Journal of Neonatal Surgery
ISSN (Online): 2226 -0439
Vol. 14, Issue 29s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Impact Of Early Complementary Feeding On Growth And Nutritional Status In Infants (6-12 Months)

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Cite this paper as: Dr. Arjama Thakur, Dr. Aryama Anirudhan, Dr. M Vaishnavi, Dr. Balagopal M, (2025) Impact Of Early Complementary Feeding On Growth And Nutritional Status In Infants (6-12 Months). *Journal of Neonatal Surgery*, 14 (29S), 296-301.

ABSTRACT

Introduction: The period between six and twelve months is the key time during an infant's growth and nutritional stage. Complementary feeding (CF) must be introduced with continuing breastfeeding to satisfy the increasing nutritional demands. The aim of this study was to assess the influence of CF introduced on time on the growth parameters and morbidity set among infants in rural South India.

Methodology: A cross-sectional observational study was conducted from July to December 2024 at a rural hospital in South India. A total of 120 infants aged six to twelve months were selected and randomly assigned to two groups: Group A initiated CF at 6 months of age and Group B who were not introduced to CF. Anthropometric measuring based on WHO standards were performed and morbidity patterns were determined through caregiver interviews. Finally, descriptive and statistical analysis was done using SPSS version 25 with $p < 0.05$ as significant.

Observations & Results: Group A had consistently better growth outcomes and significantly lower proportions of underweight (8.3 vs 17%), stunting (10 vs 15%), and wasting (6.7 vs 15%) when compared to group B ($p < 0.05$). Morbidity was similar in both group at the start of the study; however gastrointestinal and respiratory illnesses declined in group A by 12 months, while no improvement was noted in group B.

Discussion: Infants who were introduced to CF at 6 months experienced better growth and lower rates of infections. These findings highlight the role of timely CF in preventing undernutrition and enhancing immunity.

Conclusion: Timely complementary feeding at 6 months is very important for improving growth and reducing morbidity and disease among infants. Education programs, aimed specifically at rural caregivers, are important for improving CF practices and preventing long-term health consequences.

Keywords: *Complementary feeding, infant nutrition, growth monitoring, undernutrition, morbidity, rural health*

1. INTRODUCTION

The period from 6 to 12 months of age marks a critical window in infant development, characterized by neurological maturation and increasing nutritional demands. During this time, just breast milk or infant formula becomes insufficient to meet the evolving energy and micronutrient requirements of infants. As a result, the introduction of complementary foods which is defined as any solid or liquid food other than breast milk or infant formula suddenly becomes essential to ensure optimal growth, health and development. This process, known as complementary feeding (CF), is a pivotal dietary transition that bridges exclusive milk feeding and the gradual adoption of family foods.

The World Health Organization (WHO) recommends that complementary feeding should begin at around 6 months of age [1], coinciding with the point when infants are developmentally ready to accept new textures and flavors and when their nutritional needs increase. The WHO also recommends that breast feeding can be continued up to the age of 2.

Obesity and metabolic disorders in children have been linked to inappropriate early introduction, particularly before the age of 4 months [2]. In addition to experiencing significant dietary changes as a result of exposure to new foods, flavors, and feeding experiences, the CF period is a time of rapid growth and development during which infants are vulnerable to nutrient excesses and deficiencies [3]. Such deficiencies are usually irreversible and can cause significant harm in the long run.

Growth faltering, micronutrient deficiencies and common childhood illnesses like respiratory infections and diarrhea are also at their highest risk during the 6-12 month age period in infants [4]. Delays in motor development, a later risk of noncommunicable diseases and substantial morbidity and mortality are the direct effects of undernutrition during this critical phase. Adolescent obesity has repercussions as well. Children who are overweight are more likely to experience major health issues later in life, such as type 2 diabetes mellitus, hypertension, asthma and other respiratory issues, sleep disorders, liver diseases, overweight and obesity and adult disabilities [5].

A National Health Survey conducted has revealed that in India the introduction of complementary feeding along with continued breastfeeding in the 6-9 month age group is only 55.8% [6].

This study aims to compare growth patterns in children who have been having CF to children who are on exclusive breast feeding over a period of 6 months from their 6^{th} month of age to their 12^{th} month.

2. MATERIALS & METHODS

Study Design:

A cross-sectional observational study was conducted in a rural Hospital in South India between July to December 2024.

Study Population:

The study included infants aged between 6 and 12 months attending the immunization and pediatric outpatient departments. Mothers or primary caregivers were interviewed after obtaining informed consent.

Sample Size:

Based on the population in the district where the study was conducted in and the population of children below 1 year of age, the sample size was found to be 117 (rounded off to 120).

- Group A: Infants who were introduced to Complementary Feeding at 6 months.
- Group B: Infants who were not introduced to Complementary Feeding.

Inclusion Criteria:

- Infants entering the study at their 6^{th} month.
- Full-term and singleton births.
- Mothers who provided informed consent.
- Availability of a reliable caregiver for interview.
- Fully immunized babies.
- Complementary feeds strictly having only pureed, mashed semi-solids.

Exclusion Criteria:

- Preterm or low birth weight infants.
- Infants with congenital anomalies or chronic illnesses.
- Infants with a history of hospitalization in the last one month.
- Infants who were started on complementary feeding in the control group.
- Any necessity for hospitalization during the study period.

Data Collection:

Data were collected using a pre-tested, semi-structured questionnaire following WHO/UNICEF core indicators which included:

- Demographic details (age, gender).
- Feeding history.

- Breastfeeding status and duration.
- Morbidity profile (history of GI disturbances, Respiratory Infections).

Anthropometric Measurements:

- **Weight:** Measured using a digital baby scale.
- **Length:** Measured using an infantometer.
- **Mid-Upper Arm Circumference (MUAC):** Measured using standard MUAC tape

The anthropometric data were interpreted using WHO growth standards to assess weight-for-age, length-for-age, and weight-for-length Z-scores.

Nutritional Assessment:

Growth and nutritional status were evaluated using:

- WHO growth charts and Z-score classification
- Presence of undernutrition: stunting (length-for-age < -2 SD), wasting (weight-for-length < -2 SD), and underweight (weight-for-age < -2 SD)

Statistical Analysis:

Data were analyzed using SPSS version 25. Descriptive statistics were used to summarize demographic and feeding data. The chi-square test and Student's t-test were applied to compare categorical and continuous variables between the two groups. A p-value of <0.05 was considered statistically significant.

Ethical Considerations:

The study protocol was approved by the Institutional Ethics Committee (No.1504/24). Written informed consent was obtained from the caregivers of all participating infants prior to inclusion in the study. Confidentiality and anonymity of data were maintained throughout.

OBSERVATIONS & RESULTS

Demographic	Group A	Group B	Total	p-value
Male	32 (53.3%)	34 (56.7%)	66 (55%)	0.715
Female	28 (46.7%)	26 (43.3%)	54 (45%)	

Table 1: Gender Wise Distribution

As seen in Table 1, it can be noted that the gender distribution is almost equal with no significance indicating equal distribution.

Introduction Time	Group A	Group B
< 6 months	10 (58.3%)	0 (0%)
6 months	50 (41.7%)	0 (0%)
> 6 months	0 (0%)	60 (100%)

Table 2: Age of Introduction of Complementary Feeding

As seen in Table 2, 10 babies in Group A were started on complementary feeds below 6 months of age and the rest 50 at the 6th month of age.

Frequency of Feeding	Group A
1-2 times/day	40 (66.7%)
>=3 times/day	20 (33.3%)

Table 3: Frequency of Complementary Feeding

As seen in Table 3, CF was given 1-2 times a day in 67% of the babies and the rest 33% had it more than twice a day.

Breastfeeding Status	Group A	Group B
Continued till 12 months	52 (86.7%)	60 (100%)
Weaned <12 months	8 (13.3%)	0

Table 4: Breastfeeding Status and Duration

As seen in Table 4, breast feeding was continued till 12 months in 87% of the babies in Group A while 13% of mothers discontinued breast feeds.

Morbidity	6 months		9 months		12 months	
	Group A	Group B	Group A	Group B	Group A	Group B
GI Disturbances	5 (8.3%)	6 (10%)	11 (18.3%)	4 (6.7%)	1 (1.6%)	1 (1.6%)
Respiratory Infections	2 (3.3%)	2 (3.3%)	2 (3.3%)	3 (1.6%)	1 (1.6%)	6 (10%)
No Morbidity	53 (86.6%)	52 (86.6%)	47 (78.3%)	53 (86.6%)	58 (96.7%)	53 (86.6%)

Table 5: Morbidity Profile at 6th, 9th and 12th months (having 1 diagnosis in the preceding 4 weeks)

As seen in Table 5, there was a descending trend seen in the number of babies having some form of morbidity from the 6th to 12th months in Group A while the same remained constant in Group B. The p-value was found to be <0.05 in comparison between groups at 6th and 12th months with respect to the morbidity profile.

Nutritional Indicator	Group A	Group B	Total	p-value
Weight-for-Age Normal (≥ -2 SD)	55 (91.7%)	50 (83%)	105	0.018
Underweight (< -2 SD)	5 (8.3%)	10 (17%)	20	
Height-for-Age Normal (≥ -2 SD)	54 (90%)	51 (85%)	105	0.009
Stunted (< -2 SD)	6 (10%)	9 (15%)	15	
Weight-for-Height Normal (≥ -2 SD)	56 (93.3%)	51 (85%)	107	0.040
Wasted (< -2 SD)	4 (6.7%)	9 (15%)	13	

Table 6: Z-Score Classification

As seen in Table 6, there was a difference seen in the number of babies attaining adequate height and weight as per the age was found to be significantly better in Group A as compared to Group B (p-value <0.05 in all comparative parameters)

3. DISCUSSION

The WHO states that the energy needed in addition to breast milk is about 200 kcal per day in infants 6–8 months, 300 kcal per day in infants 9–11 months and 550 kcal per day in children 12–23 months of age. The amount of intake required to cover the gap increases as the child gets older as the child takes lesser liquid diet and switches out to more and more solids based on the exponential growth [7].

Appropriate CF is not very convenient in some environments. Maternal education, employment and health significantly influence CF. Targeted interventions and education programs are essential to support healthy feeding behaviors, especially for mothers facing issues with number of children at home [8].

In a study performed in 2022, it was found that early growth faltering was found in a rural setup with high exclusive breastfeeding rates and persisting growth faltering continued to be associated with poor feeding practices. They found that the Prevalence of weight faltering was 46.1%, 48.4% and 48% at 6, 9 and 12 months respectively in purely breast fed infants [9]. The same ratio was around 17% in our study at the 9th and 12th month intervals.

In another study in 2015, it was reported that age-specific body weight and length were not achieved by 30.5% and 29.5% of infants, respectively who did not receive CF or received non WHO recommended CF till the age of 12 months. Weight for length was not achieved by 25.5% of the infants [10]. This correlates to our study where the wasting was about 15%.

In a particular study in 2009 conducted in a rural Indian population, it was found that 24.5% of the infants were stunted (length-for-age [LAZ] < -2SD), 25% were underweight (weight-for-age [WAZ] < -2SD), and 17% were wasted (weight-for-age [WLZ] < -2SD) at 12 months among those who had poor to nil CF practice [11]. This study also correlates positively to our study.

Based on the finding of our study, it was noted that amount of gastrointestinal effects in babies were the same in Group A and Group B at 12 months indicating that CF is safe. At the 9 month period, the same was more in Group A indicating that the babies needed time to acclimatize to CF which would later settle at the 12 month mark.

As far as respiratory infections are considered, number of cases in the preceding 4 weeks were higher at the 9th and 12th month period indicating that babies with CF had better immunity than the ones without CF.

4. CONCLUSION

Complementary feeding at the 6th month mark is highly essential for an infant to have proper milestones as evidenced by the fact that babies without CF had more wasting and stunted growth with significantly higher episodes of respiratory illnesses. Although it has been highly advocated by the WHO, the practices are not clearly followed in the rural population as seen in this study where the study and control groups were equal. Adequate CF is critical and improper CF can cause various other health disturbances in adulthood. Maternal education and health camps can help achieve better practices.

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