STUDY OF PERINATAL OUTCOME OF PREGNANCIES WITH INTRAUTERINE GROWTH RESTRICTION IN A TERTIARY CARE CENTRE IN NORTH KERALA

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ABSTRACT

BACKGROUND

Intrauterine Growth Restriction (IUGR) remains one of the main challenges in maternity care. Intrauterine Growth Restriction (IUGR) is commonly defined as an estimated foetal weight of less than the 10th percentile. While 70% of these are small for normal reasons and not at risk, 30% are pathologically small at risk for numerous complications including foetal death. The study was conducted with the objective to study the perinatal outcome in cases of pregnancies with intrauterine growth restriction and to determine the factors affecting their outcome.

MATERIALS AND METHODS

The study was conducted in 150 patients of clinically diagnosed cases of intrauterine growth restriction in the Department of Obstetrics and Gynaecology, IMCH, Kozhikode. The study was conducted during 1 year period from June 2014 to June 2015.

RESULTS

Most of the IUGR cases occurred in the age group of 20-34 years. Gestational hypertension is the leading risk factor. Majority of the cases with abnormal Doppler and reduced AFI had poor outcome. The perinatal outcome was good in 68.7% cases. There were 4 neonatal deaths and 2 intrauterine deaths. They had severe oligohydramnios and abnormal doppler. Among the 4 NND, three had absent diastolic flow and one had flow reversal in umbilical artery. Among the IUD, one had absent diastolic flow and one had flow reversal.

CONCLUSION

AFI and Doppler velocimetry are the best noninvasive tools in detecting foetal growth restriction and predicting perinatal complications, which help the obstetrician in effective antenatal management and timely intervention.

KEYWORDS

Growth Restriction, Doppler, Perinatal Outcome.

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BACKGROUND

Intrauterine Growth Restriction (IUGR) remains one of the main challenges in maternity care.[1] Intrauterine Growth Restriction (IUGR) is commonly defined as an estimated foetal weight of less than the 10th percentile. While 70% of these are small for normal reasons and not at risk, 30% are pathologically small at risk for numerous complications including foetal death. In the late preterm IUGR foetus (>34 weeks), prematurity risks less and the risk of foetal demise becomes the primary concern. Causes of IUGR include various maternal, foetal and uteroplacental factors.

Pulsed-wave Doppler interrogation of the umbilical and middle cerebral artery is useful in reducing perinatal mortality. There are no randomised trials addressing the timing of delivery of the IUGR foetus in the late preterm or early-term period. However, retrospective reports show an increased risk of foetal demise.[2] While timing, the delivery of the late preterm/early-term IUGR foetus requires consideration of multiple factors. Available data suggests that delivery should occur by 37 to 38 weeks for singleton IUGR foetuses. In twin pregnancies with a co-twin IUGR foetus, chorionicity also impacts timing of delivery, but delivery should occur by 34-36 weeks. An Estimated Foetal Weight (EFW) less than the 10th percentile has been most widely applied as the threshold to define IUGR and has been used by ACOG. Lower percentile cutoffs are associated with increased adverse perinatal outcome.[3] Despite the limitations of the 10th percentile based on population growth curves, this cutoff is more sensitive in the identification of foetuses at increased perinatal risk.[4] Most evaluated neonatal complications are increased with decreasing birth weight percentile, even when addressed for pregnancies delivering at term. If symphysiofundal height measurement is lower than expected, an ultrasound is needed to get an estimated foetal size and to diagnose IUGR. Measurements

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can be taken of the foetus' head and abdomen and compared with a growth chart to estimate foetal weight.[5] The foetal abdominal circumference is a helpful indicator of foetal nutrition. Another way to assess foetal well-being once IUGR has been diagnosed is Doppler flow, which uses sound waves to measure blood flow. Blood flows in both the foetal brain and the umbilical cord can be checked with Doppler flow studies.[6] Doppler is not a screening test in the general obstetric population for FGR, but has an excellent role in predicting adverse outcomes in pregnancies at risk for FGR.[7] Doppler waveform analysis with angle independent Doppler indices is preferred for foetal surveillance. The most widely used arterial indices are systolic to diastolic index, resistance index and pulsatility index. The combination of foetal biometry and Doppler is the best available tool for the identification of small foetus at risk for adverse outcome. Randomised trials and meta-analyses confirm that the use of umbilical artery Doppler in this setting is associated with a significant reduction in perinatal mortality rates and less iatrogenic intervention, despite the lack of a standardised response in those trials. Before 34 weeks, small foetal size associated with an elevated umbilical artery Doppler index is likely to reflect placental dysfunction. Near term when umbilical artery Doppler findings maybe subtler, decrease in middle cerebral artery Doppler index or the cerebroplacental ratio increases the suspicion for foetal growth restriction, even if the umbilical artery blood flow resistance index remains within the normal range.[8] Measurements of the cerebroplacental ratio are affected by the indices used in calculation and a standardised approach with gestational references ranges rather than single cut-off values should be used.

MATERIALS AND METHODS

From among the antenatal women registered at the Department of Obstetrics and Gynaecology, 150 cases of clinically diagnosed cases of IUGR were selected for the study. Detailed obstetric history, blood pressure, obstetric examination findings of fundal height and various laboratory investigation results taken. Obstetric ultrasound and Doppler studies were performed on umbilical artery and foetal Middle Cerebral Artery (MCA).

1. Major outcomes were perinatal deaths- Intrauterine and early neonatal death, complications like Hypoxic Ischaemic Encephalopathy (HIE), Intraventricular Haemorrhage (IVH), Meconium Aspiration Syndrome (MAS), pulmonary haemorrhage and necrotising enterocolitis.
2. Minor outcomes include- Nonreactive cardiotocograph, caesarean section for foetal distress, Apgar score below 7 at 5 minutes, need for resuscitation, admission in NICU (neonatal intensive care unit), hypoglycaemia, neonatal hyperbilirubinaemia, etc.

Inclusion Criteria

1. Pregnant women with IUGR in singleton pregnancy.
2. Pregnant mothers giving informed written consent willing to participate in the study.

Exclusion Criteria

1. Pregnant women with IUGR in twin and triplet pregnancies.
2. Cases of IUGR terminated before 34 weeks.
3. Patients not willing for study.

Statistical analysis was done using SPSS version 16 for windows. Data was analysed by Chi-square test and Fisher exact test. A p value <0.05 was considered to indicate statistical significance.

Study Settings

Department of Obstetrics and Gynaecology at Government Medical College, Kozhikode. Study was conducted during the period of 1 year from June 2014 to June 2015. A prospective cohort study of cases of intrauterine growth restriction was conducted.

RESULTS

In our study, majority of the IUGR cases were in the age of 20-34 yrs. Most were from the low socioeconomic status. Multipara had the highest incidence of IUGR cases in the study. 52% cases were of gestational age ≥37 weeks (Table 1).

Age Group	Frequency	Percentage
< 20 yrs.	31	20.7
20 - 34	107	71.3
> 34 yrs.	12	8.0
Total	150	
Gravidity	**Frequency**	**Percentage**
Primi	64	42.7
P2 - P4	77	51.3
>= P5	9	6.0
Gestational age	**Frequency**	**Percentage**
34 - 36 wks.	72	48.0
>= 37 wks.	78	52.0

Table 1. Age wise Distribution, Obstetric Score and Gestational Age

There are no identifiable risk factors in 98 cases (65.3%). Most common risk factor was gestational hypertension in 26 cases (17.3%) (Table 2). Among the 150 cases, 57 cases had normal Amniotic Fluid Index (AFI). Majority were in the AFI- 5-10 group. Only 8 cases had AFI <5 amounting to oligamnios contributing 5.3% cases.

	Frequency	Percentage
Nil	98	65.3
PIH	26	17.3
GDM	17	11.3
PIH & GDM	6	4.0
ANEMIA	1	.7
MS, MR NYHA CLASS 2	1	.7
APLA	1	.7

Table 2. Risk factors

Majority cases were among 1.5-2.5 kg group, 87.3%. 18 cases were <1.5 kg contributing 12%.

61.3% (92 cases) had abnormal Biophysical Profile (BPP). 74% (111 cases) had abnormal Doppler (Table 3).

AFI	Frequency	Percentage
Normal	57	38.0
5 - 10	85	56.7
< 5	8	5.3
Estimated fetal weight	Frequency	Percentage
<1.5 Kg	18	12.0
1.5 - 2.5 Kg	131	87.3
> 2.5 Kg	1	0.7
BPP	Frequency	Percentage
Normal	58	38.7
Abnormal	92	61.3
DOPPLER	Frequency	Percentage
Normal	39	26.0
Abnormal	111	74.0

Table 3. AFI, Estimated Fetal Weight and BPP (Bio Physical Profile)

Absent end-diastolic flow in the umbilical artery was present in total 7 cases. Among which 1 went in for IUD and 3were NND. Reversal of flow was there in 2 patients out of which no babies survived. One became an IUD and other was NND.

86% of cases underwent induction (Table 4). 14 patients underwent LSCS directly. Caesarean section was done for foetal distress in 23.3% cases (Table 5).

Nature of Delivery	Frequency	Percentage
Spontaneous	19	14.0
Induced	117	86.0
Mode of delivery	Frequency	Percentage
Vaginal delivery	104	69.3
Instrumental delivery	14	9.3
Emergency LSCS	20	13.3
Elective LSCS	10	6.7
IUD FSB delivery	2	1.4
BIRTH WEIGHT	Frequency	Percentage
< 1.5 Kg	18	12
1.5-2.5 KG	123	82
>2.5 Kg	9	6

Table 4. Nature of Delivery, Mode of Delivery and Birth Weight

Indication for Cesarean	Frequency	Percentage
BOH, GDM 1 3.3		
Breech, Iugr , abnormal Doppler	1 3.3	
Elderly PRIMI, IUGR, Oligamnios, abnormal Doppler	1 3.3	
Elderly, Prolonged Period of Infertility	1 3.3	
Failed Induction	6	20.
Fetal Distress	7	23.3
Fetal Distress, Grade 2 MSAF	2	6.7
Grade 2 MSAF, severe Preeclampsia	1	3.3
Grade 2 MSAF, Severe Preeclampsia, fetal Distress	1	3.3
PREV 2 CS	1	3.3
PREV CS , Severe PRE Eclampsia, IUGR	1	3.3
PREV CS, IUGR	3	10
PREV CS, IUGR, Oligamnios , Abnormal Doppler	1	3.3
PRIMI, Breech, IUGR, Abnormal Doppler	2	6.6
Severe Oligamnios, IUGR, Abnormal Doppler	1	3.3

Table 5. Indication For Caesarean

123 cases (82%) were in the group of 1.5 to 2.5 kg birth weight group.

91.9% cases had Apgar score 5 mins. ≥7. 8.1% cases had Apgar score 5 mins. <7.

12.8% cases had meconium aspiration. 26.4% cases had respiratory distress. 9.5% cases had foetal hypoxia. 19.6% cases required resuscitation. 31.8% cases required NICU admissions (Table 6).

	Frequency	Percentage
APGAR		
<7	12	8.1
≥7	136	91.9
Meconium		
Yes	19	12.8
No	129	87.2
Respiratory Distress		
Yes	39	26.4
No	109	73.6
FETAL Hypoxia		
Yes	14	9.5
No	134	90.5
Resuscitation		
Yes	29	19.6
No	119	80.4
NICU Admission		
Yes	47	31.8
No	101	68.2

Table 6. Apgar, Meconium, Respiratory Distress

29.1% cases had neonatal complications. Complications like hypoglycaemia, hypothermia, hyperbilirubinaemia, sepsis, necrotising enterocolitis and intraventricular haemorrhage. 10.1% cases had sepsis. 5.4% cases had necrotising enterocolitis. 4.1% cases had intraventricular haemorrhage (Table 7).

	Frequency	%
Good Outcome	103	68.7
HIE stage 2, Jaundice	2	1.4
HIE Stage 2, Jaundice, Hypoglycemia	1	0.7
HIE Stage 2, MAS, Jaundice	1	0.7
HIE Stage 3, NND on day 2	2	1.4
HIE Stage 3, NND on day 5	1	0.7
HIE Stage 3 NND on day 4	2	1.4
HIE Stage 3 NND on day 3	1	0.7
hypoglycemia, NNHB	6	4
Jaundice	4	2.8
Jaundice, Hypoglycemia	3	2
MAS	1	0.7
MAS HIE Stage 2 Symptohypoglycemia NNHB	1	0.7
MAS, HIE Stage 2	1	0.7
MAS, Hypoglycemia, NNHB	1	0.7
MAS, Hypoglycemia, NNHB	1	0.7
MAS, Jaundice, Hypoglycemia NNHB	1	0.7
NNHB, Sympto Hypoglycemia	1	0.7
RDS	2	1.4
RDS, HIE Stage 2	1	0.7
RDS, Jaundice	3	2
RDS, hypoglycemia, NNHB	3	2
RDS, Jaundice, Hypoglycemia	1	0.7
Sympto Hypoglycemia	1	0.7
Symptohypoglycemia, NNHB	1	0.7
TTNB	1	0.7
TTNB, Jaundice	1	0.7

Table 7. Outcome

Apgar score 5 minutes <7 in 28.6% cases with oligamnios AFI <5. Meconium aspiration was present in 28.6% cases with oligamnios AFI <5. x2 (1)=2.81, p=0.094.

Respiratory distress was present in 85.7% cases of oligamnios with AFI <5. Foetal hypoxia was present in 28.6% cases with oligamnios AFI <5. Resuscitation was required in 57.1% cases with oligamnios AFI <5. NICU (neonatal intensive care unit) admissions were required in 85.7% cases with oligamnios AFI <5 (Table 8).

AFI	**APGAR**	
	<7	≥7
Normal	0	57
5-10	10	74
<5	2	5
	Meconium	
	Yes	No
Normal	4	53
5-10	13	71
<5	2	5
	Respiratory Distress	
	Yes	No
Normal	9	48
5-10	24	60
<5	6	1
	Fetal Hypoxia	
	Yes	No
Normal	0	57
5-10	12	72
<5	2	5
	Resuscitation	
	Yes	No
Normal	6	51
5-10	19	65
<5	4	3
	NICU Admission	
Normal	11	46
5-10	30	54
<5	6	1

Table 8. AFI and Outcome

85.7% cases with AFI <5 had neonatal complications. 42.9% cases with oligamnios (AFI <5) had sepsis. 14.3% cases with AFI <5 had IVH. 9.5% cases with AFI 5-10 had necrotising enterocolitis.

5 minutes Apgar score was <7 in 11% cases with abnormal Doppler (Fisher exact p value=0.036).
32.1% cases with abnormal Doppler had respiratory distress. 11.9% cases with abnormal Doppler had foetal hypoxia. Fisher exact p value=0.11 (Table 9).

Doppler	**APGAR**	
	<7	≥7
Normal	0	39
Abnormal	12	97
	Meconium	
	Yes	No
Normal	1	38
Abnormal	18	91
	Respiratory Distress	
	Yes	No
Normal	4	35
Abnormal	35	74
	Fetal Hypoxia	
	Yes	No
Normal	1	38
Abnormal	13	96
	Resuscitation	
	Yes	No
Normal	3	36
Abnormal	26	83
	NICU Admission	
Normal	5	34
Abnormal	42	67

Table 9. Doppler and Outcome

In those with abnormal Doppler, 23.9% cases needed resuscitation, 38.5% cases required NICU admission, 34.9% cases had neonatal complications, 11.9% cases had sepsis, 7.3% cases had necrotising enterocolitis and 5.5% cases had intraventricular haemorrhage.

DISCUSSION

In our study, the main risk factors determining the perinatal outcome of IUGR babies were oligamnios and abnormal Doppler. As per the evaluation of maternal characteristics, it is found that most of the IUGR cases occurred in the age group of 20-34 yrs. (71% cases). Most were from the low socioeconomic status (55.3%) as Williams (1903) wrote "heavier children being more

common in the upper walks of life." Multipara constituted 51.3% cases in our study.

In our study, the major risk factor was gestational hypertension (17.3%). This is explained by the absence of physiological modification of spiral arteries that causes IUGR in cases of hypertension. This observation was consistent with the study of Martin et al, which reported hypertension as the risk factor of particular importance in IUGR.

Majority were in the group of abnormal AFI. Severe oligamnios with AFI <5 in 5.3% cases and AFI 5-10 in majority of the cases (56.7%). Abnormal BPP was there in 61.3% cases. AFI and BPP show very low sensitivity (28.5% and 30.6%, respectively) though they show high specificity (95.4% and 96.3%, respectively). With uteroplacental hypoperfusion, the fetoplacental circulation is altered and this foetal circulatory alteration is recognised in the form of high resistance in the umbilical arterial flow and cerebral vasodilation. From the very outset, the high-resistant umbilical flow is a constant feature reminding the clinician of impending foetal jeopardy.

Majority delivered vaginally 69.3% cases. Emergency caesarean section was done for 20 cases. Out of which, the major indication for caesarean was foetal distress 23.3% cases. This can be explained by the high-risk population that is dealt with Lakhkar et al[7] also reported caesarean section rate of 62% with foetal distress constituting 38.8% and severe preeclampsia 11.2%. In the study by Odibo et al, 17% caesarean sections were for non-reassuring foetal heart rate.

The mode of delivery is determined by the underlying aetiology, evidence of acidaemia and gestational age. When termination is indicated, caesarean section is ideal whenever there is good evidence of acidaemia.

82% of the babies were in the group of 1.5 to 2.5 kg. This is in consistence with the observation by Lakhkar et al. 94.4% in the study by Bahado Singh et al. 5 minutes Apgar score was less than 7 in 8.1% cases in our study. 12.8% cases had meconium aspiration. 26.4% cases had respiratory distress. 9.5% cases had hypoxia and 19.6% cases needed neonatal resuscitation.

Rate of admission in NICU was 31.8% compared to 55% by Odibo et al and 66% by Ebrashy et al. This can be explained by the strict criteria for admission into the busy NICU unit of our institution. The need for resuscitation and NICU admission was more among the abnormal Doppler group. 29.1% cases had complications. The most common complication was neonatal hypoglycaemia and hyperbilirubinaemia, which was consistent with the observation by Lakhkar et al. 10.1% cases had neonatal sepsis and 5.4% cases had necrotising enterocolitis. The perinatal outcome was good in 68.7% cases. Out of which, there were 4 neonatal deaths and 2 intrauterine deaths. All were having oligamnios and abnormal Doppler.

Among the 2 IUD, one had reversal of end-diastolic flow in the umbilical artery, one had absent end-diastolic flow. Out of 4 NND, three had absent diastolic flow and one had severe oligamnios with no measurable liquor pocket and reversal of end-diastolic flow.

In the study by Rochelson B et al, all cases with absent or reversed diastolic flow in the umbilical artery died in utero or in the immediate postnatal period. In our study, only three foetuses with absent end-diastolic flow survived. All cases with reversal of flow were IUD.

CONCLUSION

71.3% patients were in the age group of 20-34 years. 55.3% patients were from the low socioeconomic status. Majority were multipara 57%. 34.7% patients had risk factors. Most common risk factor was gestational hypertension (17.3%).[1] AFI was abnormal in 5.3% patients. BPP was abnormal in 61.3% patients. 74% patients had abnormal Doppler.

86% patients were induced.[2] 14 patients underwent LSCS directly. 69.3% patients had vaginal delivery. 13.3% patients had emergency LSCS. Major indication for LSCS was foetal distress 23.3% patients.

There were 2 IUD FSB. 123 neonates had a birth weight of 1.5 to 2.5 kg 82%.[3] 5 minutes Apgar was <7 in 8.1% neonates. 12.8% neonates had meconium aspiration. All of them had severe oligamnios and abnormal Doppler parameters. 26.4% neonates had respiratory distress, 9.5% neonates had hypoxia, 19.6% neonates required resuscitation and 31.8% neonates requires NICU admission.[4]

29.1% neonates had complications like hypoglycaemia, hyperbilirubinaemia and hypothermia. 10.1% neonates had developed sepsis. 5.4% neonates had necrotising enterocolitis. 4.1% neonates had intraventricular haemorrhage. All were preterm with severe oligamnios and abnormal Doppler.[5] Apgar score was <7 in 28.6% cases with oligamnios AFI <5.

Meconium aspiration was present in 28.6% cases with oligamnios AFI <5. Respiratory distress was present in 85.7% cases with AFI <5. Resuscitation was required in majority of the cases 57.1%. Majority of the patients with AFI <5 had neonatal complications 85.7%. 42.9% patients with AFI <5 had developed sepsis. 14.3% patients with AFI <5 had intraventricular haemorrhage.

11% of neonates with abnormal Doppler had 5 minutes Apgar <7 and 16.5% neonates had meconium aspiration.

32.1% neonates had respiratory distress. 11.9% neonates with abnormal Doppler had foetal hypoxia. 23.9% cases with abnormal Doppler required resuscitation. 38.5% neonates with abnormal Doppler required admission in NICU.[6]

Patients with abnormal Doppler had 34.9% neonatal complications. 11.9% patients with abnormal Doppler developed sepsis.

7.3% patients with abnormal Doppler had necrotising enterocolitis. 5.5% neonates with abnormal Doppler had intraventricular haemorrhage.

AFI and Doppler velocimetry are the best noninvasive tools in detecting foetal growth restriction and predicting perinatal complications, which help the obstetrician in effective antenatal management and timely intervention.[7]

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