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Paediatrics

RISK FACTORS OF ACUTE LOWER RESPIRATORY TRACT INFECTION IN CHILDREN

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ABSTRACT **Background** Acute lower respiratory tract infection (LRTI) remains one of the leading causes of morbidity and mortality among children under five years of age, particularly in developing countries.Several biological, environmental, nutritional, and socioeconomic factors contribute to its occurrence. Identification of these modifiable risk factors is essential for developing effective preventive strategies **Objectives :** To identify the risk factors associated with acute LRTI among children aged 6 months to 5 years. **Methods:** A hospital-based case–control study was conducted among 114 children (57 cases with acute LRTI and 57 controls without LRTI) admitted to a tertiary care hospital between October 2020 and September 2022. Data regarding demographic characteristics, birth history, nutritional status, feeding practices, immunization, environmental exposures, and socioeconomic factors were collected and analysed. Statistical analysis was performed using the Chi-square test, and $p<0.05$ was considered significant. **Results:** Most children with acute LRTI were infants (77.2%) and males (66.7%). Significant risk factors associated with acute LRTI included prematurity, low birth weight, malnutrition, anemia, lack of exclusive breastfeeding, delayed weaning, incomplete immunization, passive smoking, indoor air pollution, overcrowding, low socioeconomic status, and lower parental education ($p<0.05$). Mode of delivery was not significantly associated with acute LRTI. **Conclusions:** Acute LRTI is significantly associated with multiple preventable nutritional, environmental, and socioeconomic risk factors. Improving exclusive breastfeeding, timely complementary feeding, immunization coverage, nutritional status, parental education, and reducing exposure to tobacco smoke and indoor air pollution may help reduce the burden of acute LRTI in under-five children.

KEYWORDS : Acute lower respiratory tract infection; children; pneumonia; risk factors; malnutrition; incomplete immunisation ,indoor air pollution, lack of exclusive breast feeding

INTRODUCTION :

Respiratory tract infections includes infection to lungs i.e., large airways below the larynx.Acute Respiratory Infection (ARI) continues to be the leading cause of acute illness worldwide and remain the most important cause of infant and young children mortality.[1,2] ARI in young children is responsible for an estimated 3.9 million deaths every year worldwide The incidence of pneumonia in developed countries may be as low as 3-4%, whereas in developing countries range between 20-30%. The difference is due to high prevalence of malnutrition, low birth weight and indoor air pollution in developing Countries[3,4] ARI is a serious threat to infant and child survival in India. Hospital records from states with high infant mortality rates show that up to 13% of the inpatient deaths in paediatric ward are due to ARI[5] Whereas, outpatient attendance attributing to ARI is as high as 20-40% of all outpatients and 12-35% of in-patients[6] .It has been reported that there are links between environmental risk factors (such as overcrowding, outdoor air pollution, and indoor pollution) and risk factors in the child (such as breastfeeding, low birth weight, malnutrition, and vitamin A deficiency) with ARI[7,8]

DEFINITION : Acute respiratory tract infection was defined as presence of cough with or without fever for less than two weeks**.** The **WHO** Programme of acute respiratory infection (ARI) Control guidelines define pneumonia as cough in the presence of Tachypnoea (Respiratory rate > 60 per minute in an infant less than 2 months,>50 per min in infants between age group 3-12 months > 40 per mins in children between 13-60 months)[9] and severe and very severe pneumonia as the presence of chest indrawing and central cyanosis, lethargy, convulsions and refusal of feeds respectively In the WHO criteria – children with fever, cough, fast breathing was defined as pneumonia and was taken as LRTI in our study. Acute lower respiratory tract infection (ALRTI) is a leading cause of mortality in children below five years of age in the developing countries. ARI is the major public health problem ,leading to higher mortality among under-five especially below 2 years[10] On average below 5 yrs suffer 5 to 6 episodes of Acute lower respiratory infection per year [11] The Burden of disease can be known by understanding ARTI Prevalance and associated risk factors with it ARI in young children is responsible for an estimated 3.9 million deaths every year [1,2] Most common age group prone for acute LRTI 6m-5yrs because Most of the Pneumonia is caused by Typical pneumonia like streptococcus , Staph aureus Hemophillus influenza . Whereas Children with LRTI in Above 5yrs-11yrsCaused by Atypical pneumonia like mycoplasma which accounts for 11-30% of cases . Legionella is another cause of atypical pneumonia [12] worldwide. Various studies done by Taksande AM, Yeole M. on Risk factors of Acute Respiratory Infection (ARI) in under- five children The Prevalence of pneumonia in developed countries may be as low as 3-4%, whereas in developing countries range between 20-30%. The difference is due to high prevalence of malnutrition, low birth weight And indoor air pollution in developing countries [3,4] ARI is a serious threat to infant and child survival in India. Hospital records from states with high infant mortality rates show that upto 13% of the inpatient deaths in paediatric ward are due to ARI [5] Whereas, outpatient attendance attributing to ARI is as high as 20- 40% of all outpatients and 12-35% of in-patients [6] In a review of epidemiology of ALRTI in developing countries identify low birth weightmalnutrition, vitamin A deficiency, lack of breast feeding and passive smoking has risk factors for ARI [7,8] Recent studies have added other risk factors to the list Including poor socioeconomic status, large family size, family history of Bronchitis, advanced birth order, over crowding ,young age, air pollution and the use of non allopathic treatment in early stage of illness. More recent reviews suggest that indoor air pollution is one of the major risk factor for acute lower respiratory tract infection in children in developing Countries

AIMS AND OBJECTIVES OF THE STUDY:

Aim: To To Identify the risk factors of acute lower respiratory tract infection in children

Objectives:

1. To determine the clinical profile of acute Lower respiratory tract infection in children aged 6 months to 5 years.
2. To determine the association of various factors associated with acute lower respiratory tract infection in Children with LRTI Children with fever but no LRTI (for comparision).

METHODS

This hospital-based observational case–control study was conducted in the Paediatric Intensive Care Unit (PICU), Kamineni Institute of Medical Sciences, Narketpally, Telangana, India, over a period of two years from October 2020 to September 2022.A total of 114 children aged 6 months to 5 years were included in the study.

Inclusion Criteria:
- Children in the age group 6months - 5years of either gender.
- Children with acute LRTI
- Children with fever but no LRTI (For comparision)

Exclusion Criteria:
- Children with developmental delay
- Children with multisystem involvement
- Children with congenital cardiac conditions
- Children with recurrent LRTI
- Children with age group above 5yrs-12yrs

All children in the present study detailed history was taken and clinical exam was done to differentiate between upper respiratory tract infection and lower respiratory tract infection .In the present study **Acute LRTI was defined** based onthe WHO criteria for diagnosis of Acute Respiratory Infection which included the presence of fever, cough, tachypnea with or without chest indrawing.[9]

The following factors from the history was recorded. Past history of choking or h/o recurrent respiratory tract infection and the condition. Dietary history included whether the child was given exclusive breast feed in the first 6 months or not and whether the child had a calorie and protein deficit in the dietWhether the child was completely immunised according to National immunisation scheduleSocioeconomic Status was determined using Modified Kuppuswamy scale 2019 .Details of housing conditions, medium of fuel used for cooking was recorded .A detailed examination of each child was done. Vital signs such as Respiratory rate And heart rate were measured for one minute, when the child was Quiet. Anthropometric parameters were recorded and the nutritional status was graded according to Indian Academy of paediatrics grading for malnutrition

Table 4.2: Iap Classification Of Malnutrition[13]
Grading Of Malnutrition Weight For Age Of The Standard (%)

GRADING OF MALNUTRITION	WEIGHT FOR AGE OF THE STANDARD (%)
NORMAL	>80%
GRADE-1	70-80%
GRADE-2	60-70%
GRADE-3	51-60%
GRADE-4	<50%

Various Known risk factors for acute LRTI were defined in the present study :

Lack of Exclusive breast feeding : when the baby was not breast fed or Given other milk in addition to breast feeding during the first 6 months of life .

Low birth weight : birthweight < 2500 gms

Incomplete Immunisation : Children who did not received all vaccines asper National Immunization schedule which were recommended for the child's age

Overcrowding : Overcrowding was determined by calculating Number offamily members per room . A child who was not found to be in thefollowing norm was labelled as staying in overcrowded house
1 Room - 2 persons
2 Rooms -3 persons
3 Rooms - 5 persons
4 Rooms -7 persons
5 or more rooms - 10 persons

Passive smoking : smoking by any member in the house

Indoor air pollution : use of fire wood, etc

ILLITERATE : parents who are uneducated (who cant read and write) is defined according to Modified kuppuswamy scale 2019.

Anemia : was defined, based on WHO cut off of Hemoglobin levels for a age band.

Table 4.3 : Grading Of Anemia[14]

Age Group	Mild Anemia (hb In Gm/dl)	Moderate Anemia(Hb ingm/dl)	Severe Anemia (hb In Gm/dl)
6M- 5YRS	10-10.9	7-9.9	<7

Stastical Analysis: The data collected were entered into MICROSOFT EXCEL and imported Into the SPSS Software Ver. 19, for analysis. The data was analysed Using Epi info 7 and epi calculator calculations Analysis was based on Simple percentages proportions ,tables and charts. The difference in Proportions were compared using the chi-square stastics . A P-Value of <0.05 was taken as clinically significant. Depending on risk factors the comparision done in two groups cases and controls. Tables were constructed based on risk factors The sensitivity specificity , positive predictive value and negative predictive Value P value and Odds ratio are derived based on the above values.

RESULTS:

A total of 114 children were enrolled in the study, including 57 children with acute lower respiratory tract infection (LRTI) and 57 age-matched controls with fever without LRTI. The majority of children with LRTI were aged 6–12 months (77.2%), compared with 29.8% in the control group, indicating that infancy constituted the highest-risk age group. Among children with LRTI, 66.7% were males, while 33.3% were females, demonstrating a male predominance. In contrast, the control group had an almost equal sex distribution. Among clinical presentations, rapid breathing (100%) was the universal symptom, followed by cough (96.4%), nasal congestion (94.0%), fever (78.9%), and chest indrawing (52.6%). On examination, tachypnea (100%) was the most frequent clinical sign, followed by wheeze/crepitations (70.1%), subcostal/intercostal retractions (64.9%), and tachycardia (59.6%). Prematurity (<37 weeks gestation) was observed in 26.3% of cases compared with 5.2% of controls, suggesting a significant association with acute LRTI. OR 6.42, 95% CI: 1.74–23.66; p=0.002), with preterm children having approximately 6.4-fold higher odds of developing LRTI Low birth weight (<2500 g) was present in 40.4% of children with LRTI compared with 10.5% of controls, indicating that low birth weight was an important predictor of acute LRTIOR 5.76, 95% CI: 2.10–15.79; p<0.001), indicating that low birth weight children had approximately 5.8-fold higher odds of developing LRTI than children with normal birth weight. Delayed initiation of complementary feeding (>6 months) was observed in 31 (54.3%) children with LRTI compared with 18 (31.5%) controls. Delayed weaning showed a significant association with acute LRTI (OR 2.58, 95% CI: 1.20–5.55; p=0.0139), indicating that children with delayed complementary feeding had approximately 2.6-fold higher odds of developing LRTI. Incomplete immunization was present in 40 (70.2%) cases compared with 23 (40.3%) controls. Incomplete immunization was significantly associated with acute LRTIOR 3.48, 95% CI: 1.60–7.56; p=0.001), with incompletely immunized children having 3.5-fold higher odds of LRTI than fully immunized children. Parental illiteracy was identified in 41 (71.9%) cases and 27 (47.3%) controls. A significant association was observed between parental illiteracy and acute LRTI OR 2.87, 95% CI: 1.31–6.19; p=0.0075), suggesting nearly threefold increased odds of LRTI among children of illiterate parents. Malnutrition was significantly more common among children with LRTI, affecting 41 (71.9%) cases compared with controls. Grade I malnutrition was present in 33.3%, Grade II in 24.5%, and Grade III in 14.3% of cases. Malnutrition showed a very significant association with acute LRTI (p<0.0005) Anemia was detected in 48 (84.2%) children with LRTI and occurred less frequently among controls. Moderate anemia was the predominant type (45.6%), followed by mild (31.0%) and severe anemia (7.0%). Anemia demonstrated a significant association with acute LRTI (p<0.005) Regarding the mode of delivery, 39 (68.4%) cases and 37 (64.9%) controls were delivered by lower segment caesarean section (LSCS), while 18 (31.6%) cases and 20 (35.1%) controls were delivered by normal vaginal delivery (NVD). There was no statistically significant association between the mode of delivery and acute LRTI (p>0.05), indicating that the mode of delivery did not influence the occurrence of LRTI in the present study.

Table 1. Baseline Characteristics of Study Participants (Age and Sex)

Variable	Children with LRTI (n=57)	Controls (n=57)	Total (N=114)
Age group			
6 months–1 year	44 (77.2%)	17 (29.8%)	61 (53.5%)
>1–2 years	5 (8.8%)	13 (22.8%)	18 (15.8%)
>2–5 years	8 (14.0%)	27 (47.4%)	35 (30.7%)

Sex			
Male	38 (66.7%)	28 (49.1%)	66 (57.9%)
Female	19 (33.3%)	29 (50.9%)	48 (42.1%)

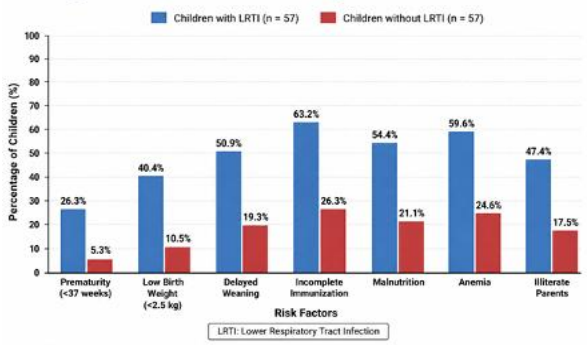
Table 2. Clinical Profile of Children with LRTI (Symptoms and Signs) (n=57)

Clinical Feature	n (%)
Symptoms	
Fever	45 (78.9%)
Cough	55 (96.5%)
Nasal congestion	54 (94.7%)
Rapid breathing	57 (100%)
Chest indrawing	30 (52.6%)
Signs	
Tachypnea	57 (100%)
Tachycardia	34 (59.6%)
Subcostal/Intercostal retractions	37 (64.9%)
Wheeze/Crepitations	40 (70.2%)

Table 3. Association of Risk Factors with Acute Lower Respiratory Tract Infection

Risk factor	Cases (n=57) n (%)	Controls (n=57) n (%)	Odds Ratio (95% CI)	P value
Prematurity	15 (26.3)	3 (5.3)	**6.43 (1.75–23.64)**	**0.005**
Low birth weight	23 (40.4)	6 (10.5)	**5.79 (2.12–15.84)**	**<0.001**
Delayed weaning	29 (50.9)	11 (19.3)	**4.34 (1.89–9.95)**	**<0.001**
Incomplete immunization	36 (63.2)	15 (26.3)	**4.82 (2.16–10.77)**	**<0.001**
Malnutrition	31 (54.4)	12 (21.1)	**4.46 (1.97–10.10)**	**<0.001**
Anemia	34 (59.6)	14 (24.6)	**4.53 (2.03–10.13)**	**<0.001**
Illiterate parents	27 (47.4)	10 (17.5)	**4.25 (1.81–9.97)**	**0.001**

Figure 1. Prevalence of Risk Factors among Children with LRTI and Controls



DISCUSSION:

The present hospital-based case–control study identified several significant risk factors for acute lower respiratory tract infection (LRTI) among children aged 6 months to 5 years. Younger age, particularly infancy, was associated with a higher risk of LRTI, reflecting increased susceptibility due to immature immune function. Perinatal factors such as low birth weight and prematurity, along with nutritional deficiencies including malnutrition and anemia, were significantly associated with acute LRTI. Lack of exclusive breastfeeding and incomplete immunization further increased the risk, highlighting the protective role of optimal infant feeding practices and routine vaccination. Environmental determinants including passive smoking, indoor air pollution, and overcrowding were also significantly associated with LRTI, likely due to increased exposure to respiratory pathogens and impaired airway defense mechanisms. In addition, lower maternal education and poor socioeconomic status were important social determinants, probably influencing child nutrition, healthcare-seeking behavior, immunization, and living conditions. Overall, the findings indicate that acute LRTI is a multifactorial disease influenced by perinatal, nutritional, environmental, and socioeconomic factors, emphasizing the need for comprehensive preventive strategies targeting these modifiable risk factor.

COMPARISION OF THE PRESENT STUDY WITH VARIOUS studies The majority of children with LRTI in the present study were aged **6–12 months (77.2%)**, which is higher than that reported by **Taksande et al**[15] **(50%)**, **Mirji et al** [17]**(60.7%)**, **Samrita Seth et al**[18] **(63%)**, and **Syed M. Azad et al.**[19]**(54.9%)**, but lower than that reported by **Pandey et al. and Pandit**[16] where infants constituted the majority of cases.Male children constituted **66.6%** of cases in the present study, comparable to **Taksande et al** [15]**(66.4%)**, **Mirji et al**[17] **(64.5%)**, **Samrita Seth et al** [18] **(62%)**, and **Syed M. Azad et al** [19] **(60.4%)**, confirming the male predominance observed in childhood LRTI.Rapid breathing, cough, and fever were the common presenting symptoms, while **tachypnea (100%)**, wheeze/crepitations (70.1%), and chest retractions (64.9%) were the predominant clinical signs. Similar findings were reported by **Prabhakar et al** [20] and **Y. Siva Rama Krishna et al** [21] who observed **tachypnea (100%)** and chest retractions (100%) as the most consistent clinical signs of pneumonia.

Malnutrition: Malnutrition was present in **71.9%** of cases and showed a **very significant association** with LRTI (p<0.0005; OR=3.7). **Taksande et al**[15] reported malnutrition in **86%** of cases with a **significant association**, while **Mirji et al**[17] also demonstrated a **very significant association**, with malnutrition present in **150 cases versus 26 controls**.

Incomplete immunization: Incomplete immunization was significantly associated with LRTI (**70.2%; OR=3.48; p<0.005**). Similar findings were reported by **Taksande et al** [15] who found a **significant association** (p<0.005), and **Pandey et al.**, who reported a **very significant association** with an **OR of 5.6**.

Delayed weaning: Delayed weaning showed a **significant association** with LRTI (**OR=2.58; p<0.05**). **Pandey et al** [16]reported a similar association (**OR=2.05**), while **Samrita Seth et al** [18] demonstrated a **very significant association** (p<0.0005).

Low birth weight: Low birth weight showed a **very significant association** with LRTI (p<0.0005). **Pandey et al** [16]also reported a **very significant association**, with an **OR of 3.63**.

Prematurity: Prematurity was strongly associated with LRTI in the present study (**OR=6.48; p<0.005**). **Pandey et al.** [16] similarly reported a **significant association** between prematurity and acute respiratory infection (p<0.05).

Parental education: Parental illiteracy was significantly associated with LRTI (**71.9%; OR=2.87; p<0.005**). **Mirji et al** [17] likewise demonstrated a **very significant association** between low parental education and LRTI (p<0.0005).

Anemia: Anemia showed a **significant association** with LRTI (p<0.005). **Pandey et al** [16] reported a significant association with an **OR of 2.57**, while **Mirji et al** [17] and **Syed M. Azad et al.**[19] also found a **very significant association** (p<0.0005).

CONCLUSION:

The present study identified **low birth weight, prematurity, delayed weaning, lack of exclusive breastfeeding, incomplete immunization, malnutrition, anemia, overcrowding, passive smoking, low socioeconomic status, and parental illiteracy** as significant risk factors for acute lower respiratory tract infection among under-five children, while the mode of delivery was not significantly associated. Early identification and modification of these preventable risk factors through improved maternal and child healthcare, optimal nutrition, complete immunization, and parental health education can substantially reduce the burden of acute LRTI in this vulnerable population.

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DECLARATIONS

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Ethical approval: The study was approved by the Institutional Ethics Committee.

REFERENCES

1. Williams BG, Gouws E, Boschi-Pinto C, Bryce J, Dye C. Estimates of world-wide distribution of child deaths from acute respiratory infections. Lancet Infect Dis. 2002;2:25-

32.
2. Mizgerd JP. Lung infection – a public health priority. PLoS Med. 2006;3: e76
3. WHO, regional office of SEAR. Health Situation in the South East Asia Region monograph, 1994-1997. New Delhi: WHO, 1999.
4. Sikolia DN, Mwololo K, Cherop H, Hussein, Juma M, Kurui J, Bwika A, Seki I, Osaki Y. The prevalence of acute respiratory tract infections and the associated risk factors: A study of children under five years of age in Kibera Lindi Village, Nairobi, Kenya. J Natl Inst Public Health. 2002;51(1):67-72.
5. WHO. World Health Report 2004, Report Of The Director General. Geneva: WHO,2004.
6. Kabra SK. Lower respiratory Tract Infection. In: Parthasarathy A, Menon PSN, Gupta P, Nair MKC (Eds.). IAP Textbook of Pediatrics. 4th ed. New Delhi: Jaypee Brothers Medi cal Publishers, 2009, p. 573.
7. Deny FW , Clyde WA jr.Acute lower respiratory tract infection in non hospitalized children J Pediatr,1986;108(5 pt 1) :635-46 .8.
8. Savitha MR, Nandeeshwara SB, Pradeep Kumar MJ, ul-Haque F, Raju CK. Modifiable risk factors for acute lower respiratory tract infections. Indian J Pediatr. 2007;74(5):477-82.
9. Vardas E, Blaauw D, McAnerney J. The epidemiology of respiratory syncytial virus (RSV) infections in South African children. S Afr Med J. 1999;89(10):1079-84.
10. Park k. Epidemiology of communicable diseases.In:Parks Textbook of preventive and social Medicine . 21st ed .Jabalpur , M/S Banarsidas Bhanot Publishers ;2011.p.156.
11. Black RE , Morris SS, Bryce J.Where and Why are 10 million children dying Every year? Lancet 2003;361:2226-34
12. Parthasarthy A, Menon PS ,Nair MK. Difference between Typical and Atypical Pneumonia , IAP Textbook of Pediatrics .Jaypee Brothers Medical publishers 7th edition , 2019; Feb-4.p.641
13. Piyush gupta , PG Textbook of paediatrics VOL 1 Grading of malnutrition According to IAP Classification 1ST Edition Vol 1 / 2015 ;P.947.
14. WHO .Hemoglobin concentrations for the diagnosis of anemia and assessment of severity Vitamin and Mineral Nutrition Information System . Geneva World health organization ,2011(WHO/NMH/NHD/MNM/11.1)
15. Taksande AM, Yeole M. Risk factors of Acute Respiratory Infection (ARI) in under-fives in a rural hospital of Central India. Journal of Pediatric and Neonatal Individualized Medicine (JPNIM). 2016;5(1):e050105.
16. Deepti P, Abha P. Risk factors of acute lower respiratory tract infection: a study in hospitallized central Indian children under 5 year age. MOJ Current Research & Reviews. 2018;1(3):129-33.
17. Mirji G, Shashank KJ, Shrikant SW. A study of modifiable risk factors for acute lower respiratory tract infections among under five children in a tertiary care hospital in Gulbarga, Karnataka. Indian Journal of Child Health. 2016 Mar 26;3(1):23-6.
18. Seth S, Ganguly S, Satpathy SK. Risk factors responsible for lower respiratory tract infections in children aged under five: a hospital based study. International Journal of Contemporary Pediatrics. 2020 Jul;7(7):1578.
19. Azad SM, Bannerji R, Ray J, Mitra M, Mukherjee A, Biyani G. Assessment of modifiable risk factors for acute lower Respiratory tract infections in under-five children. Indian Journal of Child Health. 2018 May 28;5(5):376-80.
20. Prabhakar S ,Ramanathan R, Lakshmi Sarayu Y .Clinical profile and outcome Of pneumonia in children .2016; JMSR Vol /04/10 :page 13284-13289.44.Ankush Bathia , Ritu Rakholia , Bhawna Choudhary , Ajay Arya . 2020 ;Vol/07/3 :Page :156-161.
21. Krishna YS, Ramireddy K, Aparna S, Anusha G, Mounika S, Sandeep K. Study of acute lower respiratory tract infections in children of age group 1 month to 5 years. JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS. 2015 Apr 6;4(28):4868-77.