DYNAMICS OF ANTIBIOTIC PRESCRIPTION RATES FOLLOWING PCV IMPLEMENTATION IN CHILDREN <2 YEARS OLD: COMPARISON BETWEEN HIGH AND LOW PRESCRIBING CLINICS

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Introduction

- Indiscriminate antibiotic use is common among community pediatricians
- In Israel, PCV implementation resulted in reduction of acute respiratory infections (i.e. alveolar pneumonia, otitis media and visits to Emergency Room resulting in chest radiographic examinations) *Figure 1a,b,c*. Since respiratory infections are the main reason for antibiotic prescription in young children, we expected PCVs to reduce also antibiotic consumption in the community
- We speculated that the decline in rates of dispensed antibiotic prescriptions (DAPs) will be greater among high antibiotic-using clinics (HUC) than low antibiotic-using clinics (LUC)

Objectives

This population-based study was done to:

- Determine dynamics of DAPs in children <2y in relationship to PCV7/PCV13 implementation
- Compare the dynamics between HUC and LUC

Materials and Methods

Setting

- Yearly birth cohort in southern Israel was ~14,000 in 2005 and ~18,500 in 2016
- Compared to Jewish children, Bedouin children live in more crowded conditions, and have higher respiratory morbidity and pneumococcal carriage rates. Before PCV7/PCV13 implementation, antibiotic prescription rates were higher in Bedouin than in Jewish children (Barkai, J Infect Dis, 2004)
- 78% and 86% of all children <5 years of age in Southern Israel district (in 2005 and 2016, respectively) were insured by Clalit Health Maintenance Organization (Clalit-HMO), where all prescriptions were computerized
- PCV7/PCV13 were implemented in July-2009/Nov-2010, respectively, and rapidly reached ≥90% coverage of ≥3 doses

Study design

- We enrolled all clinics that: 1) had ≥50 insured children <5y old and; 2) were active both before and after PCV implementation
- Yearly DAP rates were calculated by age (<2 years and 2-4 years), ethnic groups and antibiotic category (amoxicillin, azithromycin or other antibiotics [cephalosporins, amoxicillin/clavulanate, trimethoprim/sulfamethoxazole, clindamycin, clarithromycin, erythromycin])
- Clinics were classified as HUC (above median DAP rates) and LUC (below median DAP rates)
- In the pre-PCV years (2005-2009) an average of 9,397 and 7,225 children <2y were insured in HUC and LUC, respectively. The respective figures for children < 5y were 12,771 and 32,175

Statistical analysis

- Data were obtained from the computerized HMO databases. Incidences and 95% CI are presented as the number of prescriptions per 1,000 insured children. A P-value <0.05 was considered statistically significant

Results

- Overall, 965,150 and 486,211 prescriptions were dispensed for children <5y and <2y, respectively, from July 2005 through June 2016
- Amoxicillin was the most frequently prescribed antibiotic (60%) *Figure 2*, followed by azithromycin (12.7%). These proportions were similar when calculated for HUC vs. LUC, or Bedouin vs. Jewish children
- Following PCV7/PCV13 implementation, DAP rate dynamics had a pattern with similarities to that observed for alveolar pneumonia, otitis media and chest X-rays *Figure 1*
- PCV implementation resulted in an overall reduction of 1795.1 DAPs per 1000 children during their first 5 years of life (95% CI 1726.0 to 1864.1) and 1402.2 per 1000 children during their 2 years of life (95% CI 1338.0 to 1465.4)
- The greatest reduction in DAP rates was observed in children <2y, thus we decided to focus on this age group *Figure 1d*

Results

- Overall mean (±SD) DAP incidence (per 1000 child-years) during pre-PCV implementation was 3567.8±139.4 and 1667.8±42.5, in the HUC and LUC, respectively (P<0.001) *Figure 3a*
- Before PCV implementation, no significant trend in overall DAP rates was observed; however, comparing 2014-16 to 2005-09, overall DAP rates declined significantly in the HUC (33%, P<0.001), but not in LUC, *Figure 3a*
- It is remarkable that the higher the initial DAPs rate was, the steeper was the decline – thus achieving by 2015-16 a partial closing of the gap between Jewish clinics and Bedouin clinics and between HUC and LUC *Figure 3b,c*
- The dynamics of amoxicillin DAP rates paralleled those of the overall antibiotics *Figure 3d*
- Azithromycin was not reduced after PCV7/PCV13 implementation in HUC, and a significant increase was found in LUC *Figure 3e*
- For other antibiotics DAP rates decreased in both HUC and LUC, but the decline was already significant before PCV implementation

Figure 1: Rate Dynamics of Common Respiratory-related Morbidity in Children in Southern Israel, 2005 through 2016

Figure 2: Proportions of dispensed antibiotic prescriptions by antibiotic category, before PCV implementation, July 2005 – June 2009

Results

Figure 3: Antibiotic prescription rates in children <2yr, in all, high and low antibiotic prescribing clinics, July 2005 through June 2016

Conclusions

- A significant reduction in DAP rates was observed in children in southern Israel, in association with PCV7/PCV13 implementation
- PCV7/PCV13 implementation was associated with a significant decline in HUC DAP rates but not LUC DAP rates, resulting in partial closing of the DAP rates gap between HUC and LUC
- Similar trends were found in both distinct ethnic groups (Jewish and Bedouin children) despite significantly higher DAP rates in Bedouin children than Jewish children in the pre-PCV era