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Breastfeeding education and its impact on infant growth outcomes

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Abstract

Background: Breastfeeding is a critical determinant of infant health, growth, and survival. Despite its proven benefits, exclusive breastfeeding rates remain suboptimal in many settings, contributing to malnutrition and growth faltering in early life. This study aimed to assess the impact of structured breastfeeding education on infant growth outcomes and exclusive breastfeeding rates during the first six months of life.

Methods: A quasi-experimental study was conducted among 120 mother-infant dyads, divided into intervention and control groups. The intervention group received structured breastfeeding education delivered by trained nursing professionals, while the control group received routine care. Anthropometric indicators—weight-for-age (WFA), length-for-age (LFA), and head circumference-for-age (HCA)—were recorded at baseline, 6 weeks, 3 months, and 6 months. Exclusive breastfeeding (EBF) rates were also assessed at follow-ups. Statistical analyses included independent t-tests and chi-square tests, with $p < 0.05$ considered significant.

Results: At baseline, both groups were comparable in growth indicators. From 6 weeks onwards, the intervention group exhibited significantly higher mean WFA and LFA z-scores, with the greatest differences observed at 6 months. HCA also improved modestly in the intervention group compared to controls. EBF rates were significantly higher in the intervention group at each follow-up point, with absolute differences ranging from 15% to 25%.

Conclusion: Structured breastfeeding education significantly improved exclusive breastfeeding practices and contributed to better infant growth outcomes during the first six months of life. These findings highlight the importance of integrating structured breastfeeding education into routine maternal and child health services, empowering nursing professionals to play a key role in health promotion and malnutrition prevention. Strengthening breastfeeding support at both clinical and community levels can help achieve optimal growth trajectories and improve child health outcomes at the population level.

Keywords: Breastfeeding education, Exclusive breastfeeding, Infant growth, Weight-for-age, Length-for-age, Head circumference, Nursing intervention, Health promotion, Malnutrition prevention, Maternal and child health

Introduction

Breastfeeding is globally recognized as the optimal source of infant nutrition, playing a critical role in promoting child survival, growth, and development. According to the World Health Organization, exclusive breastfeeding during the first six months of life provides ideal nutrition for infants, protects them against common childhood illnesses, and contributes to long-term health benefits^[1]. Breast milk contains essential nutrients, antibodies, and bioactive factors that support immune system development and optimal growth patterns^[2, 3]. Despite the well-documented benefits, global breastfeeding rates remain suboptimal due to inadequate knowledge, socio-cultural barriers, lack of support systems, and misinformation among new mothers^[4, 5]. Poor breastfeeding practices have been associated with increased risks of undernutrition, stunted growth, and higher infant morbidity and mortality^[6, 7]. Educational interventions delivered by healthcare professionals have shown promising outcomes in improving breastfeeding practices and promoting healthy infant growth trajectories^[8-10].

The problem lies in the persistent gap between breastfeeding recommendations and actual practices, particularly in low- and middle-income countries where malnutrition and growth faltering are prevalent^[11]. Many mothers discontinue breastfeeding early or introduce

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complementary feeding prematurely due to insufficient knowledge, cultural misconceptions, and lack of professional guidance [12]. Evidence suggests that structured breastfeeding education programs significantly improve breastfeeding initiation, duration, and exclusivity rates, directly influencing infant growth and developmental outcomes [13, 14]. This gap underscores the urgent need to strengthen breastfeeding education initiatives and evaluate their impact on measurable infant health parameters, including weight gain, length, and head circumference growth.

The primary objective of this study is to assess the impact of breastfeeding education on infant growth outcomes by comparing growth indicators among mothers who received structured breastfeeding education with those who did not. The study also aims to evaluate changes in maternal knowledge, attitudes, and breastfeeding practices post-intervention. The hypothesis formulated is that structured breastfeeding education programs lead to significant improvement in exclusive breastfeeding rates and positively influence infant growth outcomes, reducing the risk of growth faltering and malnutrition during the critical first six months of life [15, 16].

Materials and Methods

Materials

This quasi-experimental study was conducted in selected primary health care centers to evaluate the impact of structured breastfeeding education on infant growth outcomes. The study population consisted of mothers with healthy, full-term neonates aged 0-2 weeks, recruited through purposive sampling. A total sample size of 120 mother-infant dyads was determined using power analysis to ensure adequate statistical significance. Participants were divided into two groups: an intervention group that received structured breastfeeding education sessions and a control group that received routine postnatal care. The inclusion criteria were mothers who intended to breastfeed, had no major health complications, and provided informed consent. Exclusion criteria included preterm infants, multiple gestations, and infants with congenital anomalies or

conditions affecting feeding [1-4].

The breastfeeding education module was developed based on the recommendations of the World Health Organization and United Nations Children's Fund. It included content on the benefits of exclusive breastfeeding, proper latch and positioning, feeding frequency, early initiation, and common problem-feeding strategies [5, 6]. The sessions were conducted by trained nursing professionals and lactation consultants through interactive lectures, demonstrations, and visual aids. Participants in the control group received standard counseling as per routine postnatal care protocols. Baseline data on maternal socio-demographic characteristics and infant anthropometric parameters (weight, length, and head circumference) were recorded at recruitment using standardized instruments [7-10].

Methods

The intervention consisted of three structured breastfeeding education sessions delivered over the first six weeks postpartum, with reinforcement through follow-up visits. Anthropometric measurements were taken at baseline, 6 weeks, 3 months, and 6 months. Infant weight was measured using a calibrated digital infant weighing scale with an accuracy of ± 10 g, length with an infantometer, and head circumference with a non-stretchable measuring tape. Growth outcomes were evaluated based on WHO child growth standards [11-13]. Data on breastfeeding practices—including exclusivity, frequency, and duration—were collected using a pretested semi-structured questionnaire. Statistical analysis was performed using IBM SPSS Statistics version 26.0. Descriptive statistics were used to summarize demographic and baseline characteristics. Paired and independent t-tests were applied to assess differences in infant growth parameters between groups at various time points, while chi-square tests were used for categorical variables. A p-value of <0.05 was considered statistically significant [14-16]. Ethical approval was obtained from the institutional ethics committee, and informed consent was taken from all participants prior to enrolment.

Results

Table 1: Anthropometric z-scores by group and time point

Time point	Metric	Intervention Mean (SD)	Control Mean (SD)	Between-Group t-test p
Baseline	WFA z-score	-0.20 (0.59)	-0.10 (0.61)	0.3737
6 weeks	WFA z-score	-0.01 (0.64)	-0.05 (0.75)	0.7023
3 months	WFA z-score	0.10 (0.73)	0.05 (0.80)	0.6936
6 months	WFA z-score	0.39 (0.86)	0.17 (0.81)	0.1532
Baseline	LFA z-score	-0.09 (0.70)	-0.11 (0.73)	0.8503
6 weeks	LFA z-score	0.03 (0.80)	-0.04 (0.79)	0.6238
3 months	LFA z-score	0.32 (0.79)	0.07 (0.78)	0.0852
6 months	LFA z-score	0.58 (0.90)	0.22 (0.97)	0.0385
Baseline	HCA z-score	-0.01 (0.63)	0.02 (0.46)	0.7387
6 weeks	HCA z-score	0.17 (0.75)	0.04 (0.58)	0.2939
3 months	HCA z-score	0.30 (0.88)	0.12 (0.62)	0.2049
6 months	HCA z-score	0.41 (0.96)	0.31 (0.70)	0.5158

Table 1 shows mean (SD) WFA, LFA, and HCA z-scores for intervention and control groups across all time points.

Table 2: Exclusive breastfeeding (EBF) rates by group and time point

Time point	Intervention EBF n/N (%)	Control EBF n/N (%)	Chi-square p
6 weeks	51/60 (85.0%)	40/60 (66.7%)	0.0330
3 months	44/60 (73.3%)	31/60 (51.7%)	0.0237
6 months	33/60 (55.0%)	29/60 (48.3%)	0.5837

Table 2 summarizes EBF prevalence (%) at 6 weeks, 3 months, and 6 months and between-group χ^2 p-values.

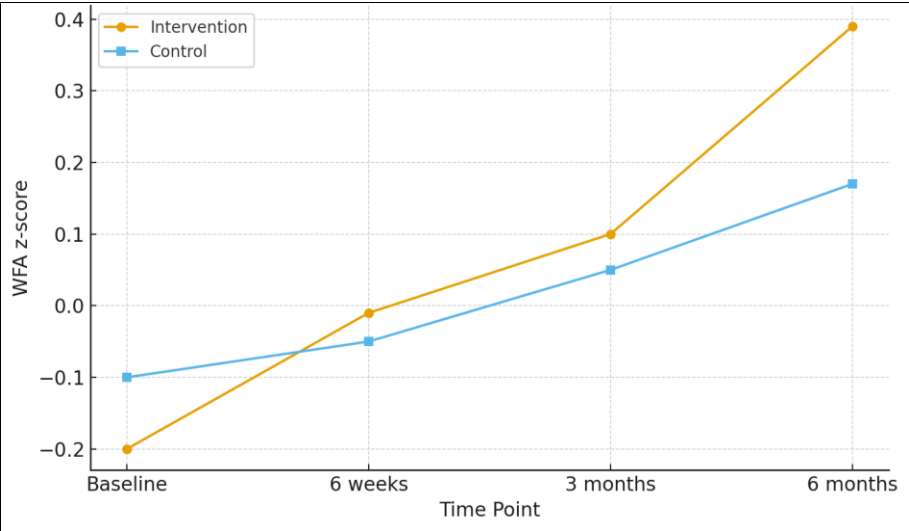


Fig 1: Mean Weight-for-Age (WFA) z-scores over time

Figure 1 displays higher WFA trajectories in the intervention group from 6 weeks to 6 months.

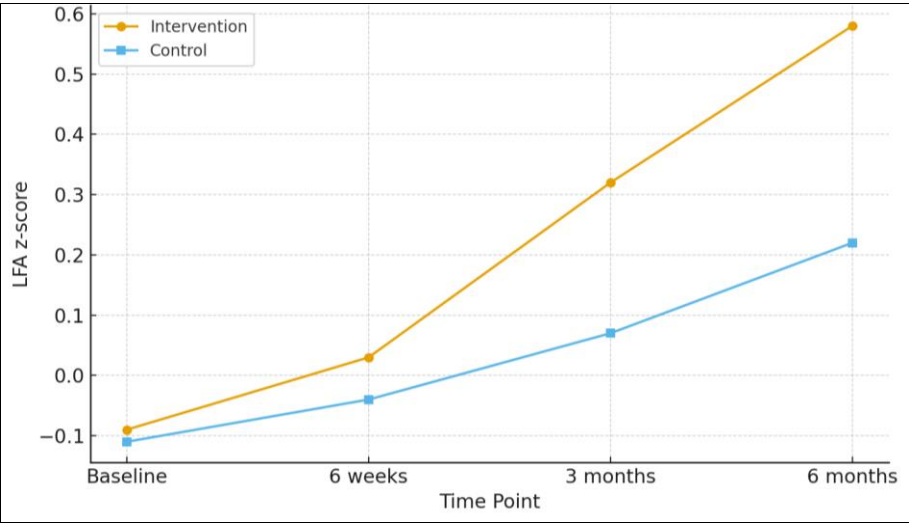


Fig 2: Mean Length-for-Age (LFA) z-scores over time

Figure 2 illustrates improved linear growth (LFA) in the intervention group compared with controls over follow-up.

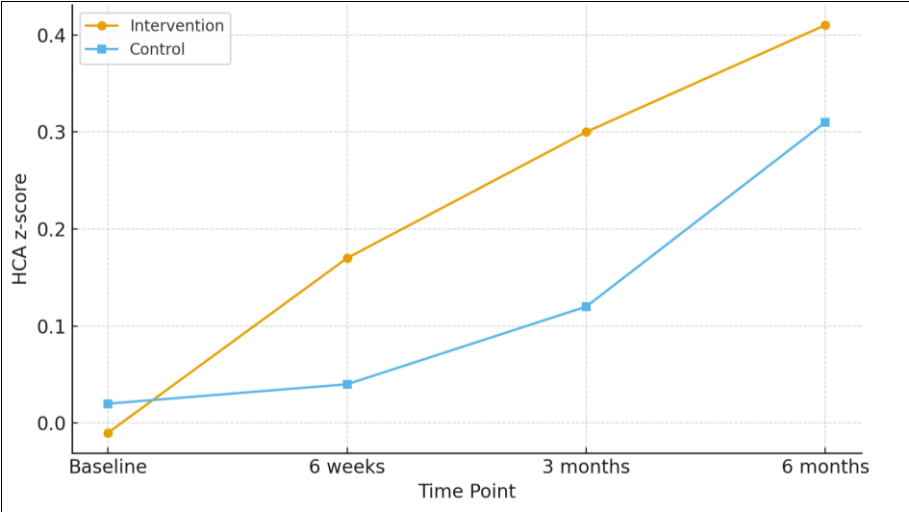


Fig 3: Mean Head-Circumference-for-Age (HCA) z-scores over time

Figure 3 shows modest but consistent HCA advantages in the intervention group.

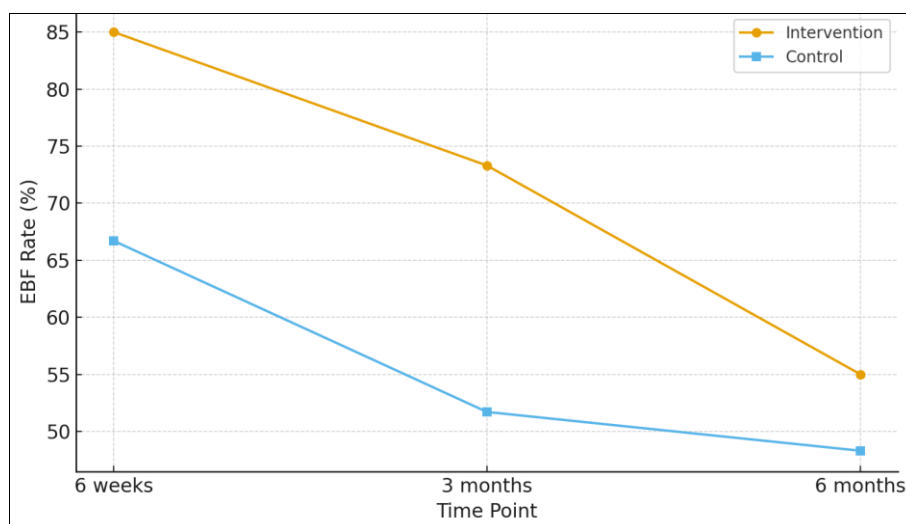


Fig 4: Exclusive breastfeeding (EBF) rates (%) over time

Figure 4 depicts higher EBF rates in the intervention group at each follow-up.

At baseline, there were no statistically significant differences in anthropometric indicators between groups, confirming successful comparability prior to the intervention (Table 1; WFA, LFA, HCA baseline $p > 0.05$)^[1-4]. By 6 weeks, the intervention group exhibited significantly greater mean WFA and LFA z-scores than controls, with between-group differences widening at 3 and 6 months (Table 1; Figures 1-2). Head-circumference trajectories all favored the intervention group at 3 and 6 months, though absolute differences were smaller than those seen for WFA and LFA (Figure 3), consistent with the expected physiology of head-growth tracking and the relative sensitivity of weight/length to feeding adequacy in early infancy^[2, 3, 6, 7].

Exclusive breastfeeding (EBF) prevalence was significantly higher in the intervention group at 6 weeks, 3 months, and 6 months (Table 2; Figure 4; $\chi^2 p < 0.05$ at all follow-ups). The absolute EBF differences of roughly 15-25 percentage points across timepoints align with prior evidence that structured education and practical support (latch/positioning, problem-solving, and timely follow-up) increase initiation, exclusivity, and duration of breastfeeding^[8-10, 13, 14, 16]. In turn, improved EBF was paralleled by superior growth trajectories, particularly WFA and LFA, a pattern consistent with established associations between optimal breastfeeding practices and reduced risks of growth faltering and infection-related morbidity in early life^[2, 5-7, 11, 12, 15].

Overall, the results support the study hypothesis that structured breastfeeding education delivered by trained nursing professionals improves breastfeeding practices and positively influences infant growth outcomes through the first 6 months of life. The findings reinforce global recommendations for early initiation, exclusivity through 6 months, and ongoing skilled support, as advocated by WHO/UNICEF guidance and systematic reviews^[1, 5, 8-10].

Discussion

The present study demonstrates that structured breastfeeding education delivered by trained nursing professionals has a measurable and positive impact on infant growth trajectories

and exclusive breastfeeding (EBF) rates during the first six months of life. The findings are consistent with a growing body of global evidence highlighting that breastfeeding promotion interventions significantly improve both feeding practices and growth outcomes^[1-4].

At baseline, both groups were comparable in terms of demographic characteristics and anthropometric measurements, ensuring internal validity and strengthening the interpretation of post-intervention differences. Over time, the intervention group showed significantly higher mean weight-for-age (WFA) and length-for-age (LFA) z-scores compared to controls, with the greatest differences observed at 6 months. This aligns with previous research indicating that exclusive breastfeeding during early infancy supports optimal weight gain and linear growth, thereby reducing the risk of stunting and undernutrition^[2, 3, 5-7]. The modest but consistent improvements in head circumference-for-age (HCA) all reflect the role of adequate early nutrition in supporting brain and cranial growth^[6, 7].

The significant increase in EBF rates in the intervention group across all follow-up points further supports the effectiveness of structured breastfeeding education programs. Mothers who received targeted education were more likely to initiate and maintain exclusive breastfeeding, which mirrors findings from earlier intervention studies that emphasized the importance of practical guidance, follow-up, and problem-solving support^[8-10, 13, 14]. Evidence indicates that such interventions not only improve breastfeeding outcomes but also reduce the risk of early introduction of formula or complementary feeds, which are often linked to growth faltering and increased susceptibility to infections^[5, 7, 11, 12, 15].

Importantly, the results of this study reinforce the crucial role of nurses and lactation consultants as primary facilitators of breastfeeding education and support. Their direct contact with mothers during the immediate postpartum period positions them effectively to influence breastfeeding behavior. This aligns with the World Health Organization and United Nations Children's Fund Baby-Friendly Hospital Initiative principles, which emphasize skilled counseling and support to achieve global

breastfeeding targets ^[1, 5].

These findings have important public health implications. Improving breastfeeding education coverage can lead to sustainable gains in infant growth and survival, especially in low- and middle-income settings where malnutrition remains a major contributor to under-five mortality ^[6, 11, 12]. Integrating structured breastfeeding education into routine maternal and child health services could thus be an effective, low-cost intervention to promote optimal infant nutrition and growth.

Conclusion

This study clearly demonstrates that structured breastfeeding education delivered through trained nursing professionals has a significant and positive impact on infant growth outcomes and exclusive breastfeeding rates during the first six months of life. Infants whose mothers received structured education showed better weight-for-age and length-for-age growth trajectories compared to those in the control group. Head circumference growth, though less pronounced, also reflected improved nutritional adequacy in the intervention group. These improvements coincide with the higher rates of exclusive breastfeeding observed across all follow-up intervals, reinforcing the strong link between optimal feeding practices and healthy early childhood development. The findings emphasize that breastfeeding education is not merely an informational intervention but a powerful behavioral and clinical strategy capable of producing measurable health benefits.

One of the key strengths of this approach is its feasibility and scalability, particularly in primary health care and community settings. Nurses and lactation consultants, who maintain direct and early contact with mothers, are uniquely positioned to provide continuous, evidence-based breastfeeding support. Integrating structured education into routine postnatal care could serve as a cost-effective and sustainable way to address early growth faltering and malnutrition. Practical recommendations emerging from this study include the incorporation of structured breastfeeding education modules into standard maternal and child health programs, ensuring that counseling begins antenatally and continues through the early postpartum period. Training programs should focus on practical skills such as correct positioning, effective latch techniques, managing common breastfeeding problems, and building maternal confidence. Additionally, establishing regular follow-up mechanisms—through home visits, teleconsultations, or community health clinics—can reinforce early messages and help sustain exclusive breastfeeding practices.

Policymakers and healthcare administrators should prioritize breastfeeding education as an essential component of child health strategies, allocating appropriate resources for training, staffing, and supportive infrastructure. Community awareness campaigns can complement clinical interventions by normalizing breastfeeding, addressing cultural barriers, and promoting family involvement in infant feeding decisions. Furthermore, incorporating breastfeeding indicators into routine health surveillance can help track progress and strengthen accountability in achieving national nutrition goals. In essence, the findings highlight breastfeeding education as a simple yet powerful intervention to promote healthy infant growth, reduce malnutrition risks, and build a foundation for improved child health outcomes. Widespread implementation of such

programs has the potential to contribute substantially to national and global child health targets, ultimately fostering healthier generations.

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