Review Article

Evaluation of the Recent Updates Regarding Diagnosis and Management of Bronchiolitis: Literature Review

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Abstract

Background: Bronchiolitis is an infectious disease that is prevalent among the pediatric age group. It is induced by a viral agent and results in an inflammation of small bronchioles and their surrounding tissue. **Objectives:** Bronchiolitis poses a huge burden on the practice of many pediatricians and thorough knowledge of its etiology, risk factors, presentation, and management are essential. Therefore, in this paper, we reviewed the literature discussing the etiology, risk factors, presentation, and management of bronchiolitis. **Methodology:** PubMed database was used for articles selection, and the following keys were used in the search: bronchiolitis, etiology, risk factors, presentation, and management. **Result:** The disease is self-limiting where only 1-3% of patients require hospital admission. Bronchiolitis is most commonly caused by syncytial virus and rhinovirus. The diagnosis is mainly clinical while X-ray is sometimes needed to rule out bacterial pneumonia. Hygienic measures play an essential role in reducing the spread of bronchiolitis. The mainstay of bronchiolitis management relays heavily on symptomatic relief. **Conclusion:** Although bronchiolitis remains a common disease among children, it is essential for clinicians to know how to promptly identify the severe course and understand the gravity it carries.

Keywords: Bronchiolitis, Etiology, Risk Factors, Presentation, and Management

Introduction

Bronchiolitis is an infectious disease that is prevalent among the pediatric age group. It is induced by a viral agent and results in an inflammation of small bronchioles and their surrounding tissue. The age limits affected group differ by region. For example, in Europe, it is agreed that the age limit varies from 6 or 12 months, while in the United States, it ranges between 6 and 24 months [1-3].

Bronchiolitis can present with a variety of respiratory symptoms, such as cough, tachypnea, hyperinflation, chest retraction, crackles, and wheezing, while expiratory breathing difficulty is characteristically present in infants. The prevalence of bronchiolitis depends on the age where the prevalence ranges between 18% and 32% and 9% and 17% in the first and second year, respectively [2, 3].

Almost one-third of children experience bronchiolitis before the age of 2 years [4, 5]. This occurs mostly during the winter season [5]. In the USA, bronchiolitis is the leading cause of hospitalizing chidden under the age of 1 year old [3, 6]. The mortality rate in those hospitalized is approximately 1% [7].

The recent development of advanced molecular detection techniques resulted in a deeper understanding of the diverse range of viral agents that possess the capable causing bronchiolitis. By far, the respiratory syncytial virus (RSV) is the leading causative agent of bronchiolitis [8]. Severe bronchiolitis is a form of bronchiolitis that requires hospital addition and it is most commonly a result of RSV infection [9, 10].

As for many viral diseases, the mainstay of treatment for patients with bronchiolitis is a supportive treatment approach. Supportive treatment includes oxygenation, nasal suctioning, mechanical ventilation, and hydration [11]. Bronchiolitis poses a huge burden on the practice of many pediatricians and

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thorough knowledge of its etiology, risk factors, presentation, and management are essential. Therefore, in this paper, we reviewed the literature discussing the etiology, risk factors, presentation, and management of bronchiolitis.

METHODOLOGY:

PubMed database was used for articles selection, and the following keys were used in the search: bronchiolitis, etiology, risk factors, presentation, and management. In regards to the inclusion criteria, the articles were selected based on the inclusion of one of the following topics; bronchiolitis, etiology, risk factors, presentation, and management. Exclusion criteria were all other articles that did not have one of these topics as their primary endpoint.

REVIEW:

Clinical presentation

Bronchiolitis typically presents in children below the age of two years. The presentation is usually characterized by a number of respiratory and systemic symptoms summarized in table 1. Following the resolution of the acute phase, airways' sensitivity may remain high for several weeks, leading to recurrent cough and wheeze [6]. Risk factors for developing bronchiolitis include age less than six months, daycare exposure, lack of breastfeeding, malnutrition, and passive smoke [12]. Table 2 summarizes the risk factors and pre-existing medical conditions that increase the risk of acute viral bronchiolitis.

Table 1. List of the viruses detected in hospitalized children with bronchiolitis.

Systemic symptoms	Respiratory symptoms
Fever	Cough
Poor feeding	Tachypnoea
Cyanosis	Labored breathing
Restlessness	Crackles and wheeze
lethargy	Low oxygen saturation

Table 2. Risk factors and pre-existing medical conditions that increase the risk of acute viral bronchiolitis.

Risk factors	Pre-existing conditions
Age < six months	Prematurity
Overcrowding/ older siblings	Low birth weight
Daycare exposure	Congenital lung abnormality
Lack of breastfeeding	Chronic lung disease
Malnutrition	congenital heart disease
Passive smoke	Immunodeficiency

Usually, the disease is self-limiting, however, 1-3% of patients may require hospital admission while a smaller percentage of admitted patients may require pediatric intensive care unit (PICU) admission [13-16]. Table 3 charts the rates of PICU admission among patients with RSV-hospitalization. Despite being rare, young children could undergo severe reinfections [17].

Table 3. Pediatric Intensive Care Unit admission rates in children hospitalized with respiratory syncytial virus bronchiolitis.

Gestation	Admission rates (%)
Term	4–15%
Gestational age < 36 weeks	10–20%
Gestational age 32–35 weeks	20%
Gestational age < 32 weeks	100%

Dehydration and desaturation are dangerous consequences of bronchiolitis; thus, hydration status and oxygen saturation should be assessed in all hospitalized children [4]. In addition, signs of respiratory distress, such as tachypnea, nasal flaring, retractions, and grunting need to be promptly identified and dealt with. A change in complexion (i.e. cyanosis) is extremely worrisome and should be addressed urgently as it might indicate an impending respiratory failure [15].

Causative agents

The two most frequently isolated viruses in patients with bronchiolitis are respiratory syncytial virus (RSV) and rhinovirus (RV) [8]. RSV is an enveloped single-stranded RNA virus with two antigenically different subtypes (A and B) [18]. In contrast, RVs are nonenveloped single-stranded RNA viruses with three different subgroups (A, B, and C) [1, 19]. Table 4 lists the viruses detected in a group of hospitalized children with bronchiolitis.

Table 4. List of the viruses detected in hospitalized children with bronchiolitis.

Virus	Approximate Frequency (%)
Respiratory syncytial virus	50-80
Human rhinovirus	5-25
Parainfluenza virus	5-25
Human metapneumovirus	5-10
Coronavirus	5-10
Adenovirus	5-10
Influenza virus	1-5
Enterovirus	1-5

Diagnosis

Bronchiolitis commonly diagnosed on clinical grounds. Imaging modalities, such as X-ray, are sometimes needed to rule out bacterial pneumonia, though not routinely [13]. In addition, a chest x-ray may be required as a part of the management of respiratory failure [14]. Septic workup that includes blood cultures, complete blood count, and electrolyte analyses is required when the child is suffering from other comorbidities or in the cases of clinical suspicion of sepsis or pneumonia [6, 14]. Virology testing to identify the causative agent has no direct effect on the management, and hence it is rarely done albeit, identifying the causative agent

is proposed to decrease antibiotic usage [13, 14]. Recently, studies have identified procalcitonin levels as a potential marker for the presence of bacterial co-infection once elevated [20].

Prevention

Hygienic measures (e.g. handwashing, and avoiding exposure to those symptomatic) paly an essential role in reducing the spread of bronchiolitis [3, 6]. Additionally, boosting the immune systems of those vulnerable to the infection is also recommended. For example, breastfeeding is integral in enhancing immunity, especially during the first month of life [14, 21]. Reports have shown the rate of respiratory infections were significantly less in breastfed infants compared to non-breastfed ones [3]. Emerging biological prevention measures are now gaining popularity. For example, Palivizumab, a monoclonal antibody against RSV, can be administered to premature infants [3]. Smoking exposure is well-established as a risk factor and an indicator of severe bronchiolitis. It is recommended that caregivers are educated on the adverse effects caused by smoking on children [3, 21].

Management

The mainstay of bronchiolitis management relays heavily on symptomatic relief [22]. The natural course of the disease typically resolves between 2 and 3 weeks [23]. In the case of severe disease, it is recommended that adequate hydration and feeding are delivered to the affected children [6]. However, the is a lack of consensus on the utilization of nebulized hypertonic saline, nebulized epinephrine, and nasal suctioning for such patients [5, 6, 24]. Adequate fluid support is a cornerstone of bronchiolitis management [3, 25 26]. Poor feeding (i.e. less than 50% of usual intake) is a sign of worse outcome and is often used as a ground for hospital admission [6]. In contrast, infants with adequate intake and mild symptoms only require observation [3]. Parenteral fluids are recommended in children who fail to sustain acceptable oral intake [3, 25]. Insufficient oxygenation is a worrying sign and requires hospital admission and close monitoring [25]. Reports have suggested that home oxygen therapy may decrease the frequency of hospital admission and duration of hospital stay [3]. Currently, other medications do not yet have evidence to support their use, although they have been studied for use in bronchiolitis. Finally, other medications lake sufficient evidence to support their use. For example, surfactant, chest physiotherapy, heliox, DNAse, and magnesium [3, 27].

Conclusion:

In conclusion, bronchiolitis is an infectious disease that is prevalent in the pediatric age group. It can present with a variety of respiratory symptoms, such as cough, tachypnea, hyperinflation, chest retraction, crackles, and wheezing. The disease is self-limiting where only 1-3% of patients require hospital admission. Bronchiolitis is most commonly caused by syncytial virus and rhinovirus. The diagnosis is mainly clinical while X-ray is sometimes needed to rule out bacterial pneumonia. Hygienic measures play an essential role in reducing the spread of bronchiolitis. The mainstay of bronchiolitis management relays heavily on symptomatic relief. Although bronchiolitis remains a common disease among children, it is essential for clinicians to know how to promptly identify the severe course and understand the gravity it carries.

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