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Original Research Article

Impact of Exclusive Breastfeeding on Growth Parameters during the First Year of Life

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Abstract

Background: Exclusive breastfeeding is recommended for optimal growth, but information on longitudinal anthropometric changes throughout the first year of life is limited in the local context. Objective: To evaluate the relationship between exclusive breastfeeding for 6 months and growth parameters in the first year of life.

Methods: 180 term singleton infants were recruited and followed from birth to 3, 6, 9 and 12 months. Infants who were only breastfed for six months were compared with infants who were mixed or formula fed prior to six months. Weight, length, head circumference and WHO z-scores were measured.

Results: 180 infants, 112 (62.2%) were exclusively breastfed for six months and 68 (37.8%) were non-exclusively breastfed. Baseline birth weight was comparable between groups (2.94 ± 0.36 kg vs 2.91 ± 0.34 kg, p=0.59). At 12 months, mean weight was slightly lower in the exclusive breastfeeding group (9.28 ± 0.86 kg vs 9.61 ± 0.91 kg, p=0.018), while length (74.9 ± 2.7 cm vs 74.3 ± 2.8 cm, p=0.15) and head circumference (45.9 ± 1.3 cm vs 45.6 ± 1.4 cm, p=0.12) were similar. There was no increased risk of undernutrition, but at 12 months, weight-for-length z-score was lower among exclusively breastfed infants (0.18 ± 0.79 vs 0.49 ± 0.84, p=0.014). Fewer episodes of respiratory illness (0.72 ± 0.84 vs 1.18 ± 1.02, p=0.002) were associated with exclusive breastfeeding.

Conclusion: Adequate linear and head growth was observed during exclusive breastfeeding, and the weight gain was relatively leaner with relatively lower morbidity.

Keywords: Exclusive Breastfeeding; Infant Growth; Anthropometry; Weight-For-Age; Head Circumference; First Year of Life.

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Introduction

Nutrition in infancy has a profound and long-lasting impact on survival, growth, neurodevelopment and future metabolic health. The World Health Organization (WHO) guidelines suggest exclusive breastfeeding for the first 6 months of life, then safe complementary feeding with continued breastfeeding until 2 years of age and beyond [1]. WHO Child Growth Standards are based on healthy breastfed children growing in supportive environments and are not a descriptive reference, but a pattern of growth [2].

Breast milk contains adequate macronutrients, bioactive peptides, immunoglobulins, oligosaccharides, hormones, and growth-regulating factors. Breastfeeding has been shown to have a protective effect against infectious morbidity and child mortality in low and middle income countries in the global evidence [3]. The Promotion of Breastfeeding Intervention Trial also showed that breastfeeding promotion led to higher rates of exclusivity and to lower rates of gastrointestinal infection and atopic eczema in infancy [4]. But, the weight curves of breast-fed and formula-fed babies can be different. Previous longitudinal research has demonstrated that breastfed infants gain weight more slowly in the second half of infancy, but have normal length and head growth [5, 6].

This difference is clinically relevant, as high infant weight gain is linked to subsequent adiposity, but not necessarily to improved nutrition. However, slower growth rates in breastfed babies can lead to the mistaken impression that the baby is not being fed enough when length, head circumference, developmental status and clinical health are normal. There is a need for local follow-up studies to support clinicians in counseling mothers based

on realistic anthropometric trends. The purpose of the present study was to assess the effect of exclusive breastfeeding for six months on weight, length, head circumference, growth z-scores, and common illness episodes in the first year of life.

Materials and Methods

This was a prospective observational study carried out in the pediatric outpatient and immunization clinic of a tertiary care teaching hospital. Infants delivered at 37-41 completed weeks, whose mothers agreed to follow-up and who weighed 2.5-4.0 kg were included. Infants who were born with congenital anomalies, who stayed in the NICU for more than 7 days, who had chronic illness, who had major feeding difficulties, or who did not complete the follow-up were excluded. A consecutive sampling of 180 infants was performed. A structured maternal interview was used to record feeding history at each visit. Exclusive breastfeeding was considered when infants received breast milk only and no other liquids or solids (other than oral rehydration solution, drops, syrups, vitamins or prescribed medicines) during the first 6 months. Infants who were not exclusively breastfed were those who consumed formula, animal milk, water, honey, or complementary food before six months of age. Anthropometry was taken at birth, 3 months, 6 months, 9 months and 12 months. Weight was measured to the nearest 10 g on a calibrated infant scale, recumbent length to the nearest 0.1 cm on an infantometer and head circumference on a non-stretchable measuring tape. Weight-for-age, length-for-age and weight-for-length z-scores were derived using WHO growth standards. Maternal education, parity, mode of delivery, socioeconomic status, immunization status and illness episodes were noted. The data were analyzed statistically using SPSS version 26. Continuous variables were expressed as mean ± standard deviation and compared using independent t-test or repeated-measures ANOVA. Categorical variables were expressed as frequency and percentage and compared using chi-square test. A p-value of < 0.05 was considered statistically significant.

Results

Among 180 infants, 112 (62.2%) were exclusively breastfed for the first six months and 68 (37.8%) received mixed or formula feeding before six months. Male infants constituted 53.3% of the cohort. Baseline demographic and birth characteristics were comparable between groups, except that maternal education above secondary level was more frequent among mothers who maintained exclusive breastfeeding (67.0% vs 48.5%, p=0.016).

Table 1: Baseline maternal and infant characteristics

Variable	Exclusive breastfeeding (n=112)	Non-exclusive breastfeeding (n=68)	p-value
Male sex, n (%)	61 (54.5)	35 (51.5)	0.69
Birth weight (kg), mean ± SD	2.94 ± 0.36	2.91 ± 0.34	0.59
Birth length (cm), mean ± SD	49.1 ± 1.8	48.8 ± 1.7	0.27
Birth head circumference (cm), mean ± SD	34.1 ± 1.1	34.0 ± 1.0	0.54
Maternal age (years), mean ± SD	26.8 ± 4.1	26.2 ± 4.4	0.36
Maternal education > secondary, n (%)	75 (67.0)	33 (48.5)	0.016

Growth parameters improved progressively in both groups. At 6 months, weight was comparable between groups (7.35 ± 0.67 kg vs 7.48 ± 0.72 kg, p=0.22). At 12 months, non-exclusively breastfed infants had slightly higher mean weight, whereas length and head circumference remained statistically similar.

Table 2: Anthropometric parameters during the first year

Age	Parameter	Exclusive breastfeeding	Non-exclusive breastfeeding	p-value
3 months	Weight (kg)	5.62 ± 0.52	5.71 ± 0.55	0.27
3 months	Length (cm)	59.6 ± 2.0	59.3 ± 2.1	0.34
3 months	Head circumference (cm)	40.1 ± 1.1	39.9 ± 1.2	0.25
6 months	Weight (kg)	7.35 ± 0.67	7.48 ± 0.72	0.22
6 months	Length (cm)	66.4 ± 2.3	66.0 ± 2.4	0.27
6 months	Head circumference (cm)	43.2 ± 1.2	43.0 ± 1.3	0.30
12 months	Weight (kg)	9.28 ± 0.86	9.61 ± 0.91	0.018
12 months	Length (cm)	74.9 ± 2.7	74.3 ± 2.8	0.15
12 months	Head circumference (cm)	45.9 ± 1.3	45.6 ± 1.4	0.12

At 12 months, weight-for-length z-score was significantly lower among exclusively breastfed infants, suggesting a leaner growth pattern rather than growth failure. The proportion of infants with weight-for-age z-score below -2 was not significantly different. Respiratory illness episodes were significantly fewer among exclusively breastfed infants.

Table 3: Growth z-scores and morbidity outcomes at 12 months

Outcome	Exclusive breastfeeding	Non-exclusive breastfeeding	p-value
Weight-for-age z-score	-0.08 ± 0.82	0.16 ± 0.86	0.064
Length-for-age z-score	0.02 ± 0.78	-0.07 ± 0.81	0.46
Weight-for-length z-score	0.18 ± 0.79	0.49 ± 0.84	0.014
Head circumference z-score	0.10 ± 0.71	0.02 ± 0.76	0.48
Weight-for-age z-score < -2, n (%)	4 (3.6)	3 (4.4)	0.78
Respiratory illness episodes	0.72 ± 0.84	1.18 ± 1.02	0.002
Hospital visit for diarrhoea, n (%)	7 (6.3)	9 (13.2)	0.11

Discussion

The present study revealed that exclusive breastfeeding for 6 months was related to good growth in the first year of life. Weight gain was comparable up to 6 months, and those infants who were exclusively breastfed had a slightly lower mean weight and weight-for-length z score at 12 months. Importantly, length, head circumference and prevalence of undernutrition were not significantly different, suggesting that exclusive breastfeeding did not lead to growth deficiency but rather physiological growth.

The results are in line with WHO's recommendation of exclusive breastfeeding for optimal nutrition in the first six months [1]. WHO standards were developed from healthy breastfed populations, making them ideal for interpreting infant growth in breastfeeding cohorts [2]. The relatively leaner pattern found in the present study is also consistent with the DARLING study and other reviews that found that breastfed infants gained weight at a slower rate in the second half of infancy without compromising linear growth [5, 6].

An important clinical implication is that increased weight is not necessarily better growth. Breastfed infants may exhibit greater self-regulation of appetite, different endocrine responses and less protein load than formula-fed infants.

These mechanisms could account for the reduced weight-for-length without affecting length and head circumference. These findings have been corroborated by more recent analyses indicating that exclusive breastfeeding is associated with normal growth and may help to prevent excessive early weight gain [7, 8].

This is because there were fewer respiratory illness episodes among exclusively breastfed infants, which further supports the public health benefits of breastfeeding. Human milk contains secretory IgA, lactoferrin, lysozyme, cytokines and human milk oligosaccharides which regulate mucosal immunity and infant microbiota. Numerous large epidemiological studies have consistently demonstrated protection against infectious morbidity and mortality [3].

PROBIT also showed that breastfeeding promotion decreased early gastrointestinal infection and atopic eczema, which helps to promote breastfeeding in routine care [4]. In the current study, maternal education was found to be significantly associated with exclusive breastfeeding, suggesting that health literacy and counseling can be a factor affecting feeding practices. But even a literate mother can stop exclusive breastfeeding due to the perception of not having enough milk, going back to work, family pressure or early introduction of water and animal milk. Improving antenatal counseling, early postnatal support, workplace accommodation and community based follow-up could help to increase adherence.

There are some limitations to this study. The feeding status was determined by the mother's report and could be subject to recall or social desirability bias. Body composition was not measured and the study was conducted in a hospital setting, which may not be generalizable. However, the findings are reinforced by the prospective follow-up, repeated anthropometry, and application of standardized growth indicators.

Conclusion

Breastfeeding alone for the first six months of life was associated with good growth in the first year of life. Exclusively breastfed infants had similar length and head circumference and a leaner weight for length profile at 12 months without higher rates of undernutrition.

The results encourage the promotion of exclusive breastfeeding and growth monitoring according to the WHO guidelines and practical maternal counselling.

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