

Deciphering the Enigma of Respiratory Syncytial Virus (RSV): Comprehending its Influence and Progress in Therapy

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ABSTRACT: Respiratory syncytial virus (RSV) is a prevalent respiratory virus that may affect several parts of the respiratory system, the trachea, larynx, bronchi, and lung-related structures [1]. Although incidences of RSV among newborns and young children are on the rise, the virus can infect people of any age; however, certain people are at a higher risk than others. In contrast to healthy adults, those who are premature, young, old, or immunocompromised are more prone to experience a more severe RSV presentation [2]. Coughing and sneezing are the primary vectors for the transmission of RSV. Airborne particles can infect children's eyes, noses, and mouths, causing RSV. Children can potentially get RSV by touching infected surfaces since the virus can survive outside of the body for a long time. This can occur when youngsters encounter potentially infectious things (such as table knobs or doorknobs) without first washing their hands, which increases the risk of contamination. The article briefly explains RSV while discussing the treatment options and focusing on the available vaccine.

KEYWORDS: RSV, respiratory infection, Arexvy, Abryso

Date of Submission: 05-03-2024

Date of acceptance: 18-03-2024

I. INTRODUCTION

RSV is a single-stranded RNA virus. It is the most common virus cause of acute lower respiratory tract infection (ALRTI) in babies and can be found worldwide and at different times of the year [3]. By the age of two, almost all children in the United States have contracted RSV. Typically, healthy individuals experience moderate symptoms of a rebound virus infection (RSV) and go away within a week. However, RSV can cause severe sickness or death in susceptible individuals, such as newborns born prematurely or with congenital heart defects, youngsters with chronic lung disease, and those over the age of 65 [4].

ETIOLOGY

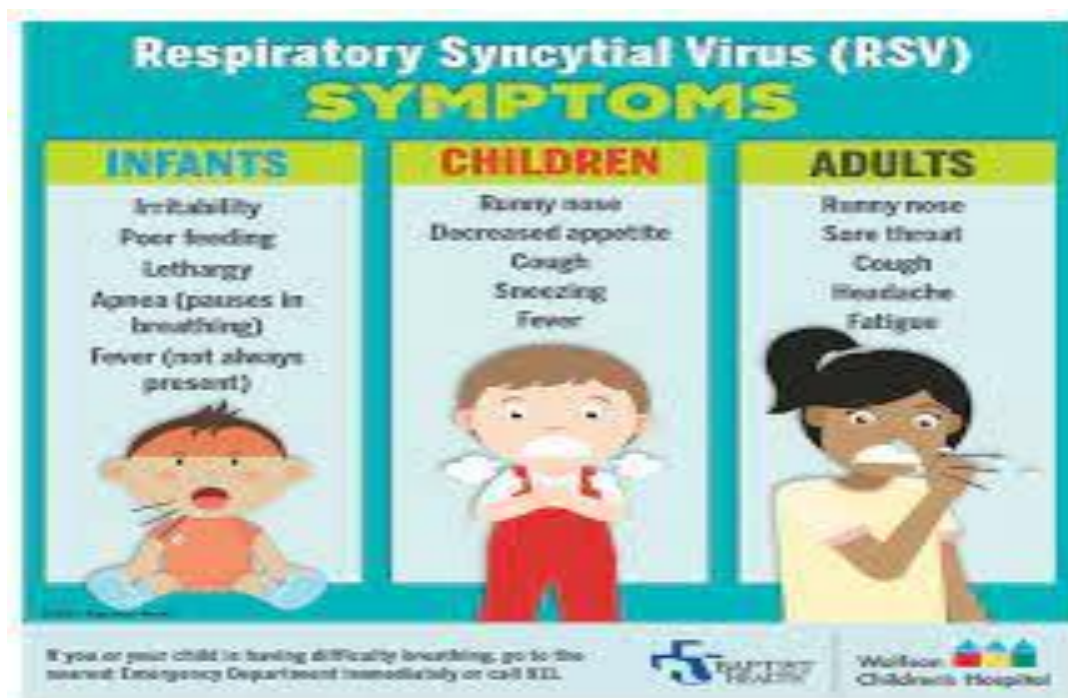
RSV is very infectious.

Transmission occurs through airborne droplets released by an infected person's cough or sneeze or through direct contact with a contaminated surface (such as a doorknob or counter) that hasn't been washed or sanitized and subsequently touches an infected person's nose, eyes, or mouth. [5].

Another way it can spread is by physical touch, such as when you kiss a child's face who has RSV [6].

After being exposed to RSV, a person can spread the virus for three to eight days [7].

Although they may no longer be experiencing symptoms, some people, including infants and those with compromised immune systems, can still transmit the virus for up to four weeks because their bodies can't effectively eliminate it. Concentrating on RSV transmission makes the concept of R0 crucial. R0 is the reproduction ratio, which is another way of saying the virus's transmissibility level. The number of people a single person can infect is represented by the R0. While the exact value of R0 for RSV might range from 1 to 5, the most common estimate is 3 [8]



SYMPTOMS [9]

The onset of signs and symptoms of respiratory syncytial virus infection typically occurs approximately four to six days after introduction to the virus. The respiratory syncytial virus (RSV) typically induces mild symptoms resembling common cold symptoms for older children and adults. These may encompass:

- Nasal congestion or rhinorrhea
- A cough that does not produce phlegm or mucus.
- Mild pyrexia
- Pharyngitis
- Cephalalgia

Severe cases of RSV infection may progress to the lower respiratory tract, leading to bronchiolitis or pneumonia, characterized by inflammation of the tiny airway passageways that lead into the lungs. Indications and manifestations may encompass:

- Elevated body temperature
- Intense coughing
- Wheezing is an audible, typically high-pitched, produced during exhalation.
- The individual may exhibit tachypnea or dyspnea and opt for an upright position rather than a prone one.
- Cyanosis refers to the bluish discoloration of the skin caused by insufficient oxygenation.

RSV has the most devastating impact on infants. Indications and manifestations of severe respiratory syncytial virus (RSV) infection in babies encompass:

- ◆ Brief, superficial, and accelerated respiration
- ◆ Having trouble breathing - the muscles and skin of the chest contract inward during each breath.
- ◆ Exhibit a sudden expulsion of air from the lungs through the mouth, often accompanied by a distinctive sound.
- ◆ Inadequate nourishment
- ◆ Fatigue
- ◆ Agitation

Most children and adults recover within an average of one to two weeks. However, a few individuals may experience recurrent episodes of wheezing. Premature newborns or anyone with chronic heart or lung issues may get a severe or life-threatening infection that necessitates hospitalization.

TREATMENTS

Supportive Care

Treatment for RSV bronchiolitis primarily consists of supportive care. Hospitalization should be considered for children who appear sick, are dehydrated, have poor eating, experience apnea, suffer respiratory distress, or require supplemental oxygen; nevertheless, most infants may be cared for at home. An inpatient stay usually lasts three to seven days [10].

Babies with RSV bronchiolitis must always be well-hydrated. A deficit occurs because fluid needs are increased by fever and tachypnea, and fluid intake is limited by dyspnea and tachypnea. Because many babies have trouble sucking and breathing at the same time, parenteral fluid administration is commonly required. [11]

Bronchodilators

There is no evidence that bronchodilators like albuterol or salbutamol increase oxygen saturation, decrease the likelihood of readmission to the hospital following outpatient treatment, shorten the length of hospital stays, or speed up the recovery time for patients treated at home. Bronchodilators are ineffective for routinely treating bronchiolitis because of the adverse side effects and high cost of these treatments [12].

Epinephrine is a compound that activates both α - and β -adrenergic receptors. The α -adrenergic effect causes vasoconstriction and decreases airway edema, which suggests its potential use in treating acute bronchiolitis [13]. In a study involving 194 healthy newborns diagnosed with bronchiolitis for the first time, the duration of hospital stay after receiving either nebulized epinephrine or a placebo was insignificant [14].

Corticosteroids

A systematic review conducted in 2013 by Cochrane analyzed 17 controlled studies involving 2596 infants with bronchiolitis. The review concluded that the use of steroid therapy does not have an impact on the clinical progression of infants and children admitted to the hospital with bronchiolitis. Therefore, it is not recommended to use steroids for the treatment of bronchiolitis in otherwise healthy patients who do not require ventilation [15].

Specific RSV Therapy

Only a small number of medications have been approved for the treatment of RSV, but as our understanding of the virus has expanded, so have the recommendations for its use. In 1993, ribavirin was suggested as a treatment for severe RSV infection; it is an antiviral nucleoside analogue and the first medication approved for this purpose [16]. For children and infants with a lower respiratory tract infection that tested positive for RSV, an older Cochrane review compared 12 randomized trials using ribavirin to those with a placebo. Statistical analysis failed to show a statistically significant difference in mortality in four trials (OR 0.37; 95% CI, 0.12 to 1.18). The therapy group also showed no statistically significant changes from the placebo group regarding hospital stay duration, disease severity, or oxygenation improvement [17]. The use of ribavirin as a treatment for RSV infection is now considered outdated [18].

Palivizumab is a type of medication derived from human genes that helps prevent severe RSV sickness in certain high-risk people. It was officially approved for this purpose in 1998. Palivizumab effectively binds to the RSV fusion protein and prevents further viral infection. Due to its effectiveness in prophylaxis, research has investigated the potential use of palivizumab to treat acute infection [19]. Palivizumab is given via intramuscular injection at a dosage of 15 mg/kg, with a frequency of once every 30 days. This treatment is offered in 5 monthly doses to infants and children during the RSV season [20].

To prevent RSV-associated lower respiratory tract sickness in newborns and young children, the Food and Drug Administration (FDA) authorized nirsevimab, a long-acting monoclonal antibody, for passive immunization in July 2023 (BeyfortusTM, Sanofi, and AstraZeneca). The Advisory Committee on Immunization Practices (ACIP) of the CDC endorsed nirsevimab on August 3, 2023, for all infants less than eight months old who are born during or about to enter their first RSV season, as well as for infants and children between the ages of eight and nineteen months old who are at a higher risk of severe RSV disease and are starting their second RSV season [21].

VACCINES

ABRYSVO

The first and only RSV vaccine approved for pregnant women to help lower their babies' risk of RSV from birth to 6 months [22]. When pregnant women receive the RSV vaccine, their infant acquires the protective proteins known as antibodies. Babies born at least two weeks after their mother gets the RSV vaccine have immunity against severe RSV disease at birth, which is the period when infants are most vulnerable to the illness. Immunization can decrease the likelihood of an infant being admitted to the hospital due to RSV by 57% within six months after birth [23].

II. CONCLUSION

Our knowledge of respiratory viral infections has come a long way, but these viruses still cause a great deal of illnesses and fatalities across the globe. Prevention is the mainstay of management since there are limited specific medicines for respiratory viruses. The lack of an effective RSV-specific treatment is still a cause for concern, but this paradigm also appears in RSV.

Each year, RSV affects a staggering number of children. The primary course of treatment for patients is supportive care, which includes feeding, hydrating, cleaning nasal secretions, and, if necessary, oxygen. To avoid spreading RSV, practicing good handwashing and using contact isolation when necessary is essential.

Before 2023, no vaccines were available to prevent respiratory syncytial virus (RSV) infections in babies. However, in 2023, the Advisory Committee on Immunization Practices of the Centers for Disease Control and Prevention recommended, and the Food and Drug Administration authorized a long-acting monoclonal antibody to protect infants and some toddlers up to 19 months of age. Additionally, RSV vaccines abrysvo was authorized for use in pregnant women.

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