Original Research Article

Study of antenatal and postnatal factors affecting catchup growth in intrauterine growth retarded babies during first year

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ABSTRACT

Background: The burden of IUGR is concentrated mainly in Asia with the proportion of IUGR 54% in India. Higher rates of IUGR should be a cause of concern because they signal high risk of malnutrition, morbidity and mortality for the new born. This study was done to see the factors affecting catchup growth (CUG) of IUGR babies during first year.

Methods: The study was done in 120 SGA babies for a period of 18 months from October 2013 to March 2015. Antenatal, postnatal factors and anthropometry at 1st, 2nd, 3rd, 6th, 9th and 12 months were noted and analysed.

Results: 78.3% babies showed CUG with in the first year. Preterm IUGR infants showed better CUG than full term. Asymmetric IUGR infants showed better CUG than symmetric. Teenage pregnancy, hypertensive disorders, multiple pregnancies, cardiac disease, anemia, type of IUGR, NICU stay, type of feeding, socioeconomic status, mother age, mother height, mother hemoglobin, gestational age, multiple gestation, birth weight, birth length, head circumference at birth all influenced CUG.

Conclusions: Teenage pregnancies should be avoided. In SGA babies of pregnancy induced hypertension and preeclampsia, failure in CUG occurred more, these babies need to be followed in high risk clinics. SGA infants of mothers with low haemoglobin failed to show CUG, so antenatal nutrition improvement of mother should be done. Breastfed babies had higher CUG rates than formula fed babies, so exclusive breastfeeding should be promoted.

Keywords: Antenatal, CUG, IUGR, Postnatal

INTRODUCTION

India has high incidence of low birth weight (LBW) and SGA babies. A large percentage (approximately 70%) of LBW is SGA. Rapid infant growth is a compensatory mechanism for prenatal growth deficit, referred to as 'Catch-up growth'. Catch-up is typically an early postnatal process that in most SGA infants is completed by the age of two years. While 80% of infants born SGA show catch-up growth during the first 6 months of life. Approximately 10% do not show catch-up growth, and most of these children continue to experience poor growth throughout childhood and remain short after the age of two years.[1] IUGR is an important public health

concern in developing countries. A fetus affected by IUGR forms a subset of cases of small for gestational age (SGA) infants.[2] Suboptimal fetal growth, as occurs in cases of IUGR, is an important cause of perinatal mortality and morbidity. Prevention of low birth weight (LBW) in infants is an important public health priority in developing countries, where the condition is largely attributed to IUGR.[3,4]

In India, the prevalence of LBW has been reported as 26%.[5] While the proportion of IUGR has been found to be 54%.[6] High rates of IUGR should be a cause of concern because they not only indicate an imminent risk of malnutrition and morbidity in women of childbearing

age but also signal a high risk of malnutrition, morbidity and mortality for the newborn in the developing countries.[7]

The present study was done to know the antenatal and postnatal factors affecting CUG of intrauterine growth retarded babies for first year.

METHODS

The study was done in 120 SGA babies in pragna childrens hospital, a tertiary center at Punjagutta, Hyderabad after taking consent from parents. Study was done for a period of 18 months from October 2013 to March 2015.

Inclusion criteria

- All IUGR Babies (<10th centile weight for their gestational age) treated by Pragna children's hospital team
- IUGR babies visiting OPD within 14 days from delivery time.

Exclusion criteria

- IUGR Babies which have died during delivery process
- Who cannot come for follow up.
- IUGR babies born with congenital defects.

Table 1: Clinical data of 120 SGA infants.

	Preterm	Full-term	Total
Total patients	82	38	120
Male (n)	30	20	50
Female (n)	52	18	70
Gestational age (week)	34.3 (1.9)	38.1 (1.6)	35.26 (2.47)
Birth weight (kg)	1.57 (0.4)	2.16 (0.34)	1.76 (0.47)
Birth length (cm)	41.56 (4.14)	44.68 (2.67)	42.5 (3.99)
Multiple birth (n)	28	12	40
Mother height (cm)	152.3 (4.57)	152.5 (5.82)	152.36 (4.86)
Mother haemoglobin (g/dl)	11.37 (0.58)	11.38 (0.55)	11.37 (0.57)
Ponderal index	2.13 (0.26)	2.4 (0.20)	2.22 (0.27)

Baseline information was recorded of 155 mothers with SGA babies gestational age, sex, mode of delivery, place of delivery, antenatal risk factors including maternal height and weight, intra partum complications, complications during delivery, symmetrical or asymmetrical IUGR, anthropometry at birth, socioeconomic status and type of family, as 135 babies lost follow-up, remaining 120 babies feeding practices of

mother and weaning foods, weights and anthropometry at next 1st,2nd,3rd, 6th, 9th and 12 months was noted. Out of 120 SGA, 50 were male and 70 were female, Preterm (<37 weeks GA) were 82 and term>37 weeks GA were 38. Data collected was tabulated as shown in Table 1.

Statistical analysis

Fisher exact test, Chi-square tests and logistic regression were used to analyse association between different factors and CUG in weight.

RESULTS

In this study, by the end of 3 months 48 out of 82 preterm SGA infants and 8 out of 38 term SGA infants showed CUG in weight, by the end of 6 months 64 out of 82 preterm SGA and 18 out of 38 term SGA infants showed CUG in weight, by the end of 9 months 66 out of 82 preterm SGA infants and 20 out of 38 term SGA showed CUG in weight, and by the end of 1 year 70 out of 82 preterm SGA and 24 out of 38 SGA showed CUG.

By the end of 6 months 52 SGA infants out of 120 SGA infants showed catchup growth in length (CUG was taken when growth curve crossed 50th centile in WHO growth charts) which was 43.3%, by the end of 9 months 82 out of 120 SGA infants showed catchup growth in length which was 68.3%, and at the end of 1 year 86(71.6%) showed catchup growth in length out of 120 SGA. Percentages were calculated for above and represented as Figure1.
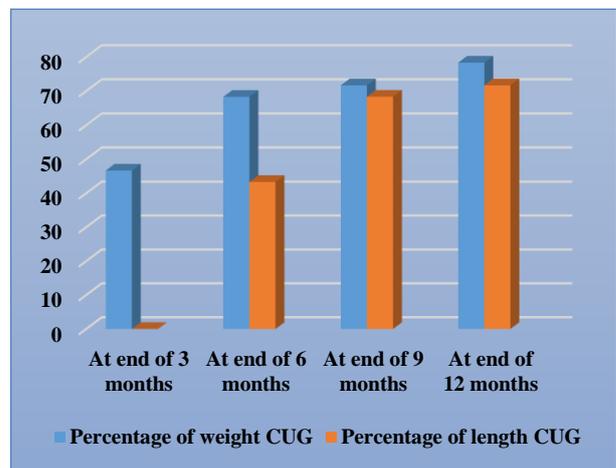
Figure 1: Graphical representation of percentages of catchup growth in weight and length at different ages.

A Pearson product-moment correlation was run to determine the relationship between catchup growth in weight and catchup growth in length. The data showed no violation of normality, linearity or homoscedasticity. There was a strong, positive correlation between catchup growth in weight and CUG in length, which was statistically significant (n=120, p <0.05).

Table 2: Correlation between in catchup growth in weight and catchup growth in length.

Correlations			CUG in weight	CUG in length
CUG in weight	Pearson correlation		1	0.357**
	Sig. (2-tailed)			0.000
	N		120	120
CUG in length	Pearson correlation		0.357**	1
	Sig. (2-tailed)		0.000	
	N		120	120

**. Correlation is significant at the 0.01 level (2-tailed).

Gestational age (preterm or term) showed significant association with CUG, mother age ('*'<20 years, 20-34 years≥35 years) out of 94 SGA infants with CUG 4 mothers age was below 20,76 mothers age was 20-35 and 4 mothers age were more than 35, Out of 28 SGA infants with no CUG 20 mothers age was below 20,6 mothers age was 20-35 and no mothers were above 35 years in this group. Chi square test was used to establish relation between age of mother and CUG in weight, $\chi^2=14.3$, p-value was <0.0001, there is statistically significant relation between mother age and CUG in weight. Logistic regression analysis was used to see for mother's height and hemoglobin association with CUG. Out of 120,94 showed catchup growth,68 infant mothers were primiparous, 35 mother's parity was 2-4 and 1 mother parity were more than 5, In the group with no catchup group, 22 mothers were primiparous and 4 mother's parity was 2-4. The statistical test chi-square test was used and $X_2= 3.68$, degrees of freedom=2, probability, p=0.159, This shows that there is no statistically significant relationship between parity and CUG in weight. Spacing didn't show any statistically significant association with CUG in this study when logistic regression was performed. In present study, out of 70 Preterm SGA with catchup growth 34 hypertension (includes PIH and preeclampsia), 8 mothers had oligohydramnios and 8 mothers had cardiac disease, where as in 12 Preterm SGA without catchup growth had 2 mothers with hypertension and 2 mothers with oligohydramnios. In term SGA with catchup growth of 24,4mothers had hypertension, 4 mothers had oligohydramnios and 4 mothers had cardiac disease. In term SGA without catchup growth 2 had hypertension, 4 had oligohydramnios and 4 were with cardiac disease. Pregnancy induced hypertension and preeclampsia were found as risk factors in 42 mothers of SGA infants. Out of 42, 38 SGA babies showed catchup growth, 4 babies didn't show catchup growth. Out of 56 other SGA babies 22 SGA babies didn't show catchup growth. Other risk factors were in very low number to draw any conclusion. Fisher-exact test was used to find any association between PIH and preeclampsia and catchup growth in weight, p value was 0.0203. Relation of mode of delivery (NVD/LSCS), multiple pregnancy, type of IUGR

(asymmetric/symmetric), type of feeding (Breast feeding/formula feeding), and NICU stay with CUG was done by Fischer-exact test and the results were tabulated. As per modified Kuppuswamy's classification in the preterm group with CUG SGA infants of class 1 were 10,class 2 were 48,class 3 were 4 and class 4 were 8,in term with CUG class 1 were o, class 2 were 24,class 3 0 and class 4 were 2,in preterm with no CUG class 1 were 0,class 2 were 4 ,class 3 were 8 and class 4 were 4,in term with no CUG class 1 were 0,class 2 were 2,class 3 were 10 and class 4 were 0.The chi-square statistical test was used to find relation between catchup growth and socioeconomic status, χ^2 value is 26.3985. The p-value is < 0. 00001.Low socioeconomic groups showed more risk of failure of catchup growth. Class 3 and class 4 had higher failure rates of achieving CUG than class 1 and class 2. birth weight, birth length and birth head circumference showed statistically significant association with CUG when logistic regression analysis was performed.

Table 3: Association between different factors and CUG in weight.

Factors	P value	Significant (S)/Not significant (NS)
Gestational age~	<0.0087	S
Mother age*	<0.0001	S
Mother height	<0.05	S
Mode of delivery^	0.15	NS
Parity#	0.159	NS
Spacing	0.10	NS
Antenatal risk factors hypertension	0.0203	S
Mother haemoglobin	0.019	S
Multiple birth%	0.0009	S
Birth weight	<0.001	S
Birth length	0.047	S
Birth head circumference	<0.001	S
Type of IUGR$	<0.05	S
Type of feeding @	0.005	S
NICU stay&	<0.05	S
Socioeconomic status!	<0.05	S

'*'<20 years, 20-34 years,>/=35 years, '^' LSCS, NVD, # 1, 2-4, ≥5, $ Asymmetric, symmetric, @ Breast feeding, formula feeding, Modified Kuppuswamy Class1, Class 2, Class3, Class 4, Class 5, & Present, Absent, % Present, Absent, ~ Term, preterm

DISCUSSION

Asymmetric IUGR constituted 67% (82), whereas symmetric IUGR constituted 33% (38), in asymmetric IUGR catchup growth was seen in 76(92.6%), in symmetric IUGR catchup growth was seen in 18(47.3%) and the difference was statistically significant. In this study 82 were preterm and 38 were term. In this study out of 120, 94 showed catchup growth in weight, of this

preterm baby 64 (78.0%) had catchup growth by 6 months and 85.3 % (70) by 1 year, whereas term infants showed 47.3% (18) catchup growth by 6 months and 63.1% (24) by 12 months and the difference was statistically significant. In this study out of 120, 86 showed catchup growth in length in 1 year, in this preterm baby of 78% (64) achieved catchup growth by 9 months and 80.4% (66) of by 1 year, whereas in term infants showed 47.3% (18) of catchup growth by 9 months and 52.6% (20) by 12 months and the difference was statistically significant. Catchup growth occurred earlier in weight at around 3-6 months, whereas catchup growth in length occurred at 6-12 months in this study. In an unpublished study conducted at Moulana Azad medical college8 over a period of two years from 2010-2012, of the 110 SGA babies enrolled 21.8% (24) showed catch up growth only in weight, 10.9% (12) only in length, and 30% (33) showed catch-up both in weight and length. A total of 51.8% babies showed catch-up in weight and 40.9% in length.[9,10] In present study breast fed SGA babies had higher catchup growth rates than SGA babies who were formula fed. In the study of Lucas which compared the growths of SGA babies who were fed with breast milk and formula, similar results were noted, it was shown that breast milk provided a faster growth compared to formula.[11] Roggero et al, study said that the growth pattern in SGA preterm infants is not affected by the consumption of an enriched post discharge formula.[12] In the antenatal risk factors mother age, mother height, mode of delivery, parity, spacing, mother hemoglobin, multiple births, birth weight, birth length and birth head circumference were studied. Mc Cowan et al, study said that shortness (failure of CUG) at 6 months can be predicted by less birth length, birth weight and birth head circumference. Among them mode of delivery, parity and spacing didn't show correlation.[13] Mother age, height, hemoglobin, multiple births, birth weight, birth length and birth head circumference, type of IUGR were related to catchup growth statistically.

CONCLUSION

Teenage pregnancies below 20 years of age should be avoided. In SGA babies of pregnancy induced hypertension and preeclampsia, failure in catchup growth occurred more, these babies need to be followed in high risk clinics. SGA infants of mothers with low haemoglobin failed to show catchup, so antenatal nutrition improvement of mother should be done. Breastfed babies had higher catchup growth rates than formula fed babies, so exclusive breastfeeding should be promoted.

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