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Community-acquired pneumonia during the first post-pandemic influenza season: A prospective, multicentre cohort study

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Summary *Objectives:* To determine the aetiology, clinical features and prognosis of CAP during the first post-pandemic influenza season. We also assessed the factors associated with

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Community-acquired pneumonia;
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Mortality;
Post-pandemic period

severe disease and tested the ability of a scoring system for identifying influenza A (H1N1) pdm09-related pneumonia.
Methods: Prospective cohort study carried out at 10 tertiary hospitals of Spain. All adults hospitalised with CAP from December 01, 2010 to March 31, 2011 were analysed.
Results: A total of 747 adults with CAP required hospitalisation. The aetiology was determined in 315 (42.2%) patients, in whom 154 (21.9%) were due to bacteria, 125 (16.7%) were due to viruses and 36 (4.8%) were mixed (due to viruses and bacteria). The most frequently isolated bacteria were *Streptococccus pneumoniae*. Among patients with viral pneumonia, the most common organism identified were influenza A (H1N1)pdm09. Independent factors associated with severe disease were impaired consciousness, septic shock, tachypnea, hyponatremia, hypoxemia, influenza B, and influenza A (H1N1)pdm09. The scoring system evaluated did not differentiate reliably between patients with influenza A (H1N1)pdm09-related pneumonia and those with other aetiologies.
Conclusions: The frequency of bacterial and viral pneumonia during the first post-pandemic influenza season was similar. The main identified virus was influenza A (H1N1)pdm09, which was associated with severe disease. Although certain presenting clinical features may allow recognition of influenza A (H1N1)pdm09-related pneumonia, it is difficult to express them in a reliable scoring system.

Introduction

Community-acquired pneumonia (CAP) is one of the world's major public health problems. The aetiology of CAP has been under constant study in different local settings. The most frequently documented causative pathogens of CAP are *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Legionella pneumophila*.[1–3] Evidence of viral infection has been detected in 15%–56% of cases, mainly by influenza viruses, respiratory syncytial virus, parainfluenza viruses and adenovirus.[4]

Notably, CAP was one of the most frequent complications of influenza A (H1N1)pdm09 infection during the pandemic period. In addition, it was associated with high morbidity and mortality.[5,6] The reported incidence of pneumonia in hospitalised patients with influenza A (H1N1)pdm09 infection was 23%–66%,[7–9] with primary viral pneumonia being the main cause of admission to intensive care units.[10,11] Similarly, bacterial co-infection was associated with worse prognosis.[7,12]

Knowledge of the predominant microbial patterns in CAP is the basis for initial decisions about its empirical antimicrobial treatment.[3] Importantly, influenza A (H1N1)pdm09 continues to circulate as a seasonal virus after the pandemic period. It is therefore crucial to determine the microbial patterns and outcomes in CAP in the post-pandemic influenza seasons.[13] In addition, although Bewick et al.[14] developed a scoring system for identifying patients with influenza A (H1N1)pdm09-related pneumonia, this has not been validated to date.

In this multicentre, prospective cohort study conducted in Spain, we aimed to determine the aetiology, clinical features and prognosis of hospitalised adults with CAP during the first post-pandemic influenza season (2010–2011). We also assessed the factors associated with severe disease and tested the reliability of a scoring system for identifying patients with influenza A (H1N1)pdm09-related pneumonia.

Patients and methods

Setting, patients and study design

This prospective cohort study was carried out at 10 tertiary hospitals in different areas of Spain. All adults admitted to hospital for at least 24 h with CAP from December 01, 2010 to March 31, 2011 were prospectively recruited and followed up. Cases were identified at the emergency department by attending physicians or investigators. The study was approved by the Ethics Committee of the coordinating centre, Hospital Universitari de Bellvitge, and informed consent was obtained from patients.

Clinical assessment and follow-up

Patients were seen during their hospital stay by one or more of the investigators at each participating hospital, who recorded clinical data in a standardized, computer-assisted protocol. Data were collected on demographic features, comorbidities, clinical features, biochemical analyses, chest X-ray findings, therapy, complications and in-hospital mortality. To stratify patients according to risk, we used pneumonia severity index (PSI) and CURB-65.[15,16] Completed protocols were carefully revised by two clinical investigators prior to the final validation.

Definitions

CAP was defined by the presence of a new infiltrate on chest X-rays, together with at least two symptoms of a lower respiratory tract infection (fever or hypothermia, new cough with or without sputum production, pleuritic chest pain, dyspnoea or altered breath sounds on auscultation) and no alternative diagnosis during follow-up. Viral CAP was diagnosed if a virus was detected by multiplex PCR, and the respiratory and blood bacterial cultures and urine antigen tests were negative. Bacterial CAP was diagnosed in patients with one or more positive cultures obtained from blood, normally sterile fluids or sputum and/or a positive urinary antigen test, and with no viral pathogens detected. A mixed infection was defined as the presence of both respiratory virus and bacteria, as defined above.

Comorbidities were assessed by the Charlson Comorbidity Index.[17] Complications were defined as any untoward circumstances occurring during hospitalisation. Multilobar pneumonia was defined as chests X-ray infiltrate involving