



Pattern of Respiratory Illnesses and Associated Risk Factors among Pediatric Inpatients in a Teaching Hospital: An Observational Study.

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Abstract

Background: Respiratory illnesses remain a leading cause of pediatric hospital admission and early childhood morbidity, particularly in low- and middle-income settings where environmental and nutritional vulnerabilities remain common. **Objectives:** To describe the pattern of respiratory illnesses and associated risk factors among pediatric inpatients admitted to a teaching hospital. **Methods:** This hospital-based prospective observational study was conducted among one hundred consecutive pediatric inpatients with respiratory illnesses. Demographic details, clinical diagnosis, presenting features, risk factors, severity at admission, treatment received, and in-hospital outcomes were recorded using a structured proforma and analyzed descriptively. **Results:** The mean age of the participants was 3.8 ± 3.1 years, and 44.0% were aged 1–5 years. Males constituted 58.0% of the study population. Pneumonia was the most common diagnosis [34.0%], followed by bronchiolitis [22.0%] and wheeze-associated lower respiratory tract infection/acute asthma exacerbation [18.0%]. Cough [94.0%] and fever [88.0%] were the predominant presenting complaints. Overcrowding [54.0%], indoor biomass fuel exposure [42.0%], passive smoking [39.0%], lack of exclusive breastfeeding [36.0%], and undernutrition [33.0%] were frequent associated risk factors. Severe illness was seen in 32.0% of children. Most patients were discharged after treatment, while the in-hospital mortality was 4.0%. **Conclusion:** Lower respiratory tract illnesses, especially pneumonia and bronchiolitis, constituted the major burden of pediatric respiratory admissions. Young age, household crowding, smoke exposure, incomplete immunization, and undernutrition were prominent associated factors. Early risk identification, improved environmental control, nutritional strengthening, and timely hospital care are important to reduce severity and adverse outcomes.

Keywords: pediatric respiratory illness, pneumonia, bronchiolitis, risk factors, hospitalization.



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INTRODUCTION

Respiratory illnesses are among the most important causes of morbidity, health-care utilization, and hospital admission in childhood across the world. Acute respiratory infections range from self-limited upper respiratory tract disease to severe lower respiratory tract involvement such as pneumonia, bronchiolitis, and wheeze-associated illnesses that require oxygen therapy, intensive monitoring, or ventilatory support [1-5]. In low- and middle-income countries, the burden remains particularly high because of persistent exposures related to poverty, crowding, undernutrition, household air pollution, delayed care seeking, and incomplete immunization [2-7]. India continues to shoulder a substantial share of pediatric respiratory disease, and pneumonia remains a major contributor to childhood illness and mortality despite improvements in immunization, antibiotic availability, and facility-based care [5].

The epidemiology of pediatric respiratory admissions is shaped by age, seasonality, environmental exposures, nutritional status, and background susceptibility. Infants and younger children are particularly vulnerable because of narrower airways, immature immune responses, and dependence on caregivers for early recognition and access to care [3,4]. Bronchiolitis commonly affects infants, while pneumonia, acute bronchitis, and wheeze-associated lower respiratory infections contribute to a broad spectrum of inpatient disease in early childhood [3,]. Several modifiable determinants have been repeatedly associated with more frequent and more severe respiratory illness, including biomass fuel smoke, passive tobacco exposure, lack of exclusive breastfeeding, low birth weight, overcrowding, and malnutrition [6]. These determinants frequently coexist in resource-constrained settings and amplify the clinical burden.

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Beyond diagnosis alone, a careful description of symptom profile, severity at admission, treatment requirements, and immediate outcomes provides useful clinical and public health information. Such hospital-based data help identify locally relevant risk patterns, inform pediatric triage and supportive care priorities, and support targeted preventive interventions in the community [5-7]. Teaching hospitals in semi-urban and rural catchment regions often receive children with delayed presentation and clustered household risk factors, making them important sites for epidemiological observation.

Although many studies have examined childhood respiratory infections globally, regional institutional data remain essential because disease pattern and associated exposures vary by locality, fuel use, socioeconomic conditions, health-seeking behavior, and referral practices [5,6]. Limited data from individual teaching hospitals in Telangana further underline the need for context-specific reporting of inpatient respiratory morbidity.

The objectives of the present study were to describe the demographic and clinical profile of pediatric inpatients admitted with respiratory illnesses, identify the pattern of respiratory diagnoses and associated risk factors, assess severity at admission, and document the treatment profile and short-term in-hospital outcomes in a teaching hospital setting.

METHODOLOGY

Study design and setting: This prospective observational study was conducted in the Department of Pediatrics, Prathima Institute of Medical Sciences, Karimnagar, Telangana, over a six-month period from February 2022 to July 2022. The hospital is a teaching institution that serves urban, semi-urban, and surrounding rural populations and receives a broad range of pediatric respiratory admissions. The study was designed to provide a descriptive account of the pattern of respiratory illnesses and associated risk factors among admitted children.

Study population: Pediatric inpatients aged 2 months to 14 years admitted with a primary respiratory illness during the study period were considered eligible. A total of 100 consecutive children fulfilling the eligibility criteria were enrolled and included in the final analysis. Respiratory illnesses were categorized clinically into pneumonia, bronchiolitis, wheeze-associated lower respiratory tract infection/acute asthma exacerbation, acute bronchitis or other lower respiratory tract infections, upper respiratory tract infection with complications, pleural effusion or empyema, croup, and pulmonary tuberculosis using standard pediatric diagnostic principles and institutional case records [5-7,12,13].

Inclusion and exclusion criteria: Children admitted with clinical features suggestive of respiratory tract disease, either upper or lower, were included after assessment by the pediatric team. Children with incomplete records, those admitted primarily for non-respiratory conditions with incidental respiratory symptoms, and those discharged before initial evaluation could be completed were excluded from analysis.

Data collection: Information was recorded in a structured proforma after clinical evaluation. The variables documented included age, sex, residence, socioeconomic status, nutritional status, final respiratory diagnosis, presenting complaints, and selected household or biological risk factors. Risk factors specifically assessed were overcrowding at home, indoor biomass fuel exposure, passive smoking, absence of exclusive breastfeeding for the first 6 months, incomplete immunization, anemia, low birth weight or prematurity, and previous hospitalization for respiratory illness. Severity at admission was classified as mild, moderate, or severe based on the overall clinical assessment, including respiratory distress, feeding difficulty, oxygen requirement, and need for closer monitoring or respiratory support, in line with routine pediatric practice and published severity-oriented approaches to childhood respiratory disease [6,7,10,13]. Management details including use of intravenous antibiotics, nebulization, oxygen supplementation, pediatric intensive care unit admission, mechanical ventilation, and duration of hospital stay were also recorded. Final in-hospital outcome was noted as discharged, referred, left against medical advice, or death.

Statistical analysis: The collected data were entered into Microsoft Excel and analyzed using descriptive statistical methods. Continuous variables were summarized as mean $\pm$ standard deviation, whereas categorical variables were expressed as frequencies and percentages. The findings were presented in tables to allow clear depiction of disease pattern, risk profile, treatment requirements, and outcomes.

Ethical considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee of Prathima Institute of Medical Sciences before commencement of data collection. Confidentiality of patient information was maintained throughout the study, and all data were used only for academic and research purposes.

RESULTS

A total of 100 pediatric inpatients admitted with respiratory illnesses during the study period were included in the final analysis. The age of the participants ranged from 2 months to 14 years, with a mean age of 3.8 ± 3.1 years. Most children belonged to the 1–5 years age group [44.0%], followed by infants aged less than 1 year [28.0%]. Males constituted 58.0%

of the study population, while females accounted for 42.0%. A majority of the children were from rural areas [62.0%], and 57.0% belonged to lower socioeconomic strata. Undernutrition was noted in 33.0% of cases, as shown in Table 1.

Table 1. Baseline characteristics of pediatric inpatients with respiratory illnesses [N = 100]

Variable	Category	n	% / Mean $\pm$ SD
Age [years]	Mean $\pm$ SD		3.8 $\pm$ 3.1
Age group	<1 year	28	28.0
	1–5 years	44	44.0
	6–10 years	18	18.0
	11–14 years	10	10.0
Sex	Male	58	58.0
	Female	42	42.0
Residence	Rural	62	62.0
	Urban	38	38.0
Socioeconomic status	Lower	57	57.0
	Middle/Upper	43	43.0
Nutritional status	Normal	67	67.0
	Undernutrition	33	33.0

Lower respiratory tract illnesses predominated among the admissions. Pneumonia was the most common respiratory illness, affecting 34.0% of children, followed by bronchiolitis [22.0%], wheeze-associated lower respiratory tract infection or acute asthma exacerbation [18.0%], and acute bronchitis or other lower respiratory tract infections [12.0%]. Cough [94.0%] and fever [88.0%] were the most common presenting complaints, followed by tachypnea [72.0%], breathlessness [61.0%], and wheeze [34.0%]. The pattern of respiratory illnesses and clinical presentation is shown in Table 2.

Table 2. Pattern of respiratory illnesses and presenting features among pediatric inpatients [N = 100]

Variable	Category	n	%
Respiratory illness	Pneumonia	34	34.0
	Bronchiolitis	22	22.0
	Wheeze-associated LRTI / acute asthma exacerbation	18	18.0
	Acute bronchitis / other LRTI	12	12.0
	URTI with complications	6	6.0
	Pleural effusion / empyema	4	4.0
	Croup	2	2.0
	Pulmonary tuberculosis	2	2.0
Presenting features*	Cough	94	94.0
	Fever	88	88.0
	Tachypnea	72	72.0
	Breathlessness	61	61.0
	Wheeze	34	34.0
	Chest retractions	29	29.0
	Poor feeding	27	27.0
	Cyanosis	8	8.0

*Multiple responses were possible.

Several associated risk factors were identified among the admitted children. Overcrowding was the most frequent risk factor and was present in 54.0% of cases, followed by indoor biomass fuel exposure [42.0%], passive smoking exposure [39.0%], absence of exclusive breastfeeding for 6 months [36.0%], undernutrition [33.0%], incomplete immunization [28.0%], anemia [26.0%], low birth weight or prematurity [21.0%], and previous respiratory hospitalization [17.0%]. Severe respiratory illness was observed in 32.0% of children overall. The associated risk profile and severity distribution at admission are presented in Table 3.

Table 3. Associated risk factors and severity profile among pediatric inpatients [N = 100]

Variable	Category	n	%
Risk factors*	Overcrowding at home	54	54.0
	Indoor biomass fuel exposure	42	42.0
	Passive smoking exposure	39	39.0
	No exclusive breastfeeding for 6 months	36	36.0
	Undernutrition	33	33.0
	Incomplete immunization	28	28.0
	Anemia	26	26.0
	Low birth weight / prematurity	21	21.0
	Previous respiratory hospitalization	17	17.0
Severity at admission	Mild	26	26.0
	Moderate	42	42.0
	Severe	32	32.0

*Multiple responses were possible.

Regarding treatment and outcomes, 64.0% of children required intravenous antibiotics, 58.0% received nebulization therapy, and 48.0% required supplemental oxygen. Pediatric intensive care unit admission was needed in 14.0% of cases, while 6.0% required mechanical ventilation. The mean duration of hospital stay was 5.8 ± 2.7 days. Most children improved and were discharged [93.0%]. Two children were referred, one left against medical advice, and four deaths were recorded, resulting in an in-hospital mortality of 4.0% [Table 4].

Table 4. Treatment profile and clinical outcomes among pediatric inpatients [N = 100]

Variable	Category	n	% / Mean $\pm$ SD
Treatment received*	Intravenous antibiotics	64	64.0
	Nebulization therapy	58	58.0
	Oxygen supplementation	48	48.0
	PICU admission	14	14.0
	Mechanical ventilation	6	6.0
Duration of hospital stay [days]	Mean $\pm$ SD		5.8 ± 2.7
Outcome	Discharged	93	93.0
	Referred	2	2.0
	Left against medical advice	1	1.0
	Death	4	4.0

*Multiple responses were possible.

DISCUSSION

The present hospital-based observational study showed that respiratory illness admissions were concentrated in younger children, with the largest proportion occurring in the 1–5-year age group and a substantial additional burden among infants. This age pattern is consistent with the recognized epidemiology of pediatric respiratory disease, wherein early childhood carries the greatest susceptibility because of smaller airways, immature host defenses, and higher exposure to household respiratory pathogens [5,12]. The modest male predominance observed in the study has also been reported in several pediatric respiratory series and likely reflects a combination of biological vulnerability and health-care utilization patterns [12-14].

Pneumonia emerged as the most common diagnosis, followed by bronchiolitis and wheeze-associated lower respiratory tract infection. This finding supports the continuing dominance of lower respiratory tract illness in pediatric inpatient practice, particularly in resource-constrained settings [13]. The frequency of bronchiolitis in the younger age groups is in line with prior hospitalization studies showing that viral bronchiolitis remains a major cause of infant admission and often contributes to significant oxygen requirement and prolonged observation [12,14]. The predominance of cough, fever, tachypnea, and breathlessness among presenting complaints reflects the typical symptom complex described in pediatric respiratory infections and reinforces the importance of early recognition of fast breathing and respiratory distress by caregivers and frontline providers [13].

A notable aspect of this study was the clustering of modifiable household and host-related risk factors. Overcrowding, indoor biomass fuel exposure, passive smoking, lack of exclusive breastfeeding, undernutrition, and incomplete immunization were frequently observed. These are well-established determinants of acute lower respiratory infection

burden and severity in children [6-11]. Household smoke exposure and poor ventilation increase inhalational injury and susceptibility to infection, while undernutrition adversely affects immune competence and clinical recovery [8-11]. Similarly, incomplete immunization and suboptimal infant feeding practices weaken protection against common infectious triggers and severe disease [7,13]. The current findings therefore underline the continuing interaction between medical illness and social environment.

Most children in the present study improved with standard inpatient care, yet a meaningful proportion required oxygen therapy, pediatric intensive care, and mechanical ventilation. The mean hospital stay of 5.8 days and mortality of 4.0% indicate that pediatric respiratory admissions still carry appreciable severity. Previous hospital-based studies have shown that poor nutritional status, delayed presentation, hypoxemia, severe pneumonia, and coexisting risk exposures contribute to unfavorable outcomes and greater resource use [7,10,13]. Although mortality in the present series was limited to a small number of children, the deaths emphasize that respiratory illness remains clinically important even in the era of improved antimicrobial therapy and supportive care.

Overall, the study highlights that the burden of pediatric respiratory hospitalization is driven not only by infectious diagnosis but also by preventable environmental and nutritional determinants. Strengthening exclusive breastfeeding, immunization coverage, smoke-free homes, cleaner household fuel use, nutritional improvement, and timely referral can reduce disease severity and inpatient burden in similar teaching hospital settings [11,13].

Limitations

Several limitations should be acknowledged. This was a single-center hospital-based study with a modest sample size and a six-month duration, which limits wider generalization. Etiological confirmation was not uniformly available for all admissions, so diagnosis was primarily clinical. The study included only admitted children and therefore did not capture milder outpatient respiratory illness. Full seasonal variation across an entire year was also not assessed.

CONCLUSION

Respiratory illnesses among pediatric inpatients in this teaching hospital were dominated by lower respiratory tract diseases, with pneumonia and bronchiolitis accounting for the largest share of admissions. Most affected children were young, and several preventable risk factors were common, particularly overcrowding, biomass fuel exposure, passive smoking, lack of exclusive breastfeeding, undernutrition, and incomplete immunization. Although the majority of children responded well to inpatient treatment, a substantial proportion required oxygen therapy and intensive care support, and mortality was still present. These findings emphasize the need for integrated strategies combining early clinical recognition, timely referral, improved inpatient supportive care, nutritional strengthening, immunization completion, and reduction of harmful household environmental exposures.

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