

Research Article

Correlation Between Feeding Pattern and Duration of Hospital Stay in Pneumonia of Infants Below 6 Months of Age

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Abstract

Introduction: Pneumonia is the most common respiratory disorder among infants and one of the leading causes of hospital admission. Various feeding patterns have multiple impacts on pneumonia and recovery from it. Breast milk provides some protective properties against respiratory tract and gastrointestinal illness to protect infants during the first year of life. This study aimed to find an association between feeding patterns and duration of hospital stay due to pneumonia in infants below 6 months of age. **Methodology:** This cross-sectional study was conducted in the Department of Paediatrics, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh from February, 2019 to August, 2020. In our study, 200 infants below 6 months of age admitted with pneumonia in the Department of Paediatrics in Shaheed Suhrawardy Medical College Hospital, Dhaka were enrolled according to selection criteria. **Result:** Maximum incidence was seen in the 3 to 4 months of age, e.g. 40.0% & 36.30% in girls and boys respectively, mean age of the pneumonia patient was 2.9 ± 1.5 months. Out of 200 cases, 55.0% cases were male and 45.0% were female. Among all infants 93.75% of exclusively breastfed infants needed ≤ 10 days, and 27.88% of non-exclusive breastfed infants needed > 10 days in the hospital for recovery from pneumonia. In both cases, the p-value was 0.001. **Conclusion:** Exclusive breastfed infants have shorter and non-exclusive breastfed infants have longer hospital stays due to pneumonia below 6 months of age.

Keywords

Correlation, Feeding Pattern, Hospital Stay, Pneumonia, Infants

1. Introduction

Pneumonia is an acute lower respiratory tract infection that specifically affects the lung parenchyma. It is a common problem in infants with significant mortality and a major cause of referral and hospital admission. It is the leading cause of death globally, accounting for approximately 1.2 million

children younger than 5 years annually [1]. In the context of child survival strategies, countries should plan for the control of pneumonia. The main strategies for managing cases at all levels, preventing and controlling HIV infection, improving nutrition and lowering low birth weight, controlling indoor air

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pollution, encouraging exclusively breastfeeding, and zinc supplementation are the best ways to treat, prevent, and guard against pneumonia [2].

Various factors like the age of the child, nutrition state, breastfeeding practices, vaccination status, bacterial profile, and associated congenital anomalies determine the severity of pneumonia and mortality due to pneumonia. WHO experts' panel redefined the classification of pneumonia severity as 'pneumonia' with fast breathing and/or chest indrawing and 'severe pneumonia'- pneumonia with any general danger signs [3]. A systematic review and meta-analysis reported that suboptimal breastfeeding practices among infants and young children <24 months of age are associated with elevated risk of pneumonia morbidity and mortality [4].

A lot of research has been done on how human milk protects against acute illnesses. In the past ten years, many studies have shown that breastfed babies have a lower incidence of infectious disorders than babies given alternative types of milk [5]. In the case of acute respiratory infections, the barrier effect does not exist; thus, the mechanisms for such a protective effect must include substances with anti-microbial activity or that modulate the immune response of the infant. The evidence of protection against respiratory tract infections relates more to lower incidence rates, but little attention has been given to the effects on the severity and duration of individual episodes.

More than 95% of all new occurrences of pneumonia in children under the age of five occur in developing nations as a result of factors like illiteracy, low immunization coverage, undernutrition, and absence of exclusive breastfeeding. Risk factors for severe pneumonia include not breastfeeding exclusively until six months of age, not receiving all recommended vaccinations, malnutrition in children, and being an infant or toddler [6]. It remains unclear whether breastfeeding protects infants against acute respiratory infection (ARI). To determine if breastfeeding protects against ARI as it does against diarrhea, 170 healthy newborns were followed for 6 months. Feeding mode, incidence, and duration of ARI and diarrhea were recorded biweekly. Incidence of ARI was significantly lower in fully breast-fed infants than in formula-fed infants from birth up to 4 months, as was the mean duration of individual episodes (5.1 ± 3.5 vs. 6.4 ± 3.6 d, respectively). The incidence of ARI was negatively associated with the duration of breastfeeding and positively associated with the presence of siblings ($P < 0.05$) [7]. The results demonstrate protection against ARI as a result of breastfeeding similar to that for diarrhea, i.e., lower incidence and percentage of days ill, and episodes of shorter duration. In addition to preventive treatments including exclusive breastfeeding, routine vaccinations, and supplemental feeding, three main therapeutic approaches that emphasize community capacity building can help reduce pneumonia mortality in underdeveloped countries [8].

Mean hospital stay was less in the case of breastfed infants afflicted with gastroenteritis, bronchopneumonia, bronchio-

litis, otitis media, or skin diseases compared to top-fed infants. There is a statistically significant association between feeding patterns and morbidity among breastfed infants of less than six months of age. Lesser morbidity in cases of gastroenteritis, bronchopneumonia, bronchiolitis, meningitis, and septicemias was seen [9]. Therefore, this study aimed to find a relationship between feeding patterns and duration of hospital stay due to pneumonia in infants below 6 months of age at tertiary care hospitals in Bangladesh.

2. Methodology & Materials

This cross-sectional study was conducted in the Department of Paediatrics, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh from February, 2019 to August, 2020. In our study, 200 infants below 6 months of age admitted with pneumonia in the Department of Paediatrics in Shaheed Suhrawardy Medical College Hospital, Dhaka were enrolled according to selection criteria.

These are the following criteria to be eligible for enrollment as our study participants: a) Infants aged below 6 months; b) Infants with high fever, fast breathing & cough; c) Infants with chest indrawing, & crepitation on auscultation; d) Infants with typical X-ray findings of pneumonia were included in the study And a) Infants with any history of acute illness (e.g., renal or pancreatic diseases, ischemic heart disease, asthma, etc.); b) Infants who will not complete ongoing treatment were excluded from our study.

Data collection procedure: Diagnosis was made based on the patient's statement, the statement of the witness, and characteristic features of pneumonia, clinical examination, and available records. A thorough history and physical examination were performed and recorded on the questionnaire. Demographic data of the infants, mode of delivery, pre-lacteal feeds, type of milk, frequency, and pattern of infant feeding, and previous illnesses were recorded. Based on the feeding pattern infants were categorized as exclusively breastfed, artificial fed, and mixed fed. All other details of feeding practices were taken. The nutritional status was determined using WHO growth charts for recording growth percentiles.

Statistical Analysis: All data were recorded systematically in preformed data collection form. Quantitative data was expressed as mean and standard deviation and qualitative data was expressed as frequency distribution and percentage. Comparison will be done by Chi-Square (χ^2) test and unpaired t-test where necessary. A p-value < 0.05 was considered as significant. Statistical analysis was performed by using SPSS 16 (Statistical Package for Social Sciences) for Windows version 10. The Ethical Review Committee of Shaheed Suhrawardy Medical College Hospital, Dhaka approved the study.

3. Results

Figure 1 shows the age distribution of 200 patients by gender. In the study, the maximum incidence (36.30%) in

boys was seen in the 3 to 4 months of age, followed by in the 1-2 months of age (34.50%). The highest incidence of pneumonia in girls was in the age group between 3-4 months (40.0%) and followed by 1-2 months (35.50%) respectively.

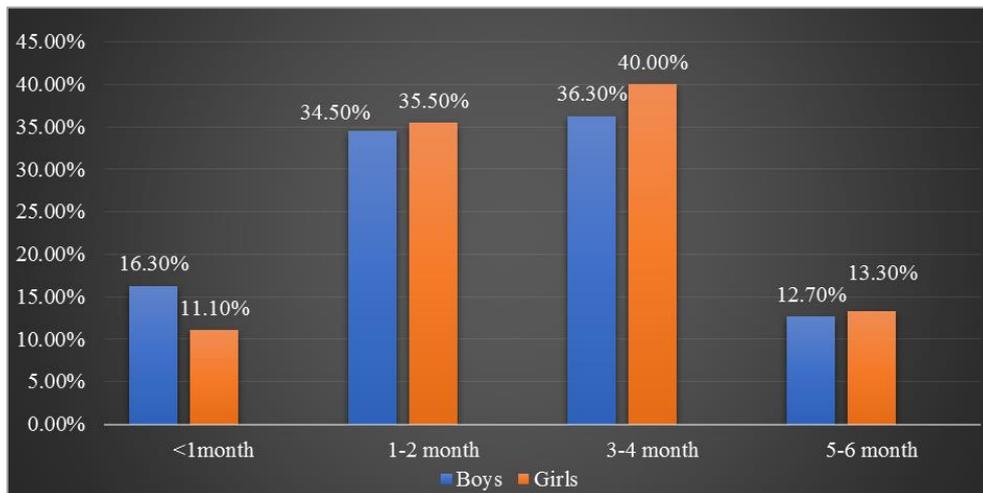


Figure 1. Age distribution of study patients by gender.

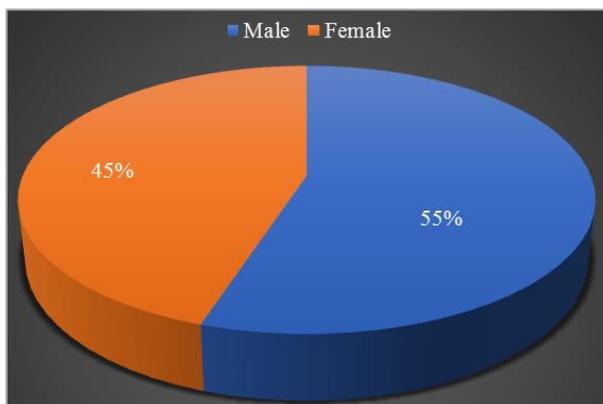


Figure 2. Sex distribution of patients (n=200).

Figure 2 shows the gender of the patients. Among 200 study patients, most of the patients were male (55.0%) and 45.0% were female. The male and female ratio was 1.22:1 in this study.

Figure 3 shows that most of the patients were from the poor income group 42%, followed by the middle-income group 38%, and the remaining upper-income group 20%.

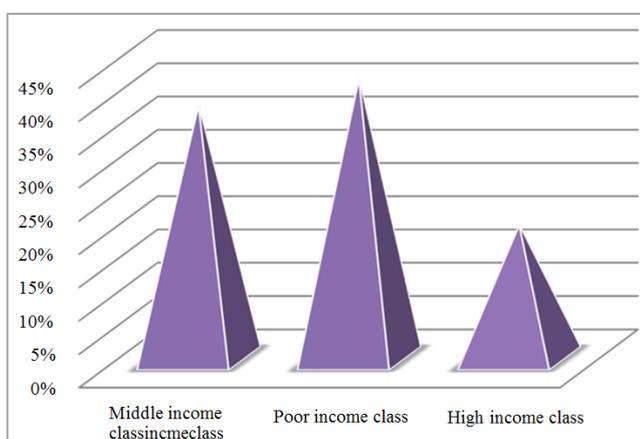


Figure 3. Socioeconomic status of the study population (n=200).

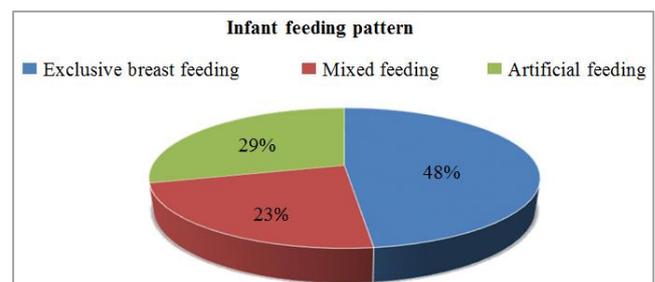


Figure 4. Distribution of the pneumonic infant according to feeding pattern (n=200).

The pie chart shows the feeding pattern of infants. Exclusive breastfeeding was observed in 48% of infants, mixed feeding was reported in 23.0%, and artificial feeding in 29.0% of infants.

Table 1. Distribution of the pneumonic infant according to duration of hospitalization (n=200).

Duration of hospitalization	Number of patients	Percentage (%)
≤ 10 days	165	82.5
>10 days	35	17.5

Table 1 shows the hospital stay of pneumonic children. Among the 200 patients, the duration of hospitalization revealed that 82.5% of patients' duration was ≤ 10 days, and 17.5% of patients required >10 days.

Table 2. Relationship between feeding pattern and duration of hospital stay (n=200).

Feeding pattern	Duration of hospital stay		P-value
	≤10 days	>10 days	
EBF (n=96)	90 (93.75%)	6 (6.25%)	0.001
Non-EBF (n=104)	75 (72.12%)	29 (27.88%)	0.001
Total	165	35	

EBF= exclusive breastfeeding; Non EBF=mixed feeding + artificial feeding.

Table 2 shows the relationship between feeding patterns and duration of hospital stay. It was evident from this study that exclusive breastfeeding is associated with less hospital stay, but babies with other feeding patterns require prolonged hospital stay. The difference between groups was statistically significant.

4. Discussion

This study investigated the correlation of feeding patterns with the duration of hospital stay while earlier studies explored the elevated risk of mortality & morbidity pneumonia in non-breastfed infants [4]. This study found that EBF infants with pneumonia before 6 months needed less hospital stay for recovery.

In this study exclusive breastfeeding was observed in 48% of infants, mixed feeding was reported in 23.0%, and artificial feeding in 29.0% of infants. In this study, we observed the maximum incidence of pneumonia within 3-4 months of age. A previous study reported that the prevalence of exclusive breastfeeding is low among the population, with only one-third of infants exclusively breastfed at 6 weeks of age and less than 20 % having ever been exclusively breastfed during the first 6 months of life [9]. Thu et al. have previously

reported exclusive breastfeeding in rural Vietnam at 3 months of age as 58 % in boys and 65 % in girls [10].

There was a scarcity of evidence examining the impact of inadequate breastfeeding on certain morbidity events during the neonatal period. However, studies reporting the impact of breastfeeding on all-cause mortality were largely consistent. Our review validates and expands upon the evidence base established by the Lancet nutrition series [11]. A prospective study among 232 infants in the age group of 14 weeks to 6 months was evaluated. Infants are divided into two groups: breastfed and top-fed. They reported that breastfed infants have shorter hospital stays and less morbidity with various disorders than top-fed newborns [12].

About 82.5% of patients needed equal or less than 10 days while the rest part needed more time for recovery. Among all infants, 93.75% of EBF infants needed ≤10 days, where the p-value was 0.001 which was significant, and 27.88% of non-BBF (Mixed+Artificial) needed >10 days where the p-value was also significant. In the current study, a statistically significant relation was observed between shorter hospital stays in exclusively breastfed infants in comparison to non-exclusive breastfed infants. Results almost similar to our study were shown by a study conducted by Cushing et al. in the USA on 1202 healthy infants who were followed up for the first 6 months of life and incidence of lower respiratory infection in the form of wheezing or cough or both were noted. It was shown that breastfed infants had a shorter hospital stay of 5 days, compared to 6 days for non-breastfed infants (results were significant at 95% confidence interval) [13]. Another study from New Delhi on children treated with pneumonia likewise demonstrated that not exclusively breastfeeding is linked to longer hospital stays, defined as stays longer than five days. Of the infants with prolonged hospital stays, 86% were not exclusively breastfed, whereas only 14% were exclusively breastfed [14].

Our study is supported by another study from Brazil on bronchiolitis patients in which it was concluded that exclusive breastfeeding was negatively correlated with hospital stay [15]. A study from Scotland concluded that exclusively breastfed infants had a shorter length of hospital stay (mean: 2.81 days) compared with formula-fed infants (mean stay: 3.25 days) but the length of hospital stay was not calculated for diseases individually [16]. Another study supported that the estimated relative risk of prevalent pneumonia was higher among partially and not breastfed infants 0-5 months of age compared to those exclusively breastfed. The relative risk of prevalent pneumonia was also elevated among infants 6-23 months of age who were not breastfed compared to those who were breastfed [7].

In another study hospital admission because of broncho-pneumonia in breastfed infants was 7.33% while in top-fed infants it was 12.07% and in case of bronchiolitis admission in breastfed infants was 3.45% and in top-fed infants, it was 7.33% [17]. According to a Scottish study, formula-fed infants had a 1.50 hazard ratio for lower respiratory tract infec-

tions, while breastfeeding infants had a 1.0 hazard ratio [7].

Our result is further supported by a meta-analysis of the preventive impact of breastfeeding in avoiding hospitalization for respiratory infections. After analyzing seven studies from developed nations, it was shown that formula feeding, as opposed to at least four months of exclusive breastfeeding, is linked to a 3.6-fold increase in an infant's risk of respiratory hospitalization [16].

Another study showed that only breastfeeding for 3 or more months was associated with a lower risk of hospital admission in the first 6 months of life for respiratory infection [18]. A comparative study was done in California to determine whether breastfeeding is protective against infection in relatively affluent populations and results indicated that the reduction in morbidity associated with breastfeeding is of sufficient magnitude to be of public health significance [19]. In 2011, a meta-analysis was released regarding the correlation between diarrhea incidence, prevalence, hospitalization, death, and breastfeeding. The analysis comprised eighteen studies, and the results showed that, compared to infants who were exclusively breastfed, the 0–5-month age group of mainly breastfed (RR 1.26), partially breastfed (RR 1.68), and not breastfed (RR 2.65) had a greater relative risk of diarrhea [20].

Our findings highlight the protective effects of breastfeeding against pneumonia, rapid recovery, and less mortality from it. Exclusive breastfeeding conferred incrementally greater protection among infants 0–6 months of age than mixed feeding and artificial breastfeeding.

5. Limitations of the Study

Our study was a single-center study. We took a small sample size due to our short study period. After evaluating those infants, we did not follow up with them for the long term and do not know other possible interference that may happen in the long term with these patients.

6. Conclusion and Recommendations

In our study, a statistically significant association has been found between feeding patterns and duration of hospital stay due to pneumonia in infants below 6 months. Exclusive breast-fed infants have a shorter duration of hospital stay and non-BBF infants have a longer duration of hospital stay. Exclusive breastfeeding and inhibition of artificial feeding are important elements of pneumonia prevention and early recovery from it.

So further study with a prospective and longitudinal study design including a larger sample size needs to be done to validate the findings of our study.

Ethical Approval

The study was approved by the Institutional Ethics Com-

mittee.

Author Contributions

Farjana Afroze Jui: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

Umme Qulsum Sonia: Formal Analysis, Funding acquisition, Investigation, Methodology, Validation

Mukta Thakur: Methodology, Resources, Software, Writing – original draft

Jakiya Jesmine: Formal Analysis, Investigation, Resources, Software

Al-Amin Mridha: Data curation, Project administration, Supervision, Visualization, Writing – review & editing

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Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Mathew S, Kelly, Thomas J, Sandora. Community Acquired Pneumonia. In: Kliegman RM, Stanton BF, St Gem JW, Schor, eds. Nelson Textbook of Pediatrics. 20th ed. Philadelphia: Elsevier; 2016. p 2088-93.
- [2] The Optimal Duration of Exclusive Breastfeeding. Report of an Expert Consultation. Geneva, Switzerland: World Health Organization; 2001.
- [3] World Health Organization. Chapter for textbooks: IMCI Integrated Management of Childhood Illness. Geneva: World Health Organization: 2001.
- [4] WHO Global Data Bank on Infant and Young Child Feeding, September 2015, <http://www.who.int/nutrition/databases/infantfeeding/en/>
- [5] International Institute of Population Sciences (IIPS) National Family Health Survey (NFHS-3), 2005-06: India: Volume I. Mumbai, India: International Institute of Population Sciences (IIPS); 2007.
- [6] Global Nutrition Targets 2025: Breastfeeding policy brief, September 2015, http://www.who.int/nutrition/publications/globaltargets2025_policybrief_breastfeeding/en/
- [7] Ajetunmobi OM, Whyte B, Chalmers J, et al. Breastfeeding is associated with reduced childhood hospitalization: evidence from a Scottish Birth Cohort 1997-2009. *Journal of Pediatrics* 2015; 166(3): 620-54.

- [8] Kramer M, Chalmers B, Hodnett E D, et al. Promotion of breastfeeding intervention trial (PROBIT): a randomized trial in the Republic of Belarus. *The Journal of the American Medical Association*. 2001; 285(4): 413–420.
- [9] Tarrant M, Kwok MK, Lam TH, Leung GM, Schooling CM. Breast-feeding and childhood hospitalizations for infections. *Epidemiology*. 2010 Nov 1; 21(6): 847-54.
- [10] Thu HN, Eriksson B, Khanh TT, Petzold M, Bondjers G, Kim CN, Thanh LN, Ascher H. Breastfeeding practices in urban and rural Vietnam. *BMC Public Health*. 2012 Dec; 12: 1-8.
- [11] Porta F, Mussa A, Baldassarre G, et al. Genealogy of breastfeeding. *European Journal of Pediatrics*. 2016; 175(1): 105–112. <https://doi.org/10.1007/s00431-015-2605-6>
- [12] Mishra D, Singh H. P. Kuppuswamy's socioeconomic status scale— a revision. *Indian Journal of Pediatrics*. 2003; 70(3): 273–274.
- [13] Cushing AH, Samet JM, Lambert WE, Skipper BJ, Hunt WC, Young SA, McLaren LC. Breastfeeding reduces risk of respiratory illness in infants. *American journal of epidemiology*. 1998 May 1; 147(9): 863-70.
- [14] Tiewsoh K, Lodha R, Pandey R. M, Broor S, Kalaivani M., Kabra S. K. Factors determining the outcome of children hospitalized with severe pneumonia. *BMC Pediatrics*. 2009; 9, article 15 <https://doi.org/10.1186/1471-2431-9-15>
- [15] Dornelles CT, Piva JP, Marostica PJ. Nutritional status, breastfeeding, and evolution of Infants with acute viral bronchiolitis. *Journal of health, population, and nutrition*. 2007 Sep; 25(3): 336.
- [16] Bachrach VR, Schwarz E, Bachrach LR. Breastfeeding and the risk of hospitalization for respiratory disease in infancy: a meta-analysis. *Archives of pediatrics & adolescent medicine*. 2003 Mar 1; 157(3): 237-43.
- [17] Kaur A, Singh K, Pannu MS, Singh P, Sehgal N, Kaur R. The effect of exclusive breastfeeding on hospital stay and morbidity due to various diseases in infants under 6 months of age: a prospective observational study. *International journal of pediatrics*. 2016; 2016(1): 7647054.
- [18] Howie PW, Forsyth JS, Ogston SA, Clark A, Florey CD. Protective effect of breastfeeding against infection. *British Medical Journal*. 1990 Jan 6; 300(6716): 11-6.
- [19] UNICEF 2015, Breastfeeding, viewed 3rd March 2018, <http://www.unicef.org/nutrition/-24824.html>
- [20] Williams LA, Davies PS, Boyd R, David M, Ware RS. A systematic review of infant feeding experience and hospitalization in developed countries. *Acta Paediatrica*. 2014 Feb; 103(2): 131-8.