

## Relationship of Exclusive Breastfeeding with History of Acute Respiratory Infection (ARI) in Children in Benha University

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### ABSTRACT

**Background:** Acute respiratory infections (ARIs) represent a significant public health concern in young children, with potential long-term consequences for their health and well-being. Exclusive breastfeeding has been postulated to have a protective effect against ARIs, but the extent of this association requires further investigations.

**Objective:** This research aimed to determine whether or not exclusive breastfeeding was associated with upper and lower respiratory tract infections during infancy. **Methods:** This cross-sectional observational study was carried out in November and December 2022 at Benha University Hospital. Children with acute respiratory tract infections between 1 and 24 months were included. Children with immunocompromised states or chronic inflammatory disorders were excluded. Comprehensive medical, obstetric, maternal, familial, and perinatal records were compiled.

**Results:** Of the children in the study, 58% received exclusive breastfeeding, and 48% experienced acute respiratory infections. Those with acute respiratory infections had significantly lower exclusive breastfeeding rates (20.8%) compared to those without respiratory infections (92.3%). Univariate analysis indicated that higher gestational age and exclusive breastfeeding were correlated with a lower risk of acute respiratory infection. In the multivariate analysis, exclusive breastfeeding was associated with a substantial 97.6% risk reduction in acute respiratory infections.

**Conclusions:** The results showed a statistically significant correlation between the occurrence of ARIs and lower gestational age. It has been shown that exclusive breastfeeding significantly reduces the risk of developing ARIs.

**Keywords:** Exclusive breastfeeding, Acute respiratory infection, Maternal history, Child health.

### INTRODUCTION

Acute respiratory infection (ARI) is one of the major public health issues in both developed and developing nations because it can result in a high infant and toddler mortality rate, roughly 1 in 4 fatalities [1].

ARI is a condition in which both the upper and lower respiratory tracts are affected. A virus or bacteria is the cause of ARI. WHO states that ARI is the primary infectious disease-related killer worldwide, particularly in underdeveloped nations. The primary reason for treating children in hospitals or health facilities is ARI [2].

Risk factors that can lead to ARI in children include unfavourable environmental conditions (such as poor ventilation and exposure to cigarette smoke), partial immunizations, low birth weight, inadequate nutrition, which can compromise an underdeveloped immune system, low parental education, gender, and non-exclusive breastfeeding. In the first few months after delivery, breast milk has a protective impact that tends to assist lower morbidity. According to the research, infants who did not receive exclusive breastfeeding had a 4.96-fold higher incidence of ARI than children who did receive it [3].

Mother's milk is a food that provides nutrients that kids need to strengthen their immune systems against different diseases. Giving breast milk to infants between the ages of 0 and 6 months without any additional food is a unique way to provide neonates with nourishment [4]. The benefits of breastfeeding extend to women, newborns, and the socioeconomic sphere. Research indicates that breastfeeding plays a critical role in

lowering infant mortality because it can lower the incidence of illnesses that frequently affect babies, such as diarrhoea, ARI, otitis media, and urinary tract infections. Lactoferrin, a protein found in breast milk, is an immunological component that works to shield against bacterial infections brought on by viruses, fungus, bacteria, and other agents. Apart from lactoferrin, other immune-boosting compounds found in breast milk include antibodies, immunoglobulin A, and oligosaccharides [1].

The current study aimed to investigate the relationship between upper and lower respiratory tract infections and exclusive breastfeeding during infancy.

### PATIENTS AND METHODS

#### Patients:

This observational cross-sectional study was carried out on a total of 100 children from November to December 2022 in Banha University Hospital's Pediatric and Neonatology Department. All children between the ages of 1 and 24 months who were hospitalised for acute respiratory tract infections, including lower and upper infections, were included in the study population. The study was conducted with the utmost ethical considerations; all parents provided informed consent and the study was approved by Benha Faculty of Medicine ethical committee for research involving human beings, along with administrative permission.

**Inclusion criteria:** Children diagnosed with acute respiratory tract infections (including lower and upper respiratory tract infections), those aged from 1 to 24

months of age, and children admitted to the hospital's paediatric department for the purpose of treating and managing acute respiratory tract infections.

**Exclusion criteria:** Patients suffering from immunocompromised circumstances (such as HIV/AIDS, severe immunodeficiency) and chronic inflammatory disorders (such SLE, cystic fibrosis).

**Methods:**

**All patients were subjected to the following:** Maternal, obstetric, perinatal and medical history. Complete history taking included demographic data of the mothers (name, residential location, age, and gender), medical history (diabetes, hyperthyroidism, anemia, cardiac or pulmonary problems), obstetric history (number of prior pregnancies, any history of Caesarean sections or other interventions, and any difficulties encountered during prior pregnancies), perinatal history (details about the present pregnancy such as gestational age, anticipated due date, and prenatal care received). Preeclampsia, intrauterine growth restriction, gestational diabetes, and other pregnancy-related problems were noted if present.

**Medical history of the infant:**

After noting any past surgeries, which might affect the current health, we gathered details about any past chronic illnesses or conditions. Following the medical history, a detailed examination covered appearance, activity, and vital signs to monitor cardiovascular and respiratory health, including checking for fever or hypothermia.

To evaluate skin colour, texture, and the existence of any dermatological problems, a comprehensive skin examination was performed. Any abnormal discolouration or cyanosis was noticed, as these could be indicators of possible oxygenation problems. The examination also included the head and face, evaluating the size and morphology of the cranium and identifying any abnormalities on the face. In order to assess the chest and breathing, breath sounds were auscultated in order to identify any aberrant pulmonary symptoms, and the respiratory effort and pattern were noted.

In order to detect any pathological abnormalities or pain in the abdomen, the gastrointestinal system was evaluated by auscultating the bowel sounds. In addition, to evaluate muscle tone and range of motion in the extremities, the upper and lower limbs were examined for edema, abnormalities, or indications of trauma. In addition, to measure muscle strength and coordination, the neurological evaluation comprised an examination of infant reflexes, including the Moro and sucking reflexes. Furthermore, to evaluate the progress and maturation of the infants, their head circumference, length, and weight were also recorded.

**Ethical considerations: The study was done after being accepted by the Research Ethics Committee,**

**Benha University (Approval code: MS-16-9-2022). All parents or guardians provided written informed consents prior to their enrolment of their children. The consent form explicitly outlined their agreement to participate in the study and for the publication of data, ensuring protection of their confidentiality and privacy. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.**

**Statistical analysis**

SPSS version 28 was conducted for data management and statistical analysis (IBM, Armonk, New York, United States). Utilizing Shapiro-Wilk test, Kolmogorov-Smirnov test, and direct data visualization techniques, normality of quantitative data was evaluated. Quantitative data were summarized as means and standard deviations, or as medians and ranges, in accordance with normalcy. Numbers and percentages were utilized to summarize the categorical data. Independent t-test was utilized to contrast quantitative data among the groups under investigation. Both Fisher's exact test and Chi-square test were utilized to contrast categorical data. Acute respiratory infection was predicted utilizing univariate and multivariate logistic regression analysis. It was determined to get odds ratios with 95% confidence intervals. There are two sides to every statistical test. P values ≤ 0.05 were considered significant.

**RESULTS**

**Exclusive breastfeeding & ARI:** About two-thirds (58%) received exclusive breastfeeding. Acute respiratory infections were reported in 48%. All of them had acute onset and progressive course. The median acute respiratory infection duration was seven days, ranging from 1 – 20 days (Table 1).

**Table (1):** Exclusive breastfeeding & ARI in the studied children

<b>Breastfeeding &amp; ARI</b>		
<b>Exclusive breastfeeding</b>	n (%)	58 (58)
<b>ARI</b>	n (%)	48 (48)
<b>ARI onset</b>		
Acute	n (%)	48 (100)
<b>ARI course</b>		
Progressive	n (%)	48 (100)
<b>ARI duration (days)</b>	Median (range)	7 (1 - 20)

ARI: Acute respiratory infection

**Exclusive breastfeeding according to ARI:** Patients with acute respiratory infection demonstrated significantly lower exclusive breastfeeding (20.8%) compared to those without respiratory infection (92.3%) (P < 0.001) (Table 2).

**Table (2):** Exclusive breastfeeding of the studied children according to ARI

	n (%)	ARI		P-value
		Yes (n = 48)	No (n = 52)	
<b>Exclusive breastfeeding</b>		10 (20.8)	48 (92.3)	<b>&lt;0.001*</b>

\*Significant P-value; ARI: Acute Respiratory infection

**Univariate and multivariate analysis to predict acute respiratory infection:** Univariate analysis for prediction of acute respiratory infection revealed that higher gestational age (OR = 0.737, 95%; CI = 0.569 – 0.955, P = 0.021) and exclusive breastfeeding (OR = 0.022, 95% CI = 0.006 – 0.075, P < 0.001) were connected to a risk reduction of acute respiratory infection. All significant variables were included in a multivariate analysis, which revealed that only exclusive breastfeeding was associated with 97.6% risk reduction of acute respiratory infection (OR = 0.024, 95% CI = 0.007 – 0.084, P < 0.001) (Table 3).

**Table (3):** Univariate and multivariate analysis to predict acute respiratory infection.

	Univariate		Multivariate	
	OR (95% CI)	P-value	OR (95% CI)	P-value
<b>Age (months)</b>	0.955 (0.886 - 1.029)	0.227	-	-
<b>Sex</b>	1.354 (0.61 - 3.003)	0.456	-	-
<b>Consanguinity</b>	0.877 (0.339 - 2.267)	0.787	-	-
<b>Family history</b>	2.184 (0.918 - 5.195)	0.077	-	-
<b>History of surgery</b>	1.667 (0.266 - 10.431)	0.585	-	-
<b>History of systemic disease</b>	5.93 (0.667 - 52.726)	0.11	-	-
<b>Heart rate</b>	0.962 (0.923 - 1.003)	0.068	-	-
<b>Respiratory rate</b>	1.016 (0.963 - 1.071)	0.567	-	-
<b>Temperature</b>	0.936 (0.374 - 2.342)	0.887	-	-
<b>Gestational age (wks)</b>	0.737 (0.569 - 0.955)	<b>0.021*</b>	0.897 (0.620 - 1.297)	0.563
<b>Mode of delivery</b>	1.02 (0.389 - 2.672)	0.969	-	-
<b>Maternal risk factor</b>	1.593 (0.603 - 4.206)	0.348	-	-
<b>NICU admission</b>	1.286 (0.428 - 3.863)	0.654	-	-
<b>Exclusive breastfeeding</b>	0.022 (0.006 - 0.075)	<b>&lt;0.001*</b>	0.024 (0.007 - 0.084)	<b>&lt;0.001*</b>

\*Significant P-value; OR: Odds ratio; 95% CI: 95% confidence interval; NICU: Neonatal intensive care unit.

**DISCUSSION**

Children and infants are hospitalized, and morbidity rates are primarily caused by infectious disorders, such as respiratory tract infections. Extensive epidemiological evidence supports the notion that breastfeeding confers protection against a diverse array of diseases. Antimicrobial and anti-inflammatory chemicals, as well as immune-promoting factors, are all present in breast milk. During breastfeeding, they develops the infant's defence against infectious agents and other foreign substances and improves the infant's underdeveloped immune system [5].

The WHO advises exclusive breastfeeding for the first six months of life and then supplemental feedings after that. It has been discovered that the advantages depend on the dosage and the length of breastfeeding [6]. It has frequently been proposed that exclusive and extended breastfeeding protects infants against respiratory tract infections throughout their first year of life. Research indicates that the benefits of breast milk on a baby's immune system might last longer than the breastfeeding phase since it not only promotes passive immunity but also helps the immune system mature over time [7].

After the first year of life, breastfeeding may provide a prolonged defence against respiratory tract infections, as it has been shown to protect against adult disorders including type 1 diabetes and inflammatory

bowel disease. Only a small number of research, with mixed results, have assessed the relationship between nursing and respiratory tract illnesses after infancy [7].

The current study was set out to investigate the relationship between upper and lower respiratory tract infections and exclusive breastfeeding during infancy. This observational cross-sectional study, which involved all children admitted with acute respiratory tract infections (upper or lower) aged 1-24 months, was conducted in the Paediatrics and Neonatology Department of Banha University Hospital.

Our study's participants included about 58% who were breastfed exclusively. Acute respiratory infections were identified in 48% of the subjects. Bronchiolitis (47.9%), pneumonia (31.3%), and bronchitis (20.8%) were the most common. Seven days was the median length of time for ARIs. Investigations were conducted into the connection between ARIs and exclusive breastfeeding. An observation was made regarding the prevalence of exclusive breastfeeding among patients who had been diagnosed with acute respiratory infections. Specifically, only 20.8 % of these patients reported being exclusively breastfed, which is notably lower than the 92.3 % rate of exclusive breastfeeding among those who did not have respiratory infections (P < 0.001).

In a similar vein, a study highlights that breastfeeding for at least 6 months lowers an infant's

risk of lower respiratory tract infections up to the age of 4 [5]. Additionally, a number of other research, including some authors' studies [8] and another authors [9], endorse the idea that exclusive breastfeeding for six months can prevent infants from respiratory tract infections during the early stages of life, which is in line with World Health Organization guidelines. In 2006 study, the authors [10] discovered that infants who received just breast milk for four to fewer than six months had a higher chance of developing pneumonia than infants who received only breast milk for six months or longer. Nevertheless, there were no statistically significant variations in the frequency of wheezing, otitis media (OM) episodes, cold/flu episodes, or the first incidence of OM before the age of twelve months.

Certain studies, like those by **Hatakka et al.** [11] and **Hetzner et al.** [12] showed a correlation between breastfeeding and a decrease in upper respiratory tract infections after childhood. The majority of the research focused on cases of otitis media that occurred before the age of 3 years. Further studies looked into the wider impact of breastfeeding on infections of the respiratory tract. A study conducted in Japan found a marginally significant correlation between breastfeeding for 6-7 months and a decrease in hospitalizations for respiratory tract infections in children between the ages of 18 and 30 months [13]. Both univariate and multivariate analyses were carried out in the current study in an attempt to predict ARIs. A lower incidence of ARI was shown to be associated with both exclusive breastfeeding ( $P < 0.001$ ) and higher gestational age ( $P = 0.021$ ), according to univariate analysis. A subsequent multivariate analysis included all variables that were considered significant. According to this analysis, exclusive breastfeeding had a significant impact on its own and was connected to a stunning of 97.6% reduction in the incidence of ARIs ( $P < 0.001$ ). In a similar vein, the study of **Tromp et al.** [5] found a significant correlation between reduced incidence of lower respiratory tract infections up to age of 4 years and partial breastfeeding until 4 months. However, after controlling for confounding variables, this link became less significant. In the same way, a trend toward predominant breastfeeding was noted, although it was not statistically significant.

Additionally, a study of **Christensen et al.** [14] found that fewer hospitalizations for infections were linked to longer breastfeeding durations. The first year of life was associated with the highest effects, especially for lower respiratory tract infections and other infections. The likelihood of hospitalisation was significantly lower in infants who were exclusively breastfed. Our study was limited by the fact that it was a single centre study with a small sample size.

## CONCLUSIONS

The present study showed a significant correlation between the occurrence of ARIs and a lower gestational

age. The study also showed that there were no significant correlations between ARIs, NICU hospitalization, maternal risk factors, and mode of birth. A noteworthy protective factor against the development of ARIs was found to be exclusive breastfeeding, which may help lower the incidence of respiratory infections in infants.

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