



## Original Article

# Frequency and Outcome of Acute Respiratory Tract Infection in Exclusive, Partial, and Non-Breastfed Babies

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### Abstract

**Background:** Exclusive breastfeeding provides nutritional and immunological support for the normal growth and development of the infant. Bangladesh is traditionally a breastfed community. The probability of having an acute respiratory infection (ARI) episode was higher for formula-fed infants than fully breastfed infants during the first four months of life. The risks for partially breastfed infants fell between those of formula-fed and fully breastfed infants, suggesting a dose-response effect of breastfeeding on the risk of respiratory infection.

**Objective:** This study compares exclusive, partial, and non-breastfed groups regarding the frequency and outcome of acute respiratory infection.

**Materials and methods:** This cross-sectional comparative study was done at the Department of Pediatrics, Rajshahi Medical College Hospital, from January 2013 to June 2013, a period of six months. A total of 300 cases of infants suffering from ARI were selected. Among them, 100 are each for exclusive breastfed (EBF) babies, partially breastfed babies (PBF), and non-breastfed (NBF) babies. In addition, demographic profile, frequency, severity of attacks, outcomes, and length of hospital stay were assessed.

**Results:** Most EBF babies came to the hospital with a history of one or two attacks of ARI, but PBF and NBF babies had multiple attacks. i.e., two, three, or more attacks. Most of the NBF and PBF have presented with severe attacks (84% and 72%, respectively), whereas only 42% of EBF babies presented with severe attacks; nonetheless, a maximum of 58% of EBF babies present with mild attacks. The severe attack is more frequent in the PBF and NBF groups than in the EBF groups.

**Conclusion:** Frequency, severity, and hospital staying of ARI attacks are found to be more in the PBF and NBF group of babies than in EBF babies. Better outcomes were found in EBF group babies.

**Keywords:** Respiratory distress, severe, morbidity, mortality, breastfeeding, exclusive

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### Introduction

Exclusive breastfeeding is the fundamental component of child nutrition and survival. Exclusive breastfeeding provides nutritional and immunological support for the average growth and

development of the infant.<sup>1,2,3</sup> Bangladesh is regarded as a traditionally breastfed community.<sup>4</sup> In a survey in Bangladesh in 2007, 98.9% of children continued breastfeeding at one year. Almost equal numbers of rural and urban mothers continued breastfeeding at one year

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(98.9% versus 98.7%). An average of 88.8% of mothers were continuing breastfeeding at two years (87.8% of rural and 92.8% of urban mothers).<sup>5</sup>

In Dhaka's urban affluent, bottle feeding was observed in 3.6% at birth, 57.7% at one month, and 70% at four months of age.<sup>6</sup> The prevalence of bottle feeding was 2-3 times higher among urban mothers (Fifty-third World Health Assembly, 2000).<sup>7</sup> Every year, some 22 million children in developing countries die before their fifth birthday, many during the first year of life. ARI (Acute Respiratory Tract Infection) is one of the principal causes of these deaths.<sup>8</sup> In most of the studies, it has been shown that lack of breastfeeding is associated with increased incidence, severity, mortality, and morbidity of ARI in infants. However, this study aims to identify the effects of exclusive breastfeeding on the frequency and outcome of ARI in infants.

In Bangladesh, infants exclusively breastfed (EBF) for 4 or more months had significantly fewer respiratory infections than infants exclusively breastfed for three or fewer months or partially breastfed (PBF). Infants who were never or non-breastfed (NBF) had the highest risk of hospital admission for an acute respiratory infection.<sup>9</sup>

Studies in Brazil, the Philippines, and Tanzania, mortality from acute lower respiratory infection (ALRI) and the relationship between lack of breastfeeding were shown. The weighted average of the relative risk of pneumonia deaths due to lack of breastfeeding was 2.0.<sup>10</sup> Data from a population-based study in Brazil showed that children <12 months who were not breastfed and partially breastfed had a relative risk of dying from ALRI of 3.6 and 1.6, respectively.<sup>11</sup> The probability of having an episode of acute respiratory infection was higher for formula-fed than for fully breastfed infants during the first 4 months of life. Partially breastfed infants fell in between, suggesting a dose-response effect of breastfeeding on the risk of respiratory infection. The prevalence of respiratory infection was also higher in breastfed infants than in formula-fed.<sup>12</sup>

In a study in Indonesia, there was a significant decrease in the number of days ill from ARI, and it prevented weight loss as time spent breastfeeding was increased.<sup>13</sup> In a study in China, associations between hospitalization during the first 18 months of life and feeding patterns were observed and adjusted for infant sex, birth weight, paternal education, and household smoking status. The results would be biased against findings because of breastfeeding. The hospitalization rate for the first episode of respiratory infection was 18% for artificially fed children and 11% for children who had ever been breastfed. Children with non-breastfed had twice the risk of hospitalization for respiratory infection. The adjusted odds ratio for a method of feeding and risk of hospitalization with respiratory infection was 2.11 (95% CI: 1.34-3.30).<sup>14</sup>

A study in Bangladesh shows there were 180 infant deaths (107 per 1,000 live births), 39 (22%) due to ARI, and another 10 (6%) due to ARI plus diarrhea. Proportional hazards regression was used to relate the infant feeding method at the previous visit (up to month 3) to subsequent infant ARI death, adjusting for birth weight, income, education, and parity. Many other confounding variables were tested for significance and excluded. Infants who were PBF or NBF had a risk of ARI death 2.40 times greater (95% CI: 1.14-5.04) than EBF infants. The risk of death due to ARI among predominantly breastfed infants was not statistically different from that of exclusively breastfed infants.<sup>15</sup>

ARI in infants is one of the major contributors to infant mortality and morbidity. In many studies, it has been shown that exclusive breastfeeding is associated with a reduced incidence of respiratory infection in infants. The picture of breastfeeding and its association with ARI in infants in this North-West part of Bangladesh is still undiscovered.

### **Aims and objectives**

Find out the effects as well as compare between exclusive, partial, and non-breastfed groups regarding frequency and outcome of acute respiratory infection.

## Materials and Methods

This cross-sectional study was done in the Department of Pediatrics Rajshahi medical college and Hospital, Rajshahi, during six month period from January 2013 to June 2013.

In this study, 300 cases of infants suffering from ARI were selected. Among them, 100 are exclusively breastfed babies, 100 are partially breastfed babies, and 100 are non-breastfed babies.

The infants with clinical features of acute respiratory infection aged two months to 1 year and male and female infants were included. Age <2 months and > one year with other concomitant illnesses were excluded. Information was collected

with the informed consent of the infant's parents. Detailed information was obtained in each case according to protocol. Collected data was classified, edited, coded, and entered into the computer for statistical analysis. Data were analyzed by using SPSS software, version 12.0 (statistical package for social science SPSS Inc. Chicago, USA). Statistical software employing appropriate statistical tests, student's "t" test, mean, SD and chi-square test to determine significant differences. Standard Error and their "p" values were obtained to see the statistical significance. P value < 0.05 was considered significant.

## Results

**Table I: Demographic Profile**

Demographic Profile		EBF (N=100)	PBF (N=100)	NBF (N=100)	Total (N=300)
Sex	Male	48	44	40	132
	Female	52	56	60	168
Economic status	Higher	28	8	4	40
	Middle	44	64	40	148
	Lower	26	28	56	112
Educational status (Mother)	Illiterate	12	24	36	72
	Primary	24	32	32	88
	SSC	36	24	24	84
	HSC	28	20	8	56
Educational status (Father)	Illiterate	20	20	48	88
	Primary	12	28	8	48
	SSC	20	28	24	72
	HSC	48	24	20	92

**Table II: Frequency of ARI attacks in EBF, PBF, and NBF group**

	Number of attacks			
	1	2	3	4
EBF	48%	28%	24%	00%
PBF	16%	52%	28%	04%
NBF	12%	28%	52%	08%

**Table III: Comparison of outcome between EBF, PBF, and NBF group**

	Cure	Complication	Death
EBF (n=100)	96	2	2
PBF (n=100)	84	12	4
NBF (n=100)	76	16	8

**Table IV: Severity of attack in EBF, PBF, and NBF group**

	Mild		Severe	
	Number	Percentage	Number	Percentage
EBF	58	58%	42	42%
PBF	28	28%	72	72%
NBF	16	16%	84	84%

**Table V: Outcome of nonbreast-feeding babies suffering from ARI**

Non-breastfeeding	Complication	Death	Cure
Mild=16	2	1	13
Severe=84	10	7	67
Total=100	12	8	80

**Table VI: Outcome of PBF baby suffering from ARI**

PBF	Complication	Death	Cure
Mild=28	2	00	26
Severe=72	4	4	64
Total=100	6	4	90

**Table VII: Outcome of EBF baby suffering from ARI**

EBF	Complication	Death	Cure
Mild=58	00	00	58
Severe=42	02	02	38
Total=100	02	02	96

**Table VIII: Comparison of duration of hospital staying in EBF, PBF, and NBF**

	Hospital stays up to 3 days.	Hospital staying >3 days
EBF	36%	64%
PBF	04%	96%
NBF	04%	96%

**Table IX: Hospital stay in severe attack patients of EBF, PBF, and NBF**

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	D <sub>6</sub>	D <sub>7</sub>
EBF (N=42)	00	00	18	15	5	2	2
PBF (N=72)	00	00	00	24	16	20	12
NBF (N=84)	00	00	00	12	16	28	24

No patients of the NBF and PBF groups with severe attacks could be discharged before the fourth day of admission. At the same time, many (18) EBF babies were discharged on the third day of admission.

Four patients of NBF died on the second day of admission.

### Discussion

ARI in infants is one of the contributors to infant mortality and morbidity. Studies showed. In this study, a total of 300 patients were included. There are three groups of patients. These are EBF, PBF, and NBF groups. Each group includes 100 babies. Among 100 EBF babies, 48 are male, and 52 are female; most of the babies came from middle-class families; the educational status of their parents mainly was SSC to HSC. In the PBF group, among 100 patients, 44 are male, and 56 are female; most of the babies come from middle-class families. The educational status of their parent is mostly primary level. In the NBF group, among 100 patients, 40 are male, and 60 are

female. Most of the babies come from lower socioeconomic conditions (Table I).

In this study, it is observed (Table II) that in most % of EBF babies (48+28=), 76% came to the hospital with a history of one or two attacks of ARI. But partial and non-breastfeeding babies were found to come with multiple attacks. i.e., two, three, or more attacks. That is (52+28+04=) 80% and (28+52+08=) 84% respectively. The frequency of ARI attacks is found to be higher in the PBF and NBF groups of babies than in the EBF babies. So, PBF and NBF groups are at a higher risk of developing ARI.

A study in Sri Lanka done in 1999 showed that infants with EBF for four or more months had

significantly fewer respiratory infections than those for three or fewer months. Infants who were NBF had the highest risk of hospital admission for an ARI.<sup>17</sup>

A similar study done in Mexico in 1997 has shown that the probability of having an episode of ARI was higher for formula-fed than for EBF during the first four months of life. The risks for PBF fell between those of formula-fed and fully breastfed infants, suggesting a dose-response effect of breastfeeding on the risk of respiratory infection. The prevalence of respiratory infection was also higher for formula-fed than for breastfed infants.<sup>16</sup> Another similar study in Bangladesh in 1997 showed that infants with EBF had significantly fewer respiratory infections than PBF. Infants who were NBF had the highest risk of hospital admission for an ARI.<sup>9</sup>

In this study (Table III), cure, complication, and death rates are studied in different groups (EBF, PBF, NBF). It is observed that among 100 EBF babies, 96 babies were cured without complication. Only two babies developed complications, and two unfortunate deaths were found. But in the case of PBF babies cure rate was 84%, but more complications and death were found at 12 and 4 in number, respectively. In NBF babies, complications and deaths were observed more than 16 and 8 in number, respectively, but only 76 babies were cured. The EBF group is associated with more cure rate and less complication rate, whereas the NBF group is associated with more complication and death rate (worse outcome) with a relatively lower cure rate.

A study done in Brazil, the Philippines, and Tanzania in 1999 showed that mortality from ALRI had a relationship with lack of breastfeeding. The weighted average of the relative risk of pneumonia deaths due to lack of breastfeeding was 2.0.<sup>10</sup> Data from a population-based study showed that children <12 months who were NBF had a relative risk of dying from ALRI of 3.6; infants who were PBF had a relative risk of 1.6.<sup>11</sup> In another study in Dhaka, Bangladesh, in 2001 showed that infants who were PBF or NBF had a risk of ARI death 2.40 times greater than

EBF infants.<sup>16</sup> In Rwanda, it was reported that no breastfed children were twice more likely to die from pneumonia than were breastfed children.<sup>10</sup>

Table IV shows that most of the NBF and PBF presented with a severe attack (84% and 72%, respectively), whereas only 42% of EBF babies presented with a severe attack; nonetheless, a maximum of 58% of EBF babies presented with the mild attack. The severe attack is more frequent in the PBF and NBF groups than in the EBF group. Any infections were less severe in EBF babies than those who were PBF or NBF at all.

Table V shows that 96% of PBF and NBF patients had to stay in the hospital for more than three days, whereas 64% of EBF patients had to stay more than three days. Hospital stays of EBF babies suffering from ARI are shorter than PBF and NBF babies suffering from ARI.

Mardya Lopez et al. show that infants who NBF were more likely to have longer episodes of ARI than those breastfed.<sup>16</sup>

Table VI, VII, VIII shows that among the NBF 100 patients, 16 were in mild attack. Among them, 13 were cured, complication in two, and death in one. Of the remaining 84 severe attack patients, 67 were cured, death occurred in seven, and complications occurred in 10 patients. 80% of patients were cured, 8% died, and 12% became complicated.

Among the PBF 100 patients, 28 had mild attack; of them, 26 were cured, two had complicated course. On the other hand, from the rest of the 72 severe attacks, four patients were complicated, deaths in four and 64 patients were cured. In total, 90% of patients were cured, 4% died, and 6% were complicated.

Among the 100 EBF patients, 58 were in mild attack, and all were cured without complication. Of the rest of the 42 severe attack patients, 38 were cured, two died, and two became complicated. In total, 96% of patients were cured, 2% died, and 2% became complicated.

A number of patients of the NBF and PBF groups with severe attacks couldn't be discharged before the fourth day of admission. Whereas many (18)

EBF babies were discharged on the third day of admission, four patients of NBF died on the second day of admission.

In a study, Mardya Lopez et al. present evidence of a protective effect of breastfeeding against ARI. EBF has reduced the percentage of days ill and the duration of individual episodes in breastfed infants.<sup>16</sup>

### Conclusion

Lack of breastfeeding is not only a factor related to increased incidence, severity, and outcome of ARI. Other vital factors are LBW, malnutrition, chronic disease, early diagnosis, and treatment which are not incorporated in this study because of limitations. Nevertheless, breastfeeding inevitably has a vital role in the incidence, severity, morbidity, mortality, and outcome of ARI in infants. So, it is imperative to practice EBF widely to prevent ARI.

**Conflict of interest:** None declared

### References

1. Ahn CH, William C, MacLean Jr. Growth of the exclusively breastfed infants. *American J Clinical Nutr.* 1980; 33: 183–192.
2. Cohen RJ, Brown KB, Canahuati J, Dewey KJ. Effects of Age of Introduction of Complementary Foods on infant breast milk Intake. Total Energy Intake and Growth: A Randomized Intervention Study Honduras. *The Lancet.* 1994; 344: 288-93.
3. Talukder MQK, Kawsar CA, Growth Pattern of Exclusively Breastfed Infants. *Bangladesh J Child Health.* 1986; 10: 59-65.
4. Dewey KG, Cohen RJ, Brown KH, Rivera LL. Effects of exclusive breastfeeding for four versus six months on maternal nutritional status and infant motor development: results of two randomized trials in Honduras. *J Nutr.* 2001; 13: 262-267.
5. Bangladesh Nutritional Survey. Child and Mother Nutrition Survey of Bangladesh, UNICEF/Bangladesh Bureau of Statistics. Dhaka, 2007.
6. Dewey K. Guideline principles for complementary feeding of the breastfed child. *American Health Organization/ World Health Organization,* 2001; 8-9.
7. Fifty-third World Health Assembly. Infant and Young Child Nutrition. *World Health Assembly A53/7, Agenda item 12.4* March 2000.
8. WHO. Global Health Observatory([https://www.who.int/gho/child\\_healthindex.html](https://www.who.int/gho/child_healthindex.html)).
9. Zaman K, Baqui AH, Yunus MD, Bateman OM, Chowdhury HR, Black RE. Acute respiratory infections in children: A community-based longitudinal study in rural Bangladesh. *J Trop Pediatr.* 1997; 43: 133-7.
10. Victora CG, Smith PG, Barros FC, Vaughan JP, Fuchs SC. Risk factors for deaths due to respiratory infections among Brazilian infants. *Int J Epidemiol.* 1989; 9:18-25.
11. Victora CG, Kirkwood BR, Ashworth A, et al. Potential interventions for the prevention of childhood pneumonia in developing countries: Improving nutrition. *Am J Clin Nutr* 1999; 70:309-320.
12. Lopez-Alarcon M, Villalpando S, Fajardo A. Breastfeeding lowers the frequency and duration of acute respiratory infection and diarrhea in infants under six months of age. *J Nutr.* 1997; 127: 436-43.
13. Launer LJ, Habicht J-P, Kardjati S. Breastfeeding protects against illness and weight loss due to illness. *Am J Epidemiol.* 1990; 131(2):322–31.
14. Chen Y, Yu S, Li W-X. Artificial feeding and hospitalization in the first 18 months of life. *Pediatrics.* 1988; 81: 58-62.
15. Arifeen S, Black RE, Atbeknab G, Baqui A, Caulfield L, Becker S. Exclusive breastfeeding reduces acute respiratory infection and diarrhea deaths among infants in Dhaka slums. *Pediatrics.* 2001; 108(4): 67.
16. Lopez-Alarcon M, Villalpando S, Fajardo A. Breastfeeding lower the frequency and duration of Acute Respiratory Infection and diarrhea in infants under Six Months of Age. *J. Nutr.* 1997; 127(3): 436-443.
17. Perera BJC, Ganesan S, Jayarasa J, Ranaweera S. The impact of breastfeeding practices on respiratory and diarrhoeal disease in infancy: A study from Sri Lanka, *J Trop Pediatr.* 1999; 45:115-8.

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