

Research Article

Evaluation of Clinical Outcome Parameters in Adult Patients Diagnosed with Pneumonia in the Emergency Department

 Mürsel Koçer,¹  Derya Tülüce,²  Muhammed Semih Gedik,³  Hakan Hakkoymaz,³  Seval Akben⁴

¹Department of Emergency Medicine, Osmaniye State Hospital, Osmaniye, Türkiye

²Department of Nursing, Osmaniye Korkut Ata University Faculty of Health Sciences, Osmaniye, Türkiye

³Department of Emergency Medicine, Kahramanmaraş Sütçü İmam University Faculty of Medicine, Kahramanmaraş, Türkiye

⁴Department of Medical Services and Techniques, Kahramanmaraş Sütçü İmam University, Göksun Vocational School, Kahramanmaraş, Türkiye

Abstract

Objectives: Pneumonia is a common infection, especially in older patients with comorbidities. This study aimed to assess outcome severity scores and arterial blood gas parameters in adult pneumonia patients in the emergency.

Methods: 112 adult patients (≥18 years) with pneumonia were prospectively enrolled at a tertiary center between March–December 2024. Data included demographics, comorbidities, vitals, lab tests, CURB-65 and PSI scores. Arterial blood gases (pH, PaCO₂, HCO₃) were evaluated by ROC analysis for prognostic value.

Results: Mean age was 69.4 years; 86.6% had chronic disease. Mean CURB-65 was 1.40; most patients were in PSI stage IV–V. Oxygen therapy was applied to 73.2%, vasopressors to 54.5%. ROC analysis showed pH cutoff of 7.35 predicted PSI I–III with 80.4% sensitivity, 50.8% specificity (p=0.007). HCO₃ cutoff 24.20 predicted CURB-65 <2 with 62.3% sensitivity (p=0.031). Low pH and HCO₃ values were strongly associated with severity.

Conclusion: Combining CURB-65 and PSI with pH and HCO₃ values may enhance severity assessment and support clinical decisions in emergency pneumonia cases.

Keywords: Pneumonia, emergency service, CURB-65, Pneumonia Severity Index, blood gas analysis, prognosis, vaccination

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Pneumonia is the highest incidence and highest death rate of acute lower respiratory tract infection worldwide.^[1] According to World Health Organization (WHO) data, pneumonia was identified as one of the clinical conditions resulting in the highest mortality of infectious diseases.^[2] Especially in elderly and comorbid patients, pneumonia is one of the main reasons for hospitalization as well as in-hospital mortality.^[3] Despite antibiotic treatment, immunization and current clinical practice guidelines, intensive care unit (ICU) death rate upon admission caused

by pneumonia is between 15% and 40%. This has a direct relationship with the type of causative microorganism, resistance pattern of antimicrobials and patient-related clinical parameters.^[4,5] Early diagnosis and efficient treatment in patients presenting to the emergency department with suspected pneumonia very much reduce mortality and morbidity.^[6-8]

The diagnostic workup; is followed by extensive anamnesis, laboratory tests (CRP, leukocyte count, levels of bilirubin, etc.) and imaging methods (radiography of the chest,

Address for correspondence: Mürsel Koçer, MD. Department of Emergency Medicine, Osmaniye State Hospital, Osmaniye, Türkiye

Phone: +90 507 783 49 01 **E-mail:** drmursel38@gmail.com

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computed tomography).^[8,9] However; in addition to clinical variables such as the age, sex, concomitant diseases, vital signs and levels of biomarkers of the patient, severity scoring systems such as CURB-65, Glasgow Coma Scale (GCS) and Charlson Comorbidity Index must also be taken into consideration.^[10]

At present, recent studies have determined that elevated levels of CRP, hypoxia, hypotension, consciousness alteration, advanced age, male gender and some biochemical markers (e.g. total bilirubin, lactate, ALT) are poor prognosis risk factors.^[11] Additionally, in the post-COVID-19 pandemic period, knowledge of respiratory tract infections increased, sensitivity to infection symptoms has increased and the clinical importance of early risk stratification has come to light.^[11]

This study, in patients with pneumonia diagnosis admitted in the emergency department-adults; It aims to examine the effects of age, sex, presence of comorbidity, vital signs, lab results, levels of biomarkers and severity scoring systems on the patients' prognosis.

Methods

Study Design

This study was designed as a single-centre, prospective, descriptive study.

Universe and Sample

The study population consisted of adult patients (aged 18 years and over) who attended the Emergency Department of Osmaniye State Hospital between 1 March and 31 December 2024 and were diagnosed with pneumonia. The sample comprised all individuals diagnosed with code "J18.9" within the scope of the International Classification of Diseases (ICD-10) who met the study inclusion criteria. Patients aged 18 years and older, presenting to the ED with suspected pneumonia, diagnosed with pneumonia using ICD-10 coding, and who were prescribed at least one antibiotic drug treatment, were included in the study. Pregnant individuals, patients with aspiration pneumonia, those with a diagnosis of active lung cancer, those with communication difficulties, or any cognitive impairment affecting communication were excluded.

Study Variables

- Independent Variables: The independent variables of the study were some socio-demographic and medical characteristics of the patients.
- Dependent Variables: The dependent variables of the study were length of hospitalization and mortality rate due to pneumonia.

Data Collection Tool

Data were collected using a structured questionnaire developed by the researchers and administered via face-to-face interviews.

Questionnaire Form

The questionnaire used in the study was developed by the researchers based on patient characteristics and clinically important parameters in the management of pneumonia, as referenced in the relevant literature.^[12] It includes questions about the patient's age, gender, current comorbidities, smoking status, how they were admitted to hospital (as an inpatient or to intensive care), whether they require oxygen therapy or mechanical ventilation, whether they have had a history of infection with COVID-19 how many doses of the pneumococcal and influenza vaccines they have had in the past five years and in the past year respectively, and their vaccination status. The form also includes questions about vital signs at the time of hospital admission and laboratory data obtained in the emergency department. The survey consists of 25 items in total and takes an average of 10–15 minutes to complete.

Clinical Assessment Tools

Two scoring systems have been used to assess the severity of pneumonia:

CURB-65 Scoring

The CURB-65 scoring system is a practical clinical tool developed to evaluate the severity of community-acquired pneumonia (CAP) and inform patient management decisions based on mortality risk.^[13] It is widely used in emergency departments and primary care settings. It supports critical decisions such as whether a patient should be monitored as an outpatient, admitted to hospital or referred to an intensive care unit (ICU) (Tables 1, 2).

Scoring is calculated by assigning one point for each of the following five clinical criteria:

- Confusion (altered mental status).
- Blood urea nitrogen (BUN) level greater than 19 mg/dL
- Respiratory rate of at least 30 per minute
- Blood pressure: systolic <90 mmHg or diastolic ≤60 mmHg.
- Age ≥ 65 years.

Table 1. CURB-65 scoring and clinical decision guide

Skor	Risk Level	Recommended Treatment Approach
0–1	Low risk	Outpatient treatment
2	Moderate risk	Short-term hospitalisation or observation.
≥3	High risk	Hospitalisation and intensive care evaluation if necessary.

Table 2. PSI scoring and clinical decision guide

Stage	Score range/Kriteria	Recommended treatment approach
I	<50 years old, no comorbidities	Outpatient oral antibiotic treatment
II	<70 points	Outpatient or short-term hospitalisation (oral or intravenous treatment).
III	71–90 points	Outpatient or short-term hospitalisation
IV	91–130 points	Inpatient treatment (general ward).
V	>130 points	Inpatient treatment with a high likelihood of intensive care.

The total score ranges from 0 to 5. Risk classification is determined based on the result of the score as follows.^[13]

The Pneumonia Severity Index (PSI)

PSI was developed under the Pneumonia Patient Outcomes Research Team (PORT) study for identifying individuals with low risk of death in patients who had community-acquired pneumonia (CAP) and to help provide effective use of health resources. PSI scoring would attempt to predict morbidity and mortality risk based on demographic characteristics, comorbid illness, physical examination findings and laboratory results.^[14]

Unlike other scoring systems, PSI uses a two-step process. In the first step, risk factors are identified based on demographic characteristics, comorbidities, and physical examination findings: age, need for home care, presence of malignancy, chronic heart failure, cerebrovascular disease, chronic kidney or liver disease, altered mental status, pulse $\geq 125/\text{min}$, respiratory rate $\geq 30/\text{min}$, systolic blood pressure $< 90 \text{ mmHg}$, and body temperature $< 35^\circ\text{C}$ or $\geq 39.9^\circ\text{C}$. If any of these factors are present, the second stage is used to calculate a total score that assigns patients to one of five risk classes. Based on this total score, patients are classified into one of five risk stages.^[14]

Statistical Analysis

SPSS version 22.0 (IBM corp., Armonk, NY) was analyzed for all statistics. Continuous variables were summarized as means $\pm$ standard deviation or medians with interquartile ranges, while categorical variables were expressed as frequencies and percentages. Chi-square tests were used for categorical comparisons. ROC curve analysis was used to evaluate the prognostic power of blood gas parameters (pH, PaCO_2 , HCO_3) in relation to CURB-65 and PSI stages. A p-value < 0.05 was considered statistically significant.

Results

The study included 112 patients, with a mean age of 69.40 ± 18.53 years (range: 19–101). Of these, 42.9% were female, and 86.6% had at least one chronic illness. Among the participants, 43.8% had quit smoking, 51.8% had previously contracted COVID-19, and 67.9% had received three or more doses of the COVID-19 vaccine. Post-vaccination complications such as pulmonary embolism, myocardial infarction, or stroke were reported in 41.1% of the patients. Furthermore, 33.9% had received a pneumococcal vaccine within the past five years, and only 4.5% had been vaccinated against influenza in the past year (Table 3).

Table 3. Sociodemographic and Habitual Characteristics of The Patients

Feature	% (n)
Sex	
Female	42.9 (48)
Male	57.1 (64)
Presence of chronic disease	
Yes	86.6 (97)
No	13.4 (15)
Additional Diseases	
HT	48.2 (54)
Asthma	31.3 (35)
Heart disease	29.5 (33)
COPD	23.2 (26)
Kidney disease	13.4 (15)
Smoking status	
No	36.6 (41)
Yes	19.6 (22)
I left	43.8 (49)
Covid-19	
Yes	51.8 (58)
No	48.2 (54)
Covid-19 vaccine	
1 dose	1.8 (2)
2 doses	29.5 (33)
3 doses and above	67.9 (76)
I didn't do it	0.9 (1)
The occurrence of diseases such as pulmonary embolism, myocardial infarction, stroke, etc. after the Covid-19 vaccine	
Yes	41.1 (46)
No	58.9 (66)
Pneumococcal vaccine in the last five years	
Yes	33.9 (38)
No	66.1 (74)
Flu vaccine in the last year	
Yes	4.5 (5)
No	95.5 (107)

When the clinical features of the patients diagnosed with pneumonia in the emergency department were examined, 35.2% were admitted to the secondary intensive care unit. Oxygen therapy was administered to 73.2%, mechanical ventilation to 4.5%, and vasopressor support to 54.5% of the patients. Chest computed tomography revealed ground-glass opacities in 93.7% of the cases (Table 4).

The mean values for vital signs and laboratory parameters at hospital admission are presented in Table 5.

The mean CURB-65 score was 1.40 ± 1.02 (range: 0–5). Confusion was observed in 6.3% of patients, elevated urea in 57.1%, increased respiratory rate in 5.4%, abnormal blood pressure in 20.5%, and 67% were aged over 65 years. According to the Pneumonia Severity Index (PSI), 39.3% of patients were classified as Stage IV (Table 6).

CURB-65 and PSI staging of the patients found a statistically significant difference ($p < 0.05$). Patients' PSI staging and the presence of chronic illnesses of patients, smoking (between those who quit smoking and PSI staging), pulmonary embolism, myocardial infarction, stroke, etc. after the Covid-19 vaccine. There was a statistically significant difference between the status of life, hospitalization status (between 2nd step in intensive care and PSI staging), oxygen support and va-

sopressin use ($p < 0.05$). There was a statistically significant difference between the CURB-65 classification of the patients and the use of smoking (cigarette users and the CURB-65 classification), oxygen support and vasopressin use ($p < 0.05$) (Table 7).

When comparing blood gas parameters across PSI and CURB-65 stages, pH levels were significantly associated with PSI I–III versus IV–V stages, while HCO_3^- levels were significantly associated with CURB-65 < 2 versus ≥ 2 classifications. ROC curve analyses demonstrated that pH had a cutoff value of 7.35 with 80.4% sensitivity and 50.8% specificity for PSI I–III ($p = .007$), and HCO_3^- had a cutoff of 24.20 with 62.3% sensitivity for CURB-65 < 2 ($p = .031$) (Table 8, Figure 1).

Significant associations were found between advanced PSI stages and elevated urea, abnormal blood pressure, and older age groups, when compared with CURB-65 parameters (Table 9).

Table 4. Disease Characteristics of Patients

Feature	% (n)
Hospitalization status	
Admission to ward	27.7 (31)
2nd level intensive care	35.7 (40)
3rd level intensive care	27.7 (31)
Discharge	8.9 (10)
Oxygen support	
Yes	73.2 (82)
No	26.8 (30)
Ventilation support	
Yes	4.5 (5)
No	95.5 (107)
Use of vasopressin	
Yes	54.5 (61)
No	45.5 (51)
Thoracic Computed Tomography result	
Ground glass	93.7 (105)
Pleural Effusion	41.0 (46)
Emphysema-emphysematous increased ventilation	28.5 (32)
Bronchial thickening	18.7 (21)
Fluid-edema	4.4 (5)
Atelectasis	16.9 (19)

Table 5. Mean Vital Signs and Laboratory Results of The Patients

Feature	$\bar{X} \pm SD$	Min-max
PR (beats/min)	86.34+13.90	62-135
SBP (mmHg)	118.97+17.15	40-180
DBP (mmHg)	68.19+11.49	20-90
Body temperature (°C)	37.04+0.41	36-39.7
RR (breaths/min)	20.68+4.10	15-40
SpO2 (%)	92.30+4.76	70-98
Hemoglobin	11.43+2.05	6.30-16.00
Hematocrit	34.41+6.10	20.60-56.90
Leukocyte	13.61+6.77	0.82-39.37
Lymphocyte	1.41+1.06	0.10-6.90
Neutrophil	12.16+10.49	0.68-97.10
Platelet	259.99+124.10	51-761
Urea	59.16+42.04	9.7-240
Creatinine	1.16+0.92	0.20-5.90
CRP	135.33+106.19	1.10-439.20
Bilirubin	0.99+2.34	0.10-23.30
Glucose	165.89+103.60	62-774
BUN	27.45+19.83	5-112
Potassium	4.05+0.71	2.30-6.70
Sodium	135.24+8.62	107-169
Lactate level	2.50+1.64	0.90-9.50
Serum HCO_3^-	24.50+5.70	5.10-47.70
Ph	7.37+0.09	6.90-7.72
PaCO2	43.73+14.14	18.50-112.40
HCO_3^-	25.01+6.85	3.60-48.80
PSI total	99.33+35.24	29-196

PR, pulse rate; SBP, systolic blood pressure; DBP, diastolic blood pressure; RR, respiratory rate, SpO2, peripheral oxygen saturation.

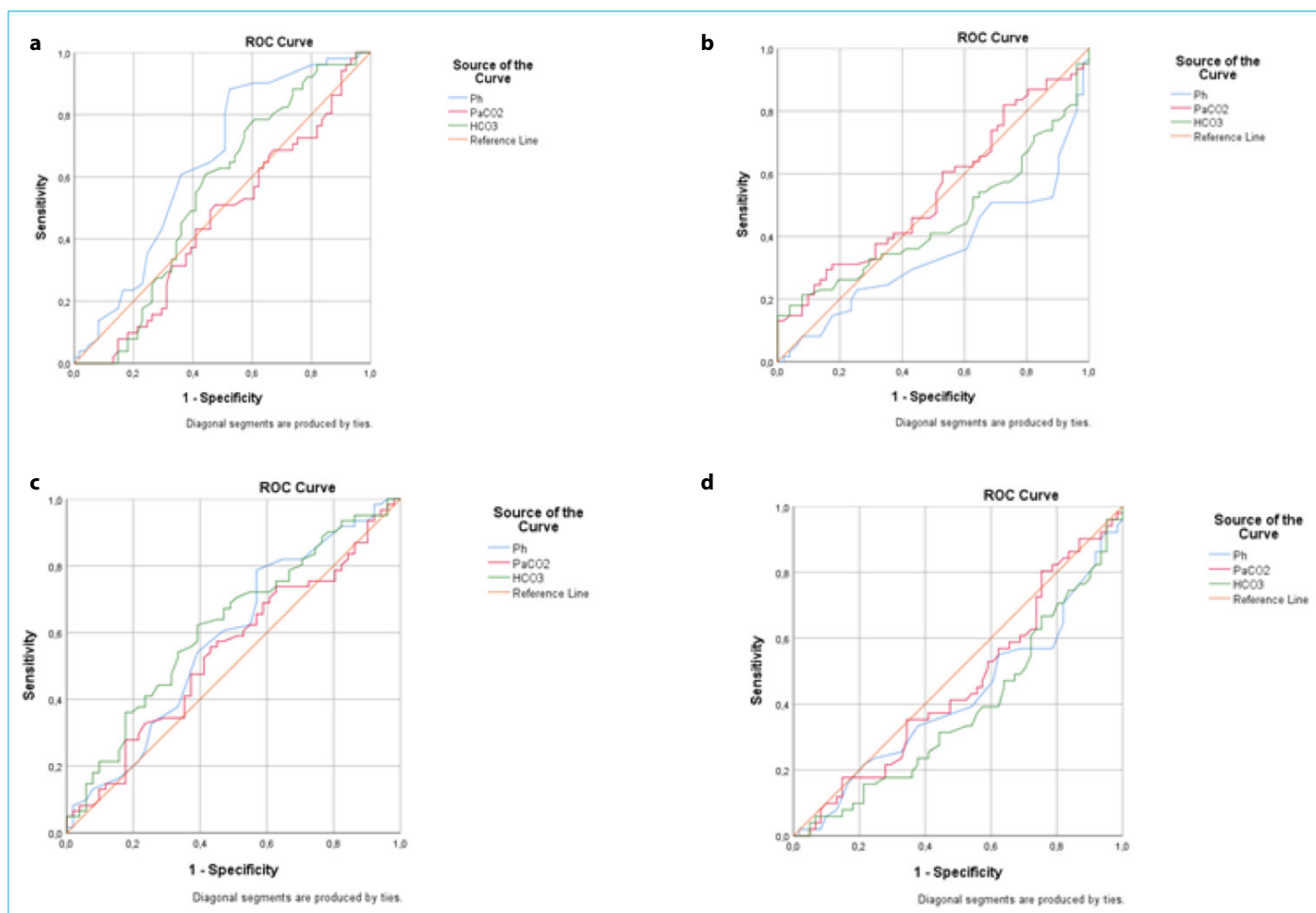


Figure 1. Comparison of patients' PSI and CURB-65 values with blood gas values;

(a) Patients' PSI I-II-III with Ph, PaCO₂ and HCO₃ values, **(b)** PSI IV-V with Ph, PaCO₂ and HCO₃ values, **(c)** CURB-65<2 with Ph, PaCO₂ and HCO₃ values, **(d)** CURB-65 ≥2 with Ph, PaCO₂ and HCO₃ values

Table 6. Distribution of CURB-65 Scoring and PSI Staging

CURB-65 Score	% (n)
Confusion	6.3 (7)
Urea> 42.8 mg/dL (Blood urea nitrogen>20 mg/dL or 7 mmol/L)	57.1 (64)
Respiratory rate ≥ 30 breaths per minute	5.4 (6)
SBP ≤90 mmHg or diastolic blood pressure ≤60 mmHg	20.5 (23)
Age ≥65 yr	67.0 (75)
PSI risk class	
Stage 1	
< 50 Age, No Concomitant Disease	13.4 (15)
Stage 2	
< 70 Point	16.1 (18)
Stage 3	
71-90 Point	16.1 (18)
Stage 4	
91-130 Point	39.3 (44)
Stage 5	
> 130 Point	15.2 (17)

Discussion

The aim of this study was to compare the effects of demographic, clinical, laboratory and radiological findings on prognosis in the patient with the pneumonia severity scores (PSI and CURB-65) in adult patients with pneumonia in the emergency department. Outcomes were evaluated based on the pertinent literature; various factors that may have an effect on patient management are discussed under the subheadings below.

Effect of Patient Profile and Burden of Comorbidities on Clinical Course

The results from the data collected in this study reveal that the patients with a diagnosis of pneumonia in the emergency department are predominantly in the older age group and have high comorbidity disease rates. Specifically, older age (>65) and male gender were significantly correlated with high-risk categories in CURB-65 and PSI scores. This implies that age and gender could be independent predictors for pneumonia prognosis.

Table 7. Comparison of PSI And CURB-65 Staging of Patients with Some Characteristics of The Patients

	PSI			CURB-65		
	PSI I-II-III	PSI IV-V	Chi-square p	CURB-65<2	CURB-65>2	Chi-square p
CURB-65<2	39	22	18.285			
CURB-65>2	12	39	<0.001			
Total	51	61				
Presence of chronic disease						
Yes	36	61	18.258	50	47	1.686
No	15	0	<0.001	11	4	0.194
Smoking status						
No	21	20	9.484	21	20	15.637
Yes	15	34	0.009	20	29	<0.001
I left	15	7		20	2	
Covid-19						
Yes	23	35	1.222	32	26	0.000
No	28	26	0.269	29	25	1.000
The occurrence of diseases such as pulmonary embolism, myocardial infarction, stroke, etc. after the Covid-19 vaccine						
Yes	14	32	6.181	20	26	3.084
No	37	29	0.013	41	25	0.079
Pneumococcal vaccine in the last five years						
Yes	16	22	0.104	22	16	0.104
No	35	39	0.747	39	35	0.747
Hospitalization status						
Admission to ward	20	11	9.394	19	12	4.846
2 nd level intensive care	16	24	0.024	20	20	0.183
3 rd level intensive care	9	22		14	17	
Discharge	6	4		8	2	
Oxygen support						
Yes	31	51	6.259	38	44	6.968
No	20	10	0.012	23	7	0.008
Use of vasopressin						
Yes	18	43	12.492	24	37	11.046
No	33	18	<0.001	37	14	0.001

Chongthanadon et al. (2023) reported that older patients and male patients have a higher risk of in-hospital death; Zhang et al. (2018) also noted that both age and gender play a major role in predicting mortality using both CURB-65 and PSI scores.^[3,15] This study supports the existing literature in that it shows that these factors are associated not only with mortality but also with the need for intensive care and supportive care. Specifically, more elevated PSI scores occur among patients with multiple comorbidities, which is also important for identification of patient profiles with multiple comorbidities in risk stratification. In this regard, our study further demonstrates that age and comorbidity burden are among the inherent factors to be considered in the treatment of pneumonia.

COVID-19 History and the Effect of Vaccines on Clinical Outcomes

In our study, it was observed that 67.9% of the patients had received three or more doses of COVID-19 vaccine, but only 33.9% had received pneumococcal and 4.5% had received influenza vaccination. This result shows that despite high participation in COVID-19 vaccination, preventive services for other respiratory tract infections remain inadequate. The neglect of these vaccines, especially in individuals with advanced age and comorbidities, is an important public health problem.^[2]

The reduced hospitalizations among individuals who received three or more doses of COVID-19 vaccine suggest

Table 8. Comparison of Patients' PSI and CURB-65 Values with Blood Gas Values

	AUC (95%)	Cut off	p	Sensitivity (%)	Specificity (%)
PSI I-II-III					
Ph	.648 (0.546-0.750)	7.35	.007	80.4	50.8
PaCO ₂	.459 (0.352-0.566)	41.25	.451	51.0	49.2
HCO ₃	.549 (0.441-0.656)	24.45	.375	56.9	42.6
PSI IV-V					
Ph	.352 (0.250-0.454)	7.39	.007	36.1	60.8
PaCO ₂	.541 (0.434-0.648)	41.25	.451	49.2	51.0
HCO ₃	.451 (0.344-0.559)	24.45	.375	42.6	56.9
CURB-65<2					
Ph	.582 (0.475-0.690)	7.39	.135	54.1	39.2
PaCO ₂	.542 (0.434-0.650)	41.10	.446	55.7	45.1
HCO ₃	.619 (0.514-0.723)	24.20	.031	62.3	39.2
CURB-65 ≥2					
Ph	.418 (0.310-0.525)	7.38	.135	47.1	60.7
PaCO ₂	.458 (0.350-0.566)	35.40	.446	76.5	75.4
HCO ₃	.381 (0.277-0.486)	21.35	.031	74.5	83.6

that the vaccine may suppress not only the infection but also secondary infections such as pneumonia that may occur thereafter. This is also consistent with previous studies that show that COVID-19 vaccines reduce disease severity and fatalities.^[16,17] Complications such as embolism, myocardial infarction or stroke were reported in 41.1% of the patients after vaccination. Such complications in the literature are referred to as rare but requiring follow-up; overall benefit-risk ratio is evaluated in favor of immunization.^[18-20] Elevated PSI and CURB-65 scores in most patients with complications also reflect the crucial role played by clinical severity.

The ground-glass opacities were detected in the majority of patients on thorax CT, in keeping with typical radiological findings suggestive of post-COVID-19 pneumonia.^[8] Evaluation of radiological and clinical data together has been guiding patient management. Overall, COVID-19 vaccines appear to have the potential to suppress the onset of pneumonia and severity of illness. However, low pneumococcal and influenza vaccination coverage means that preventive care services need to be increased in this context.

Comparison between Scoring Systems (CURB-65 and PSI) in Pneumonia

PSI and CURB-65 are two scoring systems widely used for the clinical management of pneumonia patients.^[13,14] The findings in this study confirm that both scoring systems provide reproducible results in determining the level of clinical severity of the patients and have complementary properties. Recent comparative analyses in the literature have shown that, thanks to its practicality, CURB-65 sup-

ports rapid decision-making, especially in the emergency department setting, while PSI offers more detailed risk stratification with its multivariate structure.^[21,22] Adams et al. (2021) averred that CURB-65 is easy for emergency-related decisions, while PSI ought to be applied in more sophisticated evaluations with its multivariate design.^[12]

For 54.5% of the patients in this study, stage IV–V (high risk group) was detected through the PSI, and mean CURB-65 score was 1.40 ± 1.02 . The results, in which the risk was moderate-high on both scores, show that clinical predictive ability of the systems complement each other. In addition, the multivariate character of PSI provides a more sensitive risk assessment, especially among older patients. The system, developed by Fine et al. (1997), is also known to be beneficial in referring out low-risk patients for outpatient treatment.^[14] Last but not least, the information obtained supports the applicability of both scoring systems in the treatment of pneumonia in the emergency department. However, it is important to select the systems appropriately for the clinical context in order to optimize patient management.

Prognostic Value of the Requirement for Oxygen and Vasopressor Support

In our study, 73.2% of the patients presenting to the emergency department with a diagnosis of pneumonia received oxygen therapy and 54.5% received vasopressor therapy. These observations suggest that life-threatening complications such as hypoxemia and circulatory failure very frequently accompany pneumonia cases and that the need for aggressive supportive therapies is extremely high. Oxy-

Table 9. Comparison of Patients' CURB-65 and PSI Staging

CURB-65 Score	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Chi-square p
Confusion						
Yes	1	0	0	3	3	0.118
No	14	18	18	41	14	
Urea > 42.8 mg/dL						
Yes	6	5	5	31	17	0.000
No	9	13	13	13	0	
Respiratory rate ≥ 30 /min						
Yes	1	0	0	2	3	0.150
No	14	18	18	42	14	
Blood pressure						
Yes	1	2	1	12	7	0.004
No	14	16	17	32	10	
Age >65yr						
Yes	6	7	15	31	16	0.000
No	9	11	3	13	1	

gen and vasopressor use is significantly higher, especially in the CURB-65 ≥ 2 and PSI IV–V groups ($p < 0.05$). The finding illustrates that scoring systems quantify not only the risk of death but also the need for invasive supportive interventions.

In other studies, added that the requirement for vasopressor is strongly associated with mortality in pneumonia patients who are observed in the intensive care unit and that such supportive therapies are one of the predictors of disease severity.^[4] Similarly, emphasized that oxygen therapy and hemodynamic support required during the management of pneumonia in critically ill patients play a fundamental role in determining in-hospital outcomes.^[6]

The patients, 83% of the CURB-65 ≥ 2 received oxygen support and 72% vasopressor therapy. The requirement for support was also equally high in the PSI IV–V group. This observation proves that clinical scoring systems are of prognostic value for supportive therapies in triage and intensive care decision-making algorithms. In other studies, noted that the need for supportive therapy increases and mortality is greater in situations of pneumonia developing with resistant bacteria.^[5] To this end, high rates of supportive therapy in our analysis suggest that patterns of bacterial resistance or viral concomitant sequelae (e.g. pulmonary damage after COVID-19) are implicated.

In our study, demonstrates that the need for oxygen and vasopressor support is highly correlated with both CURB-65 and PSI scores and that these parameters are important clinical markers in pneumonia prognosis. In accordance with these findings, it can be affirmed that early risk stratification in pneumonia patients in the emergency depart-

ment holds extreme importance in relation to the prediction of the need for supportive care. This can develop the effectiveness of patient care by facilitating the process of clinical decision-making.

Laboratory and Blood Gas Analysis Parameters Prognostic Utility

In our study, a significant correlation between arterial blood gas parameters and pneumonia severity. In particular, the finding that the value of HCO_3^- was significant with 74.5% sensitivity in patients with CURB-65 ≥ 2 points towards this parameter as a potential independent prognostic marker. In other studies, emphasized that blood gas analysis can serve as a clinical marker for the severity of pneumonia.^[23] Similarly, added that HCO_3^- concentration is a biochemical indicator of systemic infections.^[24] To this extent, the findings from our study show that HCO_3^- can be utilized in the diagnostic process, especially in the triage and early intervention stages.

AUC values of < 0.7 in biomarker ROC analysis of CRP, lactate and total bilirubin indicate that these markers individually are not very prognostically accurate. However, in other studies, proposed that evaluation of serum CRP, procalcitonin and leukocyte counts could increase the prognostic value.^[10] Therefore, it is argued that markers such as CRP and lactate need to be interpreted together with clinical scoring systems.

Review of Immunization Rates and Preventive Health Practices

COVID-19 vaccination was high (67.9%), pneumococcal vaccination was utilized in a rate of 33.9% and influenza

vaccination in a rate of 4.5%. In this finding, preventive health care for respiratory tract infection is seen to be inadequate in the area of diseases aside from COVID-19. The Centers for Disease Control and Prevention (CDC) recommend the routine use of pneumococcal and influenza vaccines in individuals aged ≥ 65 years and adults with chronic diseases.^[25]

Low immunization coverage increases clinical and economic burden of avoidable pneumonia. Systematic reviews and meta-analyses have shown pneumococcal vaccines to significantly reduce cases of pneumonia and hospitalization rates among adults.^[26] Influenza vaccines also represent an important preventive measure in averting secondary bacterial pneumonias that follow viral infections.

In our study, findings indicate the inadequacy of community-level immunization measures. Regardless of the increased vaccine awareness triggered by the COVID-19 pandemic, it is noted that such awareness has not been directed towards other respiratory vaccines. Reminder systems need to be designed and preventive medicine practice reinforced, especially on individuals at risk, through primary health care programs.

Conclusion

Our study demonstrated that the multidisciplinary approach in which physicians and nurses work together in the management of adult patients with pneumonia affects patient outcomes. Physician-nurse collaboration for diagnosis, risk stratification, laboratory tests and treatment planning is important as regards to patient safety, early intervention, and appropriate triage.

Follow-up of pneumonia patients in the emergency department; physicians are in charge of diagnosis, risk assessment and treatment, while nurses play active roles in tasks like monitoring vital signs, administration of supportive treatments such as oxygen and vasopressor support and close observation of patients. This collaboration ensures the management of the patient in a complete and effective manner in time-consuming clinical conditions like pneumonia.

Our study outcome indicates that CURB-65 and PSI scoring models are both effective in the diagnosis of the severity of patients. However, PSI scoring is found to be more sensitive, especially among elderly patients and those with comorbidities, since it measures parameters such as age and comorbidities in higher detail. In addition, arterial pH and HCO_3 levels have been reported to be important predictors of the severity of pneumonia. While COVID-19 vaccination has also been high in the community as a whole, pneumococcal (33.9%) and influenza (4.5%) vac-

inations occurring at very low levels confirm the inadequacy of preventive health services in these areas. This finding points towards the need for more comprehensive and targeted vaccination campaigns to prevent secondary infection, especially among the elderly and among patients with comorbidities.

Limitations of the Study

The strengths of this study include its prospective data collection design, comparison of clinical scoring systems with blood gas and laboratory parameters, and the evaluation of a patient population with a wide age range. However, several limitations must be acknowledged. As a single-center study, the generalizability of the findings is limited. The patient sample included only individuals diagnosed with pneumonia in the emergency department, which may not reflect the prevalence of pneumonia in the broader population. Additionally, microbiological analyses of pneumonia pathogens were not performed, and long-term outcomes (e.g. 30-day mortality, readmission rates) were not tracked. In addition, it is recommended that future studies include a wider patient population and multicenter works.

ROC analysis showed that pH and HCO_3 values had limited sensitivity and specificity. Therefore, these parameters should be interpreted as supportive indicators rather than standalone decision-making tools.

Disclosures

Ethics Committee Approval: This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the University Health Sciences Research and Publication Ethics Committee (Date: 08.03.2024; No: 2024/2/14), and institutional permission was granted by the chief physician of the relevant hospital. Informed consent was also obtained from all participants.

Availability of data and materials: The authors declare that all data supporting the findings of this study are available within the paper, and that any additional raw data can be obtained from the corresponding author upon request.

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Conflict of Interest: The authors declare that they have no conflicts of interest relevant to the content of this manuscript. No financial, personal or professional relationships have influenced the conduct or reporting of this study.

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