Maternal determinants of intrauterine growth restriction in Goa, India: a case-control study

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ABSTRACT

Objective: To study the maternal determinants of intrauterine growth restriction.

Methods: A case-control study was conducted at a tertiary care Hospital in the year 2009. Ninety eight cases of intrauterine growth restriction were compared to 98 controls, matched for newborns sex and type of delivery. Data was collected by interviewing the mother using a structured pretested schedule and 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. Data was analyzed using SPSS software version 17 package. Percentages, odds ratios with 95% CI and multiple logistic regression analysis were used wherever appropriate.

Results: Maternal age, education, socioeconomic status and number of antenatal visits were found to be the significant socio-demographic factors associated with Intrauterine growth restriction while, maternal height, parity, previous spontaneous abortion, direct obstetric morbidity, indirect obstetric morbidity and anemia were the maternal biological factors found to be significantly associated on bivariate analysis. Multiple logistic regression analysis identified parity, previous spontaneous abortion, direct obstetric morbidity, indirect obstetric morbidity and antenatal visits as significant maternal determinants of intrauterine growth restriction.

Conclusions: A focus on good antenatal care, especially on high risk pregnancies would go a long way in reducing the problem of intrauterine growth restriction in the community thereby ensuring a safe and healthy future for our youngest generation.

INTRODUCTION

Term infants, who, despite having adequate time to grow, are born too small and weigh less, have intrauterine growth restriction (IUGR)[1]. Intrauterine growth restriction is associated with a significant increase in mortality in the perinatal period and infancy. 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[2]. Children who are born with IUGR have higher rates of sepsis, seizures, respiratory failure and neonatal mortality. These infants also have more problems with learning. Intrauterine growth restriction results in anomalous programming of affected fetuses, predisposing them to a variety of adult onset diseases such as diabetes, hypertension, and coronary artery disease[2].

The factors that have been postulated to influence the risk of intrauterine growth retardation among the newborn in include high maternal age, low maternal education, unfavorable socioeconomic conditions, addictions, poor antenatal care, birth interval, general morbidity etc. However in developing countries evidence on the association between these factors and IUGR is scarce. A case control study was therefore conducted in state of Goa,
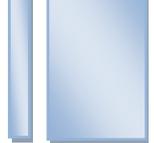
India to elucidate some of the major risk factors for intrauterine growth restriction.

MATERIAL AND METHODS

The present case control study was undertaken at a tertiary care hospital in Goa, India to study the maternal determinants of intrauterine growth restriction. Newborns with birth weight below 10th percentile for gestational age on the chart of fetal growth were classified as having intrauterine growth restriction.

A total of 98 cases and 98 controls were included in the study. This gave a power of 50% for detecting an OR more than 2.25 as significant at 5% level if prevalence of exposure among controls was 70%. Sample size was estimated using tables from 'Determination of sample size, by SK Lwanga et al.[3].

Cases were all singleton newborn babies with intrauterine growth restriction born at the tertiary hospital during the study period. Controls were singleton newborn babies appropriate for gestational age and without IUGR born at the hospital. Group matching was done using sex of newborn and method of delivery as matching variables.

Antenatal records of mothers of cases and controls were scrutinized for history, baby's weight, maternal weight, record of hemoglobin and other investigations, any illness and treatment received during pregnancy and record of hospitalization during present pregnancy. Further data on risk variables was collected by interviewing the mothers using a structured questionnaire. Weight of the mother during pregnancy was obtained from antenatal records. Weight of the newborns was obtained from case records. Data was analysed using SPSS software package version 17. Statistical tests used were chi square test and odds ratio with 95% confidence interval. Since IUGR is a multifactorial condition and many of the factors are inter-related, multiple logistic regression analysis was performed to assess their independent effects.

RESULTS

A total of 915 newborns were delivered during the study period out of which 105 newborn had IUGR. Ninety eight newborns with IUGR (cases) and equal number of controls were studied.

On univariate analysis, maternal age, maternal educational status, socioeconomic status and number of antenatal visits were found to be the significant maternal socio-demographic determinants of intrauterine growth restriction. (Table 1)

Table 1: Maternal Socio-demographic Determinants of Intrauterine Growth Restriction

	Cases	Controls	OR (95% CI)	P value
	No. (%)	No. (%)		
Maternal Age (Yrs)				
15-20	15 (15.31)	7 (7.14)	3.49 (1.26-9.65)	0.03
21-25	29 (29.59)	28 (28.57)	1.68 (0.83-3.42)	
26-30	27 (27.55)	44 (44.90)	1 (Ref)	
30+	27 (27.55)	19 (19.390	2.31 (1.08-4.94)	
Education (years of schooling)				
0	19 (19.39)	8 (8.16)	4.75 (0.37-60.14)	0.02
1-5	17 (17.35)	13 (13.27)	2.61 (0.21-32.07)	
6-10	50 (51.02)	50 (51.02)	2 (0.17-22.76)	
11-15	11 (11.22)	25 (25.51)	0.8 (0.072-10.73)	
15+	1 (1.02)	2 (2.04)	1 (Ref)	
Socioeconomic status class*				
I	5 (5.10)	12 (12.24)	1 (Ref)	0.000
II	16 (16.33)	25 (25.52)	1.56 (0.45-5.18)	
III	20 (20.41)	30 (30.61)	1.6 (0.48-5.24)	
IV	30 (30.61)	26 (26.53)	2.76 (0.86-8.90)	
V	27 (27.55)	5 (5.10)	12.96 (3.15-35.29)	
Antenatal Visits				
≤ 5	40 (40.82)	9 (9.18)	7.77 (2.82-21.41)	0.00
6-10	46 (46.94)	68 (69.39)	1.18 (0.53-2.64)	
10+	12 (12.24)	21 (21.43)	1 (Ref)	

BG Prasad classification

Mothers aged 15 to 20 years (OR=3.49; 95% CI: 1.26-9.65) and mothers aged 30 years and above (OR=2.31; 95% CI: 1.08-4.94) were more likely to have an IUGR baby compared to those in the age group of 25-30 years. Those mothers with lower level of education were more likely to have an IUGR baby. Mothers with zero years of schooling were around 4.75 times more likely to have an IUGR baby compared to those who have completed more than 15 years of schooling (OR=4.75; 95%CI: 0.37-60.14).

As far as socioeconomic status was concerned, those mothers who belonged to the lowest socioeconomic class were 12.96 times more likely to have an IUGR baby compared to those mothers in the highest socioeconomic class. Number of antenatal visits was another factor which was found to be significant. Higher number of antenatal visits lowered risk of having an IUGR baby.

As far as maternal biological factors were concerned parity, previous spontaneous abortion, direct and indirect obstetric morbidity, anemia, maternal height were found to be significantly associated with intrauterine growth restriction (Table 2).

Table 2: Maternal Biological Determinants of Intrauterine Growth Restriction

	Cases	Controls	OR *(95% CI)*	P value
	No. (%)	No. (%)		
Parity				
1	56 (57.14)	41 (41.84)	3.41 (1.47-7.88)	0.02
2	27 (27.55)	25 (25.51)	2.7 (1.08-6.72)	
3	10 (10.21)	25 (25.51)	1 (Ref)	
4+	5 (5.10)	7 (7.14)	1.78 (0.45-6.97)	
Previous spontaneous abortion				
Present	28 (28.57)	15 (15.31)	2.21 (1.09-4.47)	0.025
Absent	70 (71.43)	83 (84.69)	1 (Ref)	
Direct obstetric morbidity				
Present	39 (39.80)	16 (16.33)	3.38 (1.73-6.62)	0.00
Absent	59 (60.20)	82 (83.67)	1 (Ref)	
Indirect obstetric morbidity				
Present	53 (54.08)	26 (26.53)	3.26 (1.79-5.93)	0.00
Absent	45 (45.92)	72 (73.47)	1 (Ref)	
Anemia				
Present	48 (48.98)	21 (21.43)	3.52 (1.88-6.57)	0.00
Absent	50 (51.02)	77 (78.57)	1 (Ref)	
Maternal height (Cms)				
≤ 145	15 (15.30)	6 (6.12)	7.5 (0.64-87.19)	0.03
146-155	68 (69.39)	66 (67.35)	3.09 (0.31-30.47)	
156-165	14 (14.29)	23 (23.47)	1.82 (0.17-19.31)	
165+	1 (1.02)	3 (3.06)	1 (Ref)	

Women with lower parity were more likely to have an IUGR baby compared to those with higher parity. Those women with past history of spontaneous abortion were 2.21 times more likely to have an IUGR baby compared to women without such history (OR=2.21;95% CI:1.09-4.47). Women with height less than 145 centimeters were almost 7 times (OR=7.5;95% CI: 0.64-87-19) more likely to a baby with IUGR compared to those women with heights in excess of 165 centimeters.

Women with direct obstetric morbidity which included ante partum hemorrhage, eclampsia, preeclampsia, hydramnios, Rh incompatibility were 3.38 times more likely to have a IUGR baby compared to those without such complications (OR=3.38; 95% CI: 1.73-6.62). Women with indirect morbidity like anemia, hepatitis, cardiovascular disease, diseases of endocrine and metabolic systems and infections were also more likely to have an IUGR baby compared to those without such morbidities (OR=3.26;95%CI: 1.79-5.93).

On multiple logistic regression analysis parity, previous spontaneous abortion, direct and indirect obstetric morbidity and number of antenatal visits were found to be the significant factors associated with intrauterine growth restriction. (Table 3)

Table 3. Multiple Logistic Regression Analysis for Maternal Determinants of Intrauterine Growth Restriction

Variable	β Coefficient	p value	OR (95% CI)
Parity			
Primipara	0.89	0.01	2.44 (1.23-4.83)
Multipara			1 (ref)
Past history of abortions			
Present	1.05	0.01	2.85 (1.22-6.66)
Absent			1 (ref)
Direct obstetric morbidity			
Present	1.58	0.00	4.87 (2.21-10.75)
Absent			1(ref)
Indirect obstetric morbidity			
Present	1.31	0.00	3.71 (1.81-7.59)
Absent			1 (ref)
Number of antenatal visits			
≤ 5	1.86	0.00	6.43 (2.62-15.79)
6-10	2.19	0.00	8.98 (2.87-28.13)
10+			1 (ref)

DISCUSSION

Maternal age, maternal educational status, socioeconomic status and number of antenatal visits were found to be the significant maternal socio-demographic determinants of intrauterine growth restriction in the present study.

Odibo AO et al[4] have also reported a positive association between increasing maternal age and risk of IUGR. Aghamolaei IT et al[1] in a case control study reported that mothers who had never attended school or had attended only primary

school had 1.54 times risk of delivering IUGR babies compared to those who had attended school.

Similar to the present study Vijaynath R et al[5] in their study in Kerala also reported that mothers in low socioecomonic class had 6.5 times risk of delivering babies with IUGR as compared to mothers in high socioeconomic class. As far as antenatal care was concerned the findings of the present study were consistent with the findings of Al-Elisa YA et al[6] and Aghamolaei IT et al[1].

As far as maternal biological factors were concerned parity, previous spontaneous abortion, direct and indirect obstetric morbidity, anemia,

maternal height were found to be significant associated with intrauterine growth restriction.

In the present study parity was found to be a risk factor for IUGR with primiparous women at higher risk of delivering IUGR babies. Acharya D et al[7] and Al-Elisa YA et al[6] have reported similar findings in their respective studies in Udupi, India and Saudi Arabia. Previous history of spontaneous abortion was another significant risk factor for IUGR found in the present study. This finding was consistent with that of Vega j et a[8]l, however Aghamolaei IT et al[1] found no such association.

Direct and indirect morbidities were found to be the risk factors for IUGR in the present study. Sobral M et al[9] and Aghamolaei IT[1] have reported direct morbidity as a risk factor for IUGR whereas Odibo AO et al[4] and Kramer MS et al[10] have reported indirect morbidity as a risk factor for IUGR. As far as maternal height was concerned, the present study identified low maternal height as a risk factor for IUGR. Similar findings have been reported by Acharya D et al[7] wherein it was found that women with height less than 145 cms were having four times more risk of IUGR compared to mothers with

height more than 145 cms.

Parity, previous spontaneous abortion, direct and indirect obstetric morbidity and low number of antenatal visits were found to be the significant risk factors for intrauterine growth restriction on multiple logistic regression analysis. Acharya D et al[7] in a case control study in Udupi, India found that the significant determinants of IUGR on multivariate analysis were maternal age more than 30 years, primiparity, maternal height less than 145cms, maternal weight more than 45 kgs and anemia in pregnancy.

CONCLUSION

Several sociodemographic and maternal risk factors were identified through the present case control study. Knowledge of these determinants would help not only in proper preventive care but also early diagnosis of IUGR during the antenatal period. The expected end result would be reduction in the prevalence of IUGR in the community which would ultimately help in achieving the goal of reduced infant mortality and morbidity.

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