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Epidemiological characteristics of respiratory syncytial virus in children

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Abstract: Respiratory syncytial virus (RSV) is one of the most common respiratory diseases, causing more than 30 million cases of lower respiratory tract infections (LRTI) and 3 million hospitalizations worldwide each year [1]. RSV is especially dangerous for people with weakened immune systems, chronic lung or heart diseases, and for people under 5 years of age or over 65 years of age. RSV is the leading cause of lower respiratory tract infection (eg, bronchiolitis) in children under 1 year of age [5]. The incidence of RSV hospitalization is highest among infants younger than 6 months (2 percent per year, 95% CI 0.1–4), and significantly higher in premature infants younger than 1 year (6 percent per year, 95% CI 4–11). In an international multicenter case-control study, RSV was the most common pathogen isolated from children aged 1 to 59 months hospitalized with severe pneumonia in Africa and Asia, accounting for 31 percent of cases [24].

Introduction: Respiratory syncytial virus (RSV) is one of the most common respiratory diseases, causing more than 30 million cases of lower respiratory tract infections (LRTI) and 3 million hospitalizations worldwide each year [1]. RSV is especially dangerous for people with weakened immune systems, chronic lung or heart diseases, and for people under 5 years of age or over 65 years of age. RSV is the leading cause of lower respiratory tract infection (eg, bronchiolitis) in children under 1 year of age [5]. The incidence of RSV hospitalization is highest among infants younger than 6 months (2 percent per year, 95% CI 0.1–4), and significantly higher in premature infants younger than 1 year (6 percent per year, 95% CI 4–11). In an international multicenter case-control study, RSV was the most common pathogen isolated from children aged 1 to 59 months hospitalized with severe pneumonia in

Africa and Asia, accounting for 31 percent of cases [24].

A prospective population-based study conducted in the United States during the 2015–2016 season showed that hospitalization of children younger than 5 years with RSV was 0.3%, among children younger than 2 years 0.5%, and increases in children younger than 6 months and amounts to 1.5% [25]. RSV-related hospitalizations also remain high in children over 5 years of age [26], but these children often have underlying medical conditions (e.g., asthma, neurological disorders, immunodeficiency). LRTIs are the leading cause of death in children under 5 years of age and the leading cause of death in children under 1 year of age worldwide. In adults, RSV can cause serious lower respiratory tract infections and is responsible for more than 177,000 hospitalizations and more than 14,000 deaths annually in the United States alone [2].

RSV typically causes seasonal outbreaks worldwide. In the Northern Hemisphere, they typically occur from October or November to April or May, with a peak in January or February [5-7]. In the Southern Hemisphere, winter epidemics occur from May to September, with a peak in May, June, or July. In tropical and semi-tropical climates, seasonal outbreaks are usually associated with the rainy season. The peak of epidemics is not as sharp as in temperate climates, and in some settings, RSV can be isolated for eight months of the year [8]. Disruption of the typical RSV seasonality can lead to out-of-season outbreaks. For example, during the height of the coronavirus disease 2019 (COVID-19) pandemic, infection control measures (social distancing, masks) significantly reduced the circulation of RSV and other respiratory viruses during the fall and winter of 2020 and the summer of 2021 [11-18].

However, the subsequent two RSV seasons (2021 and 2022) have seen intense outbreaks of RSV and other respiratory virus infections that began earlier than usual, such that two major RSV outbreaks occurred within three years, 16–18 months apart [11,12,19–22]. The 2023–2024 RSV seasonal outbreak in the United States has returned to the timing that was typical before the COVID-19 pandemic. However, the timing of future seasonal patterns is still unknown [23]. Although mortality from RSV infection is rare in developed countries, the disease remains a leading cause of childhood mortality worldwide. RSV mortality among neonates <28 days of age is 2%, among infants 28–364 days of age 7%, and among children 1–4 years of age is also 2% [27]. Mortality due to RSV infection in children aged 28 to 364 days is the leading cause, second only to malaria. In developing countries, mortality from RSV infection is also the leading cause among children born full-term [28]. In studies by Geoghegan S. and others in 2017, it was shown that in developing and underdeveloped countries, death can also occur at home [29]. Based on data from studies conducted in the United States in 2014, it was found that mortality from RSV among infants and children under 5 years of age was 0.8 per 100,000 per year [30]. In developed countries, mortality from RSV was most often found in premature infants, as well as in children with concomitant chronic diseases, such as cardiovascular pathologies and primary immunodeficiency [28,31].

A study conducted in Canada between 2003 and 2013 showed that the average age of 79 children who died from RSV infection was 11 months. The study ranged from one month to 16 years of age. Among the examined patients, 20% of cases had no known risk factors for severe RSV infection, and 37% of fatal cases of RSV infection were hospital-acquired (i.e., symptoms appeared more than 72 hours after admission or less than 72 hours after discharge from the hospital after a previous admission) [32].

In addition to high mortality from RSV infection, there are also risks of developing complications such as asthma and other chronic respiratory diseases. For example, in their studies, Shi T et al. in 2020 showed that children who had RSV in the first 3 years of their life have a risk of developing asthma almost three times higher than uninfected children [3]. All these long-term consequences associated with RSV lead to significant socioeconomic burden and deterioration in children's health-related quality of life in the future [4].

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