

A Review of Clinical Profile of Lower Respiratory Tract Infections in Hospitalized Paediatric Patients

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Received: 25-08-2024 / Revised: 23-09-2024 / Accepted: 25-10-2024

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Conflict of interest: Nil

Abstract:

Introduction: Lower respiratory tract infection (LRTI) includes all infections of the lungs and large airways below the larynx. On average, children <5 years of age suffer about 5-6 LRTI episodes per year.

Aim: To study the clinical profile of LRTIs in PICU and paediatric wards of a tertiary care hospital.

Materials and Methods: This was a prospective, analytic, hospital-based, descriptive, and non-interventional study done on LRTI children aged 1–72 months. A total of 31 patients fulfilling the inclusion criteria were included in this study. A proper history and clinical examination with more emphasis on the respiratory system was carried out. Investigations such as CBC, ESR, CRP, and chest X-Ray were done. Descriptive statistics were done.

Results: There were a total of 16 (51.6%) male and 15 (48.4%) female participants.

Thirty (96.8%) patients had cough and fever. Rapid breathing or difficulty in breathing was present in 19 (61.3%) patients. Ten (32.3%) patients had respiratory distress. Twenty-three (74.2%) patients had abnormal respiratory system. There were 21 (67.7%) patients who had raised ESR>20. Nineteen (61.3%) patients had raised CRP>6. According to the final diagnosis, there were 18 (58.1%) patients who had broncho-pneumonia, 6 (19.6%) had bronchiolitis and 1 (3.2%) patient had bronchitis.

Conclusion: Bronchopneumonia is the predominant form of presentation in infants and preschool children. The focus of health care services should be on the necessary components of LRTIs such as nutrition, immunization, and environment.

Keywords: LRTIs, Respiratory Infections, Bronchopneumonia, Bronchiolitis, Bronchitis Children.

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Introduction

Lower respiratory tract infection (LRTI) includes all infections of the lungs and large airways below the larynx. On average, children <5 years of age suffer about 5-6 LRTI episodes per year. Its greatest impact is observed in developing countries with more than 70% of the cases diagnosed in the sub-Saharan Africa and Southeast Asia. [1,2]

Worldwide, the single largest infectious cause of death in children is pneumonia. In 2019, 7,40,180 children <5 years of age have been killed due to the same. This accounts for almost 14% of all deaths of children under the age of 5 years but 22% of all deaths in children aged 1 to 5 years. India, owing to their huge population, in 2018 reported the second highest pneumonia-related child mortality in terms of absolute numbers. Between 2000- 2018, even though there has been a significant reduction in deaths (54%) due to pneumonia in children under the age of 5 years, it remains the world's leading

infectious killer of children. It is estimated that over 800,000 children under the age of 5 years every year or more than 2000 every day are killed due to pneumonia. [1,3,4]

Environmental risk factors have a major impact on pediatric respiratory tract infections. [5] The most important risk factors are malnutrition, nonexclusive breastfeeding, low birth weight, missing vaccination (measles) in children under age one, vitamin A deficiency, Zinc deficiency, concomitant diseases (e.g., diarrhea, asthma, heart disease), low level of education in mother, poor socioeconomic status, crowded dwellings, pollution, smoking in the vicinity, humidity, and cold weather. [6,7] The decrease in deaths due to LRTIs has been attributed to the improvements in the nutritional status of children, improvement of supportive care, easy availability of antibiotics, and increased vaccination status. [8]

ARIs constitute a large burden of diseases requiring health care in children; and so, health policymakers need to strategize, create, and implement rational strategies for their management taking into consideration the local evidence-based guidelines. [9] At present, in India, the availability of data related to paediatric LRTIs is inadequate. This present study was conducted to study the clinical profile of LRTIs in PICU and paediatric wards of a tertiary care hospital.

Objectives

To study the clinical profile of LRTIs in PICU and paediatric wards of a tertiary care hospital

Methods

This was a prospective, analytic, hospital-based, descriptive, and non-interventional study done on LRTI children admitted to PICU and paediatric wards at Dr. D.Y PATIL Hospital, Nerul, Navi Mumbai. Ethical approval was taken from the Institutional Ethics Committee and written informed consent was taken from the parent/guardian of each patient. An information sheet was given to each parent/guardian of the participants.

The authors proposed a sample size of 100 children between 2 months to 12 years of age with a confirmed diagnosis of LRTI. However, due to the COVID-19 pandemic, there were only 31 admissions of children who fulfilled the inclusion criteria during the study period of 1 year. Children with immunosuppression, autoimmune conditions, anaphylactic reactions, with a diagnosis of pneumothorax, MODS, septic shock, and associated allergies or with congenital heart and lung diseases were excluded from the study.

A proper history and clinical examination with more emphasis on the respiratory system was carried out. Investigations such as CBC, ESR, CRP, and chest X-ray were done.

Definition of LRTI: As there is no standard definition of childhood ALRI, subjects were

included if they had at least one specific sign reported by a caregiver (difficulty in breathing, chest wall retractions) and/or abnormal auscultatory findings reported (crepitations/crepts, rhonchi or bronchial breath sounds). [10]

In children under the age of 5 years, presenting with cough and/or difficulty in breathing, with or without fever, pneumonia is diagnosed by the presence of either fast breathing or lower chest wall retractions. [11]

Diagnostic Criteria: A history of cough, nasal discharge, sore throat, difficulty in breathing, and discharge from ear with/ without fever, was used to recognize an episode of ARI. To differentiate one episode from another, a criteria of 3 days of asymptomatic period was used. Respiratory rates above 60/minute (among < 2-month infants), above 50 (2-11 months), and above 40 (1-5 years) in a child with cough, cold, or fever, alone or together are the criteria for recognition of pneumonia. In a child with pneumonia, presence of chest indrawing, impaired consciousness, mild- severe cyanosis, inability to drink water and convulsions suggest severe pneumonia. [12]

Statistical Analysis of Data: The collected data was entered in Microsoft Excel. The descriptive analysis of the data was done using SPSS (Statistical Package for Social Sciences) Version 24.0 (IBM Corporation, Chicago, USA). Tables and charts were prepared to express the data.

Results

A total of 31 subjects participated in the study. Of those who participated, 10 (32.2%) were infants, 19 (61.3%) participants were 1 to 5 years of age and 2 participants were >5 years of age. There were a total of 16 (51.6%) male and 15 (48.4%) female participants.

Thirty (96.8%) patients had cough and fever. Rapid breathing or difficulty in breathing was present in 19 (61.3%) patients (Table 1).

Table 1: Details of presenting complaints among the study population

Presenting Complaints	N	%
Cough	30	96.8
Fever	30	96.8
Rapid or difficulty in breathing	19	61.3
At least 1 above complain	30	96.8
All 3 complains	17	54.8

There were only 3 (9.7%) patients with a past history of similar complaints. Two participants (6.5%) had pre-term birth. There were only 3 (9.7%) patients who were bottle fed rest 28 (90.3%) were breastfed. There were only 3 (9.7%) patients who were partially immunized and the rest 28 (90.3%) were

completely immunized according to the National Immunization Program.

Ten (32.3%) patients had respiratory distress. Only three (9.7%) patients were febrile. All patients had normal BP / CRT. Spo2 was not maintained in 5 (16.1%) patients. Six patients had protein energy malnutrition (PEM). Out of these 6 patients, 5

(16.1%) had grade I PEM and 1 (3.3%) had grade III PEM.

Twenty three (74.2%) patients had abnormal respiratory system. About one third (74.2%) of the patients had anaemia. Six (19.4%) patients had leukocytosis (Table 2).

Table 2: Details of CBC of the study population

Variables	N	%
Anaemia		
Yes	23	74.2
No	8	25.8
Leucocytosis		
Yes	6	19.4
No	25	80.6
Neutrophilia	6	19.4
	Mean	S.D.
HB	9.92	1.80
TLC	12.15	6.01

All these six patients had neutrophilia. The mean HB of the study participants was 9.92 ± 1.80 and mean TLC count was 12.15 ± 6.01 . twenty five (80.7%) patients had abnormal chest x-ray.

As per provisional diagnosis 20 (64.5%) patients had pneumonia, 10 (32.3%) had bronchiolitis and 1

(3.2%) patient had bronchitis. There were 21 (67.7%) patients who had raised ESR>20. Nineteen (61.3%) patients had raised CRP>6. There were a total of 14 (45.2%) patients who had both ESR and CRP raised (Table 3).

Table 3: Details of ECR and CRP

Variables	N	%
ESR>20		
Yes	21	67.7
No	10	32.3
CRP>6		
Yes	19	61.3
No	12	38.7
Both ESR and CRP raised		
Yes	14	45.2
No	5	16.1

There were no (0.0%) patients who had sodium <130. According to the final diagnosis there were 18 (58.1%) patients who had broncho-pneumonia, 6 (19.6%) had bronchiolitis and 1 (3.2%) patient had bronchitis (Table 4).

Table 4: Final diagnosis

Final diagnosis	N	%
Bronchiolitis	6	19.6
Bronchitis	1	3.2
Bronchopneumonia	18	58.1

Discussion

The present prospective cross-sectional hospital-based study was carried out to study the clinical profile of lower respiratory tract infection of children between the age of 1–72 months. A total of 31 patients were included in this study.

In the present study, there were 32.2% of patients less than 1 year of age, 61.3% of 1 to 5 years of age, and 6.5% of >5 years of age. Similar observations were also made by Champatiray et al [13] in their study. The occurrence of pneumonia in lesser age

groups could be attributed to the fact that infants and lesser-aged children have lower immunity, higher susceptibility to infections, smaller/ narrower airways, repeated exposure to infections, and poor nutritional status, [14,15]

In our study, we observed that male children (51.6%) outweighed female children (48.4%). This was similar to other studies carried out among children with lower respiratory tract infection hospitalization in the USA, [16] Iran, [17] Nigeria, [18] and China. [19] One reason could be due to the preferential treatment being given to the male child

in the family. A study by Libert et al., [20] indicated that the incidence of acute LRTI in girls could be attributed to their inherent immunity due to the presence of an extra “X” chromosome in their genotype.

In our study immunization of children was done as per age. Similar findings were also seen in the study done by Vinaykumar and Maruti. [21] In a study done by Demissie et al. [22] children who were not vaccinated were twice as likely to have acute lower respiratory tract infections than vaccinated children.

In our study, most of the patients (80.6%) had no protein energy malnutrition and only 6 patients had PEM. In the study by Vinaykumar and Maruti, [21] a majority of children diagnosed with severe pneumonia had grade I and II malnutrition. In a study conducted by Alok Kumar et al [23] 60.5% of cases had Protein Energy Malnutrition, 17% presented with features of Rickets, and 16% had a deficiency of micronutrients (zinc, Vit- B12, Vit A, and others). Malnutrition has been significantly associated with the occurrence of acute lower respiratory tract infections, especially among children under the age of 5 years. Malnutrition reduces the cell-mediated immune response predisposing a child to infection. [24]

Most of the patients in this study (90.3%) were breastfed. In developing countries like India breastfeeding is a common practice but in Western countries, it is not the same. A study by Demessie et al [22] reported that children receiving replacement feeds were 1.85 times more likely to have acute lower respiratory tract infections compared to exclusively breastfed children. This can be attributed to breast milk containing antibodies.

In this study most of the patients (74.2%) were anaemic. This conforms with a study done by Ramakrishnan et al. [25] They reported anaemia as a significant contributing factor. Alok Kumar et al [23] study reported 73.5% LRTIs cases had haemoglobin less than 11 gm/dl.

In this study most (96.8%) patients had cough and fever. Rapid breathing or difficulty in breathing was present in 61.3% of patients. Alok Kumar et al [23] study reported similar findings. In our study, 32.3% of patients had respiratory distress.

Regarding the laboratory findings, it was observed that in a small percentage (19.4%) of children leucocytosis was present. The reason could be that the majority of the cases were already on oral antibiotics before being admitted to the hospital. A study done by Vinaykumar and Maruti. [21] and Champatiray J et al also reported the same [13]

The final diagnoses in our study were 18 (58.1%) patients with Broncho-pneumonia, 6 (19.6%) of bronchiolitis and 1 (3.2%) patient of bronchitis. The study done by Vinaykumar and Maruti [21] showed

that a higher number of children had bronchopneumonia, followed by bronchiolitis, and lobar pneumonia. This was similar to the study conducted by Kannam D et al, [26] in which 40% of cases were diagnosed as bronchopneumonia, 25% as lobar pneumonia, and 19% as bronchiolitis. In a study by Reddaiah et al, [27] a diagnosis of bronchopneumonia was present in 64%, lobar pneumonia in 6.4%, and post-measles bronchopneumonia in 4.0% of cases. [15] In a similar study conducted in South Korea, the diagnoses were similar in number. [28]

None of the children in this study died and all of the patients recovered completely. Similar studies conducted among children with lower respiratory tract infections reported that the mortality rate of children was 1.04% in Mexico [29] and 4% in Morocco [30]. In contrast, a study conducted by Mirkarim M et al [31] reported an overall mortality rate of 11.6%. In a study in South Africa, among 265 patients requiring admission to PICU, a mortality rate of 12.8% was reported. [32]

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