Early Impact of PCV10/PCV13 Vaccine Program on Invasive Pneumococcal Disease (IPD) in Toronto, Canada

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Abstract

Objective: To assess the Ontario PCV10/PCV13 immunization program.

Methods: TIBDN has performed population-based surveillance for IPD in Toronto/Peel (4M) since 1995. Publicly funded PCV programs started as follows: PCV7 12/2005 (4, 6, 11m), PCV10 10/2009 (4, 6, 15m), PCV13 11/2010 (2, 4, 6, 12m + catch-up 12-35m). We compare post-PCV10/13 IPD in vaccine eligible (VEC) & ineligible children (VIC).

Results: For 2005-10, adult IPD incidence was stable: 8,100/100,000. The percent of IPD due to PCV7 serotypes declined: 51% PCV7 - 7% in 2011; that of PCV13/not7 increased (18-45%). 19A comprised 25% of PCV13/not7 STs in 2003 and 39% in 2010, 7F 16% (2007) and 33% (2010). In children <6y, IPD decreased: 37.3 pre-PCV7 - 13.5/100,000/y in 2010. The percent of PCV7 STs decreased (79-10%); PCV13/not7 STs increased (8-65%). Among PCV13/not7 STs, 19A was stable (63%); 7F increased (0-19%). By Jan 2011, children 6-35m should have received at least 3 doses of PCV7 to be eligible (4, 6, 15m) (Figure). Compared to Jan-Jun 2008-10, PCV13/not7 incidence in Jan 2011 did not change for VIC or VEC, that in VIC decreased (14-3.4/100,000/y, P<0.05) (Figure).

Conclusions: PCV13 & PCV10 appear to prevent IPD due to additional STs. Catchup dose uptake and conversion to PCV at 12m vs. 15m was incomplete in the program’s first 2m.

PCV programs in Ontario

In Ontario, PCV7 was licensed in June 2001 and, in January 2002, the Canadian National Advisory Committee on Immunization (NACI) recommended routine vaccination of all children aged <24 months. By late 2002, uptake in the private market resulted in usage of approximately 1 dose per child in the birth cohort in Ontario; data on the distribution of these doses are not available. In January 2005, PCV7 became publicly funded for healthy children. PCV10 was introduced in October 2009 and PCV13 in late November 2010 (Table 1).

Table 1: Licensing and public funding of pneumococcal conjugate vaccines for healthy children, Ontario.

Date Vaccine Availability/program change
Jan 2005 PCV7 Licensed (available private market)
Jan 2005 PCV10 Public funding for routine immunization (2.5, 15 months)
Dec 2008 PCV10 Licensed
Jan 2010 PCV13 Replaces PCV7 in publicly funded program
Nov 2010 PCV13 Replaces PCV10 in publicly funded program

Table 2: Characteristics of 2011 cases of IPD (to September 7, 2011) among children <5 years

<table>
<thead>
<tr>
<th>Serotype</th>
<th>Vaccine history</th>
<th>Enrollment</th>
<th>Disease type</th>
<th>Vaccination history</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>PCV2 + PCV10</td>
<td>185</td>
<td>63</td>
<td>Low risk</td>
</tr>
<tr>
<td>3</td>
<td>PCV2 + PCV10</td>
<td>128</td>
<td>60</td>
<td>Low risk</td>
</tr>
<tr>
<td>4</td>
<td>PCV2 + PCV10</td>
<td>113</td>
<td>55</td>
<td>Low risk</td>
</tr>
<tr>
<td>5</td>
<td>PCV2 + PCV10</td>
<td>87</td>
<td>48</td>
<td>Low risk</td>
</tr>
</tbody>
</table>

Results (cont’d)

During 2010, 51 cases of IPD due to serotypes included in PCV13 were identified in children <5 years of age in our surveillance area. The serotype distribution of the 38 IPD cases in children under 5 years was: 19A (28), 7F (3), 3 (3), 19F (2), 23F (2), 6A (1). In children 5-15 years old, the serotype distribution was: 7F (9), 19A (5), 6A (1), 6B (1).

Because PCV10 was introduced into the birth cohort in November 2009 (Table 1), children 2 months of age or less as of November 2009 would have had any protection against PCV10/not7 STs in 2010 and protection would be incomplete (<3 doses) until October 2010 at the earliest. If the subsequent November 2010 PCV13 program uptake was complete by January 2011, most children aged 6-35 months during 2011 should have been protected from PCV13 serotype IPD. The exception would be children aged >12m years to <10 months in November 2010, who should not have received a dose of PCV13 until they were 12 months old (between January and June 2011). However, concern about the efficacy of the three dose program might have led pediatricians to give an additional dose of PCV13 to some members of this group.

We therefore anticipated that, if extended spectrum conjugate vaccines were effective against IPD, rates of disease due to PCV13/not7 serotypes pneumococci should decrease in 2011 compared to 2008-2010 in children aged 6-35 months, but not change in other children and adults.

The six-month rate (Jan-June) of IPD due to PCV13/not7 serotypes in children aged 6-35m decreased from a mean of 7.4 per 100,000 in years 2008-10 combined to 2.6 per 100,000 in 2011. Rates of PCV13/not7 increased (8-65%). Among PCV13/not7 serotypes, 19A was stable (65%); 7F increased (0-19%). By Jan 2011, children 6-35m should have received at least 3 doses of PCV7 to be eligible (4, 6, 15m) (Figure).

Conclusions

These early data suggest that PCV13 is effective in preventing IPD due to serotype 19A strains and either both PCV10 and PCV13 are effective in preventing IPD due to serotype 7F strains.

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