Serotype Replacement After the Introduction of the 13-Valent Pneumococcal Conjugate Vaccine in Ontario, Canada, 2007-2018

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Abstract

Introduction: Invasive pneumococcal disease (IPD) is a disease of public health significance in Ontario, Canada, where publicly funded pneumococcal vaccination programs target children, older adults, and people at high risk of disease. Since the implementation of pneumococcal conjugate vaccines (PCV), serotype replacement has been documented, where non-PCV serotypes replace the niche created by the reduction in vaccine-preventable serotypes. Our objective was to determine whether there has been serotype replacement or a change in IPD severity in Ontario since implementation of the childhood 13-valent (PCV13) program by assessing IPD burden over a 12-year period (2007-2018).

Methods: We included all confirmed IPD cases reported in Ontario's integrated Public Health Information System (iPHIS) and defined the pre-PCV13 era (January 2007-December 2010) and post-PCV13 era (January 2011-December 2018). We grouped IPD serotypes according to associated vaccine type: PCV13; 23-valent polysaccharide vaccine (unique PPV23); and non-vaccine-preventable (NVP). We used population data to calculate incidence and hospitalization rates (per 100,000 population) by age group, vaccine type, and era.

Results: In the post-PCV13 era, PCV13-specific incidence and hospitalization rates decreased, while the incidence and hospitalizations due to unique PPV23 and NVP serotypes increased; this was consistent across all age groups. The greatest decrease in incidence (RR=0.4) and hospitalizations (RR=0.4) was observed in children <5 years with PCV13 serotypes. There were no distinct age-related trends observed for case fatality ratios; the highest CFR was observed in adults ≥65 years.

Conclusion: A shift in serotype distribution was seen across all age groups; IPD incidence and hospitalization rates due to PCV13 serotypes decreased after PCV13 implementation, but this reduction was offset by the increasing burden and severity of unique PPV23 and NVP serotypes. As IPD continues to be a severe disease, continued surveillance is required to better understand the growing burden of these serotypes and emergence of non-vaccine-preventable serotypes.