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COMPARATIVE GROWTH OUTCOMES IN INFANTS AGED 6 TO 12 MONTHS RECEIVING HOMEMADE VERSUS COMMERCIAL COMPLEMENTARY FOODS: A PROSPECTIVE OBSERVATIONAL COHORT STUDY

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Abstract

Background:
Complementary feeding during infancy plays a pivotal role in determining growth and health outcomes. While both homemade and commercial complementary foods are commonly used, their comparative impact on growth and morbidity remains underexplored, particularly in resource-limited settings.

Objectives:
To compare growth patterns and morbidity outcomes among infants aged 6 to 12 months receiving predominantly homemade versus commercial complementary foods.

Methods:
This prospective observational cohort study enrolled 120 healthy term infants at 6 months of age from a community-based setting. Participants were divided into two groups based on their predominant complementary feeding type: homemade (n=60) and commercial (n=60). Anthropometric measurements were recorded at baseline, 9 months, and 12 months. The primary outcome was weight-for-age z-score (WAZ); secondary outcomes included weight-for-length (WLZ), length-for-age (LAZ), and morbidity indicators. Statistical analysis was performed using SPSS v22 with multivariate regression to identify independent predictors of weight gain.

Results:
Infants in the commercial group had significantly higher mean WAZ (–0.10 ± 0.6 vs. –0.41 ± 0.5; $p = 0.01$) and WLZ (+0.05 ± 0.4 vs. –0.35 ± 0.5; $p = 0.001$) compared to the homemade group. LAZ was higher in the commercial group but did not reach statistical significance ($p = 0.08$). No significant differences were observed in morbidity outcomes, including diarrhoea, respiratory infections, or hospitalizations. Regression analysis showed that commercial food use and higher maternal education were positive predictors of weight gain, while diarrheal illness negatively impacted growth. **Conclusion:**
Commercial complementary foods were associated with significantly better weight-related growth outcomes without increased morbidity. However, affordability and access remain limitations in low-income settings. Strengthening the nutritional quality of homemade foods through caregiver education and local interventions remains essential.

Keywords: Infant Nutrition, Complementary Feeding, Growth, Morbidity, Infant.

INTRODUCTION

The first year of life represents a critical period for physical and neurodevelopmental growth, with the transition from exclusive breastfeeding to complementary feeding playing a central role in shaping long-term health outcomes. The World Health Organization recommends exclusive breastfeeding for the first six months of life, followed by the timely introduction of nutritionally adequate and safe complementary foods while continuing breastfeeding up to two years or beyond (1).

The period between 6 and 12 months is especially crucial, as inadequate nutrition during this time has been linked to growth faltering, increased infection risk, and impaired cognitive development (2). In low- and middle-income countries, including India, complementary feeding practices are highly variable and influenced by maternal education, socioeconomic conditions, and cultural preferences (3).

Homemade complementary foods, typically based on cereals or pulses, are widely used due to affordability and cultural acceptability. However, they may lack the nutrient density required for optimal growth unless appropriately fortified or diversified (4). In contrast, commercially available complementary foods have gained popularity, particularly in urban settings, due to their convenience and standardized nutritional profiles(5). These products are often fortified with essential micronutrients and formulated to meet dietary recommendations, although concerns persist regarding their affordability, potential over-processing, and limited accessibility for low-income households(6). Despite these contrasting characteristics, there remains a lack of longitudinal studies directly comparing the growth outcomes of infants predominantly receiving homemade versus commercial complementary foods. Most available evidence focuses on general feeding practices without isolating the impact of food type while adjusting for confounding factors such as morbidity and caregiver characteristics (7).

To address this gap, the present prospective cohort study was undertaken to assess and compare the growth patterns and morbidity outcomes of infants aged 6 to 12 months based on their predominant mode of complementary feeding—homemade or commercial. The primary outcome was weight-for-age z-score (WAZ), while secondary outcomes included weight-for-length z-score (WLZ), length-for-age z-score (LAZ), and morbidity indicators such as diarrhea, respiratory infections, and hospital admissions. The findings aim to generate evidence-based insights to inform infant feeding policies and caregiver education, particularly in resource-limited, community-based settings.

MATERIALS AND METHODS

Study Design

This was a prospective observational cohort study conducted at Dept. of Paediatrics, Saveetha Medical College and Hospitalto evaluate the impact of different complementary feeding practices—homemade versus commercial—on growth parameters in infants aged 6 to 12 months. The study followed infants longitudinally from the initiation of complementary feeding at 6 months through to 12 months of age, without altering their natural feeding patterns.

Study Setting and Duration

The study was conducted in a community-based setting, primarily through paediatric outpatient departments and routine immunization clinics of Saveetha Medical College and Hospital. Data collection took place over a 6months period between Dec 2023 – June 2024.

Participants

The study included healthy, term infants with a gestational age between 37 and 42 weeks who were exclusively breastfed up to six months of age and initiated on complementary feeding at six months. Only infants whose parents or legal guardians provided informed written consent were enrolled. Infants with congenital anomalies, chronic illnesses, or a history of mixed feeding or formula use before six months were excluded. Additionally, infants with incomplete follow-up or missing data at key timepoints were not included in the final analysis.

Eligible infants were consecutively enrolled and stratified into two groups based on their predominant type of complementary feeding. Group A consisted of infants receiving predominantly homemade complementary foods, while Group B included infants primarily fed with commercial or store-bought complementary foods.

Sampling and Sample Size

The sample size was calculated using the formula for comparing two independent means, assuming a minimum detectable weight gain difference of 500 grams between the groups, with a standard deviation of 900 grams. Considering a power of 80% and an alpha level of 0.05, the total calculated sample size was 120 infants, with 60 participants in each group.

Data Collection Procedures

Recruitment was initiated at six months of age, and each infant was followed up at three key timepoints: baseline (6 months), mid-point (9 months), and endpoint (12 months). At each visit, anthropometric measurements were obtained, including weight, length or height, head circumference, and mid-upper arm circumference (MUAC), following standard paediatric measurement protocols. Z-scores such as weight-for-age (WAZ), length-for-age (LAZ), and weight-for-length (WLZ) were calculated using WHO growth standards, with the aid of WHO Anthro software.

Dietary intake was assessed using a 24-hour dietary recall and a semi-quantitative Food Frequency Questionnaire (FFQ) to evaluate feeding patterns, food diversity, and frequency. Morbidity data were collected through parental recall, focusing on episodes of diarrhoea, acute respiratory infections (ARI), and hospital admissions that occurred between follow-up visits. In addition to health and dietary data, socio-demographic and contextual variables were recorded, including maternal education level, socioeconomic status (classified according to the Modified Kuppuswamy Scale), birth order, and household feeding environment. A structured and pre-validated questionnaire was administered by trained healthcare personnel to ensure uniform data collection and minimize interviewer bias.

Statistical Analysis

Data were analysed using SPSS version 22 during analysis. Descriptive statistics, including means, standard deviations, and frequencies, were used to summarize baseline characteristics and outcome measures. Continuous variables such as weight gain and z-scores were compared between the two groups using the Independent t-test for normally distributed data or the Mann–Whitney U test for non-normally distributed variables. Categorical variables, including morbidity outcomes and socio-demographic characteristics, were analysed using the Chi-square test.

To account for potential confounding factors such as maternal education, socioeconomic status, and illness episodes, a multiple linear regression analysis was performed to identify independent predictors of growth outcomes. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

This study was approved by the Institutional Ethics Committee of Saveetha Medical College and Hospital, Chennai. Written informed consent was obtained from all parents or legal guardians prior to enrollment. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and relevant national guidelines on biomedical research involving human participants.

RESULTS

Baseline Characteristics

A total of 120 infants were enrolled, with 60 infants in each group (homemade vs. commercial complementary foods). The baseline characteristics of the two groups were found to be comparable, ensuring internal validity. The mean age at enrolment was identical in both groups (6.1 ± 0.2 months), and the sex distribution was nearly equal (33:27 in the homemade group and 35:25 in the commercial group), with no statistically significant differences ($p = 0.85$ and $p = 0.69$, respectively). The mean birth weight was slightly higher in the homemade group (2.9 ± 0.3 kg) compared to the commercial group (2.8 ± 0.4 kg), although this difference was not statistically significant ($p = 0.12$).

All infants were exclusively breastfed up to 6 months of age. Maternal education (≥10th standard) was reported in 75% of the homemade group and 68% of the commercial group ($p = 0.41$). Socioeconomic status (classified as upper-lower and lower-middle) was also similar between the groups, with 78% and 80% representation in the homemade and commercial groups, respectively ($p = 0.77$)**Table 1**.

Table 1. Baseline Characteristics of Study Groups

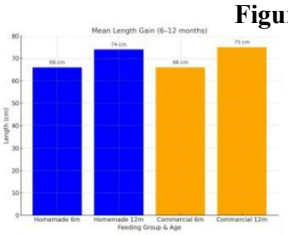
Variable	Homemade Group (n=60)	Commercial Group (n=60)	*p*-value
Mean age at enrolment (months)	6.1 ± 0.2	6.1 ± 0.2	0.85
Male : Female	33:27	35:25	0.69
Birth weight (kg)	2.9 ± 0.3	2.8 ± 0.4	0.12
Exclusive breastfeeding till 6 months	100%	100%	—
Maternal education (≥10th std)	75%	68%	0.41
Socioeconomic status (upper-lower & lower-middle)	78%	80%	0.77

Growth Outcomes

Growth was assessed over the 6-month period from 6 to 12 months of age. **Figure 1**, illustrating mean weight gain trends, shows that infants in the commercial food group had a consistently higher weight trajectory compared to those in the homemade group. Similarly, **Figure 2**, depicting mean length gain, suggests a slight advantage in linear growth among the commercial

Figure 1. Weight gain in both the groups

Figure 2. Mean length gain in both groups



Z-score analysis based on WHO growth standards revealed significant differences in anthropometric outcomes between the two groups. The mean weight-for-age z-score (WAZ) was significantly higher in the commercial group (–0.10 ± 0.6) compared to the homemade group (–0.41 ± 0.5), with a *p*-value of 0.01. The weight-for-length z-score (WLZ), which reflects acute nutritional status, was also significantly better in the commercial group (+0.05 ± 0.4) versus the homemade group (–0.35 ± 0.5), with a highly significant *p*-value of 0.001. The length-for-age z-score (LAZ), indicative of chronic undernutrition or stunting, showed slightly higher values in

the commercial group (–0.19 ± 0.7) compared to the homemade group (–0.38 ± 0.6), although this difference did not reach statistical significance ($p = 0.08$)**Table 2**.

Table 2. Z-Scores Based on WHO Growth Standards (6–12 Months)

Parameter	Homemade Group (mean ± SD)	Commercial Group (mean ± SD)	*p*-value
Weight-for-age (WAZ)	–0.41 ± 0.5	–0.10 ± 0.6	0.01
Length-for-age (LAZ)	–0.38 ± 0.6	–0.19 ± 0.7	0.08
Weight-for-length (WLZ)	–0.35 ± 0.5	+0.05 ± 0.4	0.001

Morbidity Outcomes

The morbidity profiles of both groups were analyzed over the same 6-month period. The incidence of at least one diarrheal episode was reported in 28% of infants in the homemade group and 35% in the commercial group, with no statistically significant difference ($p = 0.39$). Acute respiratory infections were observed in 25% of the homemade group and 33% of the commercial group ($p = 0.29$). Hospital admissions occurred in 5% of infants in the homemade group and 8% in the commercial group ($p = 0.47$). These findings suggest that neither type of complementary feeding conferred a clear advantage or risk in terms of infection or hospitalization**Table 3**.

Table 3. Morbidity Outcomes Between 6–12 Months

Outcome	Homemade Group (%)	Commercial Group (%)	*p*-value
≥1 episode of diarrhea	28%	35%	0.39
≥1 episode of ARI	25%	33%	0.29
Hospital admission	5%	8%	0.47

Predictors of Weight Gain

Multiple regression analysis was conducted to identify independent predictors of weight gain from 6 to 12 months. After adjusting for maternal education, socioeconomic status, and morbidity, the use of commercial complementary food emerged as a statistically significant positive predictor of weight gain (+0.38 kg; $p = 0.003$). Maternal education (≥10th standard) also independently contributed to increased weight gain (+0.19 kg; $p = 0.04$), highlighting the role of maternal knowledge in shaping infant nutrition. In contrast, the occurrence of diarrhea was associated with a significant reduction in weight gain (–0.22 kg; $p = 0.01$), reaffirming the detrimental impact of infections on growth.

DISCUSSION

This prospective cohort study examined the impact of homemade versus commercial complementary foods on the growth and morbidity outcomes of infants aged 6 to 12 months. The findings indicate that infants who received predominantly commercial complementary foods demonstrated significantly better growth, particularly in terms of weight-for-age (WAZ) and weight-for-length (WLZ) z-scores. However, there was no significant difference between the two groups in terms of morbidity, including diarrheal episodes, acute respiratory infections (ARI), or hospital admissions.

The commercial complementary food group showed superior weight-related outcomes, with a higher mean WAZ and WLZ, indicating better nutritional status.As defined a priori, the primary outcome—weight-for-age z-score (WAZ)—showed a statistically significant improvement in the commercial group, while secondary outcomes such as WLZ also demonstrated significant benefit, and LAZ showed a non-significant upward trend, indicating a potential for long-term linear growth improvement with extended follow-up. This observation is consistent with findings from a recent global synthesis of complementary feeding interventions, which showed that fortified and standardized products improve weight gain and micronutrient status in low- and middle-income settings(8). Commercial preparations are often energy-dense and fortified with iron, zinc, and other essential micronutrients, which may contribute to improved anthropometric outcomes when compared to unfortified homemade foods (9).

In contrast, homemade foods, although affordable and culturally accepted, may lack sufficient energy and nutrient density when not diversified or enriched adequately. Studies in Indian urban slums have highlighted that homemade preparations are often thin, cereal-based, and lacking in critical food groups such as animal-source proteins or fats (10). This may partially explain the lower WAZ and WLZ scores observed in our study's homemade food group. While the length-for-age (LAZ) score showed a trend toward better values in the commercial group, the difference was not statistically significant, possibly due to the short follow-up duration or other unmeasured environmental influences. Nevertheless, global evidence suggests that complementary feeding interventions, including fortified products and caregiver education, have modest but meaningful effects on linear growth over time (11).

Importantly, our study did not find a significant increase in infection rates among the commercial food group. This is noteworthy, as concerns about hygiene and food safety are often raised with the use of packaged foods.

However, similar results were observed in community-based settings where proper food handling practices were emphasized, indicating that the morbidity risk can be mitigated when safe preparation and storage guidelines are followed (12). Multivariate regression analysis further reinforced our main findings. Use of commercial complementary food was independently associated with greater weight gain, even after adjusting for maternal education, socioeconomic status, and illness episodes. Maternal education also emerged as a significant predictor of weight gain, emphasizing the role of informed caregiving in determining infant nutritional outcomes (13). On the other hand, diarrheal illness was negatively associated with weight gain, aligning with regional evidence that repeated gastrointestinal infections contribute to growth faltering and wasting among infants(14).
Our findings suggest that commercial complementary foods, when accessible and used appropriately, may support improved growth outcomes in infants without increasing infection risk. However, their cost and availability may restrict widespread use in lower-income households. Therefore, public health strategies should also focus on improving the quality of homemade complementary foods through caregiver education, local fortification initiatives, and integration of dietary diversity messages into routine maternal and child health programs. Such multifaceted interventions—particularly when supported by community engagement and health system platforms—have demonstrated effectiveness in improving complementary feeding practices and nutrition outcomes at scale (15).

Strength

The strength of this study lies in its prospective design, use of standardized WHO growth metrics, and adjustment for multiple potential confounders. The inclusion of exclusively breastfed infants at baseline and follow-up at three defined timepoints strengthens internal validity and enhances comparability between groups.

Limitation

However, several limitations must be acknowledged. First, although efforts were made to categorize infants accurately based on predominant complementary food type, some degree of dietary overlap may have occurred, especially in mixed households. Second, reliance on caregiver recall for dietary and morbidity data could introduce recall bias. Third, the study was conducted in a single urban or semi-urban setting, which may limit the generalizability of findings to rural or high-income populations. Finally, the duration of follow-up was limited to six months; longer-term impacts on stunting and cognitive development were not assessed.

CONCLUSION

In conclusion, this study provides evidence that commercial complementary foods, when used appropriately, may support better weight-related growth outcomes in infants during the complementary feeding period without increasing morbidity. However, given cost and accessibility barriers, especially in low-income households, there is an urgent need for public health strategies that promote nutritionally adequate homemade feeding options alongside caregiver education. Strengthening maternal awareness, improving dietary diversity at the household level, and potentially fortifying homemade foods through community nutrition programs may serve as cost-effective alternatives to bridge the nutritional gap.

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