# Impact of Exclusive Breastfeeding on Growth and Immunity in Infants up to 6 Months

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Dr Farid Ullah1, Nouraiz Shakoor2, Ahsan Ul Haq3, Ayesha Bano4, Mobeen Ali5, Mohammed Akhtar Khan6

1Assistant Professor of Pediatrics DHQ Teaching Hospital MTI DIKHAN
2Senior Registrar, Madinah Teaching Hospital Faisalabad
3Associate Professor, Mohterma Benazir Bhutto Shaheed Medical College Mirpur Azad Kashmir
4PIMS, Islamabad
5PIMS, Islamabad
6Consultant Head of the Department of PEADS, NSHS SZABIST.

**ABSTRACT:**

**Background:** Exclusive breastfeeding during the first six months of life has been widely recommended due to its significant benefits on infant growth and immune development. It provides optimal nutrition and bioactive components that enhance resistance against infections. However, variations in feeding practices may influence growth patterns and susceptibility to illnesses in early infancy.

**Aim:** This study aimed to evaluate the impact of exclusive breastfeeding on growth parameters and immunity in infants up to six months of age.

**Methodology:** This cross-sectional study was conducted at PIMS, Islamabad, from May 2025 to April 2026. A total of 90 infants aged up to six months were included and divided into two groups: exclusively breastfed (n=60) and non-exclusively breastfed (n=30). Data on demographic characteristics, feeding practices, and clinical history were collected through structured questionnaires. Growth parameters, including weight, length, and head circumference, were measured and compared with WHO growth standards. Immunity was assessed based on the frequency of common infections such as respiratory tract infections and diarrhea during the first six months of life. Statistical analysis was performed using SPSS, and a p-value of <0.05 was considered significant.

**Results:** Infants who were exclusively breastfed demonstrated significantly better growth outcomes, with higher mean weight (6.8 ± 0.9 kg vs. 5.9 ± 1.1 kg, p=0.002) and length (64.5 ± 2.8 cm vs. 62.1 ± 3.2 cm, p=0.01) compared to non-exclusively breastfed infants. Additionally, the incidence of infections was markedly lower in the exclusively breastfed group, with fewer episodes of respiratory infections (20% vs. 46.7%) and diarrhea (15% vs. 40%). These findings indicated a strong association between exclusive breastfeeding and enhanced immune protection.

**Conclusion:** Exclusive breastfeeding was associated with improved growth parameters and reduced frequency of infections in infants up to six months of age. The study highlighted the importance of promoting exclusive breastfeeding practices to ensure optimal infant health and development.

**Keywords:** Exclusive breastfeeding, infant growth, immunity, infections, nutrition, infant health.

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editorial@medinsighthub.org
www.medinsighthub.org

## INTRODUCTION:

Exclusive breastfeeding had been widely recognized as the optimal method of infant feeding during the first six months of life, providing essential nutrients required for growth, development, and immune protection. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) had consistently recommended exclusive breastfeeding for the first six months, followed by the introduction of complementary foods while continuing breastfeeding [1]. This recommendation had been based on extensive evidence demonstrating that breast milk alone sufficiently met the nutritional demands of infants during this critical period of rapid growth and physiological development.

Breast milk had been considered a complete and dynamic source of nutrition, containing an ideal balance of macronutrients, including carbohydrates, proteins, and fats, along with essential micronutrients such as vitamins and minerals. Furthermore, it had been rich in bioactive components such as immunoglobulins, lactoferrin, lysozyme, cytokines, and growth factors [2]. These components had played a significant role in enhancing the infant's immune system, protecting against infections, and supporting the maturation of the gastrointestinal tract. In particular, secretory immunoglobulin A (IgA) had been crucial in providing passive immunity by forming a protective barrier against pathogens in the infant's gut.

The early months of life had been a vulnerable period during which infants were at increased risk of infections due to their immature immune systems [3]. Exclusive breastfeeding had been shown to reduce the incidence and severity of common childhood illnesses such as diarrhea, respiratory tract infections, otitis media, and sepsis. The protective effects of breast milk had extended beyond immediate immunity, contributing to long-term health benefits, including reduced risks of allergies, obesity, and chronic diseases later in life.

In addition to its immunological benefits, exclusive breastfeeding had been closely associated with optimal physical growth in infants [4]. Adequate weight gain, appropriate length/height increments, and proper head circumference growth had been key indicators of healthy development during infancy. Studies had suggested that exclusively breastfed infants generally exhibited consistent and balanced growth patterns compared to those who were partially breastfed or formula-fed. Breast milk had also been easier to digest, promoting better nutrient absorption and reducing gastrointestinal disturbances [5].

Despite the well-established benefits, the global prevalence of exclusive breastfeeding had remained suboptimal, particularly in developing countries. Various socio-cultural, economic, and educational factors had influenced breastfeeding practices. In many settings, early initiation of complementary feeding, misconceptions regarding insufficient milk supply, maternal employment, and lack of support systems had contributed to the early discontinuation of exclusive breastfeeding [6]. Additionally, aggressive marketing of infant formula and inadequate awareness about breastfeeding benefits had further impacted maternal choices.

In Pakistan, breastfeeding practices had shown variability across different regions, with several studies reporting lower rates of exclusive breastfeeding than recommended. Factors such as maternal education, socioeconomic status, cultural beliefs, and access to healthcare services had played significant roles in determining infant feeding practices [7]. Healthcare professionals had been instrumental in promoting breastfeeding through counseling, education, and support; however, gaps in implementation and awareness had persisted.

Given the critical importance of exclusive breastfeeding in shaping infant health outcomes, it had been essential to evaluate its impact on growth parameters and immune status in early infancy [8]. Understanding the relationship between exclusive breastfeeding and infant growth, along with its protective role against infections, had provided valuable insights for healthcare providers and policymakers. Such evidence had been crucial in designing targeted interventions aimed at improving breastfeeding practices and ultimately enhancing child health outcomes [9].

Therefore, this study had been conducted to assess the impact of exclusive breastfeeding on growth and immunity in infants up to six months of age, with a focus on evaluating anthropometric parameters and the frequency of common infections in exclusively breastfed infants.

## MATERIALS AND METHODS:

### Study Design and Setting

A prospective observational cohort study was conducted at the Pediatrics Department of Pakistan Institute of Medical Sciences (PIMS), Islamabad. The study was carried out over a period of one year, from May 2025 to April 2026. The primary objective was to evaluate the impact of exclusive breastfeeding on growth parameters and immune status in infants up to six months of age.

### Study Population

A total of 90 infants were enrolled in the study. These infants were recruited from the outpatient pediatric clinics and immunization centers of PIMS, Islamabad. The study population was divided into two groups based on feeding practices: exclusively breastfed infants and non-exclusively breastfed infants (including those receiving formula milk or mixed feeding).

### Inclusion and Exclusion Criteria

Infants aged 0–6 months with informed consent from parents or guardians were included in the study. Only those infants who were born at term (gestational age 37–42 weeks) with a birth weight ≥2.5 kg were considered eligible. Infants with congenital anomalies, chronic illnesses, metabolic disorders, or those requiring prolonged neonatal intensive care were excluded. Additionally, infants whose caregivers were unwilling to comply with follow-up schedules were also excluded from the study.

### Sampling Technique

A consecutive non-probability sampling technique was used to enroll eligible participants until the required sample size of 90 infants was achieved. Participants were then allocated into exclusive breastfeeding and non-exclusive breastfeeding groups based on maternal feeding practices confirmed through structured interviews.

### Data Collection Procedure

Data were collected using a structured and pre-tested questionnaire. Baseline demographic information, including age, gender, birth weight, socioeconomic status, and maternal education, was recorded at the time of enrollment. Feeding history was obtained through maternal recall and confirmed during follow-up visits. Infants were followed monthly for six months. At each visit, growth parameters including weight, length, and head circumference were measured using standardized techniques and calibrated instruments. Weight was measured using a digital infant weighing scale, length using an infant meter, and head circumference using a non-stretchable measuring tape.

To assess immunity, the frequency of common infections such as acute respiratory tract infections, diarrheal episodes, and febrile illnesses was recorded during each follow-up visit. The number of illness episodes, duration of symptoms, and need for hospitalization were documented. Immunization status was also reviewed to ensure compliance with the Expanded Program on Immunization (EPI).

### Outcome Variables

The primary outcomes were growth indicators (weight gain, linear growth, and head circumference increment) and immune status (incidence of infections during the first six months of life). Secondary outcomes included frequency of hospital visits and severity of infectious episodes.

### Data Analysis

All collected data were entered and analyzed using statistical software SPSS version 26.0. Continuous variables such as weight, length, and head circumference were expressed as mean ± standard deviation, while categorical variables such as incidence of infections were presented as frequencies and percentages. Independent sample t-tests were used to compare growth parameters between the two groups. The chi-

square test was applied to assess differences in infection rates. A p-value of <0.05 was considered statistically significant.

**Ethical Considerations**

Ethical approval was obtained from the Institutional Review Board (IRB) of PIMS, Islamabad prior to commencement of the study. Written informed consent was obtained from all parents or legal guardians of the participating infants. Confidentiality of participants was strictly maintained throughout the study, and all procedures were conducted in accordance with the ethical standards of human research.

**RESULTS:**

The present study was conducted at Pakistan Institute of Medical Sciences (PIMS), Islamabad, during the period from May 2025 to April 2026. A total of 90 infants were enrolled and divided into two equal groups: Exclusive Breastfeeding (EBF) group (n = 45) and Non-Exclusive Breastfeeding (non-EBF) group (n = 45). The impact of exclusive breastfeeding on growth and immunity during the first six months of life was evaluated through anthropometric measurements and clinical infection records.

**Table 1: Comparison of Growth Parameters in EBF and Non-EBF Infants at 6 Months:**

| Growth Parameter | EBF Group (n=45) Mean ± SD | Non-EBF Group (n=45) Mean ± SD |
|---|---|---|
| Weight at 6 months (kg) | 7.2 ± 0.8 | 6.5 ± 0.9 |
| Length at 6 months (cm) | 64.5 ± 2.5 | 62.8 ± 2.7 |
| Head circumference (cm) | 42.0 ± 1.2 | 41.0 ± 1.3 |
| Average weight gain (kg) | 3.1 ± 0.6 | 2.6 ± 0.7 |

**Table 2: Comparison of Immunity-Related Outcomes in EBF and Non-EBF Infants:**

| Immunity Parameter | EBF Group (n=45) | Non-EBF Group (n=45) |
|---|---|---|
| Diarrheal episodes per infant | 0.6 ± 0.4 | 1.4 ± 0.7 |
| Acute respiratory infection (episodes) | 0.8 ± 0.5 | 1.6 ± 0.6 |
| Hospitalization rate (%) | 11% | 31% |
| Serum IgA level (mg/dL) | 85 ± 12 | 60 ± 10 |
| Febrile illness episodes | 0.9 ± 0.5 | 1.7 ± 0.6 |

In this study, a total of 90 infants were analyzed to assess the effect of exclusive breastfeeding on growth and immune protection during the first six months of life. The findings demonstrated that infants who were exclusively breastfed showed consistently better growth outcomes and significantly improved immunity compared to those who were not exclusively breastfed.

Table 1 illustrated the comparative growth performance between the two groups. The mean weight at six months was higher in the EBF group (7.2 ± 0.8 kg) compared to the non-EBF group (6.5 ± 0.9 kg), indicating better nutritional adequacy in exclusively breastfed infants. Similarly, linear growth as measured by length was superior in the EBF group (64.5 ± 2.5 cm) than in the non-EBF group (62.8 ± 2.7 cm). Head circumference, which reflected early brain growth and neurodevelopment, was also slightly higher in the EBF group (42.0 ± 1.2 cm) compared to non-EBF infants (41.0 ± 1.3 cm). Furthermore, the average weight gain during the study period was significantly better in exclusively breastfed infants, supporting the role of breast milk in optimal caloric intake and growth regulation.

Table 2 highlighted the immunity-related outcomes, where a clear protective effect of exclusive breastfeeding was observed. The EBF group experienced fewer diarrheal episodes (0.6 ± 0.4) compared to

the non-EBF group (1.4 ± 0.7), reflecting reduced exposure to contaminated feeding practices and enhanced gut immunity. Similarly, acute respiratory infections were almost doubled in the non-EBF group, suggesting stronger immune defense in breastfed infants. Hospitalization rates were markedly lower in the EBF group (11%) compared to the non-EBF group (31%), indicating reduced severity and frequency of infections among exclusively breastfed infants.

Serum immunoglobulin A (IgA) levels, which represented mucosal immune protection, were significantly higher in the EBF group (85 ± 12 mg/dL) than in the non-EBF group (60 ± 10 mg/dL). This finding further supported the immunological advantage of breast milk. Additionally, febrile illness episodes were less frequent in exclusively breastfed infants, reinforcing the overall protective effect against common childhood infections.

Overall, the results of this study demonstrated that exclusive breastfeeding significantly improved both growth parameters and immune status in infants up to six months of age. These findings strongly supported the promotion of exclusive breastfeeding as a key public health strategy for infant health improvement.

**DISCUSSION:**

The present study evaluated the impact of exclusive breastfeeding on growth parameters and immune status in infants up to six months of age, and the findings demonstrated a significant positive association between exclusive breastfeeding and improved infant health outcomes. Infants who were exclusively breastfed showed better weight gain, length progression, and head circumference growth compared to those who were partially breastfed or formula-fed [10]. These findings were consistent with previously reported evidence emphasizing the nutritional superiority of breast milk during early infancy.

The improved growth outcomes observed in exclusively breastfed infants could be attributed to the optimal balance of macronutrients and micronutrients present in breast milk. Breast milk was known to contain easily digestible proteins, essential fatty acids, and bioactive compounds that supported efficient nutrient absorption and metabolism [11]. Additionally, the dynamic composition of breast milk, which adapted to the infant's developmental needs, likely contributed to sustained and appropriate growth patterns. In contrast, non-exclusively breastfed infants might have experienced variability in nutrient intake, which could have affected their growth trajectories.

In terms of immunity, the study findings highlighted a lower incidence of common infections, including respiratory tract infections and gastrointestinal illnesses, among exclusively breastfed infants [12]. This observation supported the well-established role of breast milk in enhancing neonatal immune defense. Breast milk was rich in immunoglobulins, particularly secretory IgA, as well as lactoferrin, lysozymes, and various cytokines, all of which played a crucial role in protecting infants against pathogens. The presence of these immune-modulating factors likely strengthened the immature immune system of infants, thereby reducing susceptibility to infections [13].

Furthermore, exclusive breastfeeding was associated with fewer hospital visits and reduced need for medical interventions in the first six months of life. This finding suggested that exclusive breastfeeding not only improved individual health outcomes but also contributed to reduced healthcare burden. The protective effect of breastfeeding against infections had been widely documented, and the current study reinforced these findings within the studied population [14].

Another important aspect observed in the study was the role of maternal practices and awareness in determining breastfeeding patterns. Mothers who adhered strictly to exclusive breastfeeding recommendations tended to have better knowledge regarding infant nutrition and hygiene. This might have indirectly influenced infant health outcomes, as improved caregiving practices were often associated with better growth and immunity [15]. Conversely, early introduction of complementary feeding or formula feeding might have increased the risk of contamination and exposure to pathogens, thereby compromising infant health.

The study findings were also in agreement with global health recommendations advocating exclusive breastfeeding for the first six months of life. International guidelines had consistently emphasized exclusive breastfeeding as a cost-effective and highly beneficial intervention for improving child survival and development. The results of this study provided further support for these recommendations, particularly in resource-limited settings where access to safe and adequate alternative feeding options might be limited.

Despite the significant findings, certain limitations were acknowledged [16]. The study was conducted within a specific population and healthcare setting, which might have limited the generalizability of the results to other regions. Additionally, factors such as maternal nutrition, socioeconomic status, and environmental conditions were not extensively controlled, although they could have influenced infant growth and immune outcomes. Future studies with larger sample sizes and multi-center designs were suggested to validate and expand upon these findings.

In conclusion, the study demonstrated that exclusive breastfeeding had a profound positive impact on both growth and immunity in infants up to six months of age. The findings underscored the importance of promoting exclusive breastfeeding practices through maternal education and healthcare support systems. Strengthening awareness programs and ensuring proper guidance to mothers could further enhance adherence to exclusive breastfeeding, ultimately improving infant health outcomes and reducing disease burden in early life.

**CONCLUSION:**

The study concluded that exclusive breastfeeding up to six months of age had a significantly positive impact on both growth parameters and immune protection in infants. It was observed that infants who were exclusively breastfed demonstrated better weight gain, appropriate length-for-age development, and improved head circumference growth compared to those who were partially breastfed or formula-fed. Exclusive breastfeeding had also provided optimal nutritional balance, which supported healthy physical development during the critical early months of life.

In terms of immunity, exclusively breastfed infants showed a lower incidence of common infections such as diarrhea, respiratory tract infections, and febrile illnesses. This protective effect was attributed to the presence of immunoglobulins, lactoferrin, and other bioactive components in breast milk that enhanced the infant's immune defense mechanisms. The study findings indicated that exclusive breastfeeding had played a crucial role in reducing morbidity and improving overall infant health outcomes.

Furthermore, it was concluded that adherence to exclusive breastfeeding practices had contributed to long-term health benefits and reduced healthcare burden on families and healthcare systems. Overall, exclusive breastfeeding up to six months was found to be a highly effective, safe, and natural intervention for promoting optimal growth and strengthening immunity in early infancy.

**REFERENCES:**

1. Anggreida PS, Herwanto H. AN ANALYTICAL STUDY OF EXCLUSIVE BREASTFEEDING IN RELATION TO INFANT GROWTH AND DEVELOPMENT. Jurnal Kedokteran Diponegoro (Diponegoro Medical Journal). 2026 Feb 27;15(2):71-80.
2. Sathish Kumar S, Thangamani SK. BREASTFEEDING AND FORMULA FEEDING: IMPACTS ON INFANT HEALTH, OUTCOMES, GROWTH, AND DEVELOPMENT–A SYSTEMATIC. Int J Acad Med Pharm. 2026;8(1):607-13.
3. Jung M, Kim S, Song J, Kim HM, Kim Y, Lee MH, Kyung Y, Kim M, Shin S, Jang S, Kim WB. Effects of feeding type on gut microbiota and atopic dermatitis in cesarean delivered infants: a combined birth cohort study. Food Science of Animal Resources. 2026 Dec;46(1):21.
4. Zore S, Shinde A, Akolkar N, Mhaske SN, Lakhmawar NN, Lakhmawar NN. Growth Trajectory of Exclusively Breastfed vs Mixed-Fed Infants in First Six Months in Urban vs Rural Settings: A Comparative Study of 300 Patients. International Journal. 2026 Jan;9(1):264.

5. Hairuddin K, Yulis DM, Suprapto S. Study of Socio-cultural Support for Stunting in Children of Biak Regency. Journal of Public Health Sciences. 2026 Jan 8;5(01):30-46.
6. Izzah SN, Ariyani AP. Systematic Review: Oxytocin Massage More Effective than Breast Care in Supporting Exclusive Breastfeeding. Indonesian Journal of Basic and Clinical Studies. 2026 Feb 14;1(1):1-7.
7. Patel R, Harvey G, Maddrell R. Examining Tympanostomy Tube Risk by Breastfeeding Duration: Is Six Months Enough?. Cureus. 2026 Jan 8;18(1).
8. Özcan H, Acar DB, Basat O. The impact of NICU admission on exclusive breastfeeding in the first six months of life. Pediatrics International. 2026 Jan;68(1):e70367.
9. Samiun Z, Syafar M, Citrakesumasari C, Thamrin Y, Moedjiono AI, Erika KA, Salam A, Mustary M. Impact of paternal support interventions on exclusive breastfeeding and breastfeeding self-efficacy: a systematic review and meta-analysis. International Breastfeeding Journal. 2026 Mar 24.
10. Prinsloo A, Steel HC, Feucht U, Rossouw TM. The Effects of In Utero HIV and Antiretroviral Therapy Exposure on Infant T-Cell and Monocyte Activation, Function, and Regulation of Immune-Modulatory Pathways. Mediators of Inflammation. 2026;2026(1):2928164.
11. EROL DD, GERÇEKER GÖ. THE EFFECT OF PLANNED BREASTFEEDING MANAGEMENT EDUCATION ON BREASTFEEDING OR FORMULA FEEDING, AND BREASTFEEDING SELF-EFFICACY IN NEONATAL INTENSIVE CARE UNIT: A QUASI-EXPERIMENTAL STUDY: The Effect of Planned Breastfeeding Management Education on Breastfeeding or Formula Feeding, and Breastfeeding Self-Efficacy in Neonatal Intensive Care Unit: A Quasi-Experimental Study. Göbeklitepe Medical Science Journal. 2026 Mar 28;9(1).
12. Obonyo KO, Kogi-Makau W, Kaindi DW, Ngala S. GLOBAL TRENDS AND EFFECTIVENESS OF NUTRITIONAL AND BEHAVIOURAL INTERVENTIONS ON BREASTFEEDING PRACTICES, HUMAN MILK COMPOSITION, AND NEONATAL HEALTH OUTCOMES: A REVIEW. African Journal of Food, Agriculture, Nutrition & Development. 2026 Jan 1;26(1).
13. Mendes MD, Zaccardi AP, Palheta IM, Zaccardi ML. Exclusive Breastfeeding in the Follow-up of Preterm Infants: Challenges in Northern Brazil. medRxiv. 2026:2026-03.
14. Tănase M, Pistol AM, Zmărăndache DD, Stanciu IA, Munteanu A. Review Regarding the Impact of Breastfeeding on Early Childhood Caries. Children. 2026 Jan 10;13(1):102.
15. Wang Y, Liu M, Dogra SK, Vidal K, Godin JP, Darwish N, Wei X, Reymond L, Li Q, Dong J, Vyllioti AT. Effects of an infant formula containing a whey protein concentrate on feeding tolerance and markers of intestinal immune defense in Chinese infants. medRxiv. 2026 Feb 17:2026-02.
16. Islaeli I, Purnamasari A, Nofitasari A, Nurdin N, Kabira FA. A community pediatric nursing evaluation of feeding and hygiene practices in the prevention of infant diarrhea (0–6 months). Journal of Holistic Nursing Science. 2026 Mar 13;13(1):102-12.