Maternal risk factors associated with intrauterine growth restriction: hospital based study

Ashwani N1, Neela Aruna Rekha2, Babu M.S3, C. Suresh Kumar4, O. Tejo Pratap5

1Dr. Neetika Ashwani, Medical Officer, Special newborn care unit (SNCU), 2Dr. Neela Aruna Rekha, Assistant Professor, Gynaecology and Obstetrics, 3Dr. Mendu Suresh Babu, Assistant Professor, Department of Paediatrics, 4Dr. C. Suresh Kumar, HOD and Professor of Neonatology, all authors are affiliated with Niloufer Hospital, Osmania Medical College, Hyderabad, 5Dr. O. Tejo Pratap, Neonatologist, Department of Neonatology, Fernandez Hospital, Hyderguda, Hyderabad, India.

Address for Correspondence: Dr. Neetika Ashwani, Email: cuteniti_19@yahoo.com

Abstract

Objective: To study the maternal risk factors of intrauterine growth restriction. Methods: A retrospective analysis was done at a tertiary care Hospital. Ninety three inborn intrauterine growth restriction cases were selected and data was collected by perusal of antenatal records. Intrauterine growth restriction was defined as occurring if birth weight of the newborn is below 10th percentile for gestational age on the intrauterine growth curve based on Fenton’s charts. Results: Mean age of the mothers included in the study was 20.2 ± 2.857 years. Forty four (47.3%) were born to primipara and 49 (52.7%) to multigravida. Younger maternal age, multiparity were found to be the significant socio-demographic factors associated with Intrauterine growth restriction while, pre eclampsia, chronic hypertension and anemia were the maternal biological factors found to be significantly associated on bivariate analysis. Conclusions: Younger age, multigravida and chronic medical illnesses are the main risk factors in this hospital based population. Inclusion of prenatal education and screening for medical disorders in antenatal care guidelines will help in curtailing the incidence of IUGR.

Keywords: maternal factors, IUGR, tertiary centre

Introduction

Linear growth failure is caused by multiple factors including parental factors. Infants with intrauterine growth restriction (IUGR) are defined as those with birth weight below the 10th percentile for its gestational age and it is a consequence of several factors [1]. Genetic and environmental factors influence the development throughout the growth period. Linear growth failure is largely confined to the intrauterine period and the first few years of life, and it is caused by multiple factors like inadequate diets, infections, maternal chronic diseases etc. [2,3].

IUGR is observed in about 24% of newborns; approximately 30 million infants suffer from IUGR every year [4]. The burden of IUGR is concentrated mainly in developing countries, especially in Asia which accounts for nearly 75% of all affected infants. In India, the prevalence of LBW has been reported as 26% [5] while the proportion of IUGR has been found to be 54% [6,7]. The neonatal mortality rate of a small for gestational age infant born at 38 weeks is 1% compared to 0.2% in those appropriate for gestational age [8].

The common risk factors include maternal causes (hypertension, diabetes, cardiopulmonary disease, anemia, malnutrition, smoking, drug use), fetal causes (genetic disease including aneuploidy, congenital malformations, fetal infection, multiple pregnancies), and placental causes (placental insufficiency, placental infarction, placental mosaicism). The risk factors for IUGR different in our region compared to developed region. IUGR increases the risk for intrapartum asphyxia, preterm delivery, and risks associated with preterm delivery, including but not limited to respiratory distress syndrome, sepsis, seizures,
intraventricular hemorrhage, and necrotizing enterocolitis [9,10]. Other neonatal morbidities include polycythemia, hyperbilirubinemia, hypoglycemia, and hypothermia. Effects of IUGR often affect childhood and adult life, as well. During the childhood period, associations are noted for increased risk of cerebral palsy, growth delay, short stature, and neurodevelopmental impairment [9,11]. In adult life, individuals who had IUGR were noted to have higher incidence of hypertension, diabetes, obesity, coronary artery disease, stroke, and metabolic syndrome [12].

However in developing countries evidence on the association between these factors and IUGR is scarce. Hence we tried to elucidate some of the major risk factors for intrauterine growth restriction in south India.

Materials and Methods

A retrospective descriptive analysis was undertaken at a tertiary care hospital, Niloufer Hospital, Hyderabad, India to study the maternal determinants of intrauterine growth restriction.

Results

A total of 4315 babies were delivered in our center during the study period, of which 93 (2.15%) with mean birth weight of 1.93±0.36 kg (range 0.89-2.3kg) and mean gestation age of 38.19±1.75 weeks (range 32-41weeks) were diagnosed as IUGR. Forty four were born to primipara (47.3%) and 49 (52.7%) to multigravida. Fifty eight (62.4%) were females and 35 (37.6%) were males. Forty three (46.2%) mothers were at young age (<20yrs) and eight (8.6%) mothers with weight <45kg. Birth spacing less than 1 year were found in 13(14%) women and 22(23.7%) women were found to have birth spacing between 1-2 years.

The etiological factors are shown in table 1.

Table 1: Perinatal risk factors.

|                      | SGA #  | OVERALL # | p value |
|----------------------|--------|-----------|---------|
| Anemia               | 10.8   | 1.96      | <0.001  |
| Hypertension         | 10.8   | 2.94      | <0.001  |
| Pre eclampsia        | 16.1   | 5.02      | <0.001  |
| Eclampsia            | 1.1    | 0.50      | 0.957   |
| Diabetes mellitus    | 1.1    | 0.60      | 0.999   |
| APH                  | 8.6    | 1.04      | <0.001  |
| Infections           | 1.1    | 0.69      | 0.999   |
| Hypothyroid          | 4.3    | 4.77      | 0.999   |
| No med comp**        | 46.2   |           |         |

Note: # - denotes percentage, * - Antepartum hemorrhage, **- No medical complications

Pre eclampsia was considered as one of the important risk factors of IUGR babies followed by anemia, hypertension and antepartum hemorrhage. The other perinatal risk factors did not reach statistical significance.
In forty three (46.2%) babies, no medical cause was found for SGA babies. Hence we analyzed socio-demographic factors for these SGA babies (table 2).

Table-2: Socio-demographic factors with no medical complications.

|                           | Frequency(n=43) | Percentage (%) |
|---------------------------|-----------------|----------------|
| young maternal age        | 17              | 39.5           |
| low maternal weight       | 3               | 7.0            |
| Multigravida              | 10              | 23.3           |
| short stature             | 1               | 2.3            |
| Undetermined              | 12              | 27.9           |

Young maternal age had high prevalence (39.5%) for SGA babies followed by multigravida (23.3%), low maternal weight (7.0%) and short stature (2.3%).

Twelve (27.9%) babies born to primi mothers had no cause determined. Of 12 babies 7 were associated with oligohydramnios.

**Discussion**

The ability to reach an optimal birth weight, results from the interaction between the fetal growth potential and the environment. The fetus requires several substrates for normal growth, the most important being oxygen, glucose and amino acids. Any persistent decrease in the availability of any of these substrates will limit the ability of the fetus to reach its growth potential. The availability of substrates necessary for fetal growth may be limited by pathological conditions affecting the mother, the placenta and the fetus [13].

IUGR is a multifactorial phenomenon. Many of these factors are inter-related and they can confound the results in addition to modifying the independent estimates of relative risk associated with a risk factor [14]. The perinatal risk factors responsible for IUGR in developing countries differ from the western world. Unlike our country the common risk factors related to IUGR in western countries is smoking.

In this retrospective study, we described risk factors for severe IUGR. Obstetric and maternal risk factors for IUGR are well described in many studies and the present cohort is comparable to cohorts described in other studies.

Our study demonstrated that pre eclampsia, hypertension, and anemia were the main maternal biological factors associated with IUGR which was comparable with other studies [13]. Anemia is a common problem in developing countries in pregnant women and increases the incidence of LBW and IUGR [15,16].

Maternal age and parity were found to be the significant maternal socio-demographic determinants of intrauterine growth restriction in the present study. Teenage mothers (age less than 20 years) are well known for adverse pregnancy outcomes. However, in this study teenage mothers were independently associated with IUGR compared to middle and older age mothers which are comparable to other studies [17-19]. This result is in contrast to other studies in India. Instead of teenage mothers, studies in India associated maternal weight and primiparity [15,16].

Kramer’s meta-analysis [20], and other studies conducted in developing countries have identified maternal weight (<45kg), maternal height (<145cm) as potential risk factors for LBW babies. Low socioeconomic status and low educational status leads to low health consciousness, lower nutritional status and low antenatal attendance, leading to the increased risk of IUGR babies [21]. A short interpregnancy interval is associated with IUGR [22]. In the present study, previous history of abortion/stillbirth, spacing, maternal weight, and antenatal visits were not found to be significant. Another study done in India showed that toxemia of pregnancy (30.09%), hypertensive diseases of pregnancy (HDP) excluding toxemia (5.8%), diabetes mellitus (1.94%), medical disorders including renal and cardiac (3.88%), anemia and Intra Uterine infection (0.97%) were the main conditions responsible for LBW and in 56.3% pregnancies, no cause could be ascertained [13]. But our study showed that 16.1% mothers suffered from pre eclampsia, 10.8% of the mothers with IUGR were anaemic and 46.2% of them...
were young maternal age. Around 10.8% of the mothers with IUGR babies suffered from hypertension.

We found 12 cases (27.9%) had no cause determined. Of late genetic factors affecting the mother, placental and fetus are increasingly reported. Genetic causes can contribute to 5-20 % of IUGR, especially for early onset growth restricted fetuses. Monitoring of weight gain on prenatal visit can identify the maternal nutrition. Also, measurement of the symphysis-fundal height (SFH) height provides a helpful measure to assess fetal growth during office visits.

The women at risk for IUGR can be assessed with uterine artery Doppler to further evaluate the initiation of baby ASA before 16 weeks gestation. Diagnosis of IUGR is made by when the ultrasound EFW is less than 10th percentile. The umbilical artery Doppler should be performed in IUGR fetuses to formulate the antenatal management plans. Invasive testing should be offered to rule out aneuploidy and in utero fetal infection. Serial growth ultrasound and UA Doppler studies are used to follow-up the fetus (es) with IUGR. As the IUGR foetuses have fivefold increase in the stillbirth rate as well as threefold increase in neonatal mortality and morbidity, a very close monitoring of the labour is warranted. As the chance of IUGR babies in subsequent pregnancies is higher, these patients should be followed up post-natally.

This study provides baseline information from a tertiary hospital in this region, which could help with possible intervention regarding maternal and newborn health in the future. We could not take more information on certain risk factors like weight gain during pregnancy because of lack of available data from the records. We recommend the health authorities to strengthen the maternal health programmes focusing on maternal nutrition and iron and folic acid supplementation during antenatal period.

The strategy also needs to focus attention on nutrition education to facilitate better weight gain during adolescent period. Discouraging teenage pregnancy is also essential in order to reduce the burden of LBW/IUGR babies.

Thus findings of this study emphasizes the need for improving the quality and utilization of antenatal care, nutritional education to improve the weight gain during pregnancy, spacing, and prevention and proper management of risk factors like anemia and hypertension. The researchers concluded that there is a need to control risk factors to reduce the incidence and prevalence of Intra uterine growth restriction.

Conclusions

IUGR newborns are common in the developing countries. So in conclusion, comprehensive approaches which institute a combination of interventions to improve the overall health of the women are needed. Such approaches are likely to be most effective in reducing the IUGR problem in India. As IUGR infants can have long term morbidities, authorities should concentrate on measures to reduce this problem.

Acknowledgement- We thank Dr. Raja Sriswan Mamidi, Scientist B, National Institute of Nutrition, Hyderabad for assistance with statistical analysis and for comments that greatly improved the manuscript.

Funding: Nil, Conflict of interest: None initiated, Permission from IRB: Yes

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How to cite this article?
Ashwani N, Neela Aruna Rekha, Babu M.S, C. Suresh Kumar, O. Tejo Pratap. Maternal risk factors associated with intrauterine growth restriction: hospital based study. Int J Med Res Rev 2016;4(12):2125-2129.doi:10.17511/ijmrr.2016.i12.08.