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Risk factors and pathogenic significance of bacteremic pneumonia in adult patients with community-acquired pneumococcal pneumonia

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KEYWORDS
Community-acquired pneumonia;
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Summary *Objective:* This study was performed to identify risk factors for the development of bacteremic pneumonia and to evaluate the impact of bacteremia on the outcome of pneumococcal pneumonia.
Methods: Using a database from a surveillance study of community-acquired pneumococcal pneumonia, we compared data of the bacteremic group with that of the non-bacteremic group.

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Risk factors;
Treatment outcome

Results: Among 981 adult patients with pneumococcal pneumonia, 114 (11.6%) patients who had documented pneumococcal bacteremia were classified into the bacteremic group. In a multivariable analysis, use of immunosuppressant drugs, younger age (<65 years), and DM were independent risk factors associated with the development of bacteremic pneumonia among patients with pneumococcal pneumonia (all $P < 0.05$). The mortality rate was significantly higher in the bacteremic group than in the non-bacteremic group (28.6% vs. 8.5%; $P < 0.001$). The multivariable analysis revealed that concomitant bacteremia was one of the significant risk factors associated with mortality (OR, 2.57; 95% CI, 1.24—5.29), along with cerebrovascular disease and presentation with septic shock (all $P < 0.05$).
Conclusions: Bacteremia was a common finding in pneumococcal pneumonia and was associated with a higher mortality rate. Several clinical variables may be useful for predicting bacteremic pneumonia among patients with pneumococcal pneumonia.

Introduction

Streptococcus pneumoniae is the most common bacterial pathogen causing community-acquired pneumonia (CAP). The presence of bacteremia alters the management of patients with pneumococcal pneumonia, and complications, such as septic shock or acute respiratory distress syndrome, are also common in bacteremic pneumonia.[1-3] Failure to identify bacteremic patients may lead to poor outcomes. Thus, predicting the likelihood of developing bacteremia would help clinicians make specific management decisions about a particular patient with CAP.[4]

It has been reported that bacteremic cases have a poorer outcome than non-bacteremic cases in several types of infection, including invasive staphylococcal infections, *Serratia* urinary tract infections, ventilator-associated pneumonia, and spontaneous bacterial peritonitis.[5—8] Although the clinical significance of bacteremic pneumococcal pneumonia has been addressed by several studies, the risk factors for developing bacteremia among patients with pneumococcal pneumonia have not been fully defined in previous studies.[1—3,9—11]

Recently, the Asian Network for Surveillance of Resistant Pathogens (ANSORP) study group performed a prospective surveillance study of serious pneumococcal infections in Asian countries.[12] We analyzed relevant data from this study database to identify risk factors for the development of bacteremia among patients with pneumococcal pneumonia. The objectives of the current study were to identify risk factors for the development of bacteremic pneumonia in a large, well-defined population with pneumococcal pneumonia and to evaluate the impact of bacteremia on the outcome of pneumococcal pneumonia.

Patients and methods

Study population and design

ANSORP performed a prospective surveillance study of community-acquired pneumococcal infections at 60 hospitals in 11 Asian countries from March 2008 to December 2009.[12] We conducted a post-hoc analysis of this observational cohort study to identify risk factors for the development of bacteremic pneumonia and to evaluate the impact of bacteremia on the outcome of pneumococcal pneumonia. Only adult patients (≥16 years) were included in this study. From the database of community-acquired pneumococcal pneumonia patients, we identified patients who had bacteremic pneumonia and included them in the bacteremic group. For comparison, patients with negative blood cultures or without clinical signs of bacteremia were identified and included in the non-bacteremic group. We compared data of the bacteremic group with data of the non-bacteremic group. Detailed information describing the study population has been reported previously.[12]

All patients were evaluated using a structured case report form. The following information was collected: baseline demographic information, underlying diseases (pulmonary disease, heart disease, solid tumor, liver disease, cerebrovascular disease, renal disease, and diabetes mellitus [DM]), and comorbid conditions (smoking, neutropenia, corticosteroid use, immunosuppressive treatment, and prior use of antibiotics). As this study was observational, patient management and treatment regimens were chosen by the patients' physicians without any guidelines or intervention from the study protocol or study investigators. The main outcome measure was the 30-day mortality rate.

Definitions

Pneumococcal bacteremia was defined as a finding of *S. pneumoniae* in a blood culture specimen. The type of infection was determined on the basis of clinical, radiological, and microbiological information according to predetermined criteria. Pneumococcal pneumonia was diagnosed if patients fulfilled the clinical and radiological criteria of pneumonia and *S. pneumoniae* was isolated from adequate lower respiratory specimens. CAP was defined as follows: (1) new or progressive infiltrate(s), consolidation or pleural effusion consistent with pneumonia on chest radiography performed within 48 h prior to enrollment; (2) fever or a history of fever (defined as an oral temperature >38 °C); and (3) at least two respiratory signs and symptoms (new or increased cough; purulent sputum or a change in sputum characteristics; auscultatory findings on pulmonary examination of rales and/or evidence of pulmonary consolidation; dyspnea or tachypnea; peripheral white blood cell (WBC) count >10 000 cells/mm^3 or >15% immature neutrophils or leukopenia with a total WBC count of <4500 cells/mm^3; hypoxemia with a PaO_2 <60 mmHg while the patient is breathing room air).[13] Pneumococcal pneumonia was classified as