Invasive pneumococcal disease in birth cohorts receiving PCV7 and PCV10 vaccine regimens in Metropolitan Toronto and Peel Region, 2008-2010

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Abstract

Background: There are limited data on how effective PCV10 is at preventing invasive pneumococcal disease (IPD) in children. We performed an epidemiologic analysis to compare IPD in cohorts of children immunized with PCV7 only or with PCV10.

Methods: From 2007 to 2010, all sterile site pneumococcal isolates identified through population-based surveillance for IPD were collected in metropolitan Toronto and Peel region. Serotype was determined using latex pneumococcal antisera (Statens Serum Institute, DK) and the Quellung reaction. PCV7 was introduced in Ontario in January 2005; PCV10 in December 2009 and PCV13 in November 2010. Children born between January 2008 and December 2010 were used to identify birth cohorts in which children had received PCV7 only or PCV10 (2 doses in children aged <5 months or one dose at age >12 months). Observation periods were truncated for age, to determine the effects of post-primary/pre-booster and booster to end of follow-up.

Results: The incidence of IPD in children aged 5-11 months who received PCV10 for the primary series was lower compared to those of the same age who received PCV7 (Table 1). Similarly, children who received PCV7 for the primary series and PCV10 as a booster at age 12-15 months had a lower incidence of IPD between ages 16 and 22 months compared to those who received PCV7 for both primary and booster (Table 1).

Conclusion: The overall IPD risk was lower in children who were exposed to PCV10 compared to PCV7, supporting similar data from the province of Quebec. Results should be interpreted with care due to small sample size; further collaboration with additional surveillance networks should be explored.

Introduction

Public funding for pneumococcal conjugate vaccines was first implemented in 2005; 3+1 doses for low-risk children (2, 4, 6 and 15 months). PCV7 was first used, replaced by PCV10 in Oct 2009 and then PCV13 in Nov 2009. There is currently limited data on the effectiveness of PCV10 to prevent invasive pneumococcal disease (IPD) in children in Ontario.

The objective of this study is to determine the incidence and serotype distribution of IPD in a cohort of children immunized with PCV7 and/or PCV10 vaccine using population data collected from Toronto Invasive Bacterial Diseases Network (TIBDN).

The Toronto Invasive Bacterial Diseases Network (TIBDN) has performed population-based surveillance for invasive pneumococcal disease in metropolitan Toronto and Peel region (pop 4.8M) since January 1, 1995.

Methods

From 2008 to 2010, all sterile site isolates of pneumococci identified through population-based surveillance for invasive pneumococcal disease (defined as illness associated with a sterile site isolate of S. pneumoniae) were collected in metropolitan Toronto and Peel region. Serotype was determined using latex pneumococcal antisera (Statens Serum Institute, DK) and the Quellung reaction. The eligible population for analysis was all children born between January 2008 and December 2010. Follow-up was until December 31, 2010. Population estimates for each month in years 2006 and 2009 were obtained from Statistics Canada; estimates for year 2010 were based on projected estimates.

PCV programs in Ontario

PCV7 was first publicly funded in Ontario in 2005, with four doses scheduled at 2, 4, 6 months (primary series) and 15-18 months (booster). PCV10 replaced PCV7 in 2009, with four doses scheduled at 2, 4, 6 months (primary series) and 15-18 months (booster). PCV13 replaced PCV10 in 2010, with three doses scheduled at 2, 4 months (primary series) and 12 months (booster). Beginning in November 2010, a single catch-up dose of PCV13 was recommended for children aged 13-36 months who had not yet received a dose of this vaccine (Table 1).

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

<table>
<thead>
<tr>
<th>Date</th>
<th>Vaccine Granted or program change</th>
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<tbody>
<tr>
<td>Jun 2001</td>
<td>PCV7 Licensed (available in private market)</td>
</tr>
<tr>
<td>Dec 2009</td>
<td>PCV13 Licensed</td>
</tr>
<tr>
<td>Nov 2009</td>
<td>Change to 3 doses schedule</td>
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</tbody>
</table>

Vaccine uptake in Toronto/Peel region

Birth cohorts were determined based on month of birth and the most likely vaccine regimen they would have received based on the Ontario vaccine recommendations at the time of their eligibility for each dose of vaccine. To more accurately identify the time gap between the announcement of a vaccine program and the shipment of vaccine to providers in Toronto and Peel, additional data was obtained from the Ontario Government Pharmaceutical and Medical Supply Services (OGPMS) and Peel Public Health.

The main type of vaccine used for each month was defined as more than 75% of one particular vaccine distributed (Figure 1).

Figure 1. Distribution of pneumococcal vaccine received by month born in Toronto/Peel region

Acknowledgements:

We are grateful to the infection control practitioners, microbiology technologists, public health staff and our tireless TIBDN staff for their ongoing contributions to this surveillance. This work has been supported in part by Glaxo-SmithKline.