Pattern of IUGR in Multiple Pregnancies- a Cross Sectional Study on 100 Cases in Chittagong Maa Shishu O General Hospital

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Abstract

Background: Multiple pregnancies are particularly at risk for intrauterine growth restriction (IUGR). The study was attempted to describe the pattern of IUGR in multiple pregnancies and its immediate outcome through which we will be able to make preventive strategies during pregnancy with multiple gestations and may contribute to reduce still birth and neonatal death.

Methods: This is a tertiary care hospital based descriptive type of cross-sectional study carried out in the Neonatal department and Obstetrics department of Chittagong Maa-Shishu O General Hospital between April 2012 to March, 2013 on 100 cases of IUGR. Sample size was detected by purposive convenient sampling technique. Subjects were selected by appropriate inclusion criteria. Data were collected in case recording form after appropriate verbal or written consent and results were subjected to standard statistical evaluation and presented by tabular method and diagram.

Results: Through purposive convenient sampling 50 numbers of twin and 2 triplets were included in this study. All the gestations among 44 numbers of twin and 2 triplets were found to have IUGR. A number of 5 of the twins presented with one IUGR with one appropriate for gestational age (AGA). Among 50 numbers, 18 of the twins had both the multiples symmetrical IUGR. On the other hand, 12 of the twins presented with all asymmetrical IUGR. Combination of one symmetrical and one asymmetrical were present in 14 twins. Regarding immediate outcome after delivery, 50% of the cases enrolled required hospital admission and 36% of them were due to Preterm low birth weight (LBW). Still births were presented as 10% of cases and all of them were asymmetrical IUGR. A number of 44 of the twins found concordant whereas 4 of the twins were discordant. A total of 52 mothers were enrolled with 100 cases of IUGR. Out of 100 IUGR cases, 60 cases were symmetrical, and 40 cases were asymmetrical. Most of the mothers were from the lower middle class, educated up to secondary level and 40 of them had BMI between18 to 25 with good nutrition status. But 36 of the mothers gave a history of regular ante natal checkups.

Conclusion: Symmetrical IUGR babies were greater in number both regarding proportion among total cases and the number required hospital admission. Asymmetrical IUGR was present in all the cases of still births. Hypertension of mother was found to be the major contributing factor to cause IUGR.

Keywords: IUGR; Symmetrical; Asymmetrical; Still births

Abbreviations: IUGR: Intrauterine Growth Restriction; AGA: Appropriate for Gestational Age; LBW: Low Birth Weight; SGA: Small for Gestational Age

Background Information

Intrauterine growth retardation (IUGR) which is defined as less than 10% of predicted weight for gestational age may result in significant fetal morbidity and mortality if not properly diagnosed [1]. It is important to distinguish between some small for gestational age (SGA) infants who are constitutionally small and therefore, fall within the lower end of a normal distribution but experience normal intrauterine growth and are not considered IUGR [2].

Infants whose growth restriction began in early phase of pregnancy have proportionately small head circumference, length and weight, for this the term symmetrical IUGR (Ponderal index >2). And infants who had restriction due to factors active during the

phase of cellular hypertrophy in the last phase of pregnancy have relatively normal head circumference, some reduction in length but more reduction in weight as a result of redistribution of blood flow to vital organs, have the term head sparing or asymmetrical IUGR (Ponderal index< 2) [3]. Normally the head circumference is greater than the chest circumference by 2 cm. In IUGR babies, the difference is usually more than 3 cm [4]. Thus symmetric IUGR refers to fetuses with equally poor growth velocity of the head, the abdomen and the long bones. Asymmetric IUGR refers to infants whose head and long bones are spared compared with their abdomen and viscera [1]. Therefore the idea about symmetrical and asymmetrical IUGR leads us to the pathophysiology of early or late onset growth restriction in utero.

Normal intrauterine growth occurs in 3 stages. The first stage takes place during 4-20 wks of gestation. Rapid cell division and multiplication (hyperplasia) occur as the embryo grows into a fetus. In the second stage during 20-28 wks of gestation, cell division declines and the cells increase in size. During 28-40 wks, the third stage, there is rapid increase 4 in cell size, rapid accumulation of fat, muscle and connective tissue. Most fetal weight gain occurs during last 20 wks of gestation. If during the delicate time of development and weight gain is disturbed or interrupted, the baby can suffer from IUGR [2]. There are many causes of IUGR which are best grouped into two main categories. Factors that directly affects the intrinsic growth potential such as chromosomal defect, intrauterine infection etc. and the external influences that reduce the support for fetal growth e.g., Maternal under nutrition, maternal smoking, hypoxia, reduced placental perfusion etc. [5].

Fetal growth is independent of the number of fetuses until approximately 30 wks of gestation, after which growth of multiples gradually falls off compared to singletons. The mechanism is likely uterine crowding and limitation of placental perfusion [3]. Multiple gestation results in a sharing of uterine vascularity which causes a relative reduction in the blood flow to each placenta. Abnormalities of the umbilical cord such as single umbilical artery are associated with IUGR in mono chorionic twin [5]. Twins who share a placenta also have unequal distribution of blood and nutrients between them. As a result one may be much smaller. This is called selective intrauterine growth restriction [6]. IUGR occurs 10 times more frequently in twin deliveries than in single gestation. Incidence of IUGR in twins is about 15-25%.1 The growth rate of twin pregnancy begin to slow at 30-32wk, triplet at 27-28wk while quadruplet at 25-26wk as the placenta cannot handle any more growth of the babies competing for nutrition [7]. Growth is more likely to affect mono chorionic than di chorionic affecting one of the fetus in 52% and 36% and both twin in 17% and 7% respectively [3].

The second twin is more likely to have growth restriction, suggesting implantation may be determining factor [3]. Usually twin differ in their birth wt. by 10% and can have concordant IUGR.

When the difference >25%, it is called severe discordance [5% of twin] [8]. If the weight discordance is <20% and both fetuses follow their respective growth curve; it is safe for the pregnancy to continue under close monitoring. Severe discordance in growth (>30%) that occurs before 30 weeks of gestation, that may reflect chronic fetal distress and is associated with an increase rate of intrauterine or perinatal death and preterm birth before 32 wk. Severe discordance may be due to congenital anomaly, fetal infection, twin to twin transfusion syndrome or placental dysfunction [3]. Overall 20% of twins are mild discordant and 5% of twins are severely discordant. For triplets, severe discordance affects about 34% [8]. There is scarcity of study regarding IUGR in multiple pregnancies in our context and the estimation of discordance among the multiples enables us to determine the intensity of the factor that affected the pregnancy.

The potential complications related to IUGR are congenital anomaly, perinatal depression, meconium aspiration, pulmonary hemorrhage, persistent pulmonary hypertension, hypoglycemia, hypocalcaemia, acute tubular necrosis, polycythemia, and thrombocytopenia. IUGR is the most common factor identified in still born babies [3]. The immediate outcome of IUGR babies will depict the early complications as well as still birth.

Although this study was very much focused on immediate outcome, the late complications will raise the idea for prospective studies in future. IUGR babies are at risk for poor post natal growth comparing with preterm appropriate for gestational age (AGA) and they have a higher perinatal mortality. Finally some adult who were IUGR at birth appear to have high risk of Coronary artery disease, Hypertension, Non insulin dependent diabetes mellitus (NIDDM) and Stroke. IUGR babies may have long term neurological and behavioral problem [3].

Once gestational age has been established (by LMP), the following method can be used to diagnose IUGR:

• Fundal height that does not coincide with gestational age. (A lag of 4 cm/more difference than expected for gestational age).

• Measurements calculated in an ultra sound are smaller than would be expected for the gestational age.

• Abnormal findings discovered by Doppler ultra sound.

The first radiographic sign of IUGR may be a decreased amniotic fluid volume. About 85% IUGR have oligohydroamnios [1]. Prevention of IUGR is highly desirable. Investigators have looked at altering the thromboxane to prostacyclin ratio by administering Aspirin. Despite the theoretically benefit of Aspirin, the role of this drug is still unclear [9]. A Imdad [10-11] stated that detection and management of IUGR using maternal BMI, symphysis to fundal height measurements and targeted ultrasound could be effective method reducing IUGR related still birth. It is important to take into account that Doppler USG is used as a

diagnostic assessment method and the clinical outcome depends on availability and timely interventions such as early delivery e.g., via caesarean section. Doppler velocimetry of umbilical and fetal arteries for surveillance of identified high risk pregnancies leads to a reduction of 29% in perinatal mortality [10-18].

So, the pattern of IUGR in multiple pregnancies and the discordance among the babies will help us to know that how adversely growth restriction affects in multiple gestations. And also, we can set out preventive strategies against immediate complications of IUGR. For future, regarding follow up and prevention of long-term complications of IUGR, more studies need to be done.

Rationale of the Research

Multiple gestations are one of the major causes of intrauterine growth restriction (IUGR) which put the babies at risk for still birth and neonatal death. Through the knowledge of the pattern of IUGR in multiple pregnancies and its immediate outcome we can take appropriate preventive measures during antenatal check up of multiple pregnancy cases. We can also identify the associated risk factors related to mother and the babies. Besides improving supervision during pregnancy we can also take proper intranatal and postnatal care of the babies.

Objectives

General-

- To determine the pattern of IUGR in multiple pregnancies.

Specific-

- To determine the proportion of symmetrical and asymmetrical IUGR in multiple pregnancies.

- To determine the concordance & discordance among the multiples with IUGR.

- To determine the immediate outcome of the babies.

Materials and Method

Overview of the study design

- **Type of the study:** Descriptive type of cross-sectional study

- **Place of study:** Neonatal and obstetrical department of CMSOGH. This is a tertiary care general hospital in Chittagong. The Neonatal department is well equipped with 15 beds in NICU, 12 beds in SCBU and 23 beds in step down care unit. This hospital provides emergency, outpatient & inpatient obstetric care to a great number of patients every year.

- **Period of study:** One year. From 1st April'2012 to 31st March'2013

- **Study population:** IUGR babies with multiple gestations delivered in CMSOGH within 24 hrs of birth

- **Type of sampling:** Purposive convenient sampling

- **Sample size:** Total 100 cases of IUGR with multiple gestations

- **Data collection tool:** Case recording form

- **Method of data collection:**

1. **Asking question-** Data collected in a case recording form by asking question to the mother and the attendant after the condition of both mother and babies being stable within 24hrs of birth.

2. **Measurement-** Weight, length, occipitofrontal circumference (OFC) and chest circumference of the babies were measured within 24 hrs of birth. Weight was recorded in grams using an automated weight machine and checked it every time with a 250gm weight bar. Length was measured using an Infantometer. OFC and chest circumference were recorded in cm. The nutritional status of mother was checked by calculating standard formula for BMI and the mid upper arm circumference.

Ponderal index (PI) = wt. in gm/ ht. in $cm^3 \times 100$. PI≥2 indicate symmetrical and PI<2, asymmetrical IUGR respectively [3]

Discordance in growth may be quantified as a percentage of the larger fetus weight.

Discordance= (A-B)/A×100,   A=heavier baby,   B=lighter baby

Mild discordance <15%

Moderate discordance 15-25%

Severe discordance >25%

For triplets severe discordance affects about 34% [8].

Data analysis: By SPSS 12.0 programme

Data presentation: By tabular method and diagram.

Selection Criteria

Inclusion Criteria-

- IUGR with multiple gestations.

- Multiple gestation cases delivered in Chittagong Maa Shishu O General Hospital [CMSOGH] within 24 hrs of birth.

- Gestational age >28 wks.

- Both term and preterm babies included.

Exclusion Criteria-

- Multiple gestations <28 wks will be excluded.

- Multiple gestations without IUGR

Operational Definitions

IUGR- Intrauterine growth retardation (IUGR) which is defined as less than 10% of predicted weight for gestational age may results in significant fetal morbidity and mortality if not properly diagnosed [1].

Asymmetrical IUGR- characterized by normal head and brain being normal in size but the abdomen is smaller. Typically this is not evident until third trimester [7].

Symmetrical IUGR- characterized by all internal organs being reduced in size. Symmetrical IUGR account for 20-25% of all cases of IUGR [7].

Results

(Figure 1) Among 52 cases of multiple gestations, a number of 44 twins and 2 triplets presented with all IUGR babies. This bar diagram illustrates that among 44 numbers of twins, 18 twins had both the multiples symmetrical. Both the multiples with asymmetrical IUGR presented in 12 numbers of twins. One symmetrical and another asymmetrical IUGR were present in 14 numbers of twins. The triplets presented with all symmetrical IUGR.

(Figure 2) The Pie chart illustrates that among 100 cases of IUGR proportion of symmetrical IUGR (60%) was greater than the asymmetrical IUGR (40%). [A number of 52 cases of multiple gestations were selected and 100 cases of IUGR babies were included in this study].

(Figure 3) This pie chart demonstrates that a proportion of 50% of IUGR cases were subjected to immediate admission to neonatal ward after birth and 10% cases were complicated to still birth whereas 40% were found to be well and kept with mother.

(Figure 4) This figure demonstrate that among 50 admissions, a number of 36 IUGR babies admitted due to Preterm low birth weight(LBW) and 7 cases were due to Early onset sepsis (EONS). Only a single case of Meconium aspiration syndrome (MAS) admitted. And 6 cases got admission for Perinatal asphyxia

LBW=low birth weight

EONS=early onset neonatal sepsis

MAS=meconium aspiration syndrome

(Figure 5) This figure demonstrates that among 44 twins (both multiples IUGR), 40 of the twins were concordant and rest of the 4 twins were discordant. All the multiples among triplets were concordant multiples.

(Figure 6) This figure demonstrate that among 50 admitted cases of IUGR the number of asymmetrical IUGR was 22(44%) and symmetrical IUGR 28(56%) (Table 1-5).

Table 1: Distribution of BMI (Body Mass Index) of the mothers.

BMI of mothers	Frequency(n=52)	Percentage
<18	4	7.69%
18-25	40	76.92%
>25	8	15.38%

This table shows that among 52 mothers, 40 of them was within normal standard limit of BMI and 4 of the mothers were undernourished. n=total number of mothers.

Table 2: Distribution of maternal age according to age limits

Age interval of mothers	Number(n=52)	Percentage
<20	8	15.38%
21-30	42	80.77%
31-40	2	3.85%
>40	0	0%

This table shows that among 52 mothers, 42 mothers were between 21-30 yrs. of age. A number of 8 of the mothers were below 20 and the rest of them were above 30 yrs. of age.
n= total number of mothers
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Table 3: Number of antenatal checkups (ANC) by the mothers.

Pattern of Antenatal checkups (ANC) by mothers	Frequency(n=52)	Percentage
No ANC	4	7.69%
3-Jan	12	23.08%
Regular	36	69.23%

This table shows that majority of the mothers, a number of 36 (69.23%) were under regular antenatal checkups. Only 4 (7.69%) of the mothers had no antenatal evaluation.
n= total number of mothers

Table 4: Medical problems of the mothers during pregnancy.

Medical problem of the mothers	Frequency (n=52)	Percentage
Anemia	5	9.62%
Hypertension (pregnancy induced)	6	11.53%
Polyhydroamnios	2	3.85%
No medical problems	39	75%

This table states that among 52 mothers, 6 of them had pregnancy induced Hypertension. Two of them were diagnosed as cases of Polyhydroamnios. Anemia was a medical problem for 5 of the mothers.
n= total number of mothers

Table 5: Pattern of symmetrical and asymmetrical IUGR among still births.

Still births (n=10) with types of IUGR	Frequency	Percentage
Asymmetrical	10	100%
Symmetrical	0	0%

This table illustrates that among 10 cases of still births, all of them were asymmetrical IUGR.
n= number of still births
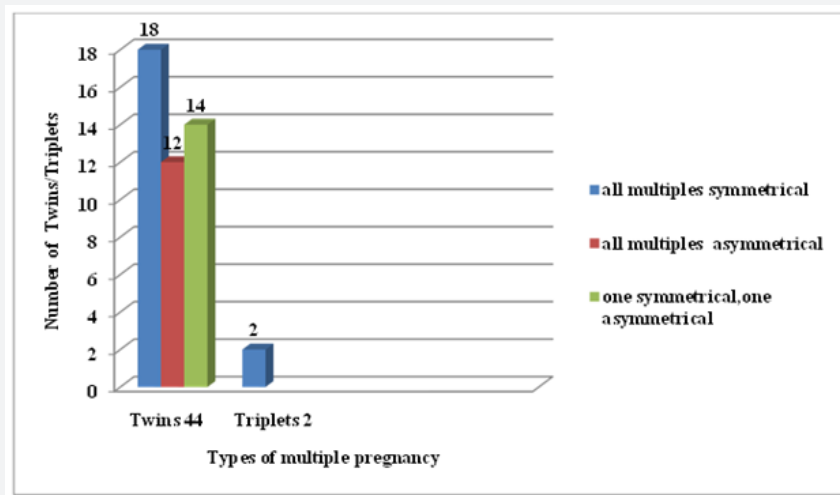
Figure 1: Pattern of symmetrical and asymmetrical IUGR among multiples gestations (with all IUGR babies).
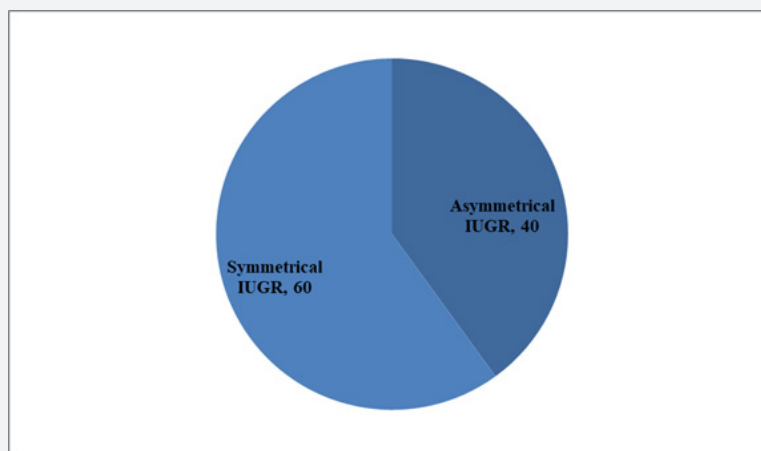

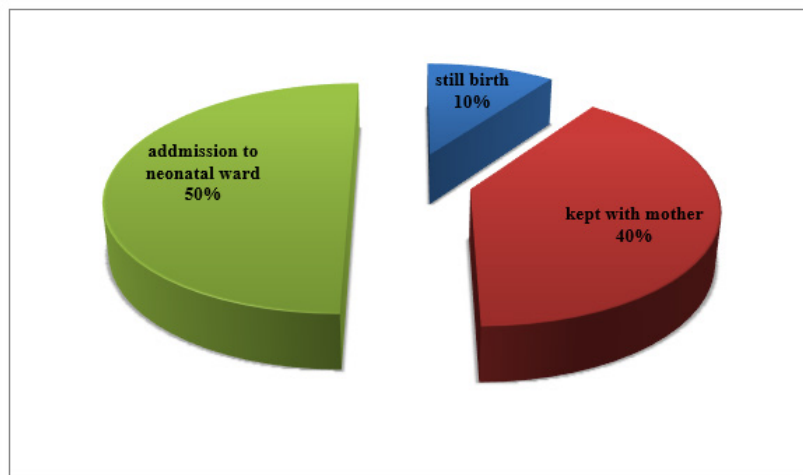**Figure 2:** Proportion of symmetrical and asymmetrical IUGR among multiples.
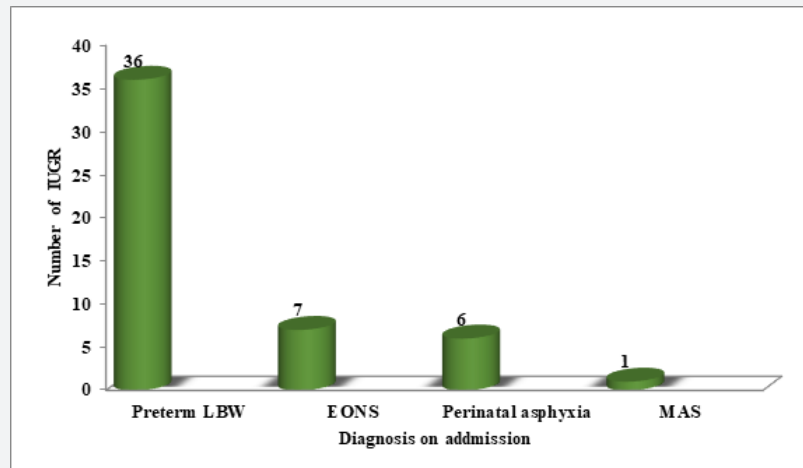
Figure 3: Immediate outcome of IUGR after birth.

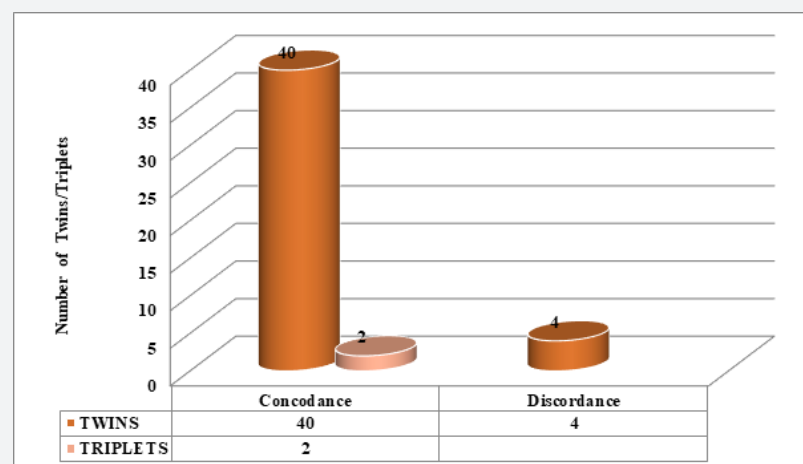**Figure 4:** Causes of admission to neonatal ward.

Figure 5: Pattern of concordance and discordance among multiples.
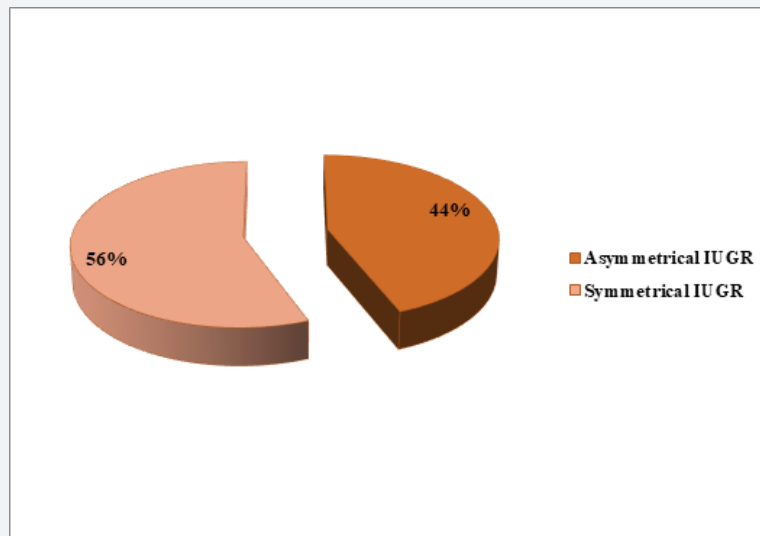
Figure 6: Proportion of symmetrical and asymmetrical IUGR among multiples admitted to neonatal ward.

Discussion

The study was attempted to describe the pattern of intrauterine growth restriction (IUGR) in multiple pregnancies and its immediate outcome through which we will be able to make preventive strategies during pregnancy with multiple gestations and may contribute to reduce still birth and neonatal death. The study was a tertiary care hospital based descriptive type of cross sectional study carried out in the Neonatology and Obstetrics department of Chittagong Maa-Shishu O General Hospital (CMSOGH) between 1st April, 2012 to 31st March; 2013. Sample size was determined by purposive convenient sampling technique. Subjects were selected by appropriate inclusion criteria. Data were collected in case recording form after appropriate verbal or written consent and results were subjected to standard statistical evaluation and presented by tabular method and diagram.

In this study a number of 52 cases of multiple gestations with 50 cases of twins and 2 cases of triplets, were included and 100 cases 0f IUGR babies were selected using the appropriate inclusion criteria. There were 50 cases of twins and 2 cases of triplets. Therefore 52 numbers of mothers were acting as the respondents. Among the twins 44 pairs presented with IUGR of both multiples and 5 of the twins had the combination of IUGR and appropriate for gestational age (AGA). One of the twins had one IUGR with one intrauterine death (IUD). But all the babies presented in triplets had IUGR. Out of 100 cases of IUGR 60 cases were symmetrical whereas 40 cases were asymmetrical IUGR. As mentioned earlier symmetrical IUGR accounts for 20-25% of all cases of IUGR [7]. But this study revealed that proportion of symmetrical IUGR was 60% of all cases included in the study.

Among the 44 twins, where all the gestations had growth restriction, 18 cases of twins presented with both babies symmetrically retarded whereas 12 cases were asymmetrically growth retarded. A number of 14 twins presented with one symmetrical and another asymmetrical IUGR. All the multiples among the triplets were symmetrically growth restricted. In 1977 Campbell and Thoms [9] introduced the idea of symmetrical versus asymmetrical growth. According to Dashe, et al [9] among 1364 infants 20% were asymmetrical and 80% were symmetrical IUGR. But in this study 60% were symmetrical and 40% were asymmetrical IUGR suggesting increase proportion of symmetrical over asymmetrical IUGR and early growth restriction in utero. Further studies can sort out this issue on increase proportion of symmetrical growth restriction in multiple pregnancies.

Out of 100, a proportion of 50% cases needed immediate hospital admission after birth and10% cases found as still birth. Dashe, et al [9] as illustrated in their study, a proportion of 27% of IUGR (18% asymmetrical, 9% symmetrical) required NICU admission. On the other hand this study depicted that a number of 36 cases admitted due to Preterm LBW, 7 cases were due to EONS, 6 cases for perinatal asphyxia and only one due to meconium aspiration. Among total admission 44% were asymmetrical and 56% were symmetrical IUGR. All the cases of still births presented with asymmetrical growth restriction.

According to Erich Cosmi, et al [19] IUGR is most common factor identified in still born babies. IUGR is associated with increased risk of premature birth, hypoxic injury and need for respiratory support and prolong NICU stay. Gardosi et al [9] noted that nearly 40% still born fetuses that were not malformed were SGA.

Regarding concordance, a number of 44 of twins were found to be concordant in this study. On the other hand only 4 twins showed discordance among the multiples. Both the triplets presented with concordance. According to Charles H Rodeck [8] 20% of twins are mild discordant and 5% twin are severely discordant. For triplets severe discordance affects about 34%. In this study only 9% twin were found discordant. But according to Jena Miller [14] 16% of twins have discordance at least 20%.

According to A Imdad [10], using maternal BMI could be effective method to detect IUGR with fundal height estimation and ultrasound. Out of 52 mothers, 40 (76.92%) of them were within normal range of BMI excluding under nutrition as major contributing factor in developing countries. This study also illustrated that a great number of the mothers, 34(65.38%), were belonged to lower middle class and lower socioeconomic status is an important factor to cause IUGR. Regarding educational background, 34 of the mothers were educated up to secondary level and age at parity was also documented in a satisfactory age range as 42 of the mothers were between 21 to 30 yrs of age. Only 2 of the mothers were elderly mother whereas 8 of them were below 20 yrs. In Bangladesh under aged mothers are most commonly malnourished and contributing to IUGR. This study revealed that 36 numbers of mothers followed regular antenatal checkups and 4 of them had never visited for antenatal evaluation. According to American Family Physician [1] fundal height measurement, ultrasounds scanning with Doppler study are the methods to diagnose IUGR. And it is almost impossible without regular antenatal checkups. Comparative studies in relation with maternal risk factors between singleton and multiple gestations may lead some more ideas in future.

As a contributing factor to IUGR, Hypertension (induced by pregnancy) was present in 6 of the mothers, anemia in 5 and polyhydroamnios in 2 of the mothers respectively during the antenatal period. According to Robert C.Vandenbosche and Jeffrey T Kirchner [1] Chronic Hypertension of mother during pregnancy is the most common cause of IUGR; in this study it also revealed the same. In this study not a single mother was found to be smoker and it is found that smoking causing 30 to 40% United States cases of IUGR [1]. Premature rupture of membrane (PROM) was documented as the major complication before delivery, presented in 21 numbers of mother [20].

Limitation

- Small sample size.

- Study carried out in only one center.

- The growth patterns of late pregnancy in most of the cases were practically unknown because of preterm delivery.

- Late outcomes of IUGR babies could not be measured.

- Control group in singleton pregnancies not included in study.

Conclusion

Asymmetrical IUGR seemed to be predominating factor in all the still births. But symmetrical IUGR appeared as increased in number regarding both neonatal admissions and total cases included in this study. Through regular antenatal checkups and ultrasound scanning we can detect the high-risk multiple pregnancies with IUGR and take appropriate measures to prevent still births.

Recommendation

No single measurement helps secure the diagnosis. Thus, a complex strategy for diagnoses and assessment is necessary. The current therapeutic goals are to optimize the timing of delivery to minimize hypoxia and maximize gestational age and neonatal outcome.

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