Severity of Pneumococcal vs. Non-Pneumococcal AOM in Children

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ABSTRACT

Background: Pneumococcal acute otitis media (AOM) has been previously considered as a more severe disease than that caused by other otopathogens. We sought to test this hypothesis in the pneumococcal conjugated vaccines (PCVs) era.

Methods: Children <6 years who presented with "severe" AOM episodes with middle ear fluid (MEF) cultures during 2008-2013 were retrospectively identified. "Severe" AOM episodes were considered if tympanocentesis was required, or if spontaneous otorrhea was present. Data were extracted for demographics, clinical and laboratory tests. Leukocytosis was defined as white blood cells (WBC) count >15,000/µL, and elevated C-reactive protein (CRP) level was considered as >50 mg/L.

Results: Of 295 eligible AOM episodes, 106 (36%) were culture positive. Children with confirmed pneumococcal AOM (65, 61%) had a significantly higher WBC counts and higher CRP levels, were more often <2 years old and were more prone to complicate with acute mastoiditis (AM), compared to children with non-pneumococcal AOM, p=0.03, p=0.02, p=0.04 and p=0.03, respectively. In the pneumococcal group, unimmunized children had higher WBC counts when compared with PCV13 immunized children (p=0.04), but there were no appreciable differences in CRP levels between unimmunized and PCV7/PCV13 immunized children.

Conclusion: Pneumococcal AOM is associated with higher leukocytosis and CRP levels than non-pneumococcal AOM. Circulating Streptococcus pneumoniae strains causing "severe" AOM in PCV13 immunized children yielded lower inflammatory responses when compared with unimmunized children.

INTRODUCTION

• Pneumococcal AOM has been previously described as a more severe disease than that caused by other otopathogens.
• Laboratory findings in AOM, such as WBC counts and CRP levels, have not been well studied, despite their high potential utility in emergency department settings.
• We studied the correlation between common laboratory findings and the causative agent(s) of AOM in a subset of children presenting with "severe" AOM episodes, in an era when pneumococcal conjugate vaccines (PCVs) were implemented in the Israeli National Immunization Program (PCV7 in July 2009, replaced by PCV13 in November 2010).

METHODS

• Children <6 years who had middle ear fluid (MEF) cultures obtained during "severe" AOM episodes during 2008-2013 were retrospectively identified.
• "Severe" episodes were defined when tympanocentesis was performed due to lack of clinical improvement despite ≥48h of antibiotics or if there were any AOM-related complications (tympanocentesis group), or when spontaneous otorrhea occurred (otorrhea group).
• Immunization status: "PCV unimmunized", when no dose of PCV was given; "PCV7/PCV13 immunized", if ≥1 dose(s) of PCV7/PCV13 was given. Any child who had received both PCV7 and PCV13 dose(s) was considered as "PCV13 immunized".
• Leukocytosis = WBC count >15,000/µL; high CRP level >50 mg/L

DISCUSSION

• WBC counts and CRP levels were significantly elevated in pneumococcal AOM episodes, whereas other parameters were not different.
• In the pneumococcal group, WBC counts were higher in "unimmunized" children, when compared to "PCV7/PCV13 immunized" children. This may be indirect evidence of the lower immunogenicity of the remaining circulating pneumococcal strains causing AOM in the post-PCV13 era.
• Observed differences in CRP levels were only subtle. This fact can be explained by: 1) the rise in CRP level is directly dependent on the serotype of the circulating offending S. pneumoniae, 2) the host resistance reaction to pneumococcal infection is influenced from previous exposure(s) to pneumococcal antigens, if had happened earlier. This response may limit the increase in CRP levels, and 3) S. pneumoniae production of a surface protein, protein A. This protein is a choline-binding bacterial protein, which serves as a major pneumococcal virulence factor. This protein competes with CRP for binding to bacterial phosphocholine. Insufficient accessibility of phosphocholine for binding by CRP therefore reduces or abolishes the protective role of CRP.
• The change in the pneumococcal serotypes population during the implementation of PCVs has indirectly been reflected in the changing WBC counts, but neither in CRP levels nor in the clinical presentation.

REFERENCES


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