Exclusive Breast Feeding in Low Birth Weight Babies

Gp Capt D Singh*, N Devi⁺, Air Vice Mshl (Retd) TS Raghu Raman, AVSM[#]

Abstract

Background: Human milk is the ideal source of nutrition for full term neonates, but there is controversy regarding its use as a nutrition source for preterm and low birth weight infants. However current data supports the use of human milk for low birth weight infants. This study was undertaken to evaluate the growth of both preterm and term small for gestational age infants nursed on exclusive breast milk from birth to four months of age.

Methods: This was a prospective, longitudinal study carried out in a recognized baby-friendly hospital where exclusive breast-feeding is practiced in all neonates. All consecutive low birth weight neonates irrespective of gestational age, born during the study period of two years were included in the study. Assessment of growth parameters included recording of weight (daily when in the hospital and later weekly), length (weekly) and head circumference (weekly) till the age of four months.

Result: Low birth weight infants, both the preterm and the term small for gestational age, on being exclusively breastfed by their own mothers, gained weight and had an increase in their head circumference and length to the levels almost comparable to the standard fetal- infant growth norms.

Conclusion: Exclusive breast-feeding results in adequate growth in low birth weight babies including preterms.

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Key Words : Breast feeding; Preterm; Low birth weight; Neonates

Introduction

Low birth weight (LBW) babies are defined as babies with birth weight of less than 2500g. These could be either term small for gestational age (term SGA) or preterm babies. LBW is a common problem in our country with an incidence of 30-40% (term SGA 20-30% and preterm 10-20%) [1]. Although it is generally agreed that human milk is the ideal source of nutrition for full term neonates, there is controversy regarding human milk as a nutrition source for preterm and low birth weight infants. Opinion varies from its being the best even if it needs the addition of several supplements, to that there is no place for breast milk in preterm nutrition [2]. However data is emerging to support the use of human milk for LBW infants. The human milk-fed premature infant may experience improved health (such as lower rates of infection and necrotizing enterocolitis, improved gastrointestinal function and better neurodevelopment). None of the substitute feeds can match the qualitative properties of human milk. Nature has modified the breast milk of the mother of a preterm baby so as to make it the ideal and best option for the LBW neonates [3].

Because inadequate or excessive intake of food can remarkably affect somatic growth, the study of growth parameters remains one of the most practical and

valuable tools for the assessment of nutritional status in neonates and infancy. There are very few Indian studies which have addressed this issue in preterm or low birth weight babies [4]. This study was undertaken to evaluate the growth of both preterm and term SGA infants nursed on exclusive breast milk from birth to four months of age.

Material and Methods

This was a prospective, longitudinal study carried out in a recognized baby-friendly hospital where exclusive breast-feeding is practiced in all neonates. All consecutive low birth weight neonates irrespective of gestational age, born during the study period of two years were included in the study. The inclusion criteria for low birth weight neonates was defined as those with birth weight below 2500g. The consent of the parents was obtained prior to their inclusion in the study. Exclusion criteria included congenital anomalies, neonates on parenteral nutrition or on intravenous fluids for more than seven days.

The babies were started on feeds once the respiratory status was stable and there was no other contraindication to orogastric feeds such as bilious or coffee ground gastric aspirates, abdominal distension or any signs of a systemic illness resulting in cardio-respiratory instability. Feeding schedule consisted of starting small volume gavage feeds with step-wise increase based on baby's tolerance of feeds. Babies were breast fed if they had a good suck and were able

*Senior Advisor (Pediatrics), Command Hospital (SC) Pune. *Post Graduate Resident (Pediatrics), Command Hospital (AF) Bangalore 560007. #Ex Commandant, Command Hospital (AF), Bangalore 560007

to co-ordinate sucking, swallowing, and breathing as observed by the pattern of feeding. While on gavage feeds the daily feed volumes did not exceed 150-200 ml/kg/day. Supplements in form of multivitamin drops 1 ml/day, osteocalcium (calcium and phosphorus supplement) 10 ml/kg/day from 14th day onwards, and 2.5mg elemental iron/kg/day from 6th week onwards were started.

Assessment of growth parameters included recording of weight (daily when in the hospital and later weekly), length (weekly) and head circumference (weekly). Babies were weighed naked on an electronic weighing scale with an accuracy of measurement of ± 1 gm. Infantometer was used to measure the length of the infants. For measurement of head circumference, a flexible plastic non stretch measuring tape was used to encircle the head at the level of occipital protuberance posteriorly and supra orbital ridges anteriorly and measurement was taken to the nearest millimeter. All the measurements were made by the same observer to avoid inter-observer variability. Following discharge, the infants were followed up and growth parameters recorded in High-Risk Neonate Clinic every week till the first four weeks (postnatal age), and then every month till four months. All recordings were charted on the selected extrauterine growth graphs (Fenton's updated Babson and Benda's growth chart) of varying gestational ages [5]. Student's 't' test was applied to compare quantitative growth data between preterm and term SGA babies.

Results

From a study population of 127 low birth weight infants during the period of study, 71 low birth weight infants were included in the study based on the selection criteria. A total of 17 infants were excluded due to non-compliance of exclusive breast-feeding, irregular follow-ups or lost to follow-up. Out of these 54 LBW infants, 26 (48%) were males and 28 (52%) females. 22 (41%) of the total cases were preterm babies with a mean gestational age of 34 ± 2 weeks (range 30-36 weeks, median 34 weeks). The mean birth weight of preterm infants was 1906 ± 276 gm (range 1390-2400 gm, median 1925 gm). 21 preterm babies were appropriate for their gestational age (AGA) and one baby was small for the gestational age (SGA). 32 (59%) babies were term SGA babies with a mean gestational age of 38 ± 1 week. The mean birth weight of the term SGA infants was 2238 ± 187 gm (range 1690-2440 gm,

median 2262.5 gm).

Table 1 shows that the preterm infants lost an average of 90 gm at a negative growth rate of 12.80 gm/day in the first week of their life. Following this, they had a brisk catch up phase with a growth rate of 20 gm/day in the second week and 28-32 gm/day thereafter. The term SGA infants lost an average of 17 gm in the first week at a negative growth rate of 2.40 gm/day. The growth rate was 26-34 gm/day in the second and third week and 30gm/day thereafter. The first week's weight loss was more in preterm infants. The differences in the weight gain at none of the other intervals were significant. The weights of babies in both the gestational age groups, grew uniformly parallel to each other.

The mean head circumference of the preterm infants at birth was 29.85 ± 2.6 cm. This increased by 0.05 cm/day in the first week, 0.11-0.12 cm/day in the next two weeks and thereafter by 0.07- 0.10 cm/day till the fourth month. The net increment was 10 cm at the end of four months. The mean head circumference of the term SGA infants was 32.32 ± 0.93 cm at birth. It increased at a rate of 0.06 cm/day in the first week and by 0.08-0.11 cm/day in the next three weeks. Thereafter, the rate of growth was 0.07-0.08 cm/day till four months. The net increment was almost 10 cm at the end of four months. The head circumference of babies in both the gestational age groups grew in parallel increments (Table 2).

The mean length of the preterm babies at birth was 44.29 ± 2.44 cm. The length increased at a rate of 0.06 cm/day in the first week and by 0.10-0.16 cm/day in the next three weeks. Thereafter it increased at a rate of 0.11-0.12 cm/day till four months. The net increment was 13.5 cm at the end of four months. The mean length of the term SGA babies at birth was 46.84 ± 1.57 cm. It increased at a rate of 0.07 cm/day in the first week and then by 0.14-0.16 cm/day in the next three weeks. Thereafter, the increment was at a uniform rate of 0.12 cm/day till four months. The net increment was 15 cm at the end of four months. The lengths of babies in both the groups grew by parallel increments. The differences in the gains at all the intervals of the recording were insignificant (Table 3).

Comparisons were made with the standard norms of Fenton's updated Babson and Benda's growth chart. Comparisons were also made between preterm and term SGA infants. The results showed that the LBW infants - both the preterm and the term SGA, on being exclusively breastfed by

Table 1
Weight gain : Preterm vs Term SGA infants

Age	Preterm (n=22)			Term (n=32)		
	Mean (gm)	$\pm$ SD	Rate (gms/day)	Mean (gm)	$\pm$ SD	Rate (gm/day)
Birth	1906	276		2238	187	
Week 1	1816.59	286.57	-12.8	2221.25	180.9	-2.4
Week 2	1957.73	314.4	20.14	2407.66	180.46	26.57
Week 3	2156.82	331.4	28.42	2651.41	202.06	34.85
Week 4	2382.05	360.28	32.28	2938.91	204.9	41.03
Month 2	3179.09	431.17	26.56	542.81	252.52	30.1
Month 3	4008.64	514.44	27.63	4715.94	322.29	29.1
Month 4	4943.86	589.77	31.16	5601.25	316.27	29.5

p value = 0.39 (non significant)

Table 2**Head circumference gain : Preterm vs Term SGA infants**

Age	Preterm (n=22)			Term (n=32)		
	Mean (cm)	± SD	Rate (cm/day)	Mean (cm)	± SD	Rate (cm/day)
Birth	29.85	2.61		32.32	0.93	
Week 1	30.23	2.58	0.05	32.76	0.97	0.06
Week 2	31.00	2.48	0.11	33.38	0.91	0.08
Week 3	31.87	2.48	0.12	34.17	0.96	0.11
Week 4	32.63	2.47	0.10	34.91	1.01	0.10
Month 2	35.26	2.32	0.08	37.33	1.02	0.08
Month 3	37.64	2.29	0.07	39.49	1.29	0.07
Month 4	39.87	2.80	0.07	41.8	1.58	0.07

p value = 0.23 (non significant)

Table 3**Length gain : Preterm vs Term SGA infants**

Age	Preterm (n=22)			Term (n=32)		
	Mean (cm)	± SD	Rate (cm/day)	Mean (cm)	± SD	Rate (cm/day)
Birth	44.29	2.44	46.84	1.57		
Week 1	44.72	2.45	0.06	47.38	1.53	0.07
Week 2	45.44	2.46	0.10	48.40	1.51	0.14
Week 3	46.27	2.41	0.12	49.45	1.48	0.15
Week 4	47.45	2.64	0.16	50.63	1.57	0.16
Month 2	50.86	2.73	0.11	54.37	1.68	0.12
Month 3	54.46	2.93	0.12	58.14	1.93	0.12
Month 4	57.88	3.26	0.11	61.93	2.07	0.12

p value = 0.24 (non significant)

their own mothers, gained weight and had an increase in their head circumference and length to the levels almost comparable to the standard fetal- infant growth norms.

Discussion

Low birth weight is a common problem in our country with an incidence of 30-40% [1]. It is universally accepted that breast milk is the superior and ideal form of nutrition for full term neonates. There is more controversy regarding the suitability of breast milk for preterm infants; however, over the past few years there is growing advocacy for providing the preterm infant with mother's milk whenever possible [2]. Given the economic advantages, metabolic efficiency, immunological benefits and demonstration of higher mineral content in the milk produced by mothers of preterm infants, breast-feeding from their own mothers appears to be the best option for these infants [6]. Growth monitoring is a simple and objective way of assessing the adequacy of breast milk as a nutritional source in such infants.

Jarvenappa et al [7] reported a weight gain of 28.5 gm/day in very low birth weight (VLBW) infants who received pooled, expressed milk, partly supplemented with their own mother's expressed milk. Gross et al [8] recorded the rate of weight gain as 23.7±1.1 gm/day in VLBW infants fed with preterm milk. In his study, he

also observed that infants fed with term milk had a lower rate of weight gain (15.8±0.8 gm/day). This shows that breast-feeding by their own mothers is the best way of feeding preterm babies.

There are also studies which suggest results to the contrary. Cooper et al [9], compared growth of a group of VLBW infants fed a formula specifically developed for such infants with another group fed expressed breast milk. Weight gain was faster in the formula-fed infants after a caloric intake of 100 kcal/kg/day was achieved. Increments in head circumference and skin fold thickness were also greater in the formula-fed group. In another study by the same authors, VLBW infants fed premature formula had significantly greater weight increments and length increments than those on own mother's milk [10]. Other studies [11,12], observed that preterm infants fed with preterm formula had better weight gain as compared to those fed with preterm milk. But even in their studies preterm infants who were fed with preterm milk had weight gain that approximated to intrauterine standards, whereas infants fed with formula had weight gain that crossed the intrauterine growth standards. Tudehope et al [12] reported weight gain of 13.2 gm/kg/day in preterm milk fed infants and 18 gm/kg/day in formula fed infants. Considering the long term adverse affects-obesity, hypertension and diabetes associated with formula

feeding [13-16], this accelerated weight gain may be detrimental to the LBW preterm infant.

In a meta-analysis of eight trials comparing formula milk versus donor breast milk for feeding preterm or low birth weight infants published in Cochrane database, enteral feeding with formula milk compared with donor breast milk resulted in higher rates of growth in the short term. There was no evidence of an effect on long-term growth rates or neurodevelopmental outcomes. Meta-analysis of data from five trials demonstrated a statistically significantly higher incidence of necrotising enterocolitis in the formula fed group [17]. In a separate meta-analysis published in Cochrane database by the authors of same group, they have commented that maternal breast milk remains the default choice of enteral nutrition because observational studies and meta-analyses of trials comparing feeding with formula milk versus donor breast milk, suggest that feeding with breast milk has major non-nutrient advantages for preterm or low birth weight infants [18]. It is to be noted that there are no data from randomised trials of formula milk versus maternal breast milk for feeding preterm or low birth weight infants.

Breast-feeding is the generally accepted feeding for term SGA infants and that is the best way to feed them. High protein formula did not increase the growth rate in these infants [19,20]. Breast-fed term SGA infants showed catch up growth with normal birth weight infants between 4 -5 months postnatally in some studies [21,22]. In our study controls of normal birth weight infants were absent. So, comparisons could not be made. Awasthi et al [20] reported weight gain of 22.99 gm/day in breast-fed term SGA infants. The rate of weight gain in term SGA infants was higher in our study.

In the present study, comparisons were made between exclusively breast-fed preterm and term SGA infants, which was not done in other studies. The growth velocities of weight, head circumference and length were almost similar for both the preterm and the term SGA babies. The growth curves run parallel to each other till the end of the study period. However, the mean birth weights of the babies in the present study was rather large (1906 gm in preterm group and 2238 gm in term SGA group). A similar study needs to be done in VLBW (babies with birth weight below 1500gm) to see if the results obtained are similar.

In short, the growth parameters of exclusively breast-fed LBW infants of this study follow the fetal-infant growth standards without any abnormal or significant deviations. The growth rates in this study were comparable with those of similar studies. Though the number of subjects in our study was small, these findings may have a useful bearing on the choices for affordable

and effective strategies for feeding LBW infants of varying gestational periods. The source of nutrition that is selected to feed these babies should be cheap, natural yet adequate. Human breast milk when supplemented with appropriate vitamins and minerals, rates favorably on adequacy in supporting optimal growth patterns not only in the normal birth weight infants but also in the preterm and the term LBW babies. In a developing country like ours, the additional evidence from this study would further encourage baby friendly policies like breast-feeding.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Air Vice Mshl (Retd) TS Raghu Raman, AVSM

Drafting & Manuscript Revision : Air Vice Mshl (Retd) TS Raghu Raman, AVSM, Gp Capt D Singh, N Devi

Statistical Analysis : N Devi

Study Supervision : Air Vice Mshl (Retd) TS Raghu Raman, AVSM, Gp Capt D Singh

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