



RESPIRATORY SYNCYTIAL VIRUS INFECTION IN CHILDREN: ASSESSMENT OF SEVERE DISEASE RISK AND MODERN PREVENTION STRATEGIES

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ABSTRACT

Respiratory syncytial virus (RSV) is one of the leading causes of acute lower respiratory tract infection in infants and young children and remains an important contributor to pediatric hospitalization and mortality worldwide. Although infection often presents as a mild upper respiratory illness, it may progress to bronchiolitis, pneumonia, hypoxemia, and respiratory failure, particularly during the first months of life. The clinical course is influenced by several interacting factors, including chronological and gestational age, prematurity, congenital heart disease, chronic lung disease, immunodeficiency, neuromuscular disorders, environmental exposure, and access to timely supportive care. Identifying infants at increased risk of severe disease is therefore essential for clinical surveillance, appropriate referral, and effective prevention.

This article aims to synthesize contemporary evidence on the assessment of severe RSV disease risk in children and to evaluate modern preventive strategies, with particular emphasis on maternal vaccination and long-acting monoclonal antibodies. A narrative review approach was used to examine international clinical guidance, World Health Organization recommendations, pediatric prevention guidelines, and relevant publications from Uzbekistan. The



review considered clinical risk factors, early warning signs, diagnostic approaches, supportive management, and the role of passive immunization in preventing severe lower respiratory tract disease.

The reviewed evidence indicates that the youngest infants, especially those born prematurely and children with significant cardiopulmonary or immune disorders, require particular attention. Clinical severity assessment should integrate respiratory rate and effort, oxygenation, feeding ability, hydration, general condition, and the presence of apnea or other signs of deterioration. Molecular testing may support diagnosis when the result is likely to influence clinical decisions, infection control, or surveillance, but treatment of typical bronchiolitis remains primarily supportive. Antibiotics, bronchodilators, and systemic corticosteroids are not routinely indicated for uncomplicated RSV bronchiolitis without another established indication.

Modern prevention has advanced substantially through maternal RSV vaccination and long-acting monoclonal antibodies, including nirsevimab and clesrovimab in settings where they are authorized and available. These interventions provide complementary approaches to protecting infants during their period of greatest vulnerability. Selection and implementation should follow current national recommendations, product authorization, local RSV epidemiology, and individual clinical circumstances. Overall, effective RSV control requires risk-based clinical assessment, timely supportive care, equitable access to preventive immunization, and strengthened pediatric surveillance.

Introduction: Respiratory syncytial virus is an enveloped RNA virus belonging to the family Pneumoviridae. It is a major cause of acute respiratory illness across all age groups, but its clinical burden is particularly pronounced in infants and young children. Primary infection frequently occurs during the first two years of life, and reinfections remain possible because naturally acquired immunity is incomplete. In most children, RSV produces symptoms resembling a common cold; however, infection can extend into the lower respiratory tract and



cause bronchiolitis or pneumonia, sometimes requiring oxygen therapy, respiratory support, or hospitalization.

The global burden of RSV is substantial. The World Health Organization has reported estimates of approximately 33 million RSV-associated lower respiratory tract infection episodes, 3.6 million hospitalizations, and more than 100,000 deaths annually among children younger than five years. A considerable proportion of fatal cases occur in infants younger than six months, while most childhood RSV-associated deaths occur in low- and middle-income countries. These estimates underline the importance of early recognition, timely access to supportive treatment, and preventive measures that protect infants before their first exposure or during the period of highest vulnerability [1, 2].

RSV transmission occurs primarily through respiratory secretions and contact with contaminated hands or surfaces. Seasonal patterns vary geographically, and the timing and intensity of outbreaks may differ between years. Consequently, prevention strategies cannot rely exclusively on a fixed calendar. Local surveillance, regional epidemiological information, and the expected period of increased viral circulation should inform the timing of preventive interventions. The clinical course of RSV infection is heterogeneous. Prematurity, very young age, chronic lung disease, hemodynamically significant congenital heart disease, severe immune compromise, and certain neuromuscular conditions are associated with an increased probability of severe outcomes. Nevertheless, severe disease can also occur in previously healthy infants. Risk assessment must therefore distinguish between baseline vulnerability and the child's current clinical condition. A history of prematurity or congenital disease increases concern, whereas apnea, marked respiratory effort, hypoxemia, poor feeding, dehydration, or reduced responsiveness may indicate an immediate need for urgent evaluation.

Historically, RSV prevention relied mainly on infection-control measures and, for selected high-risk infants, the use of palivizumab. The development of maternal RSV vaccines and longer-acting monoclonal antibodies has expanded preventive options. The WHO's 2025 position paper recommends that countries consider introducing maternal RSV vaccination or long-acting monoclonal antibodies to protect infants against severe RSV disease, according to national priorities and implementation capacity [1]. These interventions differ in mechanism, timing, eligibility, duration of protection, and delivery requirements. The relevance of this topic is particularly clear in healthcare systems where access to pediatric intensive care, oxygen therapy, and specialized respiratory support may vary between regions. A practical framework for assessing severity and identifying infants eligible for preventive interventions may help improve clinical decision-making and the allocation of limited resources.

The aim of this article is to analyze current approaches to identifying children at increased risk of severe RSV infection, summarize clinically relevant severity indicators, and evaluate modern preventive strategies with particular attention to maternal vaccination and long-acting monoclonal antibodies.



Literature review: The epidemiology of RSV has been examined extensively through systematic reviews, multicountry studies, and population-based surveillance. Shi et al. demonstrated the substantial global burden of RSV-associated acute lower respiratory tract infection in young children, emphasizing the disproportionate contribution of infancy to severe disease [3]. Subsequent analyses have confirmed that the burden varies by age, geographical region, healthcare access, and the availability of preventive and supportive interventions. RSV-associated hospitalization is concentrated in early childhood, particularly among infants during the first months after birth. Prematurity and underlying cardiopulmonary disorders are important risk factors, but the absence of an established comorbidity does not eliminate the possibility of severe disease. This distinction is clinically important because prevention and early recognition should not be restricted exclusively to children with recognized chronic conditions.

Local evidence also supports the relevance of RSV infection in pediatric practice. Yusupova and Israilova described the clinical and laboratory characteristics of RSV infection in young children in Uzbekistan, highlighting lower respiratory tract involvement and respiratory insufficiency among hospitalized patients [4]. Babadjanova and Zaidova subsequently reviewed the global burden of pediatric RSV infection and the emerging role of modern preventive interventions [5]. These publications contribute to the regional evidence base, although the findings of individual hospital-based studies should not be interpreted as national incidence estimates without representative surveillance data.

Severe RSV infection results from the interaction between viral infection, the structural and functional characteristics of the infant respiratory tract, host immune responses, and the child's baseline health status. Narrow infant airways, mucosal edema, increased mucus production, and inflammatory cellular debris may contribute to airflow obstruction during bronchiolitis. In young infants, these processes can impair ventilation and oxygenation and increase the work of breathing. Prematurity is an important determinant because respiratory and immune maturation may be incomplete at birth. Bronchopulmonary dysplasia and other chronic pulmonary conditions can further reduce respiratory reserve. Hemodynamically significant congenital heart disease may limit the ability to tolerate the increased physiological demands associated with respiratory infection. Severe immunodeficiency, neuromuscular disease affecting airway clearance, and selected congenital airway abnormalities may also increase the risk of complications. Age remains a central consideration. Infants younger than three months may deteriorate more rapidly than older children, and apnea can occasionally be an early or prominent manifestation. Poor feeding is another important warning sign because nasal obstruction and tachypnea may interfere with feeding, resulting in dehydration and inadequate energy intake. These factors support a multidimensional approach to risk assessment rather than reliance on a single clinical sign or laboratory marker [2, 6].

The diagnosis of RSV infection is primarily clinical in children with a typical presentation of bronchiolitis. Symptoms often begin with rhinorrhea and cough and may progress to tachypnea,



wheezing, crackles, chest recession, or feeding difficulties. Fever may be absent, mild, or present. In young infants, apnea, lethargy, or a marked reduction in feeding may be more prominent than classical respiratory symptoms. Molecular testing, particularly nucleic acid amplification testing, can identify RSV when laboratory confirmation is clinically or epidemiologically useful. However, routine testing is not necessary for every child with uncomplicated bronchiolitis. Test results should be interpreted in the context of clinical findings, the timing of specimen collection, and the possibility of concurrent infections. Identification of RSV does not independently determine the severity of illness or exclude bacterial coinfection when clinical features suggest an alternative diagnosis.

Severity assessment should include respiratory rate, work of breathing, oxygen saturation, feeding and hydration, alertness, and the presence of apnea. Persistent hypoxemia, severe chest recession, grunting, exhaustion, cyanosis, or reduced responsiveness requires urgent assessment. Oxygen thresholds and admission criteria should follow age-appropriate national or institutional guidance, with additional caution for infants with underlying disease. The overall clinical trajectory is often more informative than an isolated measurement.

Palivizumab, a monoclonal antibody directed against the RSV fusion protein, has historically been used to prevent severe RSV disease in selected high-risk infants. Its preventive benefit is established, but monthly administration during the RSV season creates logistical and financial challenges. Consequently, eligibility has generally been restricted to defined high-risk populations under national recommendations. Long-acting monoclonal antibodies have changed the preventive landscape. Nirsevimab was developed to provide protection over an extended period following a single dose for the relevant RSV season. In the phase 3 trial reported by Hammitt et al., nirsevimab reduced medically attended RSV-associated lower respiratory tract infection in healthy preterm and term infants entering their first RSV season [7]. The HARMONIE trial further demonstrated a reduction in RSV-associated hospitalization among infants receiving nirsevimab [8].

Maternal vaccination offers a complementary strategy. Vaccination during pregnancy stimulates maternal antibody production, allowing antibodies to cross the placenta and provide passive protection during early infancy. In a phase 3 trial, Kampmann et al. evaluated a bivalent RSV prefusion F vaccine administered during pregnancy and reported protection against medically attended severe RSV-associated lower respiratory tract disease in infants [9]. Implementation must account for the recommended gestational window, national authorization, vaccine availability, and the interval between vaccination and birth. The WHO's 2025 position paper supports either maternal RSV vaccination or infant administration of a long-acting monoclonal antibody as a population-level strategy, depending on national circumstances [1]. The approaches are not interchangeable in every clinical situation, and most mother–infant pairs do not routinely require both. The choice should be guided by national policy, maternal



vaccination status, the timing of delivery, product availability, and individual clinical circumstances.

Materials and methods: This article was designed as a narrative literature review examining contemporary evidence on severe RSV disease in children, clinical risk stratification, and preventive interventions. The review incorporated international clinical guidance, peer-reviewed pediatric research, World Health Organization recommendations, and relevant publications from Uzbekistan. The literature search focused on RSV epidemiology, risk factors for severe disease, clinical assessment of bronchiolitis, diagnostic testing, maternal vaccination, and passive immunization with monoclonal antibodies. Particular attention was given to systematic reviews, randomized controlled trials, international policy documents, and publications reporting pediatric clinical outcomes. The principal evidence sources included WHO publications, pediatric clinical guidance, the New England Journal of Medicine, The Lancet, and locally published pediatric research.

The selected literature was analyzed using descriptive synthesis, comparative assessment, and thematic classification. The evidence was organized into four domains: determinants of severe RSV disease, clinical assessment and early warning signs, supportive management, and prevention through maternal vaccination or monoclonal antibodies. Preventive interventions were compared according to their mechanism of action, target population, timing, duration of protection, and practical implementation considerations. Clinical risk assessment was examined in relation to chronological age, gestational age at birth, underlying cardiopulmonary conditions, immune status, respiratory effort, oxygenation, feeding ability, hydration, and general responsiveness. Preventive strategies were evaluated with reference to published efficacy and effectiveness outcomes, safety considerations, and current international recommendations. Because this was a narrative review, no original patient recruitment, prospective clinical observation, laboratory investigation, or independent statistical analysis was undertaken. The findings therefore represent a synthesis of published evidence rather than new clinical results. The review was not designed as a systematic review with a registered protocol, predefined screening flowchart, or formal risk-of-bias assessment. These methodological limitations should be considered when interpreting the conclusions.

Results: The comparative analysis of the selected literature identified several consistent themes relevant to pediatric RSV prevention and clinical practice. First, age and underlying medical conditions are important determinants of severe disease, but they cannot reliably identify every child who will deteriorate. The greatest vulnerability is concentrated in early infancy, particularly among premature infants and children with significant chronic pulmonary or congenital cardiac disease. Severe outcomes may nevertheless occur in previously healthy infants, supporting the need for universal clinical vigilance during periods of RSV circulation [2, 3].



Second, the evidence indicates that clinical severity assessment should be multidimensional. Respiratory effort, oxygenation, feeding tolerance, hydration, alertness, and apnea provide complementary information. A child with increasing chest recession and poor feeding may require urgent assessment even before severe hypoxemia is documented. Conversely, a positive RSV test alone does not establish the need for hospitalization. Decisions should reflect the overall clinical condition, disease trajectory, age, comorbidities, and the family's ability to recognize deterioration and access care.

Third, the literature supports supportive management as the foundation of treatment for uncomplicated RSV bronchiolitis. Maintaining adequate hydration, monitoring respiratory status, and providing oxygen when clinically indicated are central components of care. Routine antibiotics are not indicated in the absence of evidence suggesting bacterial infection. Bronchodilators and systemic corticosteroids are also not routinely recommended for typical bronchiolitis, although treatment may differ when another established diagnosis is present. Avoiding unnecessary medication is important because it reduces potential adverse effects without compromising evidence-based care.

Fourth, preventive interventions have expanded substantially beyond traditional measures. Long-acting monoclonal antibodies and maternal vaccination provide distinct mechanisms for protecting infants during the period of greatest vulnerability. In the randomized trial by Hammitt et al., nirsevimab reduced medically attended RSV-associated lower respiratory tract infection among infants entering their first RSV season [7]. The HARMONIE trial also demonstrated a reduction in RSV-associated hospitalization [8]. These findings support the clinical value of long-acting passive immunization, while recognizing that the magnitude of benefit in routine practice depends on coverage, timing, population characteristics, and local epidemiology. Fifth, maternal RSV vaccination represents an additional population-level preventive strategy. By stimulating maternal antibody production and placental antibody transfer, vaccination during pregnancy can provide protection from birth. Clinical trial evidence supports its effectiveness against severe RSV-associated lower respiratory tract disease in infants [9]. However, the timing of vaccination, gestational age at delivery, and the interval required for antibody transfer must be considered when assessing an infant's expected protection.

The WHO's 2025 recommendations emphasize that countries may implement maternal vaccination or long-acting monoclonal antibodies according to their health-system capacity, disease burden, and public health priorities [1]. These strategies should be integrated into national immunization policies rather than introduced as isolated clinical interventions. Sixth, regional publications indicate that RSV-associated lower respiratory tract disease is a relevant concern in Uzbekistan. Yusupova and Israilova reported clinical and laboratory findings among hospitalized young children with laboratory-confirmed RSV infection, while Babadjanova and Zaidova reviewed the global disease burden and emerging preventive approaches [4, 5]. Although these studies provide useful local context, broader multicenter surveillance is needed



to establish representative national estimates of incidence, hospitalization, mortality, and seasonal circulation. Taken together, the reviewed evidence supports an integrated approach combining early recognition, appropriate supportive care, identification of infants at increased risk, and access to effective preventive interventions. The literature does not establish a single clinical marker that can accurately predict all severe outcomes; therefore, risk assessment and preventive planning should be individualized.

Discussion: The findings of this review emphasize that reducing severe RSV disease requires both clinical preparedness and prevention before infection occurs. Historically, pediatric RSV management has focused largely on recognizing bronchiolitis and providing supportive care after symptoms develop. While these measures remain essential, maternal vaccination and long-acting monoclonal antibodies offer the opportunity to reduce the risk of severe disease before or during the earliest period of life. Risk stratification should not be interpreted as a rigid scoring system unless the relevant tool has been validated for the population in which it will be used. Prematurity, chronic lung disease, congenital heart disease, and immune compromise provide important information about baseline vulnerability, but clinical deterioration can occur in children without these characteristics. For this reason, healthcare professionals should combine risk history with current physiological findings and the trajectory of illness.

A further challenge is the interpretation of diagnostic testing. Molecular assays can improve etiological identification and support infection-control decisions, particularly in hospitalized children or surveillance programs. However, testing should not delay urgent clinical management. Nor should a positive result replace assessment for dehydration, respiratory failure, or alternative diagnoses. In settings where molecular testing is not readily available, careful clinical examination and appropriate monitoring remain essential. The development of long-acting monoclonal antibodies is particularly relevant to infants because it offers immediate passive protection without relying on the infant's own immune system to generate an antibody response. Nirsevimab and clesrovimab have expanded preventive options in jurisdictions where these products are authorized and available. Nevertheless, national recommendations differ regarding eligibility, seasonal timing, and use during a second RSV season. Local implementation should therefore follow current regulatory approval and public health guidance rather than assuming that recommendations from one country automatically apply to another.

Maternal vaccination offers a different delivery pathway, using placental antibody transfer to protect infants from birth. Its effectiveness depends partly on vaccination timing and the opportunity for antibody transfer before delivery. Where maternal vaccination is unavailable, contraindicated, or unlikely to provide sufficient protection under applicable guidance, an infant monoclonal antibody may be an appropriate alternative. Decisions about using both approaches should follow current national recommendations and individual clinical circumstances; routine duplication should not be assumed necessary. For Uzbekistan, implementation planning should



account for local RSV seasonality, vaccine and antibody procurement, maternity-service capacity, access to pediatric care, and the feasibility of identifying infants who may benefit most. Establishing laboratory-supported surveillance in selected hospitals could improve understanding of circulating RSV patterns and the proportion of severe disease attributable to the virus. Such data would help inform the timing and cost-effectiveness of preventive programs.

The evidence base also has limitations. Clinical trials and recommendations originate from populations with different healthcare resources, epidemiological patterns, and access to intensive care. Their findings may not translate identically into every setting. Furthermore, local studies involving hospitalized patients cannot independently establish the incidence or distribution of RSV infection across the general pediatric population. Future research should include prospective multicenter studies, standardized severity criteria, and systematic evaluation of preventive intervention coverage and outcomes. The principal implication is that an effective RSV prevention strategy should not rely on a single intervention. It should combine maternal and infant preventive options, where appropriate, with clinical surveillance, caregiver education, infection-control measures, and timely supportive treatment. Such a framework offers a practical basis for reducing severe pediatric RSV disease while allowing national programs to adapt implementation to available resources.

Conclusions and practical recommendations: Respiratory syncytial virus remains a major cause of acute lower respiratory tract disease in infants and young children. Severe outcomes are associated with young age, prematurity, underlying cardiopulmonary disease, immune compromise, and other factors that reduce physiological reserve. However, severe infection can also develop in children without recognized risk conditions, making early recognition and appropriate clinical assessment essential. The review indicates that severity assessment should integrate respiratory effort, oxygenation, feeding, hydration, alertness, apnea, and the progression of symptoms. Laboratory confirmation can support diagnosis and surveillance when clinically indicated, but management should be based on the child's overall condition. Supportive care remains the foundation of treatment for uncomplicated bronchiolitis, while unnecessary antibiotics, bronchodilators, and systemic corticosteroids should be avoided unless another clinical indication exists. Maternal RSV vaccination and long-acting monoclonal antibodies represent important advances in preventing severe disease. Their implementation should follow national guidance, product authorization, local epidemiology, and individual clinical circumstances. Equitable access to these interventions, alongside improved surveillance and caregiver education, should be considered a priority in pediatric respiratory health.

Practical recommendations:

1. Strengthen early risk assessment. Infants presenting with respiratory symptoms should be assessed for age-related vulnerability, prematurity, chronic lung disease, congenital heart disease, immune compromise, feeding difficulties, apnea, and signs of respiratory distress.



2. Standardize severity evaluation and referral. Clinical pathways should include respiratory effort, oxygen saturation, hydration, feeding tolerance, and general responsiveness. Severe respiratory distress, cyanosis, apnea, exhaustion, or reduced responsiveness requires urgent medical evaluation.

3. Improve access to evidence-based prevention. Healthcare authorities should evaluate maternal RSV vaccination and long-acting monoclonal antibodies within national immunization policies, considering local disease burden, product availability, cost, and the feasibility of timely administration.

4. Promote rational clinical management. Treatment of typical RSV bronchiolitis should prioritize supportive care and appropriate monitoring. Antibiotics and other medications should be prescribed only when supported by a separate clinical indication or current evidence-based guidance.

5. Develop regional surveillance and caregiver education. Multicenter surveillance should document RSV circulation, hospitalization, disease severity, and preventive intervention coverage. Parents and caregivers should receive clear information about feeding difficulties, breathing changes, apnea, reduced responsiveness, and other warning signs requiring prompt medical assessment.

References:

1. World Health Organization. WHO position paper on immunization to protect infants against respiratory syncytial virus disease, May 2025. *Weekly Epidemiological Record*. 2025;100(22):193–218. Geneva: World Health Organization.

2. World Health Organization. Respiratory Syncytial Virus (RSV) Immunization Products. Geneva: World Health Organization; 2025. Online technical guidance, unpaginated.

3. Shi T., McAllister D.A., O'Brien K.L., et al. Global, regional, and national disease burden estimates of acute lower respiratory infections due to respiratory syncytial virus in young children in 2015: a systematic review and modelling study. *The Lancet*. 2017;390(10098):946–958. Elsevier.

4. Yusupova G.A., Israilova N.A. Clinical and laboratory features of respiratory syncytial viral infection in young children. *Medical Science of Uzbekistan / O'zbekiston tibbiyot ilmi*. 2025;4(2):48–50. Andijan State Medical Institute. DOI: 10.56121/2181-3612-2025-2-48-50.

5. Babadjanova F.R., Zaidova D.M. The global burden of respiratory syncytial virus infection in children: achievements and challenges of modern pediatrics. *Medical Science of Uzbekistan / O'zbekiston tibbiyot ilmi*. 2025;4(6):143–147. Andijan State Medical Institute.

6. Centers for Disease Control and Prevention. Clinical Overview of RSV. Atlanta, GA: U.S. Department of Health and Human Services; 2025. Online clinical guidance, unpaginated.



7. Hammitt L.L., Dagan R., Yuan Y., et al. Nirsevimab for prevention of RSV in healthy late-preterm and term infants. The New England Journal of Medicine. 2022;386(9):837–846. Massachusetts Medical Society.

8. Drysdale S.B., Cathie K., Flamein F., et al. Nirsevimab for prevention of hospitalizations due to RSV in infants. The New England Journal of Medicine. 2023;389(26):2425–2435. Massachusetts Medical Society.

9. Kampmann B., Madhi S.A., Munjal I., et al. Bivalent prefusion F vaccine in pregnancy to prevent RSV illness in infants. The New England Journal of Medicine. 2023;388(16):1451–1464. Massachusetts Medical Society.