Pneumococcal Conjugate Vaccine Prevents Pneumonia Hospitalizations

Source: *Olarte L, Barson WJ, Barson RM, et al. Pneumococcal pneumonia requiring hospitalization in US children in the 13-valent pneumococcal conjugate vaccine era. Clin Infect Dis. 2017;64(12):1699–1704; doi: 10.1093/cid/cix115*

Investigators at multiple institutions conducted a cross-sectional study to assess the prevalence and characteristics of pneumococcal pneumonia (PP) before and after the introduction of the 13-valent pneumococcal conjugate vaccine (PCV13) in 2010. Children were eligible if they were ≤18 years old and had PP managed as an inpatient at 1 of 8 participating US children's hospitals from 2006 to 2014. PP was defined as the isolation of *Streptococcus pneumoniae* from blood, pleural fluid, lung abscess, or lung tissue, with clinical presentation and radiographic changes consistent with pneumonia. PP was categorized as complicated if there was pulmonary consolidation plus a large pleural effusion (>10-mm rim or ≥25% of the hemithorax opacified), loculated pleural fluid, parapneumonic empyema, necrotizing pneumonia, or lung abscess. Demographic, clinical, and *S pneumoniae* serotype data were obtained from the medical chart. Investigators compared annual hospitalization rates for all PP, complicated PP, and serotype-specific PP before (2006–2009) and after (2011–2014) PCV13 introduction.

There were 377 patients with PP included in the analysis. The hospitalization rate for all PP decreased from 53.6 per 100,000 admissions before PCV13 to 23.3 per 100,000 admissions after PCV13 ($P < .0001$). Hospitalization rates for complicated PP also decreased significantly. Comorbid conditions were more common among children with uncomplicated pneumonia than complicated pneumonia (52.2% vs 22.5%, respectively; $P< .001$). The need for intensive care and invasive procedures did not change after the introduction of PCV13.

A total of 364 of 377 isolates (96.6%) were available for serotyping and antibiotic susceptibility testing. Although there was a significant decrease in hospitalization rates for PP caused by PCV13 serotypes, they still accounted for 70% of PP cases in the post-PCV13 era (2011–2014). There was no increase in the hospitalization rate of PP caused by non-PCV13 serotypes (4.3 per 100,000 admissions before PCV13 vs 6.7 per 100,000 admissions after PCV13; $P = .1$). The proportion of isolates susceptible to penicillin increased from 90.8% in 2006–2009 to 97% in 2011–2014 ($P = .05$). A lower proportion of isolates associated with complicated (91.3%) versus uncomplicated (98.2%) PP were susceptible to penicillin ($P = .015$).

The investigators conclude that hospitalization rates for PP have decreased since the introduction of PCV-13.

COMMENTARY BY

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Dr Brady has disclosed no financial relationship relevant to this commentary. This commentary does not contain a discussion of an unapproved/investigative use of a commercial product/device.

The results of the current study agree with those of previous studies,[1,2] which demonstrated a significant decline in the incidence of invasive pneumococcal disease (IPD) among children after the introduction of PCV13. These observations contrast to those for the incidence of pneumococcal meningitis, which, as of 2013, had remained unchanged among these same 8 US children's hospitals. (See *AAP Grand Rounds* 2015;34[6]:65.[3]) In the meningitis study, neurological sequelae were more common among children without an underlying condition when compared to those with an underlying condition.[3] This finding was also reported in the current study. Comorbid conditions were significantly more common among children with uncomplicated versus complicated PP. This finding is not intuitive, and the factors contributing to it require further study.

Metcalf et al[4] analyzed IPD isolates recovered from children aged <5 years through the CDC Active Bacterial Core surveillance program before (2008–2009) and after (2011–2013) PCV13 implementation. Serotype 35B increased in frequency during 2011–2013. This serotype is often not susceptible to penicillin and other β-lactam antibiotics.

Richter et al[5] examined 1,498 isolates of *S pneumoniae* that cause invasive or noninvasive disease during the 2012–2013 respiratory infection season from 42 US medical centers and also found an expansion of serotype 35B among isolates from both children and adults.

During 2014, the last year of the current study, the hospitalization rate of PP due to non-PCV13 serotypes increased. This observation leads to the concern that non-PCV13 serotypes may increase as a cause of IPD in the coming years. In 2014, serotype 35B became the most common serotype that causes IPD in the US Pediatric Multicenter Pneumococcal Surveillance Group.[6] Genotyping results indicated that capsular switching had occurred between multidrug-resistant vaccine serotypes (eg, 9V, 14, and 19A) and serotype 35B.

Bottom Line: PCV13 has significantly decreased PP hospitalizations among US children. The proportion of isolates susceptible to penicillin has also increased. However, serotype replacement events, especially with serotype 35B, are emerging, which raises concern for a resurgence in pneumococcal disease.

EDITORS' NOTE

Hidden within the recesses of the current study is the fact that only 9 previously healthy children who developed PP due to a PCV13 serotype had received ≥3 doses of PCV13. The message is clear—complete immunization with PCV13 protects against IPD; incomplete immunization does not.

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