Invasive pneumococcal disease in children and adolescents: incidence of infection and serotype coverage of conjugate vaccines in Portugal

Sandra I. Aguiar, Maria J. Brito, Andreia N. Horácio, Joana P. Lopes, Mário Ramírez, José Melo-Cristino on behalf of the Portuguese Group for the Study of Streptococcal Infections and the Portuguese study Group of Invasive Pneumococcal Disease of the Pediatric Infectious Disease Society
Instututo de Microbiologia, Instituto de Medicina Molecular, Faculdade de Medicina Universidade de Lisboa, Lisboa, Portugal

Background and aims

The introduction of the 7-valent pneumococcal conjugate vaccine (PCV7) led to changes in the serotypes and also often to declines in the incidence of invasive pneumococcal disease (IPD). Two new pneumococcal conjugate vaccine (PCV) formulations are now commercially available and used in children. A 10-valent formulation (PCV10) including, in addition to the PCV7 serotypes, serotypes 1, 5, and 7F and a 15-valent conjugate vaccine (PCV13), including all PCV10 serotypes plus serotypes 3, 6A and 19A. These expanded valency conjugate vaccines (PCV13) have been implemented in Portugal since 2010. The current study aimed to document the potential effects of children vaccination in the pneumococcal population associated with infection.

Methods

Between July 2008 and June 2012 a total of 4,712 cases of invasive pneumococcal disease (IPD) recovered from patients <18 yrs were reported. Among these, 3,262 isolates were available for serotyping and antimicrobial resistance profiling. A case of IPD is defined by an isolate of S. pneumoniae recovered from a normally sterile body site (not including middle ear fluid). Only isolates recovered from pediatric invasive infections, i.e., recovered from patients <18 yrs, between 2008-2009 and 2011-2012 were included in the present study. Epidemiological years were defined as spanning from week 28 to week 20 of the following year. Only one isolate from each patient was considered. All isolates were identified as S. pneumoniae by colony morphology and hemolysis on blood agar plates, optochin susceptibility and bile solubility. The gene fya1A was used to identify pneumococci in CSF or pleural fluid. Incidences were calculated based on the Portuguese population data available from “Instituto Nacional de Estatística” (www.ine.pt). Four age groups were considered: infants less than 12 months (0-11), isolates with 12 months or more but less than 24 months (12-23), children with 24 months or more but less than 5 years (2-49), children and adolescents with five years or more but less than 18 yrs (5-18 yrs). Serotyping was performed by the standard capsular reaction test using the checkerboard system and specific sera (Statens Serum Institut, Copenhagen, Denmark). Serotypes were classified into vaccine serotypes, i.e., those included in PCV7 (serotypes 4, 6B, 9V, 14, 18C, 19F, 23F), the additional three found in PCV10 relative to PCV7 (serotypes 1, 5, 7F), the additional three found in PCV13 relative to PCV7 (serotypes 3, 6A, 19A), and non-vaccine serotypes (NVT). 

Results

Antimicrobial resistance


- The number of resistant isolates is reported as percentage of the total number of isolates recovered from each age group.
- Resistance to penicillin and erythromycin indicates the M phenotype.

Conclusions

- In spite of the remarkable decline in cases caused by vaccine serotypes, 61% of IPD in 2011-2012 was due to PCV13 serotypes.