Original Investigation

April 1, 2019

Association of Rhinovirus C Bronchiolitis and Immunoglobulin E Sensitization During Infancy With Development of Recurrent Wheeze

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Key Points

Question  Is severe bronchiolitis by different rhinovirus species during infancy associated with distinct risks of developing recurrent wheeze?

Findings  In this cohort study of 716 infants who were hospitalized for bronchiolitis, compared with respiratory syncytial virus infection, rhinovirus C infection was associated with a higher risk of developing recurrent wheeze by age 3 years. Furthermore, infants with rhinovirus C infection and IgE sensitization (to food or aeroallergen) in infancy had 3-fold higher risks of recurrent wheeze while those without sensitization had no significant differences.

Meaning  The study identifies infants at higher risk of developing recurrent wheeze and informs strategies to develop targeted preventive therapies.

Abstract

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**Importance**  Rhinovirus infection in early life, particularly with allergic sensitization, is associated with higher risks of developing recurrent wheeze and asthma. While emerging evidence links different rhinovirus species (eg, rhinovirus C) to a higher severity of infection and asthma exacerbation, to our knowledge, little is known about longitudinal associations of rhinovirus C infection during infancy with subsequent morbidities.

**Objective**  To examine the association of different viruses (respiratory syncytial virus [RSV], rhinovirus species) in bronchiolitis with risks of developing recurrent wheeze.

**Design, Setting, and Participants**  This multicenter prospective cohort study of infants younger than 1 year who were hospitalized for bronchiolitis was conducted at 17 hospitals across 14 US states during 3 consecutive fall to winter seasons (2011-2014).

**Exposures**  Major causative viruses of bronchiolitis, including RSV (reference group) and 3 rhinovirus species (rhinovirus A, B, and C).

**Main Outcomes and Measures**  Development of recurrent wheeze (as defined in national asthma guidelines) by age 3 years.

**Results**  This analytic cohort comprised 716 infants who were hospitalized for RSV-only or rhinovirus bronchiolitis. The median age was 2.9 months (interquartile range, 1.6-3.8 months), 541 (76%) had bronchiolitis with RSV only, 85 (12%) had rhinovirus A, 12 (2%) had rhinovirus B, and 78 (11%) had rhinovirus C infection. Overall, 231 (32%) developed recurrent wheeze by age 3 years. In the multivariable Cox model, compared with infants with RSV-only infection, the risk of recurrent wheeze was not significantly different in those with rhinovirus A or B (rhinovirus A: hazard ratio [HR], 1.27; 95% CI, 0.86-1.88; rhinovirus B: HR, 1.39; 95% CI, 0.51-3.77; both P>.10). By contrast, infants with rhinovirus C had a significantly higher risk (HR, 1.58; 95% CI, 1.08-2.32). There was a significant interaction between virus groups and IgE sensitization on the risk of recurrent wheeze (P for interaction< .01). Only infants with both rhinovirus C infection and IgE sensitization (to food or aeroallergens) during infancy had significantly higher risks of recurrent wheeze (HR, 3.03; 95% CI, 1.20-7.61). Furthermore, compared with RSV-only, rhinovirus C infection with IgE sensitization was associated with significantly higher risks of recurrent wheeze with subsequent development of asthma at age 4 years (HR, 4.06; 95% CI, 1.17-14.1).

**Conclusions and Relevance**  This multicenter cohort study of infants hospitalized for bronchiolitis demonstrated between-virus differences in the risk of developing recurrent wheeze. Infants with rhinovirus C infection, along with IgE sensitization, had the highest risk. This finding was driven by the association with a subtype of recurrent wheeze in children with subsequent development of asthma.
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