Original Article

Clinical Predictors of Severe Bronchiolitis and Adverse Hospital Outcomes in Children Under Two Years: A Retrospective Study

Mohammed Fasiullah Siddiqui[1], Kafeel Khan[2], Hrushita Boddam[3], MD Farooq Ershad Abdullah[1]

[1]Postgraduate, Department of Paediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India. [2]Professor, Department of Paediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India. [3]Senior resident, Department of Paediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India

Abstract

Background: Early and accurate risk stratification is crucial in management of severe bronchiolitis among children under two years. This study was undertaken with objectives to identify independent clinical predictors of severe bronchiolitis and validate the established Woods-Downes clinical severity score, and evaluate a novel composite Respiratory Distress Index (RDI) for bedside risk stratification. **Material and Methods:** In a retrospective observational study by evaluating 100 hospitalized children aged 1 to 24 months admitted with acute bronchiolitis, admission clinical parameters, including demographics, vital signs, and physical examination findings, were noted. The primary outcomes were severe bronchiolitis, prolonged hospitalization (> 5 days), and the requirement for supplemental oxygen. Independent predictors were identified using multivariable logistic regression. The discriminatory abilities of the Woods-Downes clinical severity score and the proposed 6-point RDI were assessed using Receiver Operating Characteristic (ROC) Area Under the Curve (AUC) analysis. **Results:** The mean age of the cohort was 10.17 ± 6.19 months (62% male). During hospitalization, 44% developed severe bronchiolitis, 67% required a prolonged hospital stay, and 57% needed supplemental oxygen. Multivariable analysis identified tachypnoea (aOR 7.72) at admission and male sex (aOR 2.88) as the strongest independent predictors of severe bronchiolitis. The Woods Downes score demonstrated significant discriminatory ability for predicting severe bronchiolitis (AUC = 0.961) and prolonged hospitalization (AUC = 0.875). The proposed RDI also showed robust diagnostic performance, particularly in predicting the need for supplemental oxygen (AUC = 0.863) and severe disease (AUC = 0.804). **Conclusion:** The Woods-Downes score and the newly proposed RDI are highly accurate, non-invasive clinical tools for risk-stratifying infants with bronchiolitis at the time of admission. Tachypnoea and male sex can identify high-risk infants for severe bronchiolitis, requiring supplemental oxygen and prolonged hospitalization (>5 days).

Keywords: Bronchiolitis, Respiratory Distress Index, Woods-Downes Score, Risk Stratification, Length of Hospitalization.

Received: 15 March 2026 **Revised: 10 April 2026** **Accepted: 01 June 2026** **Published: 22 June 2026**

Introduction

Acute viral bronchiolitis, ranging from mild coryza and wheezing to imminent respiratory failure requiring supplemental oxygen and mechanical ventilation, is the most common lower respiratory tract infection among infants and young children.[1] It is the leading cause of hospitalization in the first two years of life worldwide.[2–4] Severe bronchiolitis episodes results in substantial emotional burden on families and exert high demands on healthcare resources due to hospital length of stay and frequent need for pediatric intensive care.[5–7]

Many risk factors, including a variety of demographic factors, environmental and clinical factors have been linked to increased disease severity. Recognized predictors of severe bronchiolitis and prolonged hospital stay include young gestational age, prematurity, low birth weight, and exposure to household tobacco smoke.[3,8–10] To facilitate objective bedside assessments, many clinical severity scoring systems like Woods– Downes,[11,12] Modified Tal and BROSJOD,[13] and Wang scores,[14] have been developed to categorize respiratory distress and guide clinical management.[15,16]

Despite these risk factor scoring tools, significant lacunae remain early clinical prognostication of severe bronchiolitis. As the condition is a multifaced disease, reliance on individual clinical or molecular markers often fails to adequately encapsulate the full severity of illness. Consideration of single risk factor stratification tools can lead to inaccurate and incomplete categorization of children with severe bronchiolitis.[17] Many existing tools, including Woods – Downes scoring system, require more clinical validation regarding specific discriminatory ability when applied to predict prolonged hospitalization length or the distinct requirement for supplemental oxygen therapy.[18]

The present study was undertaken to address the gaps by evaluating a comprehensive set of admission clinical parameters

Address for correspondence: Dr. Mohammed Fasiullah Siddiqui, Postgraduate, Department of Paediatrics, Kamineni Institute of Medical Sciences, Narketpally, Telangana, India
E-mail: mfasiullah095@gmail.com

DOI:
10.21276/amit.2026.v13.i2.762

How to cite this article: Siddiqui MF, Khan K, Boodam H, Abdullah MDFE. Clinical Predictors of Severe Bronchiolitis and Adverse Hospital Outcomes in Children Under Two Years: A Retrospective Study. Acta Med Int. 2026;13(2):769-774.

to create a more accurate clinical profile of bronchiolitis severity. A rigorous validation of the predictive power of the established Woods-Downes clinical severity score against specific adverse outcomes and proposal of a novel, composite Respiratory Distress Index (RDI), can provide clinicians with a simple, objective framework for identifying high-risk infants early in their clinical course, thereby optimizing care and healthcare resource allocation.

The objectives of this study was to identify factors associated with severe bronchiolitis, requirements of supplemental oxygen with among hospitalized children aged 1–24 months. In addition, utility of the Woods-Downes Clinical Severity Score in predicting oxygen requirement and hospitalization duration was explored. A simple clinical risk model for predicting severe bronchiolitis using admission clinical parameters was proposed.

Materials and Methods

Study design: This retrospective observational study was conducted in the Department of Paediatrics, of a tertiary care hospital. The study involved a review of hospital records of children admitted with acute bronchiolitis during the study period from January 2022 to December 2025.

Study population: The study population comprised children aged 1–24 months admitted with a diagnosis of acute bronchiolitis. Bronchiolitis was defined as the first episode of wheezing associated with signs and symptoms of an acute viral lower respiratory tract infection in children younger than two years, in accordance with established international guidelines.[19]

Sample size

Several studies report oxygen supplementation rates ranging from 7%,[20] to 26%,[21] among hospitalized bronchiolitis patients. For example, Schroeder et al. reported prolonged hospitalization related to oxygen therapy in 26% of hospitalized infants with bronchiolitis. Therefore, the sample size was calculated using a prevalence of 20% of infants requiring supplemental oxygen among bronchiolitis patients, using the formula n=Z^2 pq/d^2, where Z=1.96 at 95% confidence level, p=20% (expected proportion of hospitalized children with bronchiolitis requiring oxygen therapy), q=80%, and d=8%absolute precision. The calculated sample size was 96. Therefore, a minimum sample size of 100 children was considered adequate for the study.

Eligibility Criteria: Children aged between 1 and 24 months admitted with a first episode of wheezing and a clinical diagnosis of bronchiolitis were eligible for study. Only records with complete clinical and outcome data were considered for analysis.

Children with congenital heart disease, chronic lung disease including bronchopulmonary dysplasia, previously diagnosed bronchial asthma or recurrent wheezing disorders, myocarditis, primary or secondary immunodeficiency disorders, and incomplete medical records were excluded from the study.

Data Collection: Required data was extracted from inpatient records available from medical record section of the medical college hospital using a structured data collection form. Medical records included admission notes, nursing charts, investigation reports, and discharge summaries. Demographic details including age, sex, weight, nutritional status, residence, birth history, prematurity, immunization status, and breastfeeding history whenever available were recorded. Clinical variables recorded at admission included duration of symptoms of fever, cough, rhinorrhea, feeding difficulty, breathing difficulty, apnea, cyanosis, respiratory rate, heart rate, oxygen saturation (SpO_2), and chest examination findings including wheeze, crepitations, and retractions were noted.

The severity of bronchiolitis was assessed using the Woods-Downes Clinical Severity Score documented at admission. The score was calculated based on respiratory rate, wheezing, air entry, chest retractions, and cyanosis. Available laboratory and radiological investigations including complete blood count, inflammatory markers, and chest radiography findings whenever performed and recorded in the files as part of routine clinical care were also noted from each patient/

Outcome variables included requirement of supplemental oxygen, duration of oxygen therapy, duration of hospital stay, requirement for intensive care admission, need for respiratory support, and in-hospital mortality.

Operational Definitions: Hypoxemia was defined as oxygen saturation below 92% on room air at admission, while severe hypoxemia will be defined as oxygen saturation below 90%. Tachypnea was defined according to age-specific World Health Organization criteria. For infants aged 2–11 months, a respiratory rate of 50 breaths per minute or greater was considered tachypnea, whereas a respiratory rate of 40 breaths per minute or greater was considered tachypnea in children aged 12–24 months. Prolonged hospitalization was defined as a hospital stay exceeding five days. The requirement for supplemental oxygen during hospitalization was considered as oxygen dependency.

Derived Clinical Variables: To facilitate risk stratification, a composite Respiratory Distress Index was constructed using admission clinical parameters. One point was assigned for the presence of tachypnea, hypoxemia (SpO_2 <92%), feeding difficulty, nasal flaring, chest retractions, and oxygen requirement. The cumulative score was used to evaluate its association with severe disease and adverse hospital outcomes. Children were categorized into age groups of 1–5 months, 6–11 months, and 12–24 months to assess age-related differences in disease severity and outcomes. Severe bronchiolitis was defined by the presence of severe respiratory distress, severe hypoxemia, need for respiratory support, intensive care admission, or a Woods-Downes severity score corresponding to severe disease.

Statistical Analysis: Data entered in Microsoft Excel and analyzed using JASP statistical software (open-source statistical software, University of Amsterdam, Netherlands). Continuous variables were tested for normality using the Shapiro-Wilk test. Normally distributed variables were expressed as mean ± standard deviation, whereas non-normally distributed variables were expressed as median with interquartile range. Categorical variables were presented as frequencies and percentages. Comparisons between severe and non-severe bronchiolitis groups were performed using the Chi-square test or Fisher's

exact test for categorical variables and the independent Student's t-test or Mann-Whitney U test for continuous variables, as appropriate.

Variables demonstrating a p-value less than 0.20 on univariate analysis was entered into a multivariable logistic regression model to identify independent predictors of severe bronchiolitis. Adjusted odds ratios with 95% confidence intervals were reported. Separate regression models was constructed to identify predictors of oxygen requirement and prolonged hospitalization. The discriminatory ability of the Woods-Downes score and Respiratory Distress Index was evaluated using receiver operating characteristic (ROC) curve analysis, and area under the curve values were reported. All statistical tests were two-tailed, and a p-value less than 0.05 was considered statistically significant.

Ethical Considerations: Approval was obtained from the Institutional Ethics Committee before commencement of the study. As the study involved retrospective review of existing medical records without direct patient contact or intervention, a waiver of informed consent was obtained. Confidentiality of patient information was strictly maintained by anonymizing all records prior to analysis. No personal identifiers were included in the study database, presentations, or publications.

Results

Baseline characteristics of the study population: A total of 100 children aged 1–24 months hospitalized with acute bronchiolitis were included in the study. The mean age of the study population was 10.17 ± 6.19 months. Males constituted 62% (n=62) of the cohort, while females accounted for 38% (n=38). Among the study participants, 44 children (44%) fulfilled the criteria for severe bronchiolitis. Supplemental oxygen therapy was required in 57 patients (57%), while prolonged hospitalization (>5 days) was observed in 67 patients (67%).

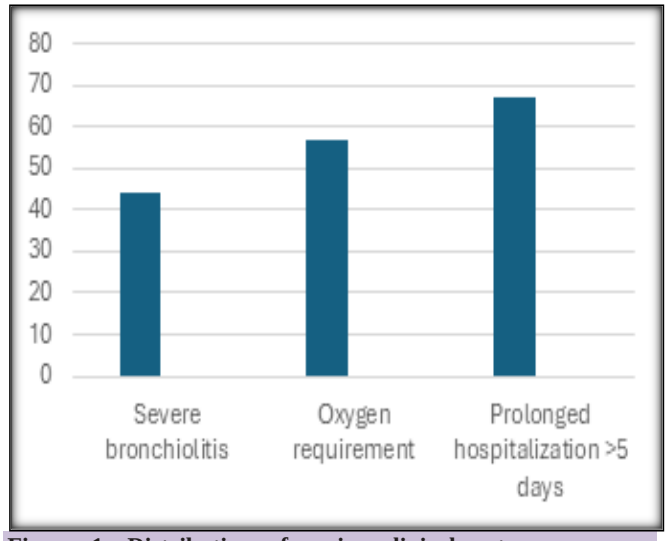

Figure 1: Distribution of major clinical outcomes among children hospitalized with acute bronchiolitis.

Factors associated with severe bronchiolitis: Tachypnoea was significantly more frequent among children with severe bronchiolitis than among those with non-severe disease (86.4% vs. 42.9%, p<0.001). Similarly, hypoxemia at admission (SpO_2 <92%) was observed in 65.9% of severe cases compared with 14.3% of non-severe cases (p<0.001). Requirement for supplemental oxygen was also significantly higher among children with severe bronchiolitis (81.8% vs. 37.5%, p<0.001). Although not statistically significant at the conventional 5% level, age, male sex, and presence of cough demonstrated p-values below 0.20 and were therefore included in the multivariable logistic regression analysis.

No significant differences were observed between severe and non-severe groups with respect to fever, feeding difficulty, nasal flaring, chest retractions, or severe hypoxemia (SpO_2 <90%).

Multivariable logistic regression analysis: Admission tachypnoea with adjusted OR (aOR) 7.72 (95% CI: 3.50 – 15.20) was the strongest independent risk factor predicting severe bronchitis [Figure 2]. In addition, male gender was also significant predictor of severe disease (aOR 2.88, 95% CI: 1.20–6.50). In the parallel model evaluating the need for supplemental oxygen, the presence of a cough was the most prominent predictor (aOR 3.42, 95% CI: 1.50–7.80), followed closely by male sex (aOR 2.92, 95% CI: 1.30–6.20), admission hypoxemia (aOR 2.22, 95% CI: 1.10–4.50), and tachypnoea (aOR 1.86, 95% CI: 1.05–3.20).

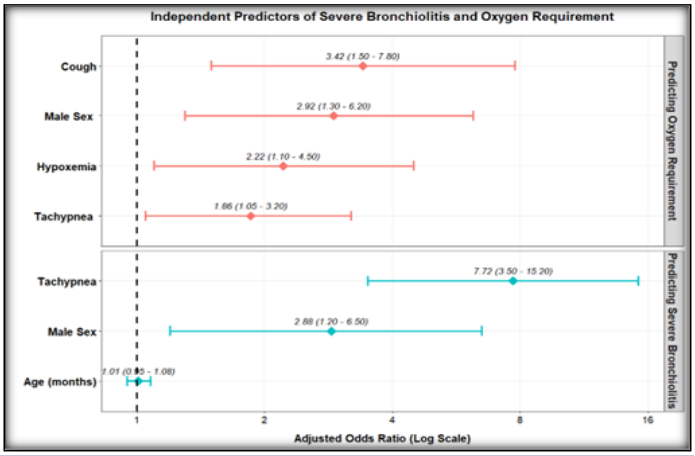

Figure 2: Forest plot of multivariable logistic regression analysis for adverse bronchiolitis outcomes.

The plot illustrates the Adjusted Odds Ratios (aOR) and corresponding 95% Confidence Intervals (CI) for independent clinical predictors of supplemental oxygen requirement in the top panel and severe bronchiolitis in the bottom panel. Predictors with CI located to the right of the reference line demonstrate a statistically significant increased risk for the respective outcomes.

Predictive performance of clinical severity scores: Receiver operating characteristic (ROC) curve analysis was performed to evaluate the discriminatory ability of the Woods-Downes Clinical Severity Score and the Respiratory Distress Index (RDI).

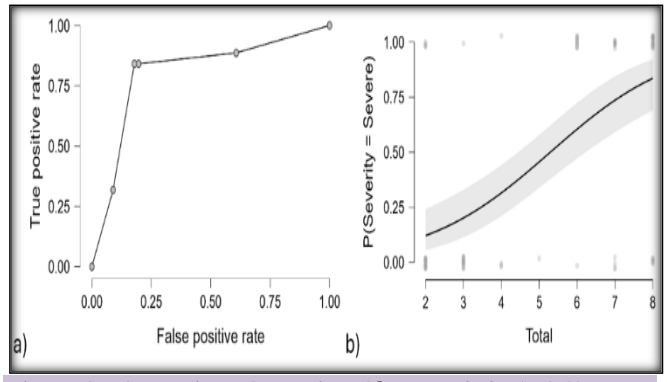

Figure 3: a) Receiver Operating Characteristic (ROC) curve evaluating the diagnostic accuracy of the Woods-Downes clinical severity score. The plot illustrates the discriminatory ability of the Woods-Downes to predict severe bronchiolitis in hospitalized infants at the time of admission. The curve plots the true positive rate (sensitivity) on the y-axis against the false positive rate (1 - specificity) on the x-axis across various RDI cut-off thresholds. (AUC = 0. 961). b) Predicted probability of severe bronchiolitis based on the Woods-Downes score. These conditional estimates plot demonstrates the direct positive correlation between a patient's Woods-Downes on the x-axis and their predicted probability of developing severe bronchiolitis on the y-axis. The solid black line represents the estimated probability, showing a smooth rise in risk as clinical parameters of distress accumulate, reaching over 70% in patients with a maximum score. The shaded grey band indicates the 95% confidence interval for the model's predictions, and the scattered grey dots reflect the actual distribution of patient outcomes within the cohort.

Prediction of Severe Bronchiolitis: The Woods-Downes score demonstrated excellent discriminatory performance for identifying severe bronchiolitis, with an area under the ROC curve (AUC) of 0.961 [Figure 3]. The Respiratory Distress Index also demonstrated good predictive ability, with an AUC of 0.804 [Figure 4].

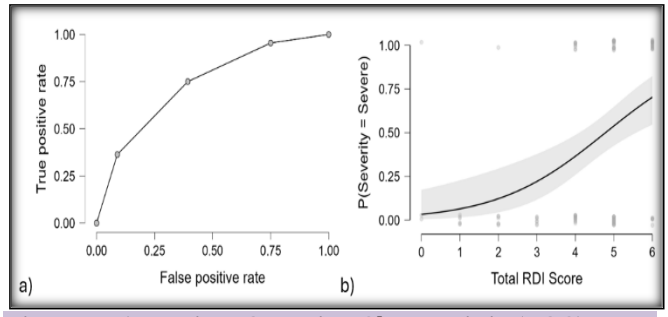

Figure 4: a) Receiver Operating Characteristic (ROC) curve evaluating the diagnostic accuracy of the Respiratory Distress Index (RDI). The plot illustrates the discriminatory ability of the composite RDI to predict severe bronchiolitis in hospitalized infants at the time of admission. The curve plots the true positive rate (sensitivity) on the y-axis against the false positive rate (1 - specificity) on the x-axis across various RDI cut-off thresholds. (AUC = 0.804). b) Predicted probability of severe bronchiolitis based on the cumulative RDI score. These conditional estimates plot demonstrates the direct positive correlation between a patient's total RDI score (ranging from 0 to 6) on the x-axis and their predicted probability of developing severe bronchiolitis on the y-axis. The solid black line represents the estimated probability, showing a smooth rise in risk as clinical parameters of distress accumulate, reaching over 70% in patients with a maximum score. The shaded grey band indicates the 95% confidence interval for the model's predictions, and the scattered grey dots reflect the actual distribution of patient outcomes within the cohort.

Prediction of Prolonged Hospitalization: For predicting prolonged hospitalization (>5 days), the Woods-Downes score achieved an AUC of 0.875, while the Respiratory Distress Index demonstrated an AUC of 0.820.

Discussion

Evaluation of admission clinical parameters to predict severe bronchiolitis, prolonged hospitalization and need for supplemental oxygen in paediatric cohort, leading to multivariate analysis, identified tachypnoea and male sex as strong independent predictors of severe disease. In addition, both Woods-Downes clinical severity score and proposed composite RDI demonstrated robust discriminatory ability for risk stratifying infants at the time of admission. In our cohort of 100 infants, a significant proportion experienced severe bronchiolitis (44%) and required a prolonged hospitalization of more than 5 days (67%). Identifying clinical predictors of severity and prolonged hospitalization is critical for counselling patients, and for resource allocation. This area is actively explored by previous researchers. Studies by Weisgerber et al,[9] and Masarweh et al,[10] have demonstrated that the severity of clinical presentation such as the degree of respiratory distress, strongly predicts the length of hospital stay. In our multivariable models, tachypnoea emerged as the most significant independent predictor of severe disease (aOR 7.72), alongside male sex (aOR 2.88). The vulnerability of male infants to more severe respiratory outcomes aligns with broad epidemiological profiling of bronchiolitis cohorts and comprehensive reviews of the disease's natural history.[22,23] Early identification of high-risk factors is crucial, not only to anticipate the failure of initial supportive therapies like high-flow nasal cannula but also to maintain vigilance for complications.[20,21]

Through this study, Woods-Downes score exhibited excellent discriminatory ability in our cohort, accurately predicting severe bronchiolitis (AUC = 0.961) and prolonged hospitalization (AUC = 0.875), with sensitivity of nearly 84% and a specificity of 82%.This high predictive validity is consistent with recent comparative studies by De Rose et al,[14] and Sankannavar et al,[15] which have reinforced the value of standardized clinical scores in anticipating the need for respiratory support.

A novel, 6-point composite RDI incorporating easily obtainable bedside parameters (tachypnea, hypoxemia, feeding difficulty, nasal flaring, chest retractions, and oxygen requirement) showed good discriminatory ability for predicting severe bronchiolitis (AUC = 0.804). Interestingly, the RDI slightly outperformed the Woods-Downes score in predicting the specific need for supplemental oxygen (AUC 0.863 vs 0.823). The logistic regression probability curve for the RDI confirmed a clear, positive correlation. Indicating whenever an infant's RDI score increased, the probability of severe disease rose predictably, reaching over 70% in patients scoring maximum

points.

Limitations of the study: The retrospective design limits the ability to completely exclude unmeasured confounding variables or missing clinical data. The study was conducted at a single centre with a relatively small sample size (n=100), leading to minimal generalizability of the findings. Additionally, the study has not included complete viral panel testing and therefore, study fails to account viral etiologies for severity of bronchiolitis.

Conclusion

The present study validates the Woods-Downes score and the proposed Respiratory Distress Index (RDI) (based on tachypnoea, hypoxemia, feeding difficulty, nasal flaring, chest retractions, and oxygen requirement) as highly accurate, simple bedside tools for predicting severe bronchiolitis, prolonged hospital stays, and oxygen requirements. Among infants with severe bronchiolitis, recognizing independent risk factors such as tachypnoea and male sex at admission can predict early risk stratification, aids optimal patient care and resource management. Future prospective, multicenter studies are warranted to further validate the RDI and integrate it into standardized bronchiolitis care pathways.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Chidambaranathan S, Sindhumathi S, Anantharaman P. A study on the risk factors associated with severity of bronchiolitis in children aged 1 month to 24 months. International Journal of Contemporary Pediatrics. 2025 Jul 24;12(8):1409–13. doi:10.18203/2349-3291.ijcp20252225
2. Nicolai A, Ferrara M, Schiavariello C, Gentile F, Grande ME, Alessandroni C, et al. Viral bronchiolitis in children: A common condition with few therapeutic options. Early Hum Dev. 2013 Oct;89:S7–11. doi:10.1016/j.earlhumdev.2013.07.016 PubMed PMID: 23972293; PubMed Central PMCID: PMC7130661.
3. Semple MG, Taylor-Robinson DC, Lane S, Smyth RL. Household tobacco smoke and admission weight predict severe bronchiolitis in infants independent of deprivation: prospective cohort study. PLoS One. 2011;6(7):e22425. doi:10.1371/journal.pone.0022425 PubMed PMID: 21811609; PubMed Central PMCID: PMC3139660.
4. Bower J, McBride JT. Bronchiolitis. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. 2015;818-822.e1. doi:10.1016/B978-1-4557-4801-3.00068-0 PubMed PMID: null; PubMed Central PMCID: PMC7173511.
5. Mahant S, Parkin PC, Thavam T, Imsirovic H, Tuna M, Knight B, et al. Rates in Bronchiolitis Hospitalization, Intensive Care Unit Use, Mortality, and Costs From 2004 to 2018 [Internet]. [cited 2026 Jun 13]. Available from: https://jamanetwork.com/journals/jamapediatrics/fullarticle/2787007
6. Luca DD, Pezza L, Vivalda L, Nardo MD, Lepainteur M, Baraldi E, et al. Critical care of severe bronchiolitis during shortage of ICU resources. eClinicalMedicine. 2024 Mar 1;69. doi:10.1016/j.eclinm.2024.102450 PubMed PMID: 38333363.
7. Increasing burden of viral bronchiolitis in the pediatric intensive care unit; an observational study. Journal of Critical Care. 2022 Apr 1;68:165–8. doi:10.1016/j.jcrc.2021.07.009
8. Guitart C, Alejandre C, Bobillo-Perez S, Girona-Alarcon M, Sole-Ribalta A, Cambra FJ, et al. Risk factors and incidence of invasive bacterial infection in severe bronchiolitis: the RICOIB prospective study. BMC Pediatr. 2022 Mar 17;22(1):140. doi:10.1186/s12887-022-03206-4
9. Weisgerber MC, Lye PS, Li SH, Bakalarski D, Gedeit R, Simpson P, et al. Factors predicting prolonged hospital stay for infants with bronchiolitis. Journal of Hospital Medicine. 2011;6(5):264–70. doi:10.1002/jhm.903
10. Masarweh K, Gur M, Leiba R, Bar-Yoseph R, Toukan Y, Nir V, et al. Factors predicting length of stay in bronchiolitis. Respiratory Medicine. 2020 Jan 1;161:105824. doi:10.1016/j.rmed.2019.105824
11. Wood DW, Downes JJ, Lecks HI. A clinical scoring system for the diagnosis of respiratory failure. Preliminary report on childhood status asthmaticus. Am J Dis Child. 1972 Mar;123(3):227–8. doi:10.1001/archpedi.1972.02110090097011 PubMed PMID: 5026202.
12. Westphal PJ, Teixeira C, Krauzer JRM, Bueno MH, Pereira PA, Hostyn SV, et al. Predictive factors for high-flow nasal cannula failure in patients with acute viral bronchiolitis admitted to the pediatric intensive care unit. Crit Care Sci. 2025 Feb 10;37:e20250161. doi:10.62675/2965-2774.20250161 PubMed PMID: 39969010; PubMed Central PMCID: PMC11869819.
13. Alibeyli L, Kacar A, Petmezci MT, Turkmenoglu Y. Assessment of Bronchiolitis Severity Using Modified Tal and BROSJOD Scores. European Archives of Medical Research. 2025;41(1):24. doi:10.14744/eamr.2025.10437
14. De Rose DU, Maddaloni C, Martini L, Braguglia A, Dotta A, Auriti C. Comparison of three clinical scoring tools for bronchiolitis to predict the need for respiratory support and length of stay in neonates and infants up to three months of age. Front Pediatr. 2023 Feb 17;11:1040354. doi:10.3389/fped.2023.1040354 PubMed PMID: 36873647; PubMed Central PMCID: PMC9983816.
15. Sankannavar A, P D, Kembhavi S, S KD. Comparison of KRS and WBSS clinical scores to assess the severity of bronchiolitis: single centre prospective observational study [Internet]. 2024 Jan [cited 2026 Jun 13]. Available from: http://dspace.sdmucmsh.edu.in:8080/xmlui/handle/123456789/2375
16. Martín-Latorre MDM, Martínez-Campos L, Martín-González M, Castro-Luna G, Lozano-Paniagua D, Nievas-Soriano BJ. Comparison of Easy-to-Use Bronchiolitis Scores in the Post-COVID-19 Era-An Observational Study. Children (Basel). 2023 Nov 21;10(12):1834. doi:10.3390/children10121834 PubMed PMID: 38136036; PubMed Central PMCID: PMC10742179.
17. Almasaeed MNO, Alqtaishat RM, Al-Habahbeh TN, Almajali AI, Mbydeen MA. Epidemiological and clinical profiling of bronchiolitis in a pediatric cohort: Associations with prematurity, feeding practices, and environmental exposures. International Journal of Science and Research Archive. 2025;17(3):298–305. doi:10.30574/ijsra.2025.17.3.3221
18. Durán Ochoa N, Edel Nudelman T, Mulett Hoyos H, Bastidas A, Diaz Ritter CA, Fernández-Sarmiento J. Description of the Clinical Course and Severity Score Progression in Critically Ill Children with Acute Bronchiolitis on High-Flow Nasal Cannula Support. Journal of Advances in Medical and Biomedical Research. 2022 Jul 10;30(141):340–6. doi:10.30699/jambs.30.141.340
19. Dalziel SR, Haskell L, O'Brien S, Borland ML, Plint AC, Babl FE, et al. Bronchiolitis. The Lancet. 2022 Jul 30;400(10349):392–406.

doi:10.1016/S0140-6736(22)01016-9 PubMed PMID: 35785792.
20. Gauthier M, Vincent M, Morneau S, Chevalier I. Impact of home oxygen therapy on hospital stay for infants with acute bronchiolitis. Eur J Pediatr. 2012 Dec;171(12):1839–44. doi:10.1007/s00431-012-1831-4 PubMed PMID: 23015043.
21. Schroeder AR, Marmor AK, Pantell RH, Newman TB. Impact of Pulse Oximetry and Oxygen Therapy on Length of Stay in Bronchiolitis Hospitalizations. Arch Pediatr Adolesc Med. 2004 Jun 1;158(6):527–30. doi:10.1001/archpedi.158.6.527
22. Hasegawa K, Dumas O, Hartert TV, Camargo Jr. CA. Advancing our understanding of infant bronchiolitis through phenotyping and endotyping: clinical and molecular approaches. Expert Review of Respiratory Medicine. 2016 Aug 2;10(8):891–9. doi:10.1080/17476348.2016.1190647 PubMed PMID: 27192374.
23. Loveys K, Borland ML, Oakley E, Babl FE, Cotterell E, Haskell L, et al. Risk Factors for Severe Bronchiolitis in Australian and Aotearoa New Zealand Infants: A Systematic Review. Journal of Paediatrics and Child Health. 2025;61(10):1549–65. doi:10.1111/jpc.70165.