



ORIGINAL ARTICLE

## Role of breastfeeding in protection against respiratory tract infections during childhood: A case control study.

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**ABSTRACT... Objective:** To look into the protective role of breastfeeding against respiratory tract infections in children below 5 years age. Furthermore, effect of various demographic and environmental factors like gender, passive smoking, maternal education, vaccination status of the child, source of drinking water, source of household energy and pre-existing illness on RTIs was studied. **Study Design:** Case Control study. **Setting:** Department of Pediatrics, Ayub Teaching Hospital, Abbottabad. **Period:** December 2019 to August 2020. **Material & Methods:** Data was collected on pre-formed, self-administered, structured questionnaires using non randomized sampling technique (50 cases and 50 controls). **Results:** RTI was found not to be associated with breastfeeding (OR 0.651 and 95% CI 0.226-1.875). Similarly factors including vaccination (OR 0.755 and 95% CI 0.322-1.767), pre-existing illnesses (OR 1.000 and 95% CI 0.388-2.576), passive smoking (OR 0.832 and 95% CI 0.359-1.930) and supplemental feed during first 6 months of life (OR 1.758 and 95% CI 0.796-3.880) were not significantly associated with respiratory tract infections. **Conclusion:** Breastfeeding is not associated with a reduced risk of RTIs in children less than 5 years of age. This contradicts with the hypothesis that breastfeeding plays a significant role in reducing RTIs: which may be due to the fact that majority of patients were given supplemental feed before 6 months. Whereas exclusive breastfeeding is recommended by WHO.

**Key words:** Breastfeeding, Respiratory Tract Infection (RTI).

### INTRODUCTION

Breastfeeding is a natural method of feeding for the infants and young children. Breastfeeding has many health benefits, both in the short term and the longer term, to infants and their mothers. There is an increasing number of studies that report on associations between breastfeeding and long-term protection against chronic disease. The recent World Health Organization reviews of the short- and long-term benefits of breastfeeding concluded that there was strong evidence for many public health benefits of breastfeeding. Breastfeeding is of great clinical significance and is beneficial for the new born as it provides protection against many diseases. Inadequate breastfeeding has been listed as a significant risk factor in many studies. A North American population based study showed that breastfeeding has an association with a reduced

incidence of pneumococcal illnesses (odds ratio of 0.27 with 95% confidence interval of 0.08-0.90).<sup>1</sup> Evidence suggested enhanced survival rates in children that are breastfed, especially when exclusively breastfed.<sup>2</sup>

The protective effect of human milk against infections has been addressed by many investigators.<sup>3-5</sup> Available data has shown a decreased occurrence of infectious diseases especially in breastfed infants.<sup>6</sup> Beneficial effects of breastfeeding are related to the amount of breast milk received by the young ones.<sup>4</sup> Fully breastfed infants have been shown to have lower overall illness rates, whereas minimal breastfeeding has not been found to be protective.<sup>7</sup> Lesser duration of breast feeding results in higher risk of lower respiratory tract diseases, suggested by evidence collected in US and Australian population.<sup>8,9</sup>

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Evidence regarding role of breastfeeding in protection against respiratory tract infections in children was reported in studies done in Brazil<sup>10,11</sup>, Sri Lanka, Bangladesh<sup>5,9</sup>, Spain, Greece<sup>12</sup> and India.<sup>13</sup> Where infectious illnesses like respiratory tract infections, are among the leading causes of hospitalization and deaths in younger age group.<sup>14,15</sup>

Sufficient epidemiological evidence supports benefits of breastfeeding against a large number of diseases, especially infectious.<sup>16,17</sup> Mother's milk contains many different antimicrobial and anti-inflammatory substances that help in development of immunity.<sup>17,18</sup> It improves the immature immune systems of the young ones and helps to strengthen the immunity various disease causing agents, during the breastfeeding period.<sup>16-20</sup> In light of all this evidence the World Health Organization (WHO) recommends exclusive breastfeeding for first 6 months and breastfeeding along with complementary feed thereafter.<sup>21</sup> The beneficial aspects of breastfeeding have been found to be duration and dose dependent.<sup>16,17</sup> Protective effect of exclusive and prolonged breastfeeding against respiratory tract illnesses has also been validated in The Generation R Study.<sup>16,17,22,23</sup> But, role of duration and exclusivity of breastfeeding in reduction of the occurrence of respiratory infections is not suggested by all the studies.<sup>24,25</sup>

It has been proposed that beneficial effects of breastfeeding on immunity may persist for a longer than breastfeeding period itself, reason being breastfeeding helps maturation of the immune system alongside its role in passive immunity.<sup>26,27</sup> Since protective role of breastfeeding in type 1 diabetes and inflammatory bowel disease has been proposed, protection against infectious respiratory tract illnesses after the first year of life seems credible.<sup>16,17,28</sup> However, this effect of breastfeeding after infancy has been scrutinized by very few studies and reported unpredictable results.<sup>29-33</sup> For a long time breastfeeding has been considered to provide protection against infection in infants, but its role in protection against respiratory diseases has not been constantly established in studies in progressed countries.<sup>34</sup>

This project aims at studying association between breastfeeding and respiratory tract infections in children. Our study aims at benefiting the community by providing evidence regarding the association of breastfeeding with the respiratory tract infections in children. If there is a positive association between breastfeeding and respiratory tract infection then it is going to reduce the morbidity and mortality among children under five years by simply encouraging mothers to breastfeed their children. Besides this, it will also be of economic benefit to the parents by saving the expenses of formula milk, health care provision charges and other hospital charges.

With this study we aim to:

1. Determine association between breastfeeding and RTIs.
2. Determine association of different demographic and ecological factors with RTIs in children less than 5 years of age.

## MATERIAL & METHODS

This was an age-matched case control study with a 1:1 ratio; conducted at Pediatrics units (A and B) of Ayub Teaching hospital Abbottabad. The study period extended over 8 months, from 2<sup>nd</sup> December 2019 to 21<sup>st</sup> August 2020. Hospital based non-randomized convenience sampling technique was used for data collection: one hundred patients were selected for study, comprising 50 cases and 50 controls. Cases were the patients that were admitted with respiratory tract infection. Any infectious disease of upper or lower respiratory tract ranging from common cold to life threatening condition like pneumonia was considered as respiratory tract infection. Controls were the children admitted at the same unit but having no respiratory tract infection related signs or symptoms: matched within an age range of  $\pm 3$  months of the cases. This whole selection of cases and controls, alongside matching was done by a trained research assistant medical doctor. All the cases and controls that received breast milk at any age for more than six months were considered breastfeed. Only the patients less than 5 years of age, admitted in ward were considered; irrespective of gender. Patients greater than 5 years of age and attended in emergency or outpatient department were excluded from

study. Data was collected on pre-formed self-administered questionnaires by interviewing the parents and asking them questions from the questionnaires. Data sample comprised of 100 patients (50 cases and 50 controls).

Statistical analysis was done using SPSS (Statistical Package for Social Sciences) 23 for Windows 10. Categorical data was presented in percentages. Inferential statistics has been presented in term of odds ratio and chi square tests' results.

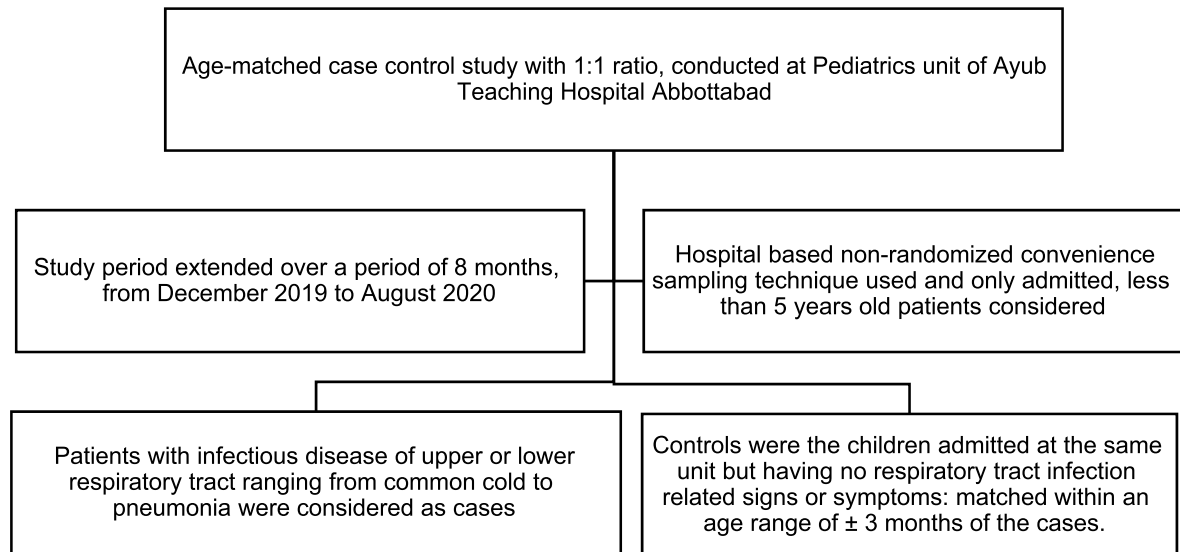


Figure-1. Recruitment algorithm

**RESULTS**

A total of 100 children admitted in the aforementioned wards were studied. Descriptive statistics of these are provided in the Table-I. Among these 100, 83 were receiving breast milk, whereas major source of milk was mother's milk (i-e in 61 patients), formula milk in 10 and cow milk in 5 children. Colostrum was fed to 74 children and history of initiation of breastfeed within first two hours of life was given by parents of 57 patients. Supplemental feeding during the first six months was done to 51 of the studied patients. Distribution of the rest of the variables including sociodemographic variables are presented in Table-I. Primary source of milk given to a child is important, so the data is presented below in a separate pie chart as well.

Inferential statistics is presented in Table-II in terms of Odds ratio, confidence interval and p-value. RTI was found not to be significantly associated with breastfeeding (OR 0.651, 95% CI 0.226-1.875, p=0.595). Similarly factors including vaccination

(OR 0.755, 95% CI 0.322-1.767, p=0.666), pre-existing illnesses (OR 1.000, 95% CI 0.388-2.576, p=1.00), passive smoking (OR 0.832 and 95% CI 0.359-1.930, p=0.830) and supplemental feed given during first 6 months of life (OR 1.758, 95% CI 0.796-3.880, p=0.230) were found not to be associated with respiratory tract infections. Detailed analysis is presented below.

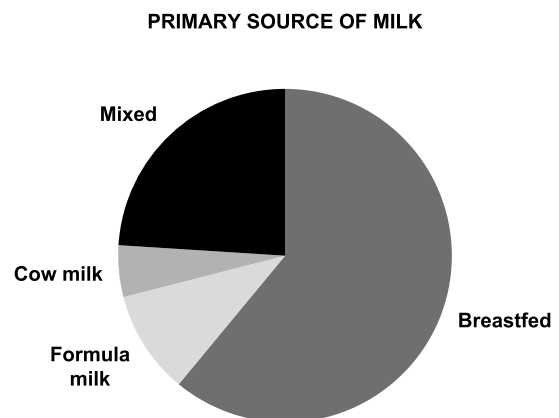


Figure-2. Primary source of milk fed to the children

Variable	Subgroups	Frequency (%)
Area of residence	Rural	65 (65%)
	Urban	21 (21%)
	Semi-urban	14 (14%)
Breast Feeding	Done	83 (83%)
	Not done	17 (17%)
Milk used	Breastfed	61 (61%)
	Milk formula	10 (10%)
	Cow milk	5 (5%)
	Mixed	24 (24%)
Colostrum	Given	74 (74%)
	Not given	26 (26%)
Time of initiation of breastfeeding	Within 2 hours	57 (57%)
	After 2 hours	33 (33%)
	Not used at all	10 (10%)
Reason for discarding colostrum	Not discarded	73 (73%)
	Considered bad for health	1 (1%)
	Elder's opinion to discard	2 (2%)
	Baby unable to suck	5 (5%)
	Insufficient quantity	12 (12%)
	Others	7 (7%)
Supplemental feeding during first 6 months	Done	51 (51%)
	Not done	49 (49%)
Rotavirus vaccination	Done	69 (69%)
	Not done	31 (31%)
Pre-existing illness	Present	22 (22%)
	Absent	78 (78%)
Monthly household income	Less than 20000	63 (63%)
	20,000 – 60,000	36 (36%)
	Greater than 60,000	1 (1%)
Source of drinking water	Municipal water	28 (28%)
	Well water	23 (23%)
	Boring	20 (20%)
	Others	29 (29%)
Weaning ag	Before 6 months	19 (19%)
	At or after 6 months	70 (70%)
	Not weaned yet	11 (11%)
Allergies	Present	11 (11%)
	Absent	89 (89%)
Source of household energy	Natural gas	31 (31%)
	Wood	69 (69%)
Smokers at home	Yes	32 (32%)
	No	68 (68%)

Table-I. Descriptive statistics of studied variables

Risk Factor	Odds Ratio	95% Confidence Interval	P-Value
Breast feeding	0.651	(0.226,1.875)	0.595
Male gender	0.841	(0.371,1.904)	0.835
<5km distance from industrial area	1.000	(0.299,3.341)	1.000
Known allergies	1.227	(0.349,4.316)	1.000
Rotavirus vaccination	0.755	(0.322,1.767)	0.666
Pre-existing illnesses	1.000	(0.388,2.576)	1.000
Use of natural gas as source of energy	0.423	(0.176,1.016)	0.083
Passive smoking	0.832	(0.359,1.930)	0.830
Normal vaginal delivery	0.577	(0.204,1.636)	0.436
Colostrum feed	0.812	(0.332,1.989)	0.820
Supplemental feed (during 1 <sup>st</sup> six months)	1.758	(0.796,3.880)	0.230

Table-II. Inferential statistics regarding various studied variables

## DISCUSSION

In this case control study we did not find any significant protective association of breastfeeding with respiratory tract infections in children. Whereas various studies found six months exclusive breastfeeding against RTIs in infancy thereby supporting the WHO recommendations. Findings similar to our study were reported in a longitudinal prospective study which concluded that breastfeeding period, including more than 6 months breastfeeding, was not significantly associated with lung infections including pneumonia in 6 years old children.<sup>35</sup> Similarly Chantry et al found full breastfeeding for 4 months has greater chances of RTIs in children as compared to those who are breast fed for 6 months.<sup>35</sup> Whereas Li et al found no association between healthcare problems like colds or URTIs and otitis media among children and breastfeeding. The project considered duration and exclusivity of breastfeeding as well.<sup>35</sup> This protective effect of breastfeeding can wear off cessation of breastfeeding.<sup>36-38</sup> Similarly an article declined the hypothesis stating that breastfeeding provides immunity against respiratory infections during first six years of life.<sup>39</sup> Since upper respiratory tract symptoms are common during childhood, these result in overrepresentation of

upper respiratory tract infections: these symptoms are more common in childhood.<sup>40</sup> Rubin DH et al<sup>41</sup>, Margolis PA et al<sup>42</sup> Dewey KG et al<sup>43</sup> also found no association between breastfeeding and RTIs in children. In contrast to our findings, breastfeeding of 6-7 months duration was found to be borderline significantly associated with a reduced hospitalization with respiratory infections over 18-30 months age.<sup>44</sup> Wang J et al also found out that there is a strong association between breastfeeding and RTIs during first 2 years of life.<sup>45</sup> Likewise, in a Dutch prospective cohort study which included cases from birth until young adulthood, it was concluded that reduced risk of LRTIs was significantly associated with breast feeding for 6 months or longer. Although in the same direction, no consequential association was found between URTIs and breastfeeding. The same outcome was found for partial and predominate breastfeeding until 4 months and LRTIs as well as URTIs.<sup>46</sup> Similarly, in a cohort study in Jordan university of science and technology, effects of feeding type on the frequency of upper respiratory tract infections was studied. It was found that the exclusively breastfed infants for first six months of their life had lower rate of URTIs as compared to those who were bottle-fed. A strong association between URTIs and protection provided by breast feeding was found by the researchers.<sup>47</sup>

In univariate analysis we found out that there is no significant association between RTIs and nearby smokers (Table-II). However in contrast to our study, in a meta-analysis of 60 studies it was presented that smoking by either of the parents or any household member significantly increases the risk of LRTI; odds ratios (OR) were 1.22 (95% CI: 1.10 to 1.35) for paternal smoking, 1.62 (95% CI: 1.38 to 1.89) when both parents were smokers, and 1.54 (95% CI 1.40 to 1.69) when any household member smoked.<sup>48</sup>

Similarly we found out there is no association between prevalence of RTIs in children with vaccination and past co-morbidities. Similar results have been reported by Abuka T in an institutional based cross sectional study. Of a total 206 patients, 52 (25.2%) of the children

had history of diarrhea. Only 6 (2.9%) of children had history of measles. Among children/mother interviewed during the time of survey only 1 (5%) was not vaccinated at all and the rest were vaccinated. Among the vaccinated the majority of children 146 (71.2%) were completely vaccinated. The rest of children 59(28.6%) were vaccinated up to their age.<sup>49</sup>

Furthermore, we could not find that there is increased risk of RTIs in children who had wood used as household fuel; in contrast with study of Fekadu GA et al which showed that 171 (83.0%) of RTI patients had wood used as a source of cooking fuel whereas 35 (17%) of parents used charcoal or electricity.<sup>49</sup> Similar findings have been reported by Abuka T in an institutional based cross sectional study that children from households which use wood for cooking purposes were 2.3 times more likely to develop pneumonia as compared to children from households where charcoal or electricity was used.<sup>48</sup>

## CONCLUSION

Our study showed an insignificant association between breastfeeding and RTIs in children less than 5 years of age. These findings are in favor of null hypothesis which states that breastfeeding does not play any significant role in protection against RTIS in children. These results may be due to the fact that exclusive breastfeeding for six months is recommended by WHO. However in our study majority of patients were given supplemental feed before 6 months of age. Also our study did not find any significant association of RTIs with smoking, immunization status of child, nearby industrial area, male gender, illiterate mother and poor family socioeconomic status. However, breastfeeding mothers need to be encouraged and supported in making their decisions to initiate breastfeeding and to maintain exclusive breastfeeding for the first 6 months as recommended by the American Academy of Pediatrics, and to continue breastfeeding for at least 1 year and as long thereafter as they desire.

## RECOMMENDATIONS

- More studies like this should be carried out in order to find out the association of RTIs with

- breastfeeding and other confounding factors.
- Seminars should be held and social media should play its role to enlighten the benefits of breastfeeding and spread awareness among the people.
  - Cohort studies and meta-analysis should be conducted to follow the patients from birth till 5 years of age. Effects of exclusive breastfeeding on prevalence of RTIs should be seen along with factors that enhances its incidence.

### STUDY LIMITATIONS

However, our research is subjected to various limitations. First of all, our study was limited to only a single tertiary care hospital of district Abbottabad and did not include all the hospitals and basic health centers in the same district. Secondly, our sample size was small which could be a possible cause of inclination towards the null hypothesis. According to WHO definition, exclusive breastfeeding for at least 6 months has significant role in reducing risk of RTIs in children but in our study most of the patients were weaned before the age of 6 months which most likely has inclined the result towards the null hypothesis. Besides these, non-randomization of the sample was another important limitation in the study.

These limitations of these studied can be overcome in further studies by increasing the sample size, randomization of sample, decreasing the prevalence of observer bias, taking in consideration of all the child care centers and hospitals of the district in which the study is being carried out.

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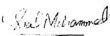




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3	Muhammad Usama	Jointly proposed the study, helped analysis & prepared the draft.	
4	Aanab Sardar	Contributed to study design, data analysis & draft review.	
5	Abbas Iqbal	Contributed to study design, data analysis & draft review.	
6	Shahista Naz	Contributed to study design, data analysis & draft review.	