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Original Article

Severe pneumonia requiring ICU admission: Revisited

Hadil A. AlOtair, ABIM [a,*], Mohammed A. Hussein, MSN [b], Mohamed A. Elhoseny, MSc [a], Abdulaziz H. Alzeer, FRCP(C) [a] and Muhammad F. Khan, FCPS [a]

[a] *Department of Critical Care, College of Medicine, King Saud University, Riyadh, KSA*
[b] *Quality Management Department, College of Medicine, King Saud University, Riyadh, KSA*

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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

* Corresponding address: Department of Critical Care Medicine, King Saud University, P.O. Box 2925(95), Riyadh 11461, KSA.
E-mail: halotair@ksu.edu.sa (H.A. AlOtair)

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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.

Statistical analysis

The collected data were analysed using descriptive and inferential tests. The descriptive test results are expressed as counts and percentages. The continuous variables of the study population are described as the means ± the standard deviations. Comparisons between two categorical variables were made with chi-square or Fisher's exact tests as appropriate, and continuous data were tested with Student's t-test or Mann–Whitney U tests depending on the distribution. *p*-values below 0.05 were taken to indicate statistical significance. The type of pneumonia, the severity scores, the risk factors and the type of drug resistance were entered into a multiple regression analysis to identify the best predictors of ICU mortality. All statistical analyses were performed using IBM SPSS statistics for Windows, version 21.0 (IBM Corp., released 2012, Armonk, NY).

Results

A total of 119 patients with pneumonia (CAP n = 89 and HAP n = 30) were admitted to the ICU during the study period. The median (range) age of the patients was 66 (12–100) years, and 60 (50%) patients were ≥65 years old. One-hundred-two patients (79 CAP and 23 HAP) received assisted ventilation after admission to the unit, and 42 (41%) of these patients were managed with non-invasive positive pressure ventilation (NIPPV). Comparisons of the demographics of the patients with CAP and HAP and the ICU survivors and non-survivors (survivors n = 90, non-survivors n = 29) are shown in Table 1. Chronic obstructive pulmonary disease (COPD), invasive mechanical ventilation, NIPPV, APACHE II score, presence of ARDS on admission, diastolic blood pressure (DBP) ≤ 60 mmHg, high A–a gradient, urea >7 mmol/L, albumin <30 g/L,

Table 1: Demographic data of the pneumonia patients (n = 119) and comparisons between the ICU survivors and non-survivors.

Variables		CAP n = 89 (75%)	HAP n = 30 (25%)	All non-survivors n = 29 (CAP = 21, HAP = 8)	All survivors n = 90 (CAP = 68, HAP = 22)	*p* Value[b]
Age, year	median (range)	66 (12–100)	65 (16–91)	65 (18–91)	66 (12–100)	0.80
Male sex	no. (%)	49 (75.4)	16 (24.6)	16 (24.6)	49 (75.4)	0.95
BMI (Kg/m^2)	mean(SD)	28 (7.9)	29 (12.5)	27 (8.6)	29 (9.4)	0.10
APACHE II	mean(SD)	18 (7.4)	21 (8.8)	23 (8.5)	18 (7.2)	0.012[a]
Comorbid Conditions	no. (%)					
COPD		33 (37.1)	4 (13.3)	3 (10.3)	34 (37.8)	0.005[a]
Asthma		5 (5.6)	1 (3.3)	2 (6.9)	4 (4.4)	0.63
Diabetes mellitus		42 (47.2)	15 (50.0)	11 (37.9)	46 (51.1)	0.29
Hypertension		51 (57.3)	17 (56.7)	16 (55.2)	52 (57.8)	0.83
Ischemic heart disease		21 (23.6)	3 (10.0)	3 (10.3)	21 (23.3)	0.18
Obstructive sleep apnoea		5 (5.6)	4 (13.3)	0 (0)	9 (10.0)	0.11
Chronic kidney disease		22 (24.7)	4 (13.3)	7 (24.1)	19 (21.1)	0.8
Congestive heart failure		15 (16.8)	4 (13.3)	5 (17.2)	14 (15.5)	0.79
Pulmonary involvement	no. (%)					
Bilateral pulmonary involvement		50 (56.8)	9 (30.0)	16 (55.2)	43 (48.3)	0.67
Multilobar pulmonary involvement		22 (25.0)	8 (26.7)	9 (31.0)	20 (22.5)	0.46
Pleural effusion		26 (29.5)	15 (50.0)	9 (31.1)	32 (35.9)	0.66
ARDS no. (%)		49 (55.1)	8 (26.7)	21 (72.4)	36 (40)	0.003[a]
Invasive MV	no. (%)	44 (49.4)	16 (53.3)	21 (72.4)	39 (43.3)	0.010[a]
NIPPV treatment	no. (%)	35 (39.3)	7 (23.3)	4 (13.8)	38 (42.2)	/
Presence of septic shock	no. (%)	35 (39.3)	14 (46.7)	21 (72.4)	28 (31.1)	<0.001[a]
Clinical and Laboratory Features						
SBP ≤ 90 mmHg	no. (%)	19 (21.3)	9 (30)	18 (62.1)	10 (11.1)	0.09
DBP ≤ 60 mmHg	no. (%)	43 (48.3)	17 (56.7)	20 (68.9)	40 (44.4)	0.032[a]
A–a gradient	mean(SD)	265 (202)	200 (182)	363 (207)	234 (193)	0.010[a]
Urea >7 mmol/L	no. (%)	50 (56.2)	20 (66.7)	22 (75.9)	48 (53.3)	0.050[a]
Albumin <30 g/L	no. (%)	61 (68.5)	25 (83.3)	27 (93.1)	59 (65.6)	0.004[a]
Leucocyte count						
> 11.0 (x 10^9/L)	no. (%)	50 (56.2)	23 (76.7)	19 (65.5)	54 (60.0)	0.67
< 4.0 (x 10^9/L)	no. (%)	6 (6.7)	0 (0)	2 (6.9)	4 (4.4)	0.63
Serum lactate (mmol/L)	mean(SD)	2.2 (1.9)	1.6 (1.1)	2.6 (1.6)	1.9 (1.8)	0.005[a]
CRP (mg/L)	mean(SD)	127 (120)	97 (77)	126 (69)	120 (122)	0.44
Serum creatinine(mmol/L)	mean(SD)	150 (117)	168 (141)	184 (121)	145 (123)	0.024[a]
Platelets (x10^9/L)	mean(SD)	249 (125)	281 (193)	275 (178)	251 (133)	0.99

CAP, community acquired pneumonia; HAP, hospital acquired pneumonia; COPD, chronic obstructive pulmonary disease; MV, mechanical ventilation; NIPP, non-invasive positive pressure; ARDS, acute respiratory distress syndrome; SBP, systolic blood pressure; DBP, diastolic blood pressure; CRP, C-reactive protein.

[a] Significant values for ICU mortality.

[b] Between all non-survivors and survivors.

lactic acidosis, serum creatinine, and presence of septic shock were significantly different between the survivor and non-survivor groups (Table 1).

Aetiology

Sputum, bronchoalveolar lavage (BAL), non-bronchoscopic lavage (NBL), blood cultures, and combinations of these samples (collected within 24 h of admission or at the time of intubation) were used to confirm the diagnoses of pneumonia based on the criteria mentioned earlier.[4,5,9] At least one culture sample was sent for 116 of the 119 (97%) patients; 83 of the patients exhibited positive results. Positive blood cultures were found only in 20 of the 110 (18%) tested cases; however, there was no significant difference in mortality between the patients with negative and positive blood cultures (24% and 30%, respectively, $p = 0.61$). The *Legionella pneumoniae* antigen test was positive in 10 (18%) of the 55 tested cases (9 CAP patients and 1 HAP patient). A total of 40 patients (CAP and HAP) of the 90 tested exhibited positive sputum cultures. In the HAP group, *A. baumannii* and *P. aeruginosa* were the most common pathogens isolated from the sputum samples and were found in 11 and 5 BAL and NBL patients, respectively (Table 2). In contrast, *H1N1* was the most common pathogen in the CAP group and was isolated from the sputum of 12 patients followed by *S. pneumoniae* in 9 patients (17%) (Table 2). MDR organisms accounted for 28 (8 CAP, 20 HAP) of the 83 isolated organisms (33.7%), and the most common was *A. baumannii* (10 cases in the HAP patients, 8 were carbapenem-resistant, and 2 were pan-resistant) followed by *ESBL*-producing *Enterobacteriaceae* (8 cases, *Escherichia coli and Klebsiella pneumoniae*), *P. aeruginosa* resistant to anti-pseudomonal penicillin and cephalosporin (7 cases) and 3 cases of *MRSA* (Table 2).

Antibiotics

All patients (n = 119) were treated with antibiotics, and single, double, and triple coverage were applied in 8%, 82%, and 10% of the cases, respectively. The median (range) time from presentation until the initiation of antibiotics was 2 h (10 min−12 h). The mean duration of antibiotic treatment for the CAP patients was 9 ± 3 days and that for the HAP patients was 12 ± 3days. The most common antibiotics used in the CAP group were macrolides (zithromycin or clarithromycin), which were used in 64 (72%) patients in combination, piperacillin-tazobactam (in 31 [35%] of patients), third-generation cephalosporins (25 [28%] of patients) and carbapenems (8 [9%]) of patients). Respiratory quinolones (i.e., levofloxacin and moxifloxacin) were used instead of macrolide in 17 (19%) patients. Clindamycin was added to the regimens of 8 patients to cover oral anaerobes. Vancomycin or linezolid was added to the regimens of 15 patients due to possible *MRSA*.

In the HAP group, 16 (53%) patients were treated using piperacillin-tazobactam alone or in combination with other agents. Carbapenems was used in 14 (47%) patients. Colistin was added for 6 patients due to poor clinical responses and due to the increased number of carbepenum-resistant *Acinotobacter* in our hospital. Additionally, vancomycin or linezolid was added for 14 (47%) patients, and azithromycin was given to one patient who was positive for the *Legionella pneumoniae* antigen. All patients (n = 12) who tested positive for *H1N1* received oseltamivir. In contrast, of 119 patients, anti-tuberculosis was used in 3 patients, and an anti-fungal was added for 9 (7.5%) patients; 4 of the latter were later confirmed to have fungal pneumonia (*Aspergillus fumigatus* in 2 cases and *Candida albicans* in 2 cases) based on positive fungal cultures (3 from NBLs and 1 from BALs) and compatible radiological findings on CT scans.

Outcomes

The overall hospital mortality rate was 30.3% (36 patients), and the ICU mortality rate was 24.4% (29 patients, 2 of them had *H1N1* pneumonia). Neither the mortality nor the length of stay significantly differed between the HAP and CAP groups, as shown in Table 3. In contrast, within the CAP group, there were significant differences between the

Table 2: Microorganisms isolated from the clinical culture specimens.

Microorganism	Blood Culture		Sputum Culture		NBL		BAL		Total
	CAP	HAP	CAP	HAP	CAP	HAP	CAP	HAP	n = 83
Acinetobacter baumannii	2	1	1	5[a]	2	3[a]	1	2[a]	17
H1N1	0	0	12	0	0	0	0	0	12
Pseudomonas aeruginosa	0	0	3[a]	3(2[a])	2	1[a]	0	1[a]	10
Streptococcus pneumoniae	3	1	6	0	0	0	0	0	10
Fungal spp.	1	1	1	1	4	1	0	1	10
Staphylococcus aureus	5	0	0	0	1	0	0	0	6
MRSA	1[a]	1[a]	0	1[a]	0	0	0	0	3
Klebsiella pneumoniae	2[a]	0	1[a]	3[a]	0	1[a]	0	0	7
Mycobacterium tuberculosis	0	0	2	0	0	1	0	0	3
Escherichia coli	0	0	1[a]	0	0	2	0	0	3
Others[b]	2	0	0	0	0	0	0	0	2
Total	16	4	27	13	9	9	1	4	83
	20		40		18		5		

CAP, community acquired pneumonia; HAP, hospital acquired pneumonia; NBL, non-bronchoscopic lavage; BAL, bronchoalveolar lavage; MRSA, methicillin-resistant Staphylococcus aureus.

[a] MDR: multidrug-resistant organism.

[b] Others: diptheroid and Enterococcus faecalis.

survivors and non-survivors in PSI, CURB-65, and SMART COP (Table 4).

Septic shock (beta = 0.43, $p < 0.001$) and ARDS (beta = 0.34, $p = 0.003$) were identified as independent predictors of mortality in both groups (CAP and HAP), and the PSI score (beta = −0.36, $p < 0.024$) was a predictor of mortality in the patients with CAP.

Discussion

In this study, we prospectively determined the mortality rates of patients with CAP and HAP who were managed in the ICU. The overall ICU mortality rate was 24.3%. Previous reports from the middle east region have indicated ICU mortality rates of 37%.[14,15] Other investigators have reported mortality rates ranging from 20 to 30% or higher in older age groups.[16–19] Half of the patients we studied were over 65 years old.

Multiple factors could explain the outcomes reported in this study. The majority of the patients received the first dose of antibiotics within 2 h, which in our setting was facilitated by the presences of satellite pharmacies in both the emergency department and the ICU, in accordance with the latest recommendations for the management of pneumonia, which strongly advises the early initiation of antibiotics.[4,5,16] Additionally, the majority of patients (82%) received combinations of antibiotics against the possible organisms, including Gram-negative bacteria, atypical organisms, and MRSA, when risk factors for MRSA were present. This regimen seems to be necessary to cover the increasing rate of gram-negative organisms that have been reported in the HAP and also in the CAP.[7,16–19]

In this study, the most common bacterial organism in the CAP patients were *S. pneumoniae*, which agrees with the results from the CAP working groups in Gulf Corporation Council Countries (GCC) who also reported *S. pneumonia, Haemophilus influenzae* and *Moraxella catarrhalis* as the most common isolated bacteria.[20] *A. baumannii* were the most common organisms isolated in patients with HAP. This could reflect the local epidemiology in of the hospital and the severity of infection with these organisms leading to ICU admission.[18–21] Interestingly, we found that the most common pathogen identified in patients with CAP requiring ICU care was *H1N1*. This corresponds with the end of the world-wide influenza epidemic and highlights the recent general increase in viral pneumonia. This pathogen is important to recognize early because it often results in a complicated course and high rates of ICU admission and mortality.[22] The ICU mortality rate of *H1N1* patients in our cohort was 16.6%, which is lower than similar reports in Saudi Arabia and Mexico.[23] In contrast, *M. tuberculosis*, which has been reported to be important in the aetiological diagnoses of CAP in the gulf region and in Saudi Arabia specifically, has been isolated only in 3 cases.[24] A possible explanation for this finding may be related to increased awareness among local physicians about tuberculosis, which has facilitated early diagnoses and referrals to specialized chest hospitals. Also worth noting is that 33.7% of the organisms were MDR. Infections due to these organisms have been associated with increased mortality rates compared with antibiotic-sensitive bacteria.[25,26]We observed that that legionella serologies were positive in 10 patients, and 9 of these CAP patients. Other studies from neighbouring countries have produced similar reports, which suggests the importance of this organism as an aetiological agent for severe CAP in this region.[27]

We found that septic shock, ARDS and PSI were predictors of mortality. The presence of shock and the need for mechanical ventilation have consistently been shown to be the main indications for ICU admission.[2,3] Similarly, a high PSI has been shown to be a sensitive predictor of ICU admission.[28] In the present study, 42 patients were managed with NIPPV; and this number was significantly higher among the survivors. Several studies have reported on the use of NIPPV in the management of pneumonia,[29] with the rationale of avoiding intubation and mechanical ventilation. However, the effectiveness of NIPPV in reducing the mortality rate remains controversial and has been demonstrated mainly in patients with cardiopulmonary comorbidities.[29,30] Many (31%) of our patients had COPD and were therefore more likely to benefit from NIPPV.

This study is limited by the small number of patients included, the lack of biochemical markers of infection (e.g., procalcitonin), and the lack of quantitative culture methods for the pneumonia diagnoses.

In conclusion, the mortality rates in the patients with CAP and HAP who were managed in the ICU were lower than those in older reports from Saudi Arabia and comparable to those of recent international reports. The adherence to international guidelines regarding early antibiotic administration and the use of broad spectrum combination antibiotics and the increased use of NIPPV in COPD patients with severe pneumonia may have contributed to the more favourable outcomes. Respiratory viruses and MDR organisms are becoming more prominent as causative agents of pneumonia, which poses a significant burden on ICUs. Patients with septic shock, ARDS and high PSIs need to be

Table 3: Clinical outcomes of the pneumonia patients (n = 119).

Outcome		CAP (n = 89)	HAP (n = 30)	*p*-Value
in-ICU Mortality	no (%)	21 (23.6)	8 (26.7)	0.807
in-Hospital Mortality	no (%)	26 (29.2)	10 (33.3)	0.654
ICU length of stay	mean(SD)	13 (21.2)	19 (24.1)	0.304
Hospital length of stay	mean(SD)	29 (43.1)	46 (52.1)	0.156
Invasive ventilation	no (%)	44 (49.4)	16 (53.3)	0.833

ICU, intensive care unit; CAP, community acquired pneumonia; HAP, hospital acquired pneumonia.

Table 4: Severity of disease in the CAP patients (n = 89).

Severity of Disease	Non-survivors (n = 21)	Survivors (n = 68)	*p*-Value
Median PSI score	135	114	0.014[a]
Median CURB-65 score	3	2	0.022[a]
Median CAP PIRO score	4	4	0.106
Median SMART COP score	6	5	0.034[a]

[a] Significant values for in-ICU mortality.

identified rapidly and admitted to the ICU because they have worse prognoses.

Conflicts of interest

All of the authors disclosed that they have no conflicts of interest and that this study was not sponsored by any drug company.

Author contributions

Hadil A Al Otair: Wrote the manuscript and performed the literature review. Mohammed A. Hussein: Statistical analysis, data collection, analysis and interpretation. Mohamed A Elhoseny: Participated in writing the manuscript. Abdulaziz H Alzeer: Prepared and designed the methodology section, provided the research idea, and revised the manuscript. Muhammad Faisal Khan: Reviewed the manuscript and participated in writing the discussion section.

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