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Research Article

Perinatal Outcome and Histopathological Evaluation of Placentas in Intrauterine Growth Restriction (IUGR) Pregnancies

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Abstract:
Introduction: Intrauterine growth restriction (IUGR) is a condition in which fetus fails to achieve its inherent growth potential. It is the second most common cause of perinatal mortality and morbidity following prematurity.
Objectives: Objectives of this study were to see the perinatal outcome and histopathological changes in placenta in IUGR pregnancies.
Material & Methods: 100 cases of IUGR were taken up for study along with 50 controls. Ultrasonography was done to evaluate the uteroplacental insufficiency. Placental weight and morphology and histopathology of placenta was done.
Results: Prevalence of IUGR was more in younger age group 49%, primigravida 58%, low socio economic status 96% and rural background 77%. History of IUGR in previous pregnancy was 30%. Abnormal color Doppler was found in 47%. Placental weight was less in IUGR and histopathology of placenta showed fibrinoid necrosis in 48% and syncytial knots 44%. Neonatal mortality in the study came out to be 12%.
Conclusion: Regular antenatal care is necessary to pick up IUGR pregnancies and once diagnosed ultrasonography for fetal growth and color Doppler help to decide the optimal time for delivery.

Keywords: IUGR, Placenta, Histopathology, Color Doppler.

INTRODUCTION

Intrauterine growth restriction (IUGR) is a global phenomenon which is associated with significant neonatal morbidity and mortality. IUGR is a term used for fetuses with birth weight less than 10th percentile of those born at the same gestational age or two standard deviations below the population mean. The World Health Organization (WHO) defines LBW babies as the babies weighing less than 2500 gm at birth. The prenatal diagnosis of IUGR is based on clinical and ultrasonographic (USG) examination. (1) Causes of IUGR can be divided into maternal, fetal, placental and unknown causes, but the basic pathophysiology is due to reduced availability of nutrients in mother or its reduced transfer by the placenta to the fetus. It may also be due to reduced utilization by the fetus. (2) Placental factors and hypoxemia are keys to IUGR and fetal death. It is a condition associated with placental insufficiency. Conditions resulting in placental dysfunction may be recurrent. (3) In a histopathological evaluation of placenta in IUGR pregnancies, the weight of IUGR placenta was less than normal placenta. Infarction and intervillous fibrinoid deposition were higher in IUGR placenta. In addition thickening of basal membrane and cytotrophoblastic hyperplasia were more common among IUGR placenta. All the main histopathological findings pointed to placental blood flow reduction and fetal blood flow restriction. (4) Because

many etiologic roots, outcomes, treatment and management of this complication of pregnancy is unrecognized yet, more extensive pathological and morphological researches on placenta can be more successful in identifying factors causing IUGR and consequently the treatment and prevention of that.

MATERIAL AND METHODS

The present study was conducted on 150 cases (100 cases of IUGR and 50 cases taken as controls) in the Department of Obstetrics and Gynecology/ Department of Radiodiagnosis, Government Medical College and Rajindra Hospital Patiala during the period 2010-2012. The cases were divided into two groups

Study group - 100 cases of IUGR

Control group - 50 cases of normal pregnancies

Inclusion criterion taken was:

1. Singleton pregnancy with fetal growth restriction

2. Definitely known LMP with regular cycles

3. Minimum 4 antenatal checkups

Exclusion criterion was:

1. Multiple gestations

2. Polyhydramnios

3. Patients with unsure dates and irregular menstrual cycles

A detailed history including age, parity, gestational age, antenatal checkups, socio economic status, any history of IUGR in previous pregnancy was taken. Ultrasonography of all patients was done for biometry and any uteroplacental insufficiency. Apgar of all fetuses was seen. Placental weight was measured and placenta was sent for histopathological examination.

AIMS AND OBJECTIVES

To study the color Doppler changes and perinatal outcome in intrauterine growth restricted pregnancies and to evaluate histopathological changes in placenta of such pregnancies.

OBSERVATIONS

We observed (Table No 1) majority of patients (49%) with IUGR were in the age group of 19-25 years, belonged to rural background (77%), were unbooked (50%), belonged to low in socio economic status (96%) and were primigravidae (58%).

Table No 1: Demographic profile of study group patients

Age (in years)	No. of cases	%age
19–25	49	49.00%
26–30	38	38.00%
31–35	10	10.00%
36–40	3	3.00%

Residence

Rural	77	77.00%
Urban	23	23.00%

Booked/Unbooked

Booked	50	50.00%
Unbooked	50	50.00%

Socio-economic Status

Low	44	44.00%
Upper Lower	52	52.00%
Middle (upper & lower)	4	4.00%

Parity

0	58	58.00%
1	21	21.00%
2	9	9.0%
>2	12	12.00%

Table No 2: History of IUGR in previous pregnancy in study group

History of IUGR in previous pregnancy	No. of cases	% age
Present	30	30.00%
Absent	70	70.00%
P value	0.00106	

30% cases in study group had history of IUGR in previous pregnancy. P value was statistically highly significant indicating that IUGR is likely to occur in next pregnancy. (Table No 2)

Table No 3: Abnormal Color Doppler Changes in study and control groups

Doppler Changes	Study group (n=100)		Control Group (n=50)	
	No.	%age	No.	%age
Raised SD ratio of umbilical A (>3)	21	44.6	0	0
Raised PI of umbilical A	20	42.5	0	0
REDV in umbilical artery	3	6.3	0	0
Decreased PI in middle cerebral artery	22	46.8	0	0
Abn. SD ratio in uterine A (N=<2.6)	22	46.8	0	0
U/L notching in uterine artery	12	25.5	0	0
B/L notching in uterine artery	15	31.9	0	0

In study group, 47 subjects had abnormal Doppler findings suggesting uteroplacental insufficiency. Out of 47, 21 (44.6%) had raised SD ratio of more than 3 in umbilical arteries. Raised pulsatility index (PI) of umbilical arteries was

observed in 20 (42.5%) patients. Reverse end diastolic blood flow (REDV) in umbilical artery was observed in 3(6.3%) of patients. 22 (46.8%) had decreased PI in fetal middle cerebral artery suggesting brain sparing effect and 22 (46.8%) had raised SD ratio in uterine arteries. Unilateral uterine artery notching was observed in 12 (25.5%) and 15(31.9%) cases had B/L notching. In control group, no abnormal Doppler change was observed.

Table No 4: Distribution of cases according to mode of delivery

Mode of delivery	**Study group (n=100)**		**Control Group (n=50)**		P Value
	No. of cases	**%age**	**No. of cases**	**%age**	
Normal Vaginal delivery	63	63	42	84	0.00975
LSCS	37	37	8	16	0.00975

In patients with IUGR 63 % had vaginal delivery and 37% had LSCS as compared to control group in which 84% had vaginal delivery and 16% LSCS. P Value was highly significant showing LSCS rate was more in IUGR pregnancies. (Table No 4)

Table No 5: Apgar Score of babies

Time	**Study group (n=100)**		**Control Group (n=50)**		**P-value**
	Mean	**SD**	**Mean**	**SD**	
1 min	7.45	1.75	8.78	0.42	0.00488
5 min	8.42	1.32	9.00	0.00	0.00832
10 min	8.89	0.92	9.00	0.00	0.19549

The mean APGAR scores in the new born babies affected by IUGR were 7.45, 8.42 and 8.89 at 1, 5 and 10 minutes respectively as compared to controls 8.78, 9.00 and 9.00 at 1, 5, and 10 minutes respectively. Mean Apgar score was better in control group than IUGR group. (Table No 5)

Table No 6: Placental Weight of Study and Control Group

Weight (gm)	**Study group (n=100)**		**Control Group (n=50)**	
	No. of cases	**%age**	**No. of cases**	**%age**
200–300	28	28.00	0	0.00
300–400	69	69.00	0	0.00
400–500	3	3.00	38	76.00
> 500	0	0.00	12	24.00
Mean	351.40 gm		491.10 gm	
S.D.	49.88 gm		31.48 gm	
P-value	0.00028			

Placental weight in the majority (69%) of study group subjects was in the range of 300-400 gm, followed by 28(28%) in the range of 200-300 gm. Only in 3(3%) placental weight was 400-500 gm but in control group placental weight was in the range of 400-500 gms in majority 38(76%) and 12 (24%) cases had placental weight >500 gms.

P-value was 0.00028 which is highly significant, showing placenta of IUGR babies weigh less as compared to normal controls. (Table No 6)

Table No 7: Histopathology of Placenta in Study Group and Controls

Histopathology of placenta	Study group (n=100)		Control Group (n=50)		P-value
	No. of cases	%age	No. of cases	%age	
Fibrinoid Necrosis	48	48.00	7	14.00	0.00634
Basement membrane thickening	32	32.00	0	0.00	0.00572
Syncytial Knots	44	44.00	4	8.00	0.00579
Stromal fibrosis	6	6.00	0	0.00	0.05545
Leucocyte Infiltration	11	11.00	0	0.00	0.04023
Retroplacental Haemorrhage	1	1.00	0	0.00	0.23251
No pathology	8	8.00	39	78.00	0.04479

In study group fibrinoid necrosis was seen in 48(48%) of placenta, syncytial knots in 44(44%), stromal fibrosis 6(6%), basement membrane thickening in 32 (32%), 11(11%) cases had leucocytic infiltration and 1% showed retroplacental hematoma. No pathology seen in 8(8%) cases. In control majority (78%) of placenta showed no pathology and only 7(14%) and 4(8%) placenta showed fibroid necrosis and syncytial knots respectively. Placental pathology is seen in most of placenta of IUGR pregnancies. (Table No 7)

Table No 8: Neonatal Mortality in Study and Control Group

Time	Group I Study Group		Group II Control Group	
	No. of cases	%age	No. of cases	%age
Meconium aspiration	5	41.67	0	0.00
Neonatal asphyxia	1	8.33	0	0.00
Hypoglycemia	2	16.66	0	0.00
Hypothermia	1	8.33	0	0.00
Septicemia	2	16.66	0	0.00
Cong. Anomalies	1	8.33	0	0.00
Total	12	100.00	0	0.00
P-value	.0101			

There were 12 (12%) neonatal deaths in study group and no neonatal death was recorded in control group. Majority of neonatal deaths (41.67%) were due to meconium aspiration followed by Hypoglycemia and Septicemia in 16.66% each. Neonatal asphyxia was seen in 8.33%. Congenital anomaly (8.33 %) was other causes of death. There was one (8.33%) late neonatal death due to complication of TOF (Tracheo-oesophageal fistula). P value (0.0101) was highly significant. (Table No 8)

DISCUSSION

In our study prevalence of IUGR was more in younger age group, primigravida subjects, those belonging to low socio-economic status, with rural background and also in patients

who had history of IUGR in previous pregnancy.

Abnormal Color Doppler changes were observed in 47% patients. Raised SD ratio of umbilical artery was observed in 44.6%. Lakhkar BN et al [5] observed deranged SD ratio in 66.66% cases and concluded that it is the most sensitive index in predicting any adverse perinatal outcome. Raised pulsatility index of umbilical artery was observed in 42.5% cases in present study which is same as observed by Lakhkar BN et al [5] (50 %). REDV in umbilical artery was present in 6.3% patients in our study and all fetuses had poor outcome with one intrauterine death (IUD) and two neonatal deaths. Our study is in concordance with Lakhkar BN et al [5] who observed REDV in 10.34% of patients which was associated with one IUD and 5 neonatal deaths. Raised SD ratio in uterine artery was seen by us in 46.8% cases. There was B/L uterine artery notching in 31.9% and unilateral in 25.5% cases. Poor fetal outcome of very low birth weight was associated with B/L artery notching. Pulsatility index of MCA was decreased in 46.8% along with decreased RI and SD ratio. The findings of present study are comparable to Cruz-Martinez R et al (2011). [6] LSCS rate in IUGR pregnancies was 37% in present study which is comparable to study done by Cruz-Martinez R et al (2011)[6] who observed caesarean section rate of 37.6%. However, Lakhkar BN et al (2006)[5] observed 62% LSCS rate which may be because they enrolled only IUGR and preeclampsia cases in their study. Mean Apgar score of 7.47 and 8.42 at 1 and 5 minutes respectively was observed in present study which is comparable to that shown by Barut et al (2010)[7] who observed a mean Apgar score of 5.9 and 7.0 at 1 minute and 5 minutes respectively. Our study recorded average placental weight 351.40 gm which is in concordance with study of Mardi K et al (2003)[8] who also observed average placental weight 350 gm and lower than study of Mansour S et al(2011)[9] who recorded placental weight in the range of 390 gm in IUGR babies. Sheela PV et al (2015)[10] observed placental weight to be 307 grams which is much less than our study. Reduction in placental weight leads to reduction in the surface area which leads to reduction of effective area of nutrient transfer. Salafia CM et al (1995)[11] has also stated that placenta is proportionally small when fetus is small. In our study the histopathology of placenta of IUGR babies showed syncytial knots in 44% of cases of IUGR whereas Mehendale et al (1998)[12] and Mardi K et al (2003)[8] observed syncytial knots in 72.20% and 64% respectively in cases of hypertensive pregnancies associated with birth of unduly small babies at term. Fibrinoid necrosis was found in 48% cases of IUGR in present study which is similar to that reported by Mardi K et al (2003)[8] and Jain K et al (2006)[13] who observed 20% and 34.4% of placenta having significant fibrinoid necrosis.

Leucocyte infiltration was seen in 11% in present study whereas Mehendale et al (1998)[12] and Jain K et al (2006)[13] observed maximum number of leucocyte infiltration in 27.7% and 30.52% in IUGR placenta respectively. Basement membrane thickening was observed in 32% of placenta in our study which is similar to that reported by Mardi K et al (2003)[8] who observed basement membrane thickening in 40% cases of IUGR which is considered to be an immunological reaction between maternal and fetal antigen. Retroplacental hematoma was observed in 1% of our cases whereas Mardi K et al (2003)[8] observed retroplacental hematoma in 4% cases of IUGR. In our study neonatal mortality was observed in 12% of cases and 41.67% deaths were due to meconium aspiration which is comparable to the study by Lakhkar BN et al (2006)[5] who also reported 12.6% neonatal mortality. Aucott SW et al (2004)[14] reported a high mortality 20.5% and which may be because he included all preterm births in his study.

CONCLUSION

Regular antenatal checkup is the key to diagnosis of IUGR. Ultrasound evaluation for fetal growth in patients who have risk factors for IUGR should be considered. Close antepartum surveillance along with color Doppler, once IUGR has been identified should be done. Reduction in incidence of IUGR babies can be achieved by good nutrition, increasing the age at child bearing, good antenatal care.

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