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Brief Communication

GROWTH PATTERN OF PRETERM AND IUGR BABIES IN AN URBAN SLUM OF KOLKATA, WEST BENGAL, INDIA

Bobby Paul*[Ψ] MD DCH, Indranil Saha MD PDCR, Abhijit Mukherjee*** DTCD, Sima Roy* MD DPH, Ranadeb Biswas† MD and Ramendra Narayan Chaudhuri‡ MD**

***Assistant Professor, Department of Community Medicine, Institute of Post Graduate Medical Education and Research, Kolkata, West Bengal, India**
****Assistant Professor, Department of Community Medicine, Burdwan Medical College and Hospital, Burdwan, West Bengal, India**
*****Department of Community Medicine, PGT, R. G. Kar Medical College and Hospital, West Bengal, India**
†Professor and Head, Department of Community Medicine, ‡Professor and Head, Department of Maternal and Child Health, All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India

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ABSTRACT: The present study was carried out to analyze the growth pattern of preterm and IUGR infants from birth up to nine months of age. A longitudinal study was conducted in an urban slum of Chetla, Kolkata, India. Study population comprised of 36 low birth weight babies, out of which 13 were preterms and rest 23 were IUGR babies. Different anthropometric parameters like weight, length, head and chest circumference was measured and compared between two groups. During the entire follow up period, all the mean anthropometric parameters of the preterms lagged behind their IUGR counterparts; in contrast the growth potential of the preterms was more as revealed by their increased mean increments in terms of weight, length, head and chest circumference. Regular growth monitoring should be an essential component of care of both preterm and IUGR babies with more focused health care services for IUGR babies, so as to detect growth faltering at the earliest.

KEY WORDS: ***Growth pattern; LBW; Preterm; IUGR***

INTRODUCTION

Birth weight has long been a subject of clinical and epidemiological investigation and a target for public health intervention. Low birth weight (LBW) with its high incidence, and subsequent morbidity and mortality continues to be a major public health problem in India. The newborn baby, who is a LBW, is either due to prematurity or intrauterine growth retardation. Preterm babies are those who are born before 37 completed weeks of gestation. Intrauterine growth retardation (IUGR) or small for date (SFD) babies are those whose birth weight is less than 10th percentile for the gestational age[1]. IUGR infants catch up partially in growth relative to their appropriate birth weight counterparts during their first one or two years of life. Thereafter, IUGR children maintain their place in the distribution and neither catch up nor fall further behind. Premature infants who survive their first year of life have a much better prognosis in terms of further growth than IUGR infants. Despite their earlier disadvantage, preterm children gradually catch up with their appropriate birth weight term counterparts when given optimum neonatal and infant care. From a programmatic viewpoint, these differences have enormous implications for interventional strategies[2]. The

[Ψ]**Correspondence at:** P-19 Jadavpur University Employees' Housing Co-operative Society Ltd. P.O. Panchasayar, Kolkata 700094, West Bengal, India; Mobile: +919830046821; E-mail: drbobbypaul@gmail.com

present study was conducted to assess the growth pattern of preterm and IUGR babies separately in an urban slum of Kolkata, West Bengal, India.

METHODOLOGY

A community based prospective longitudinal study was undertaken in Chetla, an urban field practice area of All India Institute of Hygiene and Public Health (AIIH&PH), Kolkata from May 2004 - April 2005. The estimated number of study subjects (i.e. infants) was calculated to be 132 by the formula:

$$N = 4\left[\frac{(Z\alpha + Z\beta)\sigma}{\delta}\right]^2$$

Where, $Z\alpha$ = 1.65 (as this was a one sided test); $Z\beta$ = 1.28 which is the value of Z required for the chosen level of β (one tailed) i.e. 0.10; σ = 172 (SD of weight at birth of previous study)[3] and δ = 7.5% of difference of mean weight of NBW (3003 gms) and LBW (1771 gms) at birth (data of previous study) [3]. Thus the estimated number of the study subjects was 120 and taking 10% pregnancy wastage, sample size became 132 (120 + 10%).

132 consecutive pregnant women in their third trimester, attending the Maternal & Child Health (MCH) clinic of Urban Health Centre, Chetla for antenatal check up during first three months of study period, who were permanent residents of the area, were registered, after informed consent and their names and addresses were noted down. Institutional ethical clearance was taken and the mothers were briefed about the purpose of the study. As and when the information about birth of singleton live born babies of the registered pregnant women was obtained, follow up by home visits 15 ± 5 days interval was carried out in the subsequent nine months of the study period. If the respondent could not be contacted during the visit, two consecutive visits were made in order to minimize the proportion of dropouts. Multiple births, babies with major congenital malformations and severe birth asphyxia, which were likely to hamper growth velocity pattern were excluded from the study[3]. Out of 132 deliveries, however only 126 babies could be finally followed up (drop out to the extent of 4.5%). Among the study subjects, 36 LBW (13 preterms and 23 IUGR) babies could be followed up for six months of their age and out of them 23 (7 preterms and 16 IUGR), 18 (5 preterms and 13 IUGR) and 9 (5 preterms and 4 IUGR) babies could be followed up till 7, 8, and 9 months of their age respectively. During each follow up visit, data collection was done from the mother/caregiver in a pre-designed semi-structured schedule and appropriate anthropometric measurements of the baby were done.

Anthropometric measurements

A single observer took the anthropometric measurements for each infant at monthly interval during the follow up period. Birth weight was recorded from the institutional discharge document where baby was delivered. Subsequently the weight was recorded by an electronic weighing machine at monthly interval during the follow up home visit. The weighing machine was checked at regular interval and calibrated by an object of known weight. The infant was undressed and put on the weighing machine and the weight was recorded to the nearest 50 grams[4,5]. The length (nearest 0.1 cm) of the infant was measured with an infantometer. During measurement, the infant was placed supine on the infantometer. Mother/caregiver was asked to keep the vertex snugly touching the fixed vertical plank. The legs were fully extended by pressing over the knees, and feet were kept vertical at 90^o. The movable pedal plank of the infantometer was snugly apposed against the soles and length was read from the scale[4-7]. Head circumference (nearest 0.1 cm) was measured by passing the measuring tape over the occipital protuberance posterior and just above the supraorbital ridges anteriorly to get the maximum circumference[4,6,7]. Chest circumference was measured with the same measuring tape at the level of xiphisternum in front, in a plane at right angles to the vertebral column and just below the inferior angle of scapula midway between inspiration and expiration (nearest 0.1 cm)[5-7].

Operational definition

Low birth weight has been defined as birth weight of less than 2.5 kg (up to and including 2499 gm), irrespective of the period of gestation, the measurement being taken preferably within the first hour of life, before significant postnatal weigh loss has occurred. Pre term was defined as babies born before 37 completed weeks of gestation (up to 36 weeks or less than 259 days) and IUGR babies were identified by plotting weight in intrauterine weight chart (birth weight of less than 10th percentile for their gestational age) designed by AIIMS, New Delhi[8]. Grading of malnutrition was assessed as suggested by Indian Academy of Paediatrics - weight for age criteria. Grade I, II, III and IV malnutrition being 71-80%, 61-70%, 51-60, & 50% or less of 50th percentile of NCHS data respectively, where 50th percentile of NCHS (National Centre for Health Statistics) data is taken as 100%; the values being separate for boys and girls[6].

Statistical Analysis

Difference between two means was tested by unpaired student's t test by Epi-calc software version 2000.

RESULTS

There were 70 males and 56 females among the 126 babies under study. Incidence of low birth weight (LBW) infants (< 2500 gms) was found to be 28.6% (36/126). The proportion of IUGR neonates was more (63.9% - 23/36) as compared to preterms (36.1% - 13/36). Among LBW neonates females (52.8% - 19/36) were more than the males (47.2% - 17/36) and it is also true in case of IUGR neonates, (60.9% females versus 38.1% males), while in case of preterms, males was more (61.5% males versus 38.5% females). The mean birth weight of preterms was found to be less (2036.46 ± 339.21 grams) as compared to IUGR neonates (2117.39 ± 212.99 grams), though the difference was not significant statistically ($t = 0.86$, $p > 0.05$).

At each month of the follow up period, the proportion of premature infants with normal nutritional status was more when compared to the IUGR infants except at 2nd month. The IUGR infants were proportionately more than the premature infants in grade I malnutrition status at every month (**Table 1**).

Table 1: Distribution of the preterm and IUGR infants according to their nutritional status (weight for age) at different months

Age*	Nutritional status of Preterm					Nutritional status of IUGR				
	No.	N	I	II	III & IV	No.	N	I	II	III & IV
1	13	1 (7.7)	4 (30.8)	4 (30.8)	4 (30.8)	23	--	12 (52.2)	8 (34.8)	3 (13.1)
2	13	1 (7.7)	5 (38.4)	4 (30.8)	3 (23.1)	23	2 (8.6)	15 (65.4)	4 (17.4)	2 (8.6)
3	13	2 (15.4)	6 (46.1)	2 (15.4)	3 (23.1)	23	3 (13.1)	14 (60.9)	4 (17.4)	2 (8.6)
4	13	3 (23.1)	5 (38.4)	5 (38.4)	--	23	3 (13.1)	14 (60.9)	5 (21.7)	1 (4.3)
5	13	4 (30.8)	4 (30.8)	5 (38.4)	--	23	4 (17.4)	14 (60.9)	5 (21.7)	--
6	13	5 (38.4)	5 (38.4)	3 (23.1)	--	23	5 (21.7)	13 (56.6)	5 (21.7)	--
7	7	2 (28.6)	3 (42.8)	2 (28.6)	--	16	3 (18.7)	10 (62.6)	3 (18.7)	--
8	5	2 (40.0)	1 (20.0)	2 (40.0)	--	13	3 (23.1)	7 (53.8)	3 (23.1)	--
9	5	2 (40.0)	--	3 (60.0)	--	4	1 (25.0)	3 (75.0)	--	--

***Age in months; N = normal**

Mean weight of the preterms was lower than that of IUGR infants at birth, first, second and third months of age, thereafter from fourth month onwards, the preterms had higher mean weight than the IUGR infants. Regarding mean weight increment preterms had an edge over IUGR infants throughout the follow up period, except at 1st and 7th month. However these differences were insignificant when tested statistically, except at 4th and 8th months of age ($p < 0.05$). Mean length of the preterms were lower than that of IUGR infants at birth and throughout nine months of age. However, IUGR infants had higher mean increments in length than preterms at 3rd, 4th, 5th, 6th and 9th months (differences in 5th and 6th month significant statistically) (**Figure 1 and 2**).

Although mean head and chest circumference of the preterms was lower than that of IUGR infants at birth and follow up period but mean head and chest circumference increment was higher among preterms except at 4th month in case of HC and at 4th, 5th, and 6th months in case of CC (**Figure 3 and 4**).

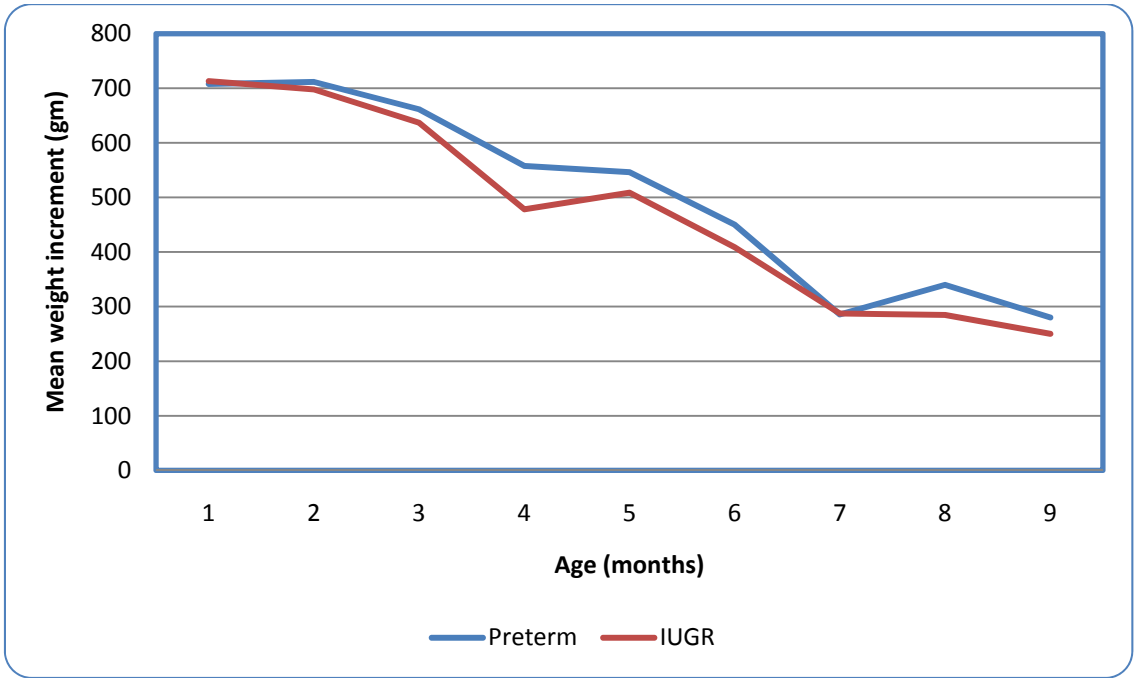

Figure 1: Line diagram showing weight increment of preterm and IUGR infants from births to nine months of age

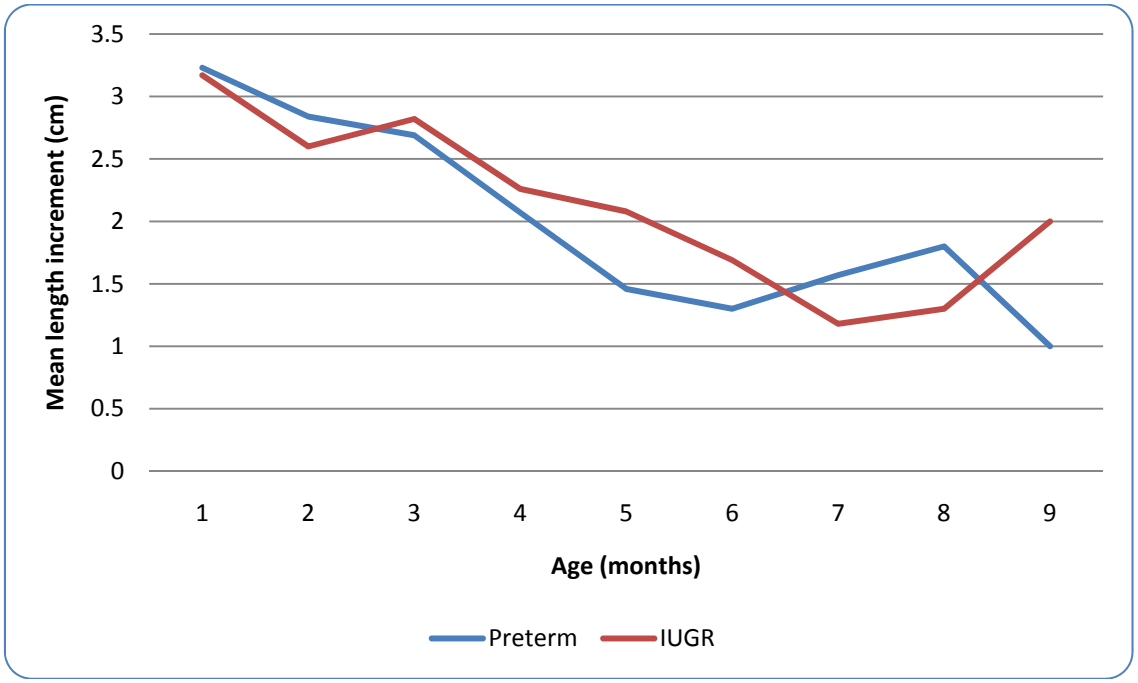

Figure 2: Line diagram showing length of preterm and IUGR infants from birth to nine months of age

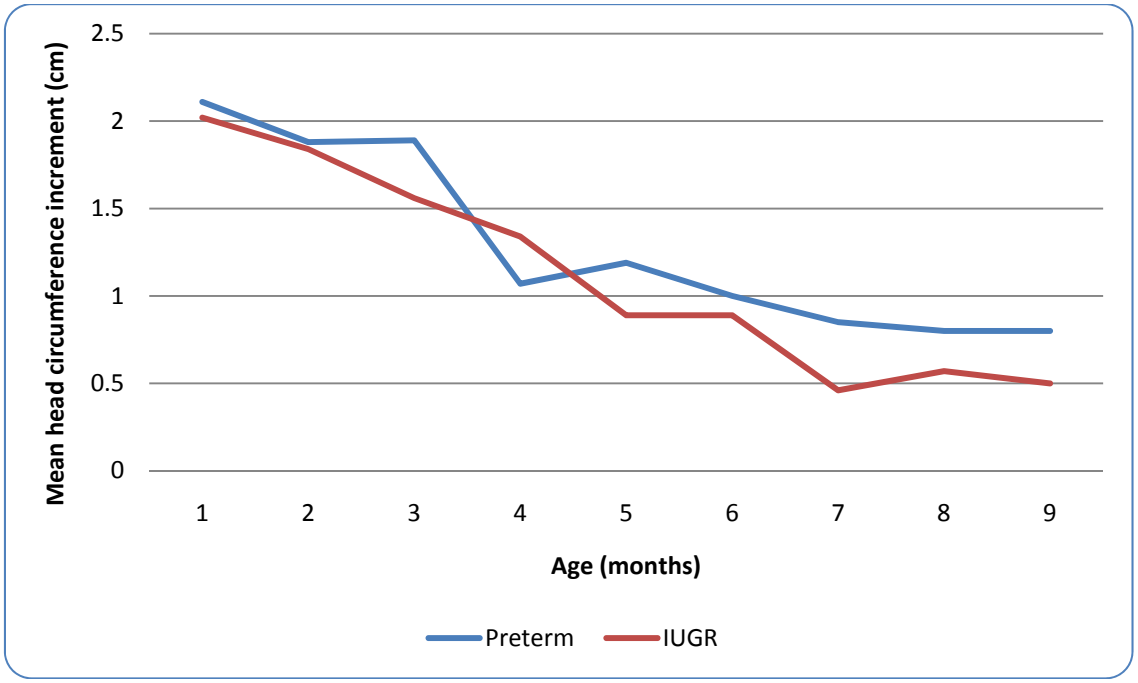

Figure 3: Line diagram showing head circumference increment of preterm and IUGR infants from birth to nine months of age

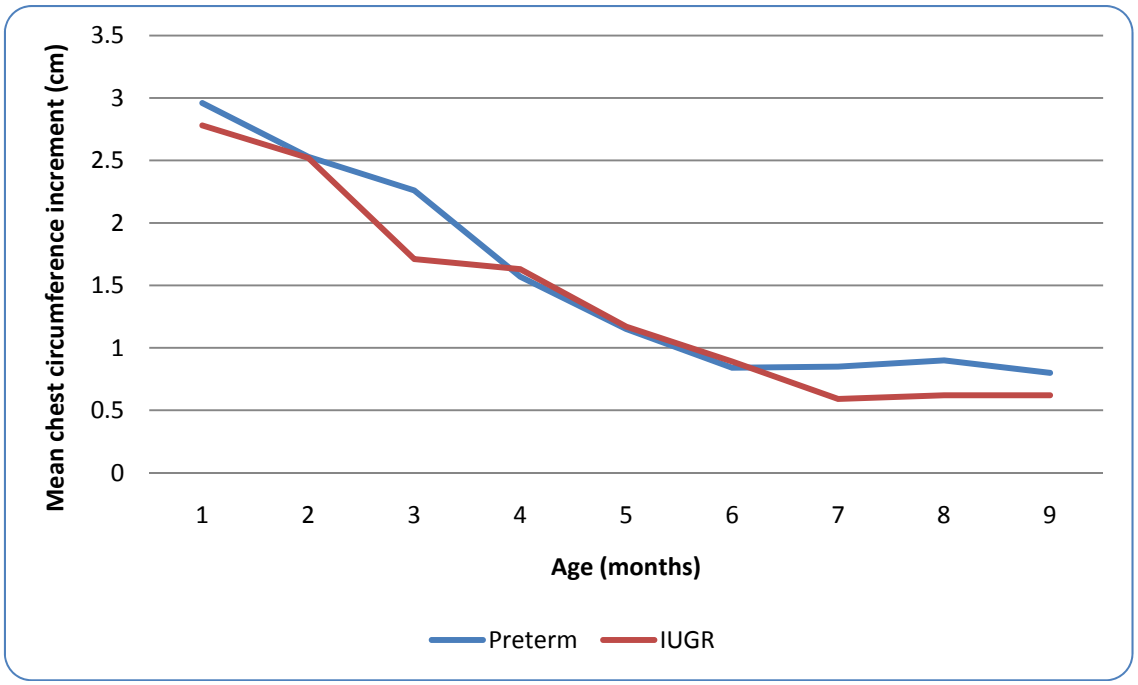

Figure 4: Line diagram showing chest circumference increment of preterm and IUGR infants from birth to nine months of age

DISCUSSION

Among the study subjects, 36 LBW babies could be followed up for six months of age and out of them 23, 18 and 9 babies could be followed up till 7, 8, and 9 months of age respectively. Thus, study subjects entered into this study in different time period, according to their birth. Since, period and duration of the study was prefixed beforehand, thus all the babies could not be followed up for a fixed time period. The proportion of IUGR neonates was more (63.9%) as compared to preterms (36.1%), but George et al found relatively high rates of preterm birth in South Asian region[9].

Although preterms and IUGR infants are both etiological subtypes of LBW, there are subtle differences in growth pattern between them. Narang et al (1994) from Chandigarh[10] and Srivastava et al (1978) from Allahabad[4], reported much lower mean birth weight of IUGR babies i.e. 1657 ± 354 gms and 1645 ± 390 gms respectively, compared to present study. Mean birth weight of preterm babies 2038.00 gm is more or less similar as documented by Prasad et al (2087.5 + 353.0 g)[11]. Similar to present study, Das et al (1992) also found higher mean birth weight of IUGR babies compared to preterm babies[12]. Present study revealed faster rates of growth increment of preterms compared to IUGR infants in all the parameters. Bhargava et al also noticed same findings in weight; in contrast length and HC increment were more in IUGR infants[3]. Similar observations of accelerated growth of preterms were also noted by Furmaga-Jablonska et al[13] but regarding HC increment IUGR babies had an edge over preterms[14]. Das et al also noticed faster weight gain for both IUGR and preterm, but increment seems to be faster in IUGR babies[12]. In general the basic underlying feature of the preterm LBW infant is immaturity of organ systems, while in case of IUGR infants; the problem is in utero undernutrition and hypoxia[15]. Thus, the preterms retain their intrauterine growth potential, the IUGR infants experience somewhat delay in catch up growth[2]. Barros et al also noticed that, preterm children despite their earlier disadvantage gradually caught up with their appropriate birth weight counterparts, and this catch-up occurred during the later period of childhood. Intrauterine growth-retarded children, however, exhibited no such catch-up and were unable to recover their nutritional handicaps and remained small and underweight. Indeed, their average monthly growth rates between measurements were always lower than those of children in the other two groups, as also found in present study[16]. Rocha et al showed that late-preterm IUGR infants present a significantly higher risk of neonatal complications when compared to late-preterm AGA infants[17].

Binkin observed that children with lesser birth weight undergo greater weight gain during the first 2 years of life, than those with higher birth weight, but children with lower birth weight remains shorter and lighter[18]. Similar to present study, children with IUGR have lower height and weight than the preterm babies. Thus prematurity results in less permanent growth impairment than growth retardation that begins in utero[18], though both remain smaller compared to their normal birth weight counterparts. Binkin also demonstrated that height for age at 0 to 2 months of age was similar for two groups. At 3-5 months of age, mean height for age began to diverge in two groups, with IUGR infants having low z score values than the premature infants. For weight for age, crossover between preterm and IUGR infants occurred at 3-5 months of age[18].

Similar to present study Garn also noticed that premature infant exhibits a greater weight gain in post natal period[19], as also supported by Pomerance et al and other studies[20].

LIMITATIONS:

Due to variable time of birth of the neonates, among the cohort of third trimester pregnant women registered for the study purpose, all the infants (i.e. 126 in number) could not be followed up uniformly up to 9 months of age. Hence all the 126 study subjects were followed up for six months and out of them 97, 71 and 32 babies could be followed up for, 7,8, and 9 months respectively. And out of 36 LBW babies, 23, 18 and 9 babies could be followed up till 7, 8, and 9 months of their age respectively. There was drop out to the extent of 4.5% that might have adversely affected the results of the study. As adequate sample size ideally representing the population of urban field practice area of AIIH & PH at Chetla could not be ensured due to time constraint, thus results are only comparable with similar such studies only.

CONCLUSION

Programmes and services must be established that provide information and education to parents and other care givers on essential neonatal care, appropriate feeding practices and growth monitoring particularly for LBW babies so that signs of growth faltering could be detected at the earliest. However, regarding growth velocity, since the preterms are at a more advantageous position than their IUGR counterparts which emphasize more focused health care services for antenatal mothers with IUGR and intensive postnatal care for LBW babies due to IUGR.

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