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Original Article

Severe pneumonia requiring ICU admission: Revisited

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الملخص

أهداف البحث: وصف مسببات ومخرجات وطرق علاج الالتهاب الرئوي المكتسب من المجتمع والمكتسب أثناء التواجد في المستشفى ممن تطلبت شدة حالتهم المرضية التنويم في قسم العناية المركزة وتحديد العوامل التي تنبئ بارتفاع نسبة الوفاة بينهم.

طرق البحث: دراسة مستقبلية لملاحظة ١١٩ مريضا متتابعا تم تنويمهم بقسم العناية المركزة بسبب إصابتهم بالتهاب رئوي مكتسب من المجتمع (٨٩ مريضا) أو رئوي مكتسب أثناء التواجد في المستشفى (٣٠ مريضا) بين الفترة من مايو ٢٠١١م حتى ديسمبر ٢٠١٢م.

النتائج: بلغ معدل الوفاة في وحدة العناية المركزة ٢٤،٤٪، وفي المستشفى ٣٠،٣٪ ولم يلحظ اختلاف بين نمطي الالتهاب الرئوي من حيث معدلات الوفاة أو متوسط عدد أيام التنويم. كان فيروس انفلونزا الخنازير أكثر الجراثيم المسببة للالتهاب الرئوي المكتسب من المجتمع (٢٣٪) في تلك الفترة، وتبعه في الترتيب بكتيريا المكورة العقدية (١٧٪)، بينما كانت الجرثومة الراكدة (٣٧٪) أكثر المسببات للالتهاب الرئوي المكتسب أثناء التواجد في المستشفى. وقد تم عزل البكتيريا المقاومة للمضادات الحيوية من ٣٢ عينة (٣٨،٧٪). كما كان متوسط الوقت اللازم لتلقي المضاد الحيوي ساعتين، ولوحظ أن معظم المرضى (٨٢٪) قد تلقوا نوعين من المضادات الحيوية، وباستخدام التحليل الإحصائي الرجعي المتعدد وجدنا أن الصدمة الدورية الجرثومية، والفشل التنفسي الحاد، وارتفاع مؤشر شدة الالتهاب الرئوي قد تنبأت بارتفاع معدل الوفاة بصفة ملحوظة.

الاستنتاجات: إن مخرجات علاج المرضى المصابين بالالتهاب الرئوي الحاد الذين تلقوا علاجهم في العناية المركزة تعد أفضل من سابقتها، وهناك حرص على الإسراع في إعطاء المضادات الحيوية المتعددة، كما لوحظ أن الميكروبات المقاومة للمضادات الحيوية والفيروسات التنفسية هي أكثر الجراثيم عزلا. وكانت الصدمة الدورية الجرثومية، والفشل التنفسي الحاد، وارتفاع مؤشر شدة الالتهاب الرئوي عوامل تنبوء مستقلة لحدوث الوفاة.

الكلمات المفتاحية: الالتهاب الرئوي؛ وحدة العناية المركزة؛ مؤشر شدة الالتهاب الرئوي؛ الفشل التنفسي الحاد

Abstract

Objectives: To describe the aetiology, outcome and management approach for patients with community-acquired pneumonia (CAP) and hospital-acquired pneumonia (HAP) who required ICU admission and to determine the predictors of mortality.

Methods: A prospective observational study of 119 consecutive patients who were admitted to the ICU with diagnoses of CAP (n = 89) or HAP (n = 30) from May 2011 until December 2012.

Results: The overall ICU and hospital mortality rates for CAP and HAP were 24.4% and 30.3%, respectively. There were no significant differences between the patients with CAP and HAP in terms of ICU mortality or the average length of hospital stay. The most commonly isolated pathogens were *H1N1* (23%) and *Streptococcus pneumonia* (17%) in the patients with CAP and *Acinetobacter baumannii* (37%) in the patients with HAP. Multidrug resistant (MDR) organisms were detected in 32 (38.6%) isolates. The median time for receiving antibiotics was 2 h. Most of the patients (82%) received double antibiotic coverage. Multiple regression analysis identified septic shock (beta = 0.43, $p < 0.001$), acute

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respiratory distress syndrome [ARDS] (beta = 0.34, $p = 0.003$), and the pneumonia severity index [PSI] (beta = −0.36, $p < 0.024$) as significant predictors of mortality.

Conclusion: The outcomes of patients with severe pneumonia who were admitted to the ICU were better than those of previous reports. Early administration of combination antibiotics was practiced with vigilance. MDR organisms and respiratory viruses were the commonly isolated pathogens. The presence of septic shock, ARDS and high PSI were independent predictors of mortality.

Keywords: ARDS; ICU; Outcome; Pneumonia; Severity scores

Introduction

Pneumonia is one of the most common causes of admission to intensive care units (ICUs). In some reports, the mortality rates associated with community-acquired pneumonia (CAP) and hospital-acquired pneumonia (HAP) requiring admission to the ICU have reached 50%.[1,2]

Over the years, many scores have been put forward to allow for the early identification of patients who require admission to the ICU,[3] and international guidelines have been introduced to guide antimicrobial treatment.[4,5] Additionally, lung protective strategies for mechanical ventilation have been practiced with vigilance, and new modes of mechanical ventilation and cardiopulmonary monitoring systems have been introduced due to the rapidly growing medical technology.[6] Taken together, these factors could favourably affect the outcomes of pneumonia managed in the ICU. In contrast, the increased use of broad spectrum antibiotics has led to the emergence of multidrug-resistant (MDR) organisms that are difficult to eradicate and can therefore adversely affect the outcomes of such patients.[7,8]

The aim of this study was to describe the aetiology, outcomes and predictors of mortality for severe pneumonia patients (both those with CAP and HAP) admitted to the ICU, to consider the current diagnostic and therapeutic practices and to compare our results with those from older studies from Saudi Arabia and international reports.

Materials and Methods

A prospective observational study of all patients admitted to the ICU at King Khalid University Hospital, Riyadh with diagnoses of pneumonia from May 2011 until December 2012 was conducted. This study was approved by the Institutional Review Board (IRB) of King Saud University, College of Medicine. Written informed consent was obtained from all patients or their next of kin.

CAP was defined as symptoms of an acute lower respiratory tract illness (cough and at least one other lower respiratory tract symptom, e.g., dyspnoea or chest pain) with evidence of systemic illness (temperature >38 °C and/or the symptom complex of sweating, fevers, shivers, aches) and demonstrable consolidation or new radiographic shadowing on chest radiography for which there was no other explanation.[4] HAP was defined as an acute lung infection that developed 48 h after hospital admission while the patient was in the general ward (excluding the patients who were ventilated prior to ICU admission), a new or progressive radiographic lung infiltrate, and the presence of at least 2 of the following signs: a temperature alteration (<36 °C or ≱38.3 °C), a white blood cell count <5000 cells/mm^3 or >10,000 cells/mm^3, or purulent-appearing sputum or endotracheal aspirate.[5,9] The exclusion criteria were as follows: (a) the use of oral prednisolone at any dose for a duration longer than 2 months, the use of other immunosuppressive drugs or primary immune deficiency disorder; (b) patients who had undergone bone marrow or solid organ transplantation; and (c) patients with known thoracic malignancies. Septic shock was defined as severe sepsis and sustained hypotension with a systolic blood pressure less than 90 mmHg despite intravenous fluids or the need for vasopressors.[9] Acute respiratory distress syndrome (ARDS) was defined according to the Berlin definition as severe respiratory failure within 1 week of a known clinical insult or new or worsening respiratory symptoms.[6] Admission to the ICU was based on a high PSI (class IV or V) or the presence of shock or respiratory failure.

A data collection form was used to collect the patients' demographic information, co-morbid conditions, APACHE II scores, causative organisms, radiologic features, antibiotics given and outcomes. Pneumonia severity scores (PSI, CURB 65, SMART COP, and CAP PIRO) were used to assess the severity and risk factors for the CAP patients.[2,10–12]

The following pathogens were considered MDR organisms: *methicillin-resistant Staphylococcus aureus (MRSA); Pseudomonas aeruginosa* resistant to antipseudomonal penicillins, cephalosporins, and quinolones; *Stenotrophomonas maltophilia; vancomycin-resistant Enterococcus (VRE)*, *Acinetobacter baumannii* resistant to penicillins and cephalosporins; *Enterobacteriaceae* producing extended-spectrum B-lactamases (ESBL); and other non-fermenting gram-negative bacilli.

The aetiology of each case of pneumonia was determined based on the growth of a single pathogen either from a bronchoscopic lavage, sputum culture or endotracheal aspirate in the presence of moderate to abundant polymorphs and the presence of *Mycobacterium tuberculosis* organisms in a Gram stain, as diagnosed based on positive acid-fast bacilli tests upon direct light microscopy examination of at least one Ziehl-Neelsen-stained respiratory tract secretion sample or a positive culture for *M. tuberculosis* in the sputum, tracheal aspirate or broncho-alveolar lavage (BAL).[13] A direct fluorescence antigen (DFA) for the diagnosis of *Legionella pneumophila* and IGM for the diagnosis of *Mycoplasma pneumoniae* were routinely requested for all patients. The presence of *H1N1* was diagnosed using the reverse transcriptase-polymerase chain reaction (RT-PCR) method.