artery doppler velocimetry and HPE abnormality of placenta as there is 21.42 times risk of abnormal placental in presence of abnormal umbilical artery Doppler velocimetry.

DISCUSSION

In the present study 92 women with known LMP and gestational age who were admitted in labour room and maternity ward of department of Obstetrics & gynaecology, IPGME&R for safe confinement, were subjected to USG for pregnancy profile, emphasizing upon placental morphology along with umbilical and uterine artery Doppler velocimetry.

In our study by Kappa statistic we found that there is strong association of umbilical artery Doppler abnormality with cytotrophoblast proliferation and infarction while there is good association with villous vascular abnormality, heamorrhage, fibrosis and calcification. Our study found by odd, s ratio that there is significant association (p. ($p<0.05$)between abnormal umbilical artery Doppler velocimetry and HPE abnormalityof placenta and there is 21.42 times more risk of abnormal placental pathology in presence of abnormal umbilical artery Doppler velocimetry

A similar study conducted by Madazli et al found association of abnormal umbilical and uterine artery Doppler velocimetry with placental biopsy pathologies.

So in our study we found that in placenta of low birthweight babies prevalence of sonological abnormality in placental morphology, abnormal umbilical and uterine arteries Doppler velocimetry and placental pathology were significantly high.LBW infants often had more than one type of placental pathology.

Association between placental pathology and abnormal Doppler velocimetry of umbilical and uterine arteries was found.

CONCLUSION

Perinatal outcome is the reflection of placental function. Placental abnormality may be responsible for many fetal problems including low birth weight. In the present study prevalence of placental pathology among low birth weight infants was rather high compared to normal birth weight infants. Also there was high prevalence of sonological abnormality of placental morphology and abnormal Doppler velocimetry of uterine and umbilical arteries. In our study association between Doppler velocimetry and histomorphological findings was found. These findings also had adverse impact on perinatal outcome as evidenced by increased NICU admission. Placental pathology are best reflected antenatally by abnormal umbilical and uterine artery Doppler flow velocimetry and placental ultrasound and Doppler study can identify a range of features which are related to specific placental pathologies. Ultrasonography for placental morphology and Doppler velocimetry are non-invasive investigations which are acceptable to all patients. Placental pathological examination will more accurately reveal the causes of low birth weight infants and also, apart from retrospective diagnosis, may help predict problems which may be repeatedly encountered in future pregnancies. So there is need of placental examination in low birth weight infants especially in cases where sonological and Doppler abnormalities are also present. Thus, specific pathological correlation with prenatal features can be provided where possible, and pathological correlates of Doppler abnormalities of blood flow can be determined.

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