

CARRIAGE OF PNEUMOCOCCAL SEROTYPES AND ASSOCIATION WITH RADIOGRAPHIC PNEUMONIA IN YOUNG CHILDREN IN THE PNEUMONIA ETIOLOGY FOR CHILD HEALTH (PERCH) STUDY

Christine Prospero for The PERCH Study Group

Department of International Health, International Vaccine Access Center, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland; Department of Pathology, University of Otago, Christchurch; Microbiology Unit, Canterbury Health Laboratories, Christchurch, New Zealand; Kenya Medical Research Institute-Wellcome Trust Research Programme, Kilifi, Kenya; Medical Research Council Unit, The Gambia; Departments of Pediatrics and Medicine, Center for Vaccine Development, University of Maryland School of Medicine, Baltimore, Maryland; Centre pour le Développement des Vaccins (CVD-Mali), Bamako, Mali; Boston University School of Public Health, Boston, Massachusetts; University Teaching Hospital, Lusaka, Zambia; Medical Research Council: Respiratory and Meningeal Pathogens Research Unit, University of the Witwatersrand, Johannesburg, South Africa; Department of Science and Technology/National Research Foundation: Vaccine Preventable Diseases Unit; Division of Global Health Protection, Centers for Disease Control and Prevention, Atlanta, Georgia; Global Disease Detection Center, Thailand Ministry of Public Health-US Centers for Disease Control and Prevention Collaboration, Nonthaburi, Thailand; International Centre for Diarrhoeal Disease Research, Bangladesh; Nuffield Department of Clinical Medicine, University of Oxford, United Kingdom



INTRODUCTION

- Pneumococcal capsular serotype is a determinant of disease potential. The presence of a pneumococcal serotype in the nasopharynx of a pneumonia case may suggest evidence of pneumonia etiology if the serotype is rarely carried in a healthy population.¹
- We aimed to assess the association between the serotype in pneumococcal carriage and radiographic pneumonia and to evaluate differences across sites.

METHODS

PERCH Study: case-control study in seven African and Asian countries (August 2011 to January 2014; 24 months at each site).²

Cases: hospitalized children aged 28 days – 59 months with WHO-defined severe or very severe pneumonia.

Controls: age-frequency matched selected randomly from the community.

Chest X-rays were interpreted in a standardized manner by a trained panel.

Prior antibiotic use: positive serum bioassay (for cases and controls), or receipt of antibiotics at a referral facility or at the study facility prior to nasopharyngeal (NP) swab collection (cases only).

PCV use: Kenya, PCV10; The Gambia, South Africa and Mali, PCV13; Zambia, Bangladesh and Thailand, None [Zambia introduced in final months of PERCH].

Specimens and Laboratory testing: Pneumococci cultured from NP specimens from cases and community controls were serotyped using Quellung or PCR-based methods.

Analysis

- Serotype-specific carriage frequencies and odds ratios (OR) were calculated comparing cases with consolidation on chest radiograph (CXR-AC) to controls, restricting to children with serotyped pneumococcal isolates (NP).
- Significance ($p < 0.05$) was not adjusted for multiple comparisons.
- Attributable fraction among the exposed (AFE), expressed as a percentage, was calculated for each serotype as $1 - (1/OR)$.

RESULTS

- Pneumococcus was isolated from the NP in 487 (51.0%) CXR-AC pneumonia cases and 3654 (69.4%) controls; the proportion positive varied by site (Fig 1).
- Prior antibiotic use among cases varied by site, ranging from 20% to 90%.
- NP culture positivity was lower among cases with antibiotic use (41% versus 63% without antibiotic use).
- The most commonly carried serotype in cases was 19F and 6A in controls.
- Serotypes 1 and 14 were significantly associated with case status (Fig2).
 - Direction of association held in all sites where ST1 was able to be evaluated, and in 6 of 7 sites for ST14.
- Stratified by site, additional serotypes associated with cases status included 19F in the Gambia, 23F in Kenya, 15C in Thailand, ST3 in Zambia, and ST18C in Bangladesh; all $p \leq 0.05$.
- AFE for CXR-AC pneumonia for Serotype 1 was 85.1%; no other ST had high AFE (the next highest AFE was 35.5% for ST 14).

FIGURE 1. Nasopharyngeal pneumococcal culture positivity by site, CXR-AC cases versus controls

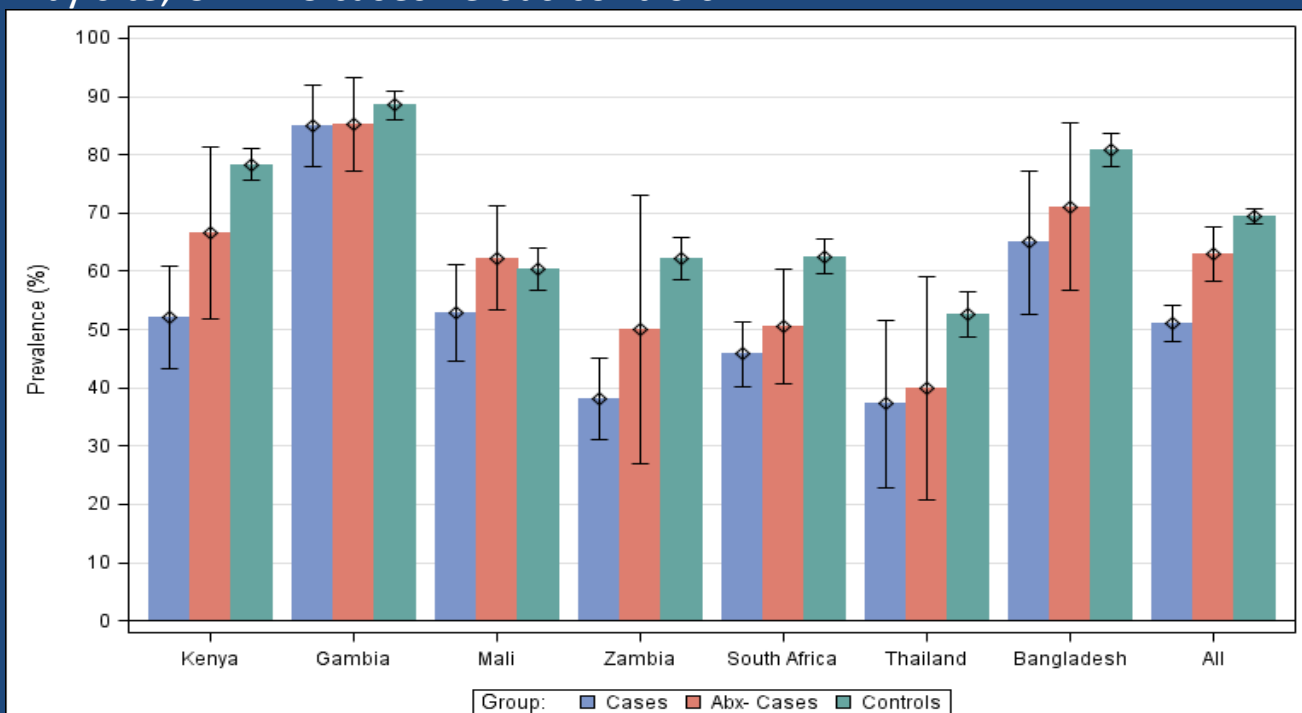
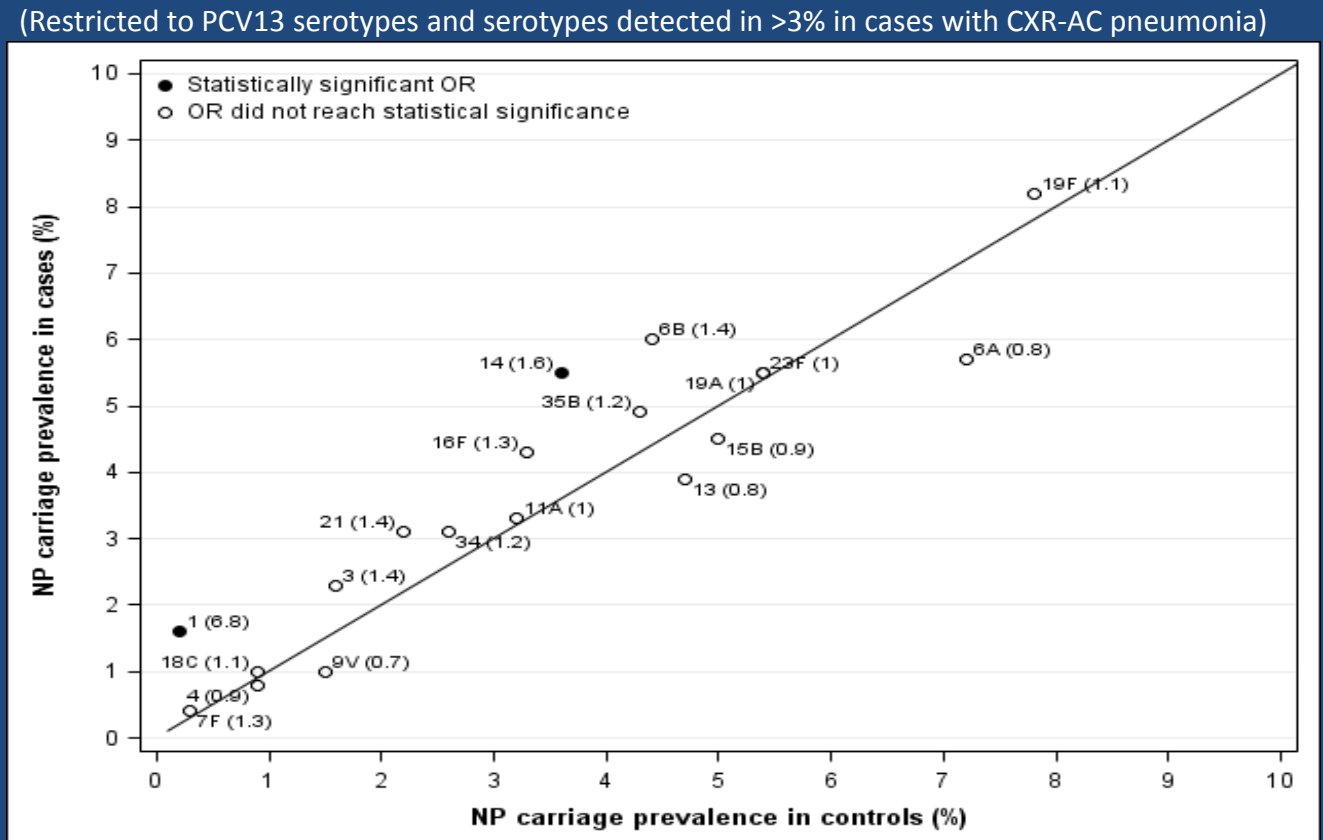
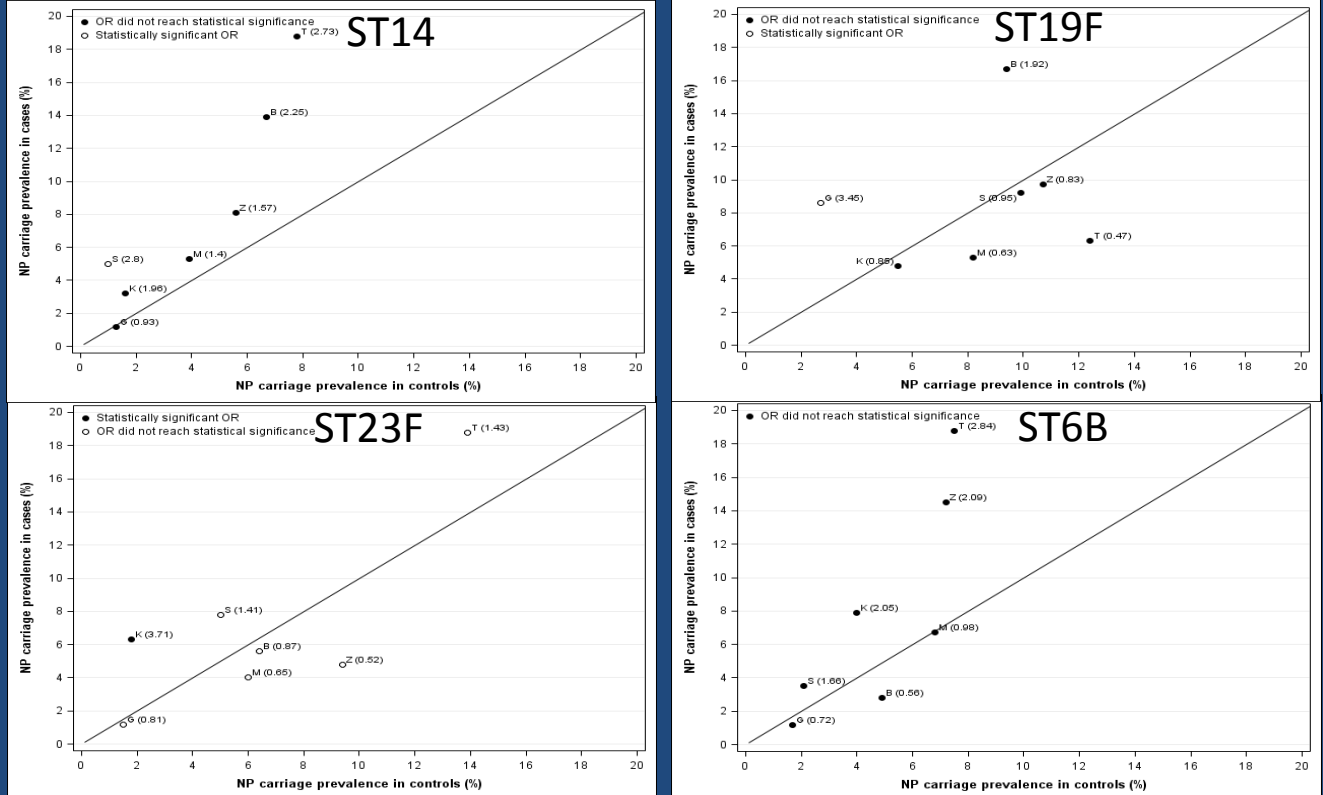


FIGURE 2. Nasopharyngeal pneumococcal carriage in cases with CXR-AC pneumonia versus controls (Restricted to PCV13 serotypes and serotypes detected in >3% in cases with CXR-AC pneumonia)



Odds ratios in parentheses. Serotype 5 excluded due to small numbers (detected in 4 [0.8%] cases with CXR-AC pneumonia).

FIGURE 3. Nasopharyngeal pneumococcal carriage in cases with CXR-AC pneumonia versus controls, by site, selected serotypes



Odds ratios in parentheses. Site: G, Gambia; K, Kenya; M, Mali; S, South Africa; Z, Zambia; T, Thailand; B, Bangladesh.

CONCLUSIONS

- Pneumococcal carriage in both CXR-AC pneumonia cases and controls varied by site and whether antibiotics were received prior to NP sample collection.
- Analyses of all sites identified only two serotypes (1 and 14) significantly associated with case status but site-specific analyses identified 5 additional STs (19F, 23F, 15C, 3, 18C).
- Small numbers limited ability to detect associations for less common serotypes and ability to adjust analyses for site or other potential confounders.
- AFE was low for all serotypes except ST1, suggesting that isolation of a serotype from the NP may not provide information about the cause of a pneumonia.

References

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