



ACUTE BRONCHIOLITIS IN CHILDREN UNDER TWO YEARS: CLINICAL FEATURES, DIAGNOSIS, AND PREDICTIVE MARKERS OF SEVERE COURSE

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Resume: Acute bronchiolitis is one of the leading causes of hospitalization in infants and young children. The disease is characterized by inflammation and obstruction of small airways, most commonly caused by respiratory syncytial virus (RSV). Despite generally favorable outcomes, a part of patients develop severe hypoxemia and respiratory failure requiring intensive care. The study investigates clinical predictors, laboratory markers, and instrumental criteria associated with severe bronchiolitis in children under two years.

Key words: bronchiolitis, RSV, infants, hypoxemia, pediatric pulmonology, inflammation, predictive markers

Relevance

Acute bronchiolitis affects nearly one third of all children during the first two years of life. RSV remains the leading etiological factor and annually leads to millions of hospitalizations worldwide. Early differentiation between mild and severe bronchiolitis is crucial for timely respiratory support and prevention of complications.

However, current diagnostic methods rely primarily on clinical judgment. The lack of robust laboratory and instrumental predictors complicates management decisions. Identifying reliable markers that indicate severity may reduce unnecessary hospitalizations and improve outcomes in high-risk infants.

Purpose of the study

To evaluate clinical, laboratory, and instrumental markers associated with severe acute bronchiolitis in children aged 1–24 months and to determine predictive factors for progression to respiratory failure.

Materials and methods

Study design

A prospective observational study conducted from 2023 to 2025 at the Pediatric Pulmonology Department.

Participants



A total of **128 children** aged 1–24 months diagnosed with acute bronchiolitis. They were divided into two groups:

- **Group I — Mild/Moderate bronchiolitis (n=82)**
- **Group II — Severe bronchiolitis (n=46)** requiring oxygen therapy, CPAP, or ICU admission.

Inclusion criteria

- Age ≤ 24 months
- Typical clinical manifestations: tachypnea, wheezing, intercostal retractions
- Confirmed viral etiology (RSV, rhinovirus, metapneumovirus)

Exclusion criteria

- Congenital heart disease
- Chronic lung disease
- Immunodeficiency

Methods

1. Clinical assessment:

Respiratory rate, SpO₂, severity scores, feeding intolerance.

2. Laboratory tests:

- Complete blood count
- CRP
- Procalcitonin
- IL-6 and IL-8 (ELISA)

3. Instrumental evaluation:

- Chest ultrasound
- Pulse oximetry monitoring
- Capillary blood gases (in severe cases)

4. Statistical analysis:

Student's t-test, logistic regression, ROC analysis.

$p < 0.05$ considered significant.

Results

Clinical findings

Children in Group II had:

- Significantly higher respiratory rate ($68 \pm 9/\text{min}$ vs $52 \pm 7/\text{min}$; $p < 0.01$)
- More frequent severe retractions (78% vs 35%; $p < 0.01$)
- Feeding difficulties in 61% vs 23% ($p < 0.01$)
- SpO₂ $< 92\%$ in 82% of severe cases



Laboratory markers

Marker	Group I	Group II	p-value
CRP (mg/L)	8.2 ± 3.1	19.6 ± 5.8	<0.01
Procalcitonin (ng/mL)	0.13 ± 0.08	0.42 ± 0.11	<0.01
IL-6 (pg/mL)	27.5 ± 6.7	68.9 ± 12.3	<0.01
IL-8 (pg/mL)	46.2 ± 11.8	102.4 ± 18.1	<0.01

IL-6 and IL-8 were the strongest predictors of oxygen-requiring disease (AUC=0.86 and 0.83 respectively).

Instrumental findings

- Lung ultrasound detected **subpleural consolidations** in 74% of severe cases vs 32% in mild cases.
- B-line dominance correlated with hypoxemia ($r=0.64$).
- Blood gases in Group II showed higher pCO_2 (52.3 ± 4.7 mmHg).

Predictive model

Multivariate regression identified **three independent predictors**:

1. $SpO_2 < 92\%$ on admission (OR 5.4; CI 3.1–9.2)
2. $IL-6 > 50$ pg/mL (OR 4.6; CI 2.6–8.1)
3. Ultrasound subpleural consolidations (OR 3.8; CI 1.9–6.2)

The combined model had a predictive accuracy of **87%**.

Discussion

Bronchiolitis severity is influenced by viral load, immune response, and airway anatomical factors.

The study demonstrates that:

- **Cytokine dysregulation** (elevated IL-6 and IL-8) reflects the intensity of airway inflammation and correlates with clinical worsening.



- **Lung ultrasound**, increasingly used in pediatrics, provides objective evidence of parenchymal involvement without radiation risk.
- Traditional markers such as CRP and leukocytosis showed moderate predictive value, confirming their limited role in differentiating viral disease severity.

Conclusion

Acute bronchiolitis remains a significant cause of morbidity in children under two years.

Severe bronchiolitis is associated with pronounced hypoxemia, respiratory distress, and feeding difficulties.

IL-6 and IL-8 are strong predictors of severe disease and may serve as reliable biomarkers for early risk stratification.

Lung ultrasound provides valuable diagnostic information and correlates with hypoxemia.

Combining SpO₂, cytokine levels, and ultrasound findings significantly increases predictive accuracy.

Implementation of these markers in routine clinical practice may improve outcomes and reduce hospitalization burden.

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