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# Clinico sonographic correlation of intrauterine growth restriction

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## Abstract
**Aim and objectives:** To study was a clinic sonographic correlation of the following factors associated with Intrauterine Growth Restriction
**Material and Methods:** This was a prospective study of 150 cases of intrauterine foetal growth restriction studied in a tertiary care institute over a period of 1 year (April 2015 to March 2016). Patients suspected to have IUGR were admitted in antenatal ward for varying period of time ranging from minimum 1 week to more than 3 weeks. Maternal monitoring and foetal monitoring was done. In maternal monitoring - pulse, BP, urine albumin were recorded, Serial increase in Fundal height, abdominal girth, maternal weight was recorded. In foetal monitoring - Strict Daily Foetal Kick Count (DFKC) was maintained.
**Results:** In our study, 52 cases (34.67%) had mild IUGR with birth weight between 1.5- 2.5kg, 93 (62%) had moderate IUGR with birth weight between 1- 1.5 kg, and 5 cases (3.33%) cases had severe IUGR with birth weight less than 1 kg. Doppler studies (99.33% sensitive) and ultrasound (100% sensitive) studies are highly sensitive in detecting intrauterine fetal growth restriction as compared to clinical examination (81.33%). In our study, 70 cases (46.66%) had vaginal delivery and 80 (53.34%) cases had to undergo LSCS-81.25% were Emergency and 18.75% were Elective cases. The most common indication for Emergency LSCS was oligohydramnios and abnormal Doppler with Fetal Distress. Incidence of neonatal mortality in our study was 10.67%, 15 Neonatal deaths and 1 Fresh stillbirth.
**Conclusion:** Early detection of maternal high risk factors by detailed history, meticulous clinical examination and appropriate use of imaging modalities like ultrasound and Colour Doppler and appropriate antenatal care is essential in reducing burden of Low Birth Weight babies in India.

**Keywords:** Clinico Sonographic, intrauterine, growth restriction

## Introduction
Obstetrics is an art & science combined and its practitioner must be concerned simultaneously with the life of the two intricately interwoven persons -the mother &her baby. High perinatal and infant mortality is one of major public health problems in developing country like ours. So, prevention of low birth weight infants by early diagnosis & treatment is most important.
Incidence of Low Birth Weight in India varies from 15-25%. Of these more than 50% are due to IUGR. IUGR is the major cause of perinatal morbidity & mortality in developing countries; about 7-9% live born babies have birth weight less than normal [1]. A complex and dynamic interaction of maternal, placental and foetal environment is involved in ensuring normal foetal growth. An imbalance of coordination in this complex system leads to intrauterine growth restriction [2].
The term "IUGR" was designed to identify fetuses with estimated weight below the 10$^{th}$ percentile for their gestational age. Prior to widespread availability of ultrasound & Doppler, foetal growth was assessed by historical dating (LMP), serial fundal height, abdominal girth, weight gain and comparison with actual size of neonate at birth.

Ultrasound evaluation of foetal growth and measurement of impedance to blood flow in foetal arterial and venous vessels by Doppler study form the cornerstone of evaluation of foetal condition and decision making. Although none of these techniques are diagnostic, their use in combination markedly improves the ability to-decide whether early delivery is indicated generally when several indices of foetal well-being become non-reassuring. Examples include a non-reactive NST combined with an abnormal biophysical profile, or inadequate interval growth combined with umbilical-artery Doppler findings of reversed end-diastolic flow [2]. To diagnose the IUGR cases at the earliest so as to achieve the healthy baby and the healthy mother and to reduce perinatal mortality and morbidity, this study has been conducted at SRI Aurobindo Institute of medical Sciences, Indore, Madhya Pradesh.

**Aim and objectives**

- The aim of our study was a clinic sonographic correlation of the following factors associated with Intrauterine Growth Restriction –
- The maternal and neonatal high-risk factors leading to IUGR.
- The various parameters like age, parity, BMI, social status, medical high-risk conditions associated with IUGR.
- Obstetric risk factors in relation to Intra uterine growth restriction.
- The Clinical and Sonographic (ultrasound/Doppler) correlation of IUGR.
- The neonatal morbidity and mortality associated with IUGR.

**Material and Methods**

This was a prospective study of 150 cases of intrauterine foetal growth restriction studied in a tertiary care institute over a period of 1 year (April 2015 to March 2016). Approval for the study was obtained from ethical committee of the institute. Their relevant data such as indoor registration number, maternal age, residential area, booking status, correct gestational age, parity, BMI, estimated foetal weight, ultrasound and doppler findings, mode of delivery was noted. Maternal information like socio economic status, occupation, gestational age of first antenatal registration, number of antenatal visits, routine antenatal investigations like blood group, Hemoglobin, HIV, VDRL, HbSag were noted. Any significant medical or obstetric history or complication was noted.

Those patients were booked, unbooked or referred as high-risk cases from other hospital with more than 28 weeks gestation, and were sure of their last menstrual period, calculated by Naegele's formula, confirmed by atleast one first trimester ultrasound. Patients with singleton pregnancies with foetal growth restriction were included. Patients with unsure dates, irregular menstrual cycles, history of consumption of oral contraceptive pills within three months of conception, multiple pregnancies were excluded.

Antenatally, intrauterine growth restriction (IUGR) was diagnosed by abdominal palpation in the outpatient department. Fundal height was measured by tape calibrated in centimeters applied over the abdominal curvature from the upper edge of the symphysis to the upper edge of the uterine fundus. If the measurement was found to be 2 to 3 cm less than the expected height, inappropriate foetal growth was suspected and the patients were admitted.

Patients suspected to have IUGR were admitted in antenatal ward for varying period of time ranging from minimum 1 week to more than 3 weeks. Maternal monitoring and foetal monitoring was done. In maternal monitoring - pulse, BP, urine albumin were recorded, Serial increase in Fundal height, abdominal girth, maternal weight was recorded. In foetal monitoring - Strict Daily Foetal Kick Count (DFKC) was maintained. Patients were given charts to maintain DFKC. Foetal heart monitoring was done and Non-stress test (NST) was done once daily. Modified Biophysical Profile was monitored (MBPP) biweekly and Biophysical Profile (BPP) was monitored every 15 days. Each patient depending on various parameters was grouped into four categories i.e. patients with Normal foetal growth, Mild IUGR, Moderate IUGR and Severe IUGR.

- Normal growth-Rate of growth of fundal height >I-2cm per week. No discrepancy between mean gestational age by ultrasound and by LMP and Normal Doppler findings.
- Mild IUGR -Rate of growth of fundal height was 1-2 cm per week, A lag of 3 weeks between the mean gestational age by Ultrasound and LMP. Doppler showed increased SID ratio in umbilical artery or bilateral/ipsilateral diastolic notch in uterine artery.
- Moderate IUGR- Rate of growth of fundal height was 1cm per week. A lag of 3-6 weeks between the mean gestational age by Ultrasound and LMP. Doppler showed decreased S/D ratio in foetal middle cerebral artery increased *S/D* ratio in umbilical artery.
- Severe IUGR-Rate of growth of fundal height was <1 cm per week or no growth, A lag of >6 weeks between the mean gestational age by Ultrasound and LMP, Doppler showed Absent or Reversal of diastolic flow in umbilical Artery.

Each patient was given treatment according to their gestational age and grade of IUGR in the form of strict Bed rest, Oxygenation, Essential amino acids, Micronutrients, Antenatal steroid injections in case of preterm fetuses to accelerate foetal lung maturity and low dose aspirin. Maternal and foetal well-being was monitored by above mentioned methods and decisions for continuation or termination of pregnancy were made accordingly. In all cases neonates immediately after birth, were subjected to Ballard's scoring to diagnose growth restriction. Patients detailed history and examination was filled in a predesigned proforma given below.

**Statistical analysis:** Data was entered in MS-Excel sheet, Summary measures like percentages were calculated to describe categorical variables.

## Results

In our study, 71 (47.33%) cases were Booked cases,53 patients were referred& 26 were unbooked cases. The average age of the patients was 24.7 years. In our study, 52% females belonged to age group 21-25years.82(54.66%) patients came from Urban slums,56(37.3%) patients came from Urban area and 12cases (8%) came from Rural area. In our study, 77 (51.33%) mothers were laborer, 47 (31.33%) mothers were house wife and 26(17.33%) had a sedentary lifestyle. In our study, 93 (62%) mothers came from families with low income (<1000Rs. per month).

84 (56%) were Primigravida, 40 (26.67%) were gravida 2, 15 (10%) were gravida 3 &11 (7.33%) were gravida 4 or more.62 (41.32%) cases registered in late second trimester (21-28 weeks), 28 cases (18.67%) registered in the early 3rd Trimester.

Maximum number of cases 74 (49.33%) had 3 antenatal visits. Only 11 mothers had 1 antenatal visit.

111 (74%) mothers out of 150 had BMI in the range of 18-24.99, & 8% cases had BMI less than 18. Maximum number of cases 89 (75.42%) had weight gain of less than five kilograms throughout pregnancy.

Pre-eclampsia was found to be the most common factor causing IUGR. 57cases (38%) 27 cases had severe PIH and 30 cases had mild PIH. 23 cases (15.33%) had Anemia (mild, moderate, severe), 14 cases (9.33%) had no detectable cause (idiopathic), 8 cases (5.33%) had chronic hypertension, 7 cases (4.67%) had history of being infected with Tropical diseases (Malaria, Typhoid, Dengue), 6 patients (4%) had heart disease mainly Rheumatic heart disease with valvular stenosis, 6 case (4%) had history of bleeding in first trimester,5 (3.33%) patients had congenital anomaly, 4 patients each (2.67%) were TORCH positive (all IgG positive) and had uterine anomalies, 3 patients (2%) had Placenta previa, 2 patients each ( 1.33%) had Diabetes, Abruptio placentae, Bronchial asthma, History of previous IUGR and Uterine anomalies was seen in 2 cases each (1.33%). There was 1 case each (0.6%) of Pulmonary tuberculosis, Hyperthyroidism and Rheumatoid arthritis.

In our study, 76 (50.67%) of intrauterine growth restriction delivered between 33wks to 38wks. Average gestational age at the time of delivery was 36weeks 5 days.

In our study, 125 cases (83.33%) had Asymmetrical type of IUGR, 25 cases (16.67%) had symmetrical type of IUGR. Mean BPD in study cases less than 36 weeks of gestational age was found to be increased. However, it was decreased in gestational age of more than 36 weeks. P-value was significant.

Mean Abdominal circumference (AC) of study cases was $10^{th}$ percentile below the Hadlock's standard value for that respective gestational age. P-value was significant. Mean FL in study cases was 10th percentile below the Hadlock's standard value for that respective gestational age. P-value was significant

In our study, 72 cases (48%) cases showed grade 3 placental maturity on ultrasound. In our study, 68.67% cases had AFI within range of 7 to 9 cm. 4% had AFI less than 3 cm.

In our study, 8.67 % cases had absent or reversal of flow in the umbilical artery, 34.67% cases had bilateral or ipsilateral diastolic notches in uterine artery, 26.67% cases showed increase in umbilical artery S/D ratio, 35.33% cases had increased flow in fetal middle cerebral artery & 6.66%.

In our study, 52 cases (34.67%) had mild IUGR with birth weight between 1.5- 2.5kg, 93 (62%) had moderate IUGR with birth weight between 1- 1.5 kg, and 5 cases (3.33%) cases had severe IUGR with birth weight less than 1 kg. Doppler studies (99.33% sensitive) and ultrasound (100% sensitive) studies are highly sensitive in detecting intrauterine fetal growth restriction as compared to clinical examination (81.33%).

In our study, 70 cases (46.66%) had vaginal delivery and 80 (53.34%) cases had to undergo LSCS-81.25% were Emergency and 18.75% were Elective cases. The most common indication for Emergency LSCS was oligohydramnios and abnormal Doppler with Fetal Distress. The most common indication for Elective LSCS was previous LSCS and cephalopelvic Disproportion.

In our study, 13 out of 13 babies with APGAR score less than 3 at 1 & 5 minutes succumbed to death. In our study, 23.48% cases required neonatal intensive care for more than 20 days. In our study, 5 babies were detected to have congenital anomalies-mainly congenital heart disease and renal anomaly.

Incidence of neonatal mortality in our study was 10.67%, 15 Neonatal deaths and 1 Fresh stillbirth.

## Discussion

### Age

In our study maximum number of cases 78(52 %) were seen in the age group of 21- 25 years of age, as this is the optimum age for reproduction in India. D. Acharya and K. Nagraj in their study of 101 cases of IUGR and 202controls showed that 77 (76.2%) cases were between the age group of 20 to 30years of age [3].

T. Aghamolae and H. Eftekhar in their study have shown that 60%of cases were from the age group of 21 to 30 years [4].

### Socio Demographic Factors Leading to IUGR

In our study maximum cases,82 (54.66%) resided in URBAN SLUMS. Cases residing in URBAN areas were 56 (37.33%) and 12 cases (8%) were from the RURAL areas. Cases hailing from rural and urban slums show higher incidence of IUGR and adverse neonatal outcome. T. Aghamolaei, and H. Eftekhar in their study of 6O cases of IUGR and 6Ocontrols have shown that maximum number of cases i.e. 74 resided in URBAN areas and 46 cases came from RURAL areas [4].

Balcazar H *et al* stated that maternal socio-demographic condition also plays important role in Causing foetal growth restriction [5].

**Social Status**

In our study 93 (62%) mothers came from families with low income (less than Rs1000 per month), 45 (30%) belonged to middle class (Rs 1001 – 2000 per month) & 12 cases (8 %) came from higher class (>Rs 2000 per month) indicating that family income plays a significant role as a causative factor in IUGR. According to Neel NR and Alvarez JO, infants of mothers of low socioeconomic status had a lower mean birth weight than those of higher socioeconomic status, even when controlled for race (p=0.034) [6].

**Parity**

In our study out of 150 cases 84 (56%) were Primigravida, 40 (26.67%) were gravida 2, 15 (10%) were gravid 3 & 11 (7.33%) were gravida 4 showing preponderance of IUGR more in primigravida. D. Acharya and K. Nagraj in their study of 101 cases of IUGR showed that 43.6% cases were primigravida and 33.7% cases were multigravida [3].

Rachdi R, and Calash M in their study of 124 cases of IUGR have shown that 46.8% mothers were primiparous [7].

**Body mass index**

111 (74%) mothers out of 150 had BMI in the range of 18-24.99.27 cases (18%) had BMI in the range of 25-29.99 and 12 cases (8%) had BMI less than 18.

According to Siega-Riz, A. M., Adair, L. S. & Hobel C. J., women with low pre pregnancy weight for height or BMI are at increased risk for a number of adverse pregnancy outcomes, including preterm birth and intrauterine growth retardation (IUGR) [8].

Nestel and Rutstein evaluated data from 46 national surveys in 36 developing countries and have stated that women with a low BMI were more likely to have an infant that was smaller or of lower birth weight than infants born to women with either a normal or high BMI [9].

Acharya and K. Nagraj in their study of 101 cases of IUGR showed that 11.9% cases had BMI less than 18.5 and 88.1% had BMI more than 18.5 [3].

**Weight Gain during Pregnancy**

In our study, maximum number of cases 61 (51.69%) had weight gain of less than five kilograms throughout pregnancy, 53 cases (44.92 %) had weight gain of 6-7 kilograms and 4 cases (3.39%) had total weight gain of 7-8 kilograms. Weight gain throughout pregnancy has been distributed as 1kg in 1$^{st}$ trimester & 5 kgs in II$^{nd}$ & III$^{rd}$ trimester; a falling or stationary weight suggests foetal growth restriction as seen in our study.

Richard S. Strauss and William H. Dietz in their study of relationship between maternal weight gain in individual trimesters to the risk of IUGR in 10,696 women showed that low weight gain in the second and third trimester increased the risk of intrauterine growth retardation significantly [10].

**Maternal high-risk factors associated with IUGR**

In this study Pre-eclampsia was found to be the most common factor causing IUGR, 57 cases (38%), 27 cases had severe PIH and 30 cases had mild PIH. Rasmussen and Svein MD their study have stated that in newborns of women with preeclampsia, mean birth weight, crown-heel length, and ponderal index were 4.4%, 0.8%, and 2.6% lower than in births without preeclampsia respectively. A large population-based study revealed that newborns from mothers with preeclampsia onset before 37weeks gestation were 2 to 5 times more likely to have birth weight below the 2.5th percentile [11].

In our study, 23cases (15.33%) had Anaemia (mild, moderate and severe). In a prospective cohort study performed on 405 pregnant Chinese women, both mild (9.5 >Hb <12g/100mI) and moderate anemia (Hb<9.5 g/100mI) were significantly associated with IUGR [12]. Farah Wali Lone and Rahat Najam Qureshi in their study have shown that there was a 2.2 times increased risk of Low Birth Weight in the anemic group and a 1.9 times increased risk among anemic women of giving birth to IUGR babies [13].

In our study, 14 cases (9.33%) had no detectable cause (idiopathic). 7 cases (4.67%) had history of being infected with Tropical diseases (Malaria, Typhoid, Dengue). In an area of high malaria prevalence in Southern Malawi, a cross- sectional study of pregnant women revealed that 20% of the newborn were IUGR [14].

Diabetes, Abruptio placentae, Bronchial asthma, history of previous IUGR was seen in 2 cases each (1.33%). Diabetes mellitus may cause injury to blood vessels of the placenta. Pregnant women with renal or ocular complications due to diabetes have increased risk of both preeclampsia and IUGR due to placental insufficiency [15, 16]. In a prospective study by Bakketeig *et* al previous LBW (< 270 Og for girls or <280 Og for boys) increased the risk of IUGR birth almost 2.5 times [17].

In our study, 5 patients (3.33%) were having congenital anomaly.

In 1988 Khoury *et* al in their study of correlation of congenital malformation and IUGR explained that one of the following three mechanisms given below are associated with IUGR-IUGR secondary to already existing malformations, IUGR predisposing foetus to malformation, IUGR co-existing with malformation because of common etiological factors [18].

**Gestational Age at the Time Delivery**

In our study most of the cases 76 (50.67%) of intrauterine growth restriction delivered between 33wks to 36wks of gestation followed by 61 cases (40.67%) in 37 to 40 wks of gestation. Average gestational age at the time of delivery was 36 weeks 5 days. Patients with severe foetal growth restriction or compromise had to be terminated at earlier weeks of gestation as compared to mild and

moderate cases of IUGR.

Foetal complications like foetal distress; non-reactive NST, meconium stained amniotic fluid, abnormal Doppler study etc are some of the major causes of preterm birth in our study. In a cases control trial of IUGR cases by Gardosi. J and Francis. A, 52 cases (7.8%) were preterm births (<37wks) and 278 cases were delivered at> 37wks of gestation [19].

**Treatment given to admitted Patients during Antenatal Period**

In-our study 90 cases were admitted in antenatal period, all of them were given bed rest, high protein diet, essential aminoacids and micronutrients. 54 cases (60%) were given steroid injection and 3 cases were given low dose aspirin. Wallenburg *et* al studied a population of women at high risk for IUGR in a nonrandomized trial and noted a decline in the rate of IUGR from 61.5% in the historic controls to 13.3% in those treated with aspirin and dipyridamole [20].

D.J. Bekedam *et* al in their study of Effect of maternal hyperoxygenation on foetal breathing and body movements and on foetal heart rate showed a significant increase in foetal breathing aid body movements and in heart rate variation during hyperoxygenation as compared to the preceding control period of40 minutes [21].

Kramer *et* al reviewed the impact of supplementation of a balanced protein/energy diet on gestational weight gain and pregnancy outcomes from 13 studies for the Cochrane collaboration. It was found that there was an increase in maternal weight gain (17g/week) and a reduction in the risk of IUGR births [22]. Pollack *et al*. examined hospital bed rest as a way to promote foetal growth and found no improvement [23]. Newnham *et al* studied women receiving 100 mg of aspirin versus placebo after a diagnosis of IUGR based on abnormal UA Doppler findings, and they didn't find a clinically significant difference [24].

**Type of intrauterine growth restriction**

In our study 125 cases (83.33%) had Asymmetrical type of IUGR, 25 cases (16.67%) had symmetrical type of IUGR. But no cases have been found of combined type of IUGR in this study.

L. K. Proctor *et* al in their case study on asymmetrical growth restriction showed 26 (60.5%) fetuses with asymmetric growth and 49.5% cases had symmetrical IUGR. Asymmetrical growth restriction is preventable and has better prognosis as compared to symmetrical IUGR [25].

**Biparietal diameter (BPD)**

In our study the mean biparietal diameter of study cases was compared to the Hadlock's standard values for that respective gestational age. It was seen that the mean BPD in study was increased in the gestational age of 28-36 weeks and was found below 10th percentile of standard Hadlock's

value for the gestational age of more than 36 weeks. P-value was found to be significant.

Wars of *et* al. analyzed the results obtained from 3616 pregnancies out of which 400 fetuses were diagnosed to have IUGR. Evaluation of BPD in these cases was associated with a sensitivity of 89% and positive predictive value of 68% [26].

Ferrazi *et* al in their study have shown that the positive predictive value of abnormal BPD for identifying IUGR increases as the gestational age advances. Several limitations have been seen if BPD is used as a single parameter for evaluation of IUGR. Late in third trimester, the normal variability of BPD is very large and therefore becomes less effective for diagnosing IUGR. Measurement of Abdominal circumference has been accepted by most experts as the most reliable index of foetal size [27]. It was seen in our study that the mean AC in IUGR cases was 10$^{t}$h percentile below the Hadlock's standard value for that respective gestational age. P-value was found to be significant.

**Backchat and Weiner in** their study showed that a low AC percentile had the, highest sensitivity (98.1%) for diagnosing IUGR. Manning *et* al in their studies, the estimated foetal weight calculated with abdominal circumference measurements was almost always within 10 percent of the actual birth weight [28, 29].

It was seen that the mean Femur Length in study cases was 10th percentile below the Hadlock's standard value for that respective gestational age. P-value was found to be significant.

Bensen *et* al in their study have reported femoral length to be less than 10th percentile in 45% growth restricted fetuses in the third trimester [30].

**Placental Maturity at the Time of Termination of Pregnancy**

In our study 72 cases (48%) showed grade 3 placental maturity on ultrasound and 78 cases (52%) showed grade 2 maturity. All Placentas of 150 cases were examined at gross. 90 cases showed calcifications, 50 cases showed infarction and 10 cases showed small contracted placenta. S.M. Chitlange *et al*. in their study have shown increased incidence of intrauterine growth retardation (6.20%) and foetal distress (7.8%) in the study group with preterm grade III placental maturity compared with the control group (nil) [31]. The incidence of low birth weight was also higher (34.37%) in the study group compared with the control group (22.33%). Prevalence rate of grade III placenta at term was 28%. In view of these findings preterm grade III placenta is found to be a sensitive predictor of poor perinatal outcome. Sharmishtha Biswas *et* al in their study have shown that in cases of IUGR placentas, there were some abnormal positions of insertion of umbilical cords in 11% placentas (marginal in 7.14% and velamentous in 3.57%), and placental weight and volume was significantly lower (*p* value<0.001). The placentas associated with IUGR were smaller in diameters than those of control group of placentas [32].

**Amniotic Fluid Index**

In our study, 68.67% cases had AFI within range of 7 to 9 cm, 27.33% had AFI within 4 to 6 cm and 4% had AFI less than or equal to 3 cm.

Varma TR *et al* their study have stated that incidence of foetal growth restriction is 5% in cases with normal amniotic fluid volume but increases to 40% in cases of oligohydramnios [33].

**Doppler Findings**

In our study 8.67% cases had absent or reversal of flow in the umbilical artery, 34.67% cases had bilateral or ipsilateral diastolic notches in uterine artery, 26.67% cases showed increase in umbilical artery S/D ratio, 35.37% cases had increased flow in foetal middle cerebral artery.Only 1 case showed normal Doppler study. Cases have been divided into three groups according to the Doppler findings.

Mild IUGR (62cases)- bilateral or ipsilateral diastolic notches\in uterine artery and increased in umbilical artery S/D ratio. Moderate IUGR (82cases) - Increased flow in foetal middle cerebral artery & increased S/D ratio.

Severe IUGR (5cases) - Absent or Reversal of flow in umbilical artery.

Sekizuka N *et al* in a cross-sectional study showed that in normal pregnancies the resistance index of spiral artery flow velocity waveforms decreased significantly with advancing gestation. In abnormal pregnancies complicated by pregnancy induced hypertension and IUGR, the incidence of adverse perinatal outcome was significantly higher in patients with abnormal spiral artery resistance indices [34].

In our study it has been observed that ultrasound (100%) followed by Doppler studies (99.3%) are highly sensitive in detecting intrauterine foetal growth restriction as compared to clinical examination (81.33%).

**Mode of delivery**

In our study, 70 cases(46.66%) had vaginal delivery out of which 54 (77.14%)were spontaneous &16 (22.86%) were induced with prostaglandins.80 (53.34%) cases had to undergo LSCS .65 cases(8.1.25%) had emergency LSCS.

Maximum cases -12 were for severe oligohydramnios followed by 10 for abnormal Doppler. Total 15 elective LSCS, were done mainly for Cephalopelvic disproportion, Previous 2 LSCS malpresentation. Bais JM in his study on IUGR has shown delivery by caesarean section was most prevalent in severe IUGR (24%), less in moderate IUGR (8%) and low in AGA cases (4%) [35].

**Diagnosis of IUGR post delivery**

In our study, maximum number of babies 93(62%) had moderate IUGR with birth weight within 1- 1.5 kg, 52 cases (34.67%) had mild IUGR with birth weight 1.5-2.5kg and 5 cases (3.33%) cases had severe IUGR with weight less than 1 kg. In a case study by JMJ Bais, mortality rate in severe IUGR infants *was* 12%, in moderate IUGR infants 2% and in AGA infants 0.7% [35].

**Apgar Score**

In our study 13 babies had APGAR score of <3 at 1 & 5 minutes of birth, 59 had in the range of 3 to 5 & 77 between 6 to 10. Poor APGAR score has been seen to be associated with poor neonatal outcome as 13 out of 13 babies with Apgar score less than 3 succumbed to death. In a case study of Immediate Outcome of Babies with low APGAR score in MULAGO Hospital, UGANDA by ONAMA *et* al showed that when the prevalence of low APGAR scores at 1 &5 minutes was 8.4 &2.4 there were12.1% deaths, adverse outcome in 57.3% & complications in 45% Cases [36].

**Perinatal Outcome**

Out of total 150 babies, 115 required Neonatal intensive care management & 16 required ventilator support. There were total 15 neonatal deaths. There was one Fresh still birth seen a patient with severe PIH with Eclampsia. Higher incidence of morbidity & mortality was seen among the unregistered and high risk referred cases & those who had late antenatal registration.

In our study the main cause of neonatal death was found to be Respiratory distress and Necrotizing enterocolitis with Septicemia. There were 9(60.00%) neonatal deaths due to Respiratory distress, 5(33.33%) neonatal deaths due to Necrotizing enterocolitis with Septicemia and 1(6.67%) due to Congenital heart disease. Relative risks associated with IUGR using morbidity and mortality parameters, from the study by

Bernstein *et a*l are as follows: Relative risk of death, 2.77; 95% confidence interval (CI), 2.3 1-3.33Relative risk of respiratory distress syndrome, 1.19; 95% CI, 1.03-1.29. Relative risk of intraventricular haemorrhage, 1.13; 95% CI, O.99-1.29Relative risk of necrotizing enterocolitis,1.27; 95% CI, 1.05-1.53 [37].

**Conclusion**

High perinatal mortality and morbidity is one of the major public health problems in developing country like ours. Early diagnosis & management of low birth weight babies is the best strategy to combat this situation..

Early detection of maternal high risk factors by detailed history, meticulous clinical examination and appropriate use of imaging modalities like ultrasound and Colour Doppler and appropriate antenatal care is essential in reducing burden of Low Birth Weight babies in India. Appropriate weight gain, bed rest and proper nutritional supplementation is the cornerstone of management of IUGR. Birth weight of the neonate is probably the single most important factor affecting neonatal mortality and morbidity. Thus, efforts should be directed towards improving growth in utero to prevent future problems.

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