Indian Academy of Pediatrics (IAP)

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Newer **R**esearch and recommendations **I**n **C**hild **H**ealth

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UNDER THE AUSPICES OF THE IAP ACTION PLAN 2023

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Dear fellow IAPans,

nRICH

Newer **R**esearch and recommendations **I**n **C**hild **H**ealth-aims to bring you the abstracts of some of the breakthrough developments in pediatrics, carefully selected from reputed journals published worldwide.

Expert commentaries will evaluate the importance and relevance of the article and discuss its application in Indian settings. nRICH will cover all the different subspecialities of pediatrics from neonatology, gastroenterology, hematology, adolescent medicine, allergy and immunology, to urology, neurology,vaccinology etc. Each issue will begin with a concise abstract and will represent the main points and ideas found in the originals. It will then be followed by the thoughtful and erudite commentary of Indian experts from various subspecialties who will give an insight on way to read and analyze these articles.

I'm sure students, practitioners and all those interested in knowing about the latest research and recommendations in child health will be immensely benefitted by this endeavor which will be published online on every Monday.

Happy reading!

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Distribution of Serotypes Causing Invasive Pneumococcal Disease in Children From High-Income Countries and the Impact of Pediatric Pneumococcal Vaccination

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BASED ON ARTICLE

Lindsay R Grant, Mary P E Slack, Christian Theilacker, Jelena Vojicic, Stephane Dion, Ralf-Rene Reinert, Luis Jodar, Bradford D Gessner

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ABSTRACT

Background: The introduction and adoption of pneumococcal conjugate vaccines (PCVs) into pediatric national immunization programs (NIPs) has led to large decreases in invasive pneumococcal disease (IPD) incidence caused by vaccine serotypes. Despite these reductions, the global IPD burden in children remains significant.

Methods: We collected serotype-specific IPD data from surveillance systems or hospital networks of all 30 high-income countries that met inclusion criteria. Data sources included online databases, surveillance system reports, and peer-reviewed literature. Percentage of serotyped cases covered were calculated for all countries combined and by PCV type in the pediatric NIP.

Results: We identified 8012 serotyped IPD cases in children <5 or ≤5 years old. PCV13 serotype IPD caused 37.4% of total IPD cases, including 57.1% and 25.2% for countries with PCV10 or PCV13 in the pediatric NIP, respectively, most commonly due to serotypes 3 and 19A (11.4% and 13.3%, respectively, across all countries). In PCV10 countries, PCV15 and PCV20 would cover an additional 45.1% and 55.6% of IPD beyond serotypes contained in PCV10, largely due to coverage of serotype 19A. In PCV13 countries, PCV15 and PCV20 would cover an additional 10.6% and 38.2% of IPD beyond serotypes contained in PCV13. The most common IPD serotypes covered by higher valency PCVs were 10A (5.2%), 12F (5.1%), and 22F and 33F (3.5% each).

Conclusions: Much of the remaining IPD burden is due to serotypes included in PCV15 and PCV20. The inclusion of these next generation PCVs into existing pediatric NIPs may further reduce the incidence of childhood IPD.

The paper was funded by Pfizer

COMMENTARY

Streptococcus pneumoniae can cuase invasive pneumococcal disease (IPD) such as meningitis, bacteremia, a bacteremic pneumonia in children and adults and non-invasive pneumonia and otitis media. There are about 100 serotypes of S.pnemoniae but out them the serotypes which are more commonly causing the disease are included in vaccines. The disease burden has been reduced in countries where the pneumococal conjugate vaccine (PCV) is part of the National Immunisation program(NIP) for the serotypes included in vaccines. PCV has shown the herd effect by reduction of IPD in non-vaccinated children and adults for the serotypes in vaccines. This is due to the reduction nasopharygeal carrier state of the vaccine serotypes which leads to reduced transmission of vaccine serotypes. In the above review the impact of pediatric PCV use on IPD causing serotype distribution and the percentage of serotype coverage by PCV10, PCV 13, PCV 15, PCV 20 in those high income country using PCV10 and PCV13 is in NIP. In these countries most common reported were 19A, 3, 10A, and 12F. High percentage of IPD cases were caused by the serotypes not included in PCV10 and PCV13. Majority countries included in the study has 2+1 schedule and 3 years prior to the collection of data. Streptococcus pneumoniae can cuase invasive pneumococcal disease (IPD) such as meningitis, bacteremia, a bacteremic pneumonia in children and adults and non-invasive pneumonia and otitis media. There are about 100 serotypes of S.pnemoniae but out them the serotypes which are more commonly causing the disease are included in vaccines. The disease burden has been reduced in countries where the pneumococal conjugate vaccine (PCV) is part of the National Immunisation program(NIP) for the serotypes included in vaccines. PCV has shown the herd effect by reduction of IPD in non-vaccinated children and adults for the serotypes in vaccines. This is due to the reduction nasopharygeal carrier state of the vaccine serotypes which leads to reduced transmission of vaccine serotypes. In the above review the impact of pediatric PCV use on IPD causing serotype distribution and the percentage of serotype coverage by PCV10, PCV 13, PCV 15, PCV 20 in those high income country using PCV10 and PCV13 is in NIP. In these countries most common reported were 19A, 3, 10A, and 12F. High percentage of IPD cases were caused by the serotypes not included in PCV10 and PCV13. Majority countries included in the study has 2+1 schedule and 3 years prior to the collection of data.

For countries with PCV13 in the pediatric NIP, serotypes contained in PCV10, PCV13, PCV15, and PCV20 caused 7.3%, 25.2%, 35.8%, and 63.4% of IPD cases, respectively. The most common serotypes overall in PCV13 countries were 3 (10.2%; min: 1.1%, max: 51.7%), 12F (7.3%; min: 0%, max: 28.7%), 19A (7.0%; min: 0%, max: 22.2%), and 10A (5.7%; min: 0%, max: 13.5)
For countries with PCV10 in the NIP, percentage of serotypes contained in PCV10, PCV13, PCV15, and PCV20 causing IPD is 16.4%, 57.1%, 61.4%, and 72.0% of IPD, respectively. The most common serotypes in PCV10 countries were 19A (27.8%; min: 14.5%, max: 50.0%), 3 (8.6%; min: 2.1%, max: 14.1%), and 14 (5.1%; min: 0%, max: 18.2%). New Zealand and Belgium reported increased incidence of IPD due to 19A serotype when they had PCV10 in NIP.

Serotypes contained in existing vaccines continue to cause a substantial burden of IPD, including serotype 19A (particularly in countries using PCV10 in the NIP but also to a lower degree in countries

using PCV13 in the NIP) and serotype 3 in all countries. Data suggests the limits of relying on cross-protection for some serotypes (eg, serotype 19F for 19A) and suggest that some serotypes may require more robust or different immunologic response than those induced by current conjugate vaccine formulations to reduce carriage acquisition and to have herd effect. And the sub optimal vaccine uptake may be reason for continued transmission and disease occurrence of some serotypes like 19A.

This study reported a high proportion of IPD due to PCV15 and PCV20 serotypes in children below 5 years. PCV15 and PCV20 will cover additional serotypes which have gained importance in post PCV10 and PCV13.

Routine PCV10 and PCV13 pediatric immunization programs have reduced IPD in children <5 years old in high-income countries. Decreased efficacy and effectiveness of some of serotypes in PCV10 and PCV13 may be due to several factors, including vaccination schedule, suboptimal vaccination coverage, and decreased efficacy of certain serotypes in the vaccine. Increasing the coverage of pediatric immunization programs and optimizing vaccine uptake may further reduce PCV13-serotype disease. Inclusion of PCV15 and PCV20 may further reduce the burden of IPD by better percentage of coverage of serotypes.

Available PCVs and their serotypes:
PCV10 serotypes (1, 4, 5, 6B, 7F, 9V, 14, 18C, 19F, and 23F, plus cross-reacting 6A)
PCV 10 Sii serotypes (PCV13 minus 3.4 and 18c)
PCV13 serotypes (PCV10 serotypes, including 6A, and 3 and 19A plus cross- reacting 6C)
PCV14 serotypes (PCV 13 without 6A, plus 22F and 33F)
PCV15 serotypes (PCV13 serotypes, 22F and 33F) not available in India
PCV20 serotypes (PCV15 serotypes plus 8, 10A, 11A, 12F, and 15B, plus cross-reacting 15C) not available in India
As PCV10 of Sii is included in NIP of India in 2+1 schedule and PCV10, PCV13, PCV14 are marketed in private market it will be prudent to monitor the distribution of serotype in future as the replacement of non-vaccine serotypes is likely to occur, few of the serotypes may cause IPD which may require to enhance the number of serotypes in future PCVs.