Surveillance of Invasive Pneumococcal Disease and Antimicrobial Resistance in the Adult Population in Ireland

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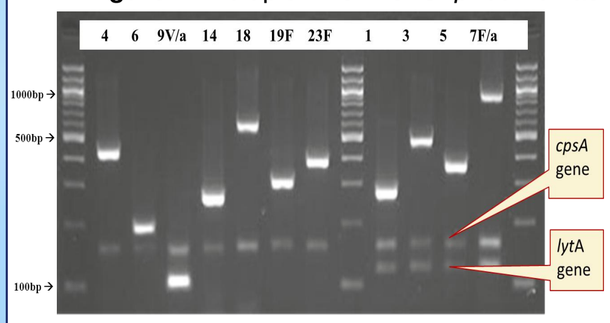
Objectives

- The majority of invasive pneumococcal disease (IPD) infections are caused by a subset of predominant *Streptococcus pneumoniae* serotypes, which are included in pneumococcal conjugate vaccines (PCV's) and pneumococcal polysaccharide vaccines (PPV).
- The objective of this study was to assess the serotype distribution and antimicrobial resistance associated with IPD in adults.

Methods

- *S. pneumoniae* isolates from sterile sites in adults over 18 years of age and older were submitted for serotyping using multiplex-PCR (Figure 1) and serological co-agglutination.
- Susceptibilities to penicillin, cefotaxime and erythromycin were determined using the E-test method and CLSI guidelines for meningitis.

Figure 1: Multiplex PCR for *S. pneumoniae*



Vickers *et al.*, 2011.EJCMID. 30(3): p. 447-453.

Results

- There was a total of 1852 IPD isolates between July 2007 and June 2014 from adults ≥18 years of age (230-298/year).
- The proportion of IPD isolates covered by PVC7, the additional serotypes in PCV13 but not PCV7 (PCV13-7) and PPV23 were 27%, 31% and 76%, respectively.
- The five predominant serotypes (38% of total) were 7F, 19A, 22F, 14 and 8, all in PPV vaccine, 7F and 19A (PCV13 and PPV) & 14 which is included in (PCV7, PCV13, PPV).
- See **table 1** for details of serotypes in the PPV and PCV's.

Table 1	Serotypes covered	Recommendation
PCV7	4, 6B, 9V, 18C, 19F, 23F	Routine infants schedule and catch-up for children < 2 years – Sept. 2008
PCV13	PCV7 + 1, 3, 5, 7F, 6A, 19A	Routine infant schedule – Dec. 2010
PPV23	1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19A, 19F, 20, 22F, 23F, 33F.	For adults ≥ 65 years of age and patients who may be immunocompromised. Underlined serotypes in PPV only (others are in both PCV and PPV).

Figure 2: The distribution of IPDs according to serotype grouping, 2007-14

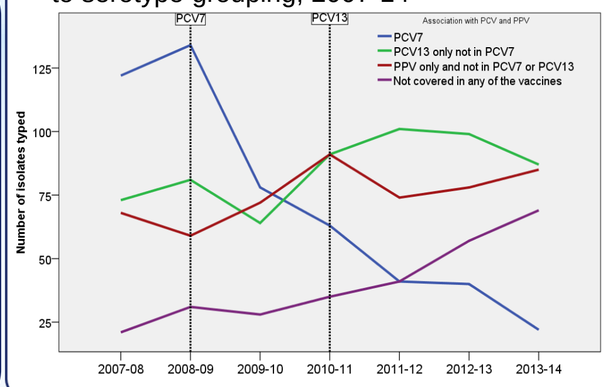
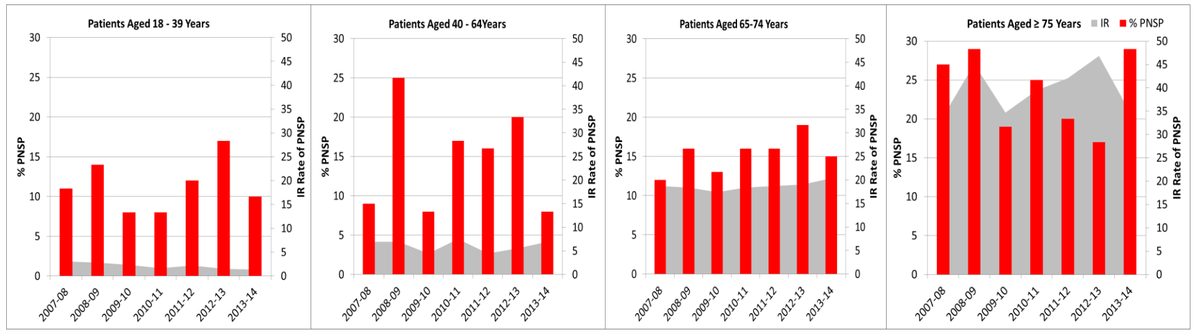


Figure 3: The Percentage of IPD isolates that were PNSP and the incidence rate of IPD, 2007-14.



Distribution of Serotypes

When the results for 2007-08 were compared to 2013-14, there was:

- A 50% increase in number of non-PPVs (p=<0.001). **Purple line** in **Figure 2.**
- 26% decline in the overall number of PPV's. (data not shown)
- The group of serotypes covered by PPV only (underlined in **Table 1)** increased over this time. **Red line** in **Figure 2.**
- PCV7 associated serotypes fell by 83% over the same period (p=<0.001).
- **Blue line** in **Figure 2.**
- The additional serotypes in PCV13-7 serotypes increased initially to a peak in 2011-12 (n=95) but fell by 10% in 2013-14 (n=85).
- **Green line in Figure 2.**

Antimicrobial Resistance

- The incidence rate of IPD and the percentage of isolates that were penicillin non-susceptible pneumococci (PNSP) increased gradually with age.
- This ranged from 11% of isolates in patients 18-39 years to 29% in patients ≥75 years old (p<0.001). See **Figure 3**.
- Reduced susceptibility to cefotaxime and erythromycin was also observed in older patients.

Conclusion

- The potential coverage against IPD in adults provided by PCV7, PCV13 and PPV was 27%, 31% and 76%, respectively.
- The decline in the number of PCV7 and PCV13-7 serotypes indicates that the vaccines offered herd effect immunity.
- However, increased antimicrobial resistance associated with the elderly is of concern.

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