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ORIGINAL ARTICLE

Infection by *Streptococcus pneumoniae* in children with or without radiologically confirmed pneumonia☆

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KEYWORDS
Bacterial infection;
Etiology;
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Abstract
Objective: Community-acquired pneumonia (CAP) is an important cause of morbidity in childhood, but the detection of its causative agent remains a diagnostic challenge. The authors aimed to evaluate the role of the chest radiograph to identify cases of CAP caused by typical bacteria.
Methods: The frequency of infection by *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* was compared in non-hospitalized children with clinical diagnosis of CAP aged 2–59 months with or without radiological confirmation ($n = 249$ and 366, respectively). Infection by *S. pneumoniae* was diagnosed by the detection of a serological response against at least one of eight pneumococcal proteins (defined as an increase ≥2-fold in the IgG levels against Ply, CbpA, PspA1 and PspA2, PhtD, StkP-C, and PcsB-N, or an increase ≥1.5-fold against PcpA). Infection by *H. influenzae* and *M. catarrhalis* was defined as an increase ≥2-fold on the levels of microbe-specific IgG.

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Results: Children with radiologically confirmed pneumonia had higher rates of infection by *S. pneumoniae*. The presence of pneumococcal infection increased the odds of having radiologically confirmed pneumonia by 2.8 times (95% CI: 1.8–4.3). The negative predictive value of the normal chest radiograph for infection by *S. pneumoniae* was 86.3% (95% CI: 82.4–89.7%). There was no difference on the rates of infection by *H. influenzae* and *M. catarrhalis* between children with CAP with and without radiological confirmation.
Conclusions: Among children with clinical diagnosis of CAP submitted to chest radiograph, those with radiologically confirmed pneumonia present a higher rate of infection by *S. pneumoniae* when compared with those with a normal chest radiograph.
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PALAVRAS-CHAVE
Infecção bacteriana;
Etiologia;
Infecção do trato respiratório inferior;
Estudo radiológico;
Testes sorológicos

Infecção por *Streptococcus pneumoniae* em crianças com ou sem pneumonia radiologicamente confirmada

Resumo
Objetivos: O objetivo deste estudo foi avaliar o papel do raio-X de tórax na identificação de casos de pneumonia adquirida na comunidade (PAC) causada por agentes bacterianos.
Métodos: A frequência de infecção por *Streptococcus pneumoniae*, *Haemophilus influenzae* e *Moraxella catarrhalis* em crianças com PAC não hospitalizadas foi comparada com a presença de confirmação radiológica da pneumonia (n = 249 crianças com pneumonia radiologicamente confirmada e 366 crianças com raio X de tórax normal). Infecção por *S. pneumoniae* foi diagnosticada com base na resposta sorológica a pelo menos uma dentre oito proteínas pneumocócicas investigadas (aumento ≥2 vezes nos níveis de IgG em relação a Ply, CbpA, PspA1 e 2, PhtD, StkP-C e PcsB-N ou aumento≥1,5 vezes em relação aPcpA). Infecção por *H. influenzae* e *M. catarrhalis* foi definida por aumento≥2 vezes nos níveis de IgG específica a antígenos de cada agente.
Resultados: Crianças com pneumonia radiologicamente confirmada apresentaram maior taxa de infecção pelo pneumococo. Além disso, a presença de infecção pneumocócica foi um fator preditor de pneumonia radiologicamente confirmada, aumentando sua chance de detecção em 2,8 vezes (IC 95%: 1,8-4,3). O valor preditivo negative do raio X normal para a infecção por *S. pneumoniae* foi 86,3% (IC95%: 82,4%-89,7%). Não houve diferença nas frequências de infecção por *H. influenzae* e *M. catarrhalis* entre crianças com PAC com ou sem confirmação radiológica.
Conclusões: Crianças com diagnóstico clínico de PAC submetidas a um raio X de tórax que apresentam confirmação radiológica tem maior taxa de infecção por *S. pneumoniae*, comparado às crianças com raio X normal.
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Introduction

Community acquired-pneumonia (CAP) is an important cause of morbidity and mortality in childhood.[1] However, the etiologic diagnosis of CAP is challenging. Chest radiographs have been used as a diagnostic tool by the identification of radiologic patterns suggestive of an inflammatory process, such as pulmonary infiltrates. Nevertheless, the role of chest radiograph in pediatric CAP remains controversial, due to problems observed in the routine use of this exam, such as poor inter-observer concordance[2] and the inability to distinguish between distinct etiologic agents.[3,4] In turn, a significant proportion of children with a clinical diagnosis of CAP present normal chest radiograph upon admission,[5] and important differences in admission and evolution have been reported among children with CAP with or without radiological confirmation.[6–9] Altogether, these data suggest that the disease in children with or without radiologically confirmed pneumonia might be caused by distinct mechanisms and/or different etiologic agents.

In Brazil, *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* have been reported as important bacterial agents of pediatric pneumonia in hospitalized children.[10] Herein, the presence of infection by *S. pneumoniae*, *H. influenzae*, and *M. catarrhalis* was investigated in non-hospitalized Brazilian children aged 2–59 months with clinical diagnosis of pneumonia with or without radiological confirmation. In doing so, the authors aimed to evaluate the role of the chest radiograph to identify probable cases of CAP caused by typical bacteria.

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