Predictive value of different severity scoring systems in patients with community acquired pneumonia

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Received: 19-Aug-2023
Revised: 19-Sep-2023
Accepted: 23-Sep-2023
Published: XX-XX-XXXX

The Egyptian Journal of Chest Diseases and Tuberculosis 2024, XX:XX–XX

Background

For patients with community-acquired pneumonia (CAP), determining the severity and location of care is essential for ensuring their safety and apportion of resources appropriately. Severity scores can help clinicians fortell the outcome of patients having CAP.

This study aimed to compare different scoring systems of CAP in predicting mortality, Intensive Care Unit (ICU) admission, mechanical ventilation, and the need for vasopressors.

Methods

This was a prospective cohort study carried out at Benha University Hospitals from March 2022 to March 2023 on 60 patients aged above 18 years (58 ± 16) presented by CAP. Scores for assessment were the pneumonia severity index (PSI), CURB-65, CORB, CRSI-65, SCAP, and SMART COP scoring systems.

Results

Higher severity scores were associated with increased mortality, ICU admission, and Intensive Respiratory and Vasopressor Support (IRVS). SMART COP was the best score with AUC 0.750 (95% CI: 0.577–0.923) for ICU admission prediction (cut-off >2, sensitivity 83.3%, *P*=0.008). SCAP score was the best score with AUC 0.710 (95% CI: 0.579–0.820) for mortality prediction. CORB score (AUC 0.674, cut-off >1, sensitivity 80.00%, *P*=0.015) and Severe Community Acquired Pneumonia score (SCAP score) (AUC 0.711, cut-off >21, sensitivity 80.00%, *P*=0.002) were most sensitive in predicted vasopressor use. PSI score was the most sensitive AUC 0.727 (95% CI: 0.597–0.834) for Mechanical Ventilation (MV) use (cut-off >115, sensitivity 94.10%, *P*=0.001).

Conclusion

Severity scoring systems, including PSI, CURB-65, CORB, CRSI 65, SCAP, and SMART COP, are valuable tools for predicting the severity, mortality, ICU admission, and the need for MV and vasopressors in patients with CAP. SCAP score was the most valuable.

Keywords:
community acquired pneumonia, intensive care unit, outcome, severity scoring systems

Egypt J Chest Dis Tuberc 2024, XX:XX–XX

0422-7638

Introduction

Severe community-acquired pneumonia (CAP) has been defined as those cases that require admission to the intensive care unit (ICU). Direct admission to the ICU is required for patients with septic shock or acute respiratory failure requiring invasive mechanical ventilation, which are defined as major severity criteria [1].

Today, severe community-acquired pneumonia is considered a separate clinical entity with specific epidemiological characteristics, different distribution of etiological agents, increased risk of complications such as acute respiratory distress syndrome (ARDS), and septic shock, as well as high mortality rate [2].

During recent decades, the patients' number requiring ICU admission due to severe community-acquired pneumonia has increased globally, especially among the elderly patients with comorbidities and the immunocompromised. According to a major population-based surveillance study of CAP patients who were hospitalized, 21% of patients required admission to an ICU, and 26% of them required mechanical breathing. Since delays in admission to the intensive care unit have been linked to higher mortality, severe pneumonia hospital mortality is still substantial, ranging from 25 to more than 50% [3].

Management strategies can be appropriately tailored to include hospital admission, the involvement of a skilled clinician in their care, early consideration of ICU management, and using broad-spectrum empirical antibiotics for patients who are determined to have 'severe pneumonia' [4]. Physicians have been encouraged to use severity scores as helpful tools to predict patient outcomes when they appear with CAP [5].

These scores were:

(1) PSI score (pneumonia severity index).

On the basis of 20 variables that are frequently available at presentation, it divides pneumonia patients into 5 classes with a higher risk of short-term mortality. Patients in risk classes I through III are considered to be at 'low risk', whereas those in risk classes IV and V are considered to be at 'high risk' [6].

(2) CURB-65 scoring system (confusion, urea, respiratory rate, blood pressure, age 65).

It includes confusion, urea greater than 30 mg/dL (7 mmol/l), respiratory rate 30 breaths per minute, blood pressure less than or equal to 90/60 mm Hg, age greater than or equal to 65 years; each characteristic was given 1 point; a severe score was regarded as a score 3 [7].

(3) CORB score (confusion, oxygen saturation, respiratory rate, blood pressure).

New beginning or aggravation of an existing condition of confusion, 90% or less oxygen saturation (on any FiO_2), breathing more than 30 times/min Systolic blood pressure below 90 mm Hg or diastolic blood pressure below 60 mmHg, with 1 point assigned for each parameter. A severe score was classified as a score greater than or equal to 2 [5].

(4) CRSI 65 (confusion, respiratory rate: shock index, age 65).

The score includes Confusion, a respiratory rate of greater than 30 breaths/min, a shock index greater than or equal to 1 (systolic pressure multiplied by heart rate), a patient who is older than 65, with 1 point assigned for each parameter. A score of two or more suggest serious pneumonia [8].

(5) SCAP (severe community-acquired pneumonia score).

P=arterial pH (13 points), S=systolic pressure (11 points), C=confusion (5 points), U=BUN (5 points), R=respiratory rate (9 points), X=radiography (5 points), O=Pao2 (6 points), and age greater than 80 years (5 points). These are the points attributed to each variable of the SCAP score. The eight scoring factors were divided into major and minor criteria based on the number of points allocated to each. Patients are classified as having severe SCAP if they meet either one major criterion or two minor criteria [9].

(6) SMART-COP score (systolic BP, multilobar chest x ray, albumin, respiratory rate, Tachycardia, confusion, oxygen saturation, PH)

It includes systolic blood pressure less than 90 mmHg: 2, Multilobar CXR involvement:1, Albumin level less than 35 g/l:1, Respiratory rate increased: 1, less than or equal to 50 years greater than or equal to 25 breaths/min, less than or equal to 60 years greater than or equal to 30 breaths/min, Tachycardia 125 beats/min: 1, Confusion of new onset: 1, Oxygen Saturation low: 2, less than or equal to 50 years, oxygen saturation less than or equal to 93% less than or equal to 60 years … oxygen saturation less than or equal to 90%, PH less than 7.35: 2, score greater than or equal to 5 is considered severe [10].

The aim of this work was to compare different scoring systems of CAP in predicting mortality, ICU admission, mechanical ventilation, and need for vasopressors.

Patients and methods

This was a prospective study on all CAP patients who visited Benha University Hospital's emergency room, chest, internal medicine ward, and general and chest critical care unit between March 2022 and March 2023.

Before participating, each Patient or relative's informed consent was obtained. After receiving approval from the Benha, Faculty of Medicine's Research Ethics Committee, the study was carried out.

The following were the exclusion criteria: age below 18, history of home nursing or hospitalization lasting more than 24 h in the previous 90 days, receipt of chemotherapy and/or radiotherapy in the previous 30 days, active tuberculosis, bronchiectasis, HIV infection, coronavirus disease 2019 (COVID-19) infection, and regular hemodialysis.

For all patients full history taking, complete physical examination (General and Local), radiology (Chest radiography, CT Chest if needed). The demographic information, comorbidities, clinical observations, and lab tests were documented. Indicators of severity were computed within the first 24 h after admission. Patients received treatment in accordance with the national CAP guidelines.

Statistical analysis

Data management and statistical analysis were done using SPSS version 28 (IBM, Armonk, New York, United States). Initially, quantitative data were assessed for normality using the Kolmogorov-Smirnov test, Shapiro-Wilk test, and direct data visualization methods. According to normality, quantitative data were summarized as means and standard deviations or medians and ranges. Categorical data were summarized as numbers and percentages. Quantitative data were compared using the independent t-test or Mann-Whitney *U* test for normally and non-normally distributed quantitative variables. Categorical data were compared using the χ^2 or Fisher's exact test. Receiver operating characteristic (ROC) analyses were done. Areas under the curve (AUC) with 95% confidence intervals, best cut-off points, and diagnostic indices were calculated. All statistical tests were two-sided. *P* values less than 0.05 were considered significant [11].

Results

This was a prospective study conducted on 60 patients presented by CAP. The mean age of the studied patients was 58 ± 16 years. Males predominated in this study (61.7%). Over one-third (41.5%) were smokers, while only 5% were ex-smokers. Co-morbidities included diabetes mellitus (25%), hypertension (40%), cardiac affection (21.7%), neurological affection (18.3%), and renal disease (15%). ICU patients showed significantly higher cardiac affection (27.1%) compared with ward patients (0%) (P=0.042). They also demonstrated a significantly higher confusion rate (41.7% vs. 8.3%, P=0.03) and lower AMT scores (median = 9 vs. 10, P=0.041) (Table 1).

Regarding site of care of the studied group (*n* 60): 12 (20%) patients were admitted to the ward while 48 (80%) patients were admitted to ICU. ICU patients demonstrated significantly higher severity scores compared with ward treated patients. (Fig. 1, Table 2).

Regarding mortality of the studied patients: 18 (30%) patients died while 42 (70%) patients survived. The nonsurvivors demonstrated significantly higher severity scores than the survivors. (Fig. 2, Table 3)

Regarding the vasopressor use in the studied patients; 20 (33.3%) patients had vasopressor need, while no need for vasopressor use in the other 40 (66.6%) patients. Patients who needed vasopressor demonstrated significantly higher severity scores. (Fig. 3, Table 4).

Regarding MV of the study group, 17 patients required MV, while 43 patients did not require MV. Patients who needed mechanical ventilation demonstrated significantly higher percentages of severity scores. (Fig. 4, Table 5).

ROC analysis of the studied patients showed that SMART-COP score was the most sensitive in predicting ICU admission with a sensitivity of 83.3% and specificity of 66.7%, while the most specific was CURB-65 score with a sensitivity of 60.4% and specificity of 91.7%. SCAP score was the most sensitive in predicting mortality with a sensitivity of 77.80% and specificity of 61.90%. While SMART-COP score was the most specific with a sensitivity of 33.30% and specificity of 97.60%. As regard vasopressor use, SCAP score was the most sensitive in predicting its use with a sensitivity and specificity were 80.00 and 62.50%. Regarding prediction of MV, PSI was the most sensitive score with a sensitivity of 94.10% and a specificity of 41.90%, SMART-COP score was the most specific with a sensitivity of 70.60% and a specificity of 69.80% (Table 6).

Discussion

Community acquired pneumonia remains one of the leading causes of death worldwide, thus a successful management requires an accurate assessment of disease severity [12]. The aim of this study was to evaluate the predictive value of the most commonly used severity scoring systems in patients with community acquired pneumonia.

The ICU admission was higher in the severe score group than nonsevere score group with the highest percentage was for PSI, and the least was for SMART-COP. ICU patients demonstrated significantly higher PSI score compared with ward treated patients. This was similar to Eldaboosy and colleagues, study where ICU admissions and scores were higher for the high risk PSI class IV and V also CURB-65 score was higher in the ICU admitted group mean (2.5 vs. 9) with 97% sensitivity, 45.5% specificity and AUC 0.83 [13].

In Spindler and Örtqvist study, the need for ICU treatment was remarkably higher (*P* 0.0001) in high-risk than in low-risk patients for all three severity scores: PSI, CURB, and mATS [14].

Table 1 General, clinical and laboratory findings in relation to site of care and mortality

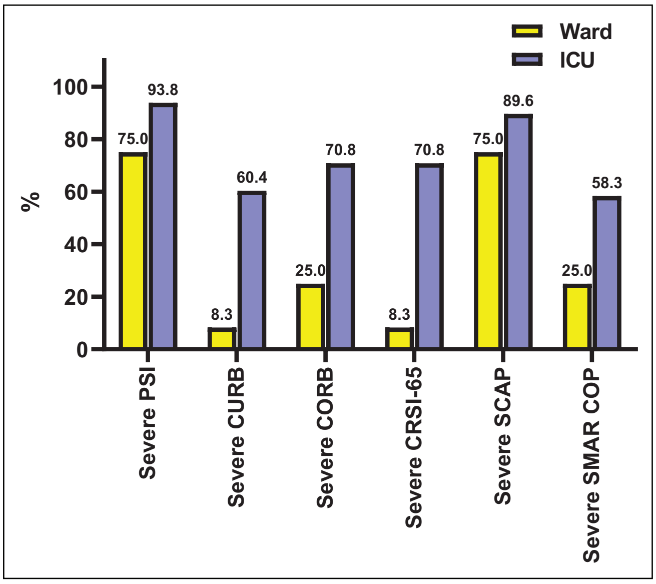
	Site of care		*P*-value	mortality		*P* value
	Ward (*n*=12)	ICU (*n*=48)		yes	No	
Demographics						
Age (years)						
Mean±SD	52 ± 13	59 ± 16	0.172	58 ± 21	58 ± 13	0.989
Sex						
Males	9 (75)	28 (58.3)	0.288	13 (72.2)	24 (57.1)	0.271
Females	3 (25)	20 (41.7)		5 (27.8)	18 (42.9)	
Addiction						
n (%)	1 (8.3)	1 (2.1)	0.363	1 (5.6)	1 (2.4)	0.514
Smoking						
Smoker						
n (%)	9 (75)	16 (33.3)	0.038*	8 (44.4)	17 (40.5)	0.899
Ex-smoker						
n (%)	0	3 (6.3)		1 (5.6)	2 (4.8)	
Smoking index (pack/year)						
Median (min-max)	60 (22.5–100)	93.8(50–165)	0.007*	90 (30–120)	80 (22.5–165)	0.588
AMT score						
Median (min-max)	10 (0–10)	9 (0–10)	0.041*	12 (66.7)	9 (21.4)	<0.001*
Confusion						
n (%)	1 (8.3)	20 (41.7)	0.03*	4 (0–10)	10 (1–10)	0.002*
Co-morbidities						
Diabetes mellitus						
n (%)	4 (33.3)	11 (22.9)	0.456	5 (27.8)	10 (23.8)	0.745
Hypertension						
n (%)	3 (25)	21 (43.8)	0.236	6 (33.3)	18 (42.9)	0.490
Cardiac affection						
n (%)	0	13 (27.1)	0.042*	5 (27.8)	8 (19)	0.452
Neurological affection						
n (%)	0	11 (22.9)	0.067	n (%)	5 (27.8)	6 (14.3)
Renal disease						
n (%)	1 (8.3)	8 (16.7)	0.470	n (%)	2 (11.1)	7 (16.7)
Vitals						
Temperature						
Mean±SD	37.8 ± 1	38.4 ± 1	0.057	38.3 ± 1.2	38.3 ± 1	0.799
Systolic blood pressure						
Mean±SD	128 ± 41	118 ± 36	0.446	106 ± 34	126 ± 37	0.044*
Diastolic blood pressure						
Mean±SD	82 ± 26	73 ± 23	0.237	67 ± 25	78 ± 22	0.114
Heart rate						
Mean±SD	100 ± 16	107 ± 21	0.273	113 ± 28	102 ± 15	0.157
Respiratory rate						
Mean±SD	29 ± 4	32 ± 8	0.333	32 ± 9	31 ± 7	0.936
Labs						
PH						
Mean±SD	7.39 ± 0.07	7.36 ± 0.11	0.252	7.31 ± 0.11	7.39 ± 0.09	0.004*
PaO_2						
Mean±SD	68 ± 13	56 ± 13	0.008*	58 ± 15	58 ± 13	0.924
SO_2						
Mean±SD	91 ± 8	84 ± 9	0.021*	83 ± 11	86 ± 9	0.420
TLC						
Median (min-max)	13.3 (7.8–27.5)	13.4 (2.9–27.2)	0.760	12.9 (2.9–27.2)	13.6 (5–27.5)	0.974
Neutrophils						
Median (min-max)	10.8 (6–25)	10.5 (1.8–24.2)	0.861	10.4 (1.8–23.3)	11.5 (3.2–25)	0.885
Lymphocytes						
Median (min-max)	1.65 (0.7–2.7)	1.75 (0.3–3.5)	0.926	2.15 (0.4–3.1)	1.65 (0.3–3.5)	0.129
Platelets						
Median (min-max)	179 (75–291)	239 (76–658)	0.053	255 (109–528)	214 (75–658)	0.205
CRP						
Median (min-max)	48 (<6–96)	48 (3–297)	0.992	48 (0–96)	48 (0–297)	0.093

Table 1 Continued

	Site of care		*P*-value	mortality		*P* value
	Ward (*n*=12)	ICU (*n*=48)		yes	No	
ESR						
Median (min-max)	43 (5–130)	80 (10–155)	0.289	40 (10–100)	93 (5–155)	<0.001*
AST						
Median (min-max)	33 (14–74)	43 (17–558)	0.1	51 (14–558)	35 (17–135)	0.053
ALT						
Median (min-max)	25 (10–182)	38 (8–442)	0.056	50 (10–442)	32 (8–182)	0.153
Serum albumin						
Mean±SD	3.2±0.5	3.3±0.8	0.624	3.3±0.8	3.3±0.7	0.654
Serum glucose						
Median (min-max)	168 (96–429)	163 (44–588)	0.782	151 (44–350)	164 (60–588)	0.513
Serum Na						
Mean±SD	139±3	138±5	0.377	138±6	138±5	0.748
Urea						
Median (min-max)	24 (15–32)	28 (8–154)	0.505	23 (8–59)	27 (9–154)	0.366
BUN						
Median (min-max)	66 (43–89)	79 (22–430)	0.477	65 (22–165)	75 (24–430)	0.379
Hospital stay						
Length of stay (days)						
Median (min-max)	16 (4–20)	18 (6–34)	0.055	11 (4–30)	18 (10–34)	0.005*

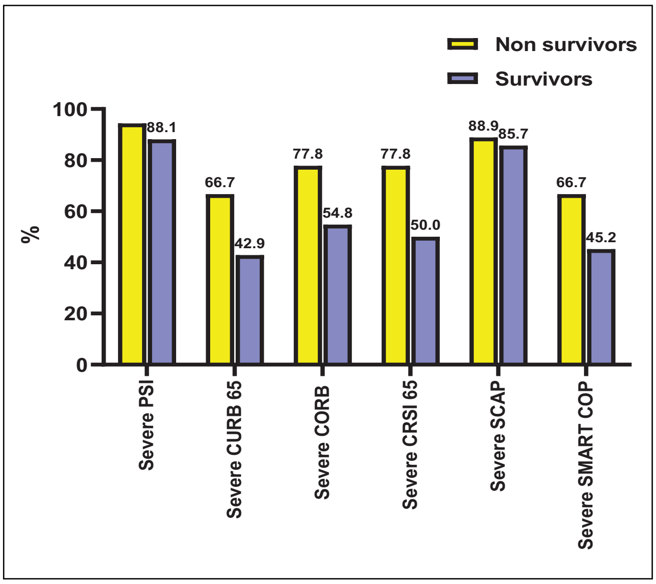
* indicates significant (*P*<0.05).

Figure 1



Site of care of the studied group in relation to severity scores.

Figure 2



Patient mortality in relation to severity scores.

Table 2 Severity scores in relation to site of care

Score	Ward	ICU	*P*-value
PSI			
Median (range)	97 (55–189)	135 (46–223)	**<0.001***
CURB-65			
Median (range)	2 (1–4)	3 (1–5)	**0.003***
CORB			
Median (range)	0 (0–4)	2 (0–3)	**0.002***
CRSI-65			
Median (range)	1 (0–3)	2 (0–4)	**0.001***
SCAP			
Median (range)	10 (5–54)	25 (0–50)	**0.008***
SMART-COP			
Median (range)	2 (0–10)	5 (0–10)	**0.007***

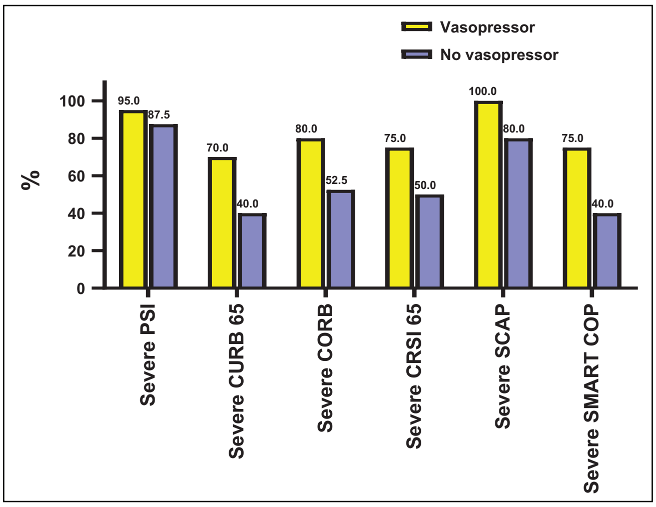
* Significant *P*-value.

Table 3 Severity scores in relation to mortality

Score	Yes (*n*=18)	No (*n*=42)	*P*-value
PSI			
Median (range)	160 (81–223)	121 (46–195)	**0.004***
CURB-65			
Median (range)	3 (1–5)	2 (1–5)	**0.013***
CORB			
Median (range)	3 (0–4)	2 (0–3)	**0.009***
CRSI-65			
Median (range)	3 (0–4)	2 (0–3)	**0.003***
SCAP			
Median (range)	30 (5–54)	20 (0–36)	**0.01***
SMART-COP			
Median (range)	6 (2–10)	4 (0–8)	**0.015***

* Significant *P*-value.

Figure 3



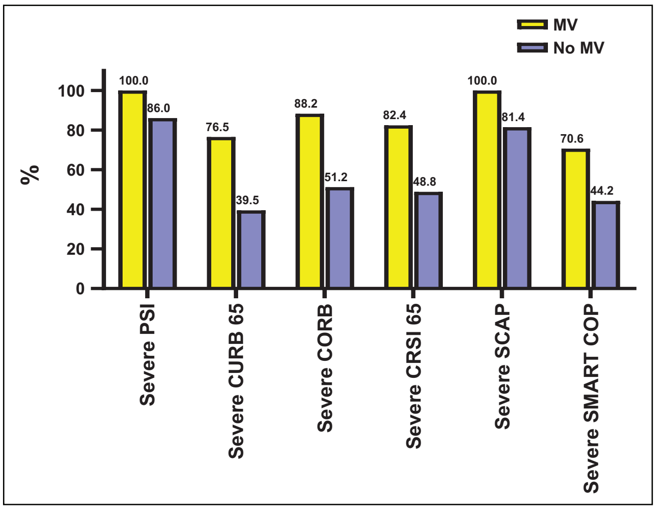
Vasopressor use of studied patients in relation to severity scores.

Table 4 Severity scores in relation to vasopressor use

Score	Yes (*n*=20)	No (*n*=40)	*P*-value
PSI			
Median (range)	146 (81–223)	123 (46–222)	0.023
CURB-56			
Median (range)	3 (1–5)	2 (1–4)	0.01
CORB			
Median (range)	2 (0–4)	2 (0–3)	0.022
CRSI-65			
Median (range)	2 (1–4)	2 (0–3)	0.007
SCAP			
Median (range)	25 (10–54)	19 (0–49)	0.008
SMART-COP			
Median (range)	6 (2–10)	4 (0–9)	0.002

In the current work, number of smokers was significantly higher in ward patients than in ICU patients, while the smoking index was significantly higher in ICU patients than in ward patients. Liapikou and colleagues studied the effect of smoking on CAP. Smoking increase CAP severity on admission (RR > 30, and Pao2/FiO_2 < 250) and during hospitalization in the form of more

Figure 4



Severe scores according to mechanical ventilation use in the studied patients.

ICU admission (*P*=0.028), MV and longer hospital stay (12 days vs. 10, *P*=0.05). During hospitalization, smokers were more often treated with corticosteroids (*P* <0.001) [15].

ICU patients showed significantly higher cardiac affection compared with ward patients (*P*=0.042). Mortensen and colleagues declared that nearly 50% of deaths in cases with CAP was due to aggravation of a pre-existing condition [16].

In the current study, ICU patients demonstrated a significantly higher confusion rate and lower AMT scores. Also, the nonsurvivors showed a significantly higher confusion rate than survivors and a lower AMT score. Mental status whether new or altered at hospital admission, independently predicts death [6].

Regarding prediction of ICU admission in the current study, the most sensitive score was SMART COP (83.3) and best cut off greater than 2. This was while the least sensitive score was CURB-65 (60.4%). In terms of specificity, CURB 65 and CRSI has specificity of 91.7% the least specific was SMART COP (66.7%).

This was in concordance with Patel's study in that CURB-65 score might not distinguish those who need ICU admission compared with PSI [17]. Similar to our study, Memon and colleagues, study detected that SMART-COP score uses accessible data from patients which can identify who needs ICU admission, sensitivity was 92.3%, specificity 62.3%, and AUC of 0.87, leading to better resources apportion and treatment introduction [18].

Table 5 Severity scores in relation to mechanical ventilation

	MV		*P*-value
	Yes (*n*=17)	No (*n*=43)	
PSI			
Median (range)	146 (105–222)	121 (46–223)	0.006
CURB-65			
Median (range)	3 (2–5)	2 (1–5)	0.01
CORB			
Median (range)	2 (1–4)	2 (0–3)	0.001
CRSI-65			
Median (range)	2 (1–3)	1 (0–4)	0.033
SCAP			
Median (range)	27 (10–54)	19 (0–50)	0.001
SMART-COP			
Median (range)	6 (2–10)	4 (0–8)	0.004

Table 6 Receiver operating characteristic analysis of the studied scores

ICU admission	AUC (95% CI)	Best cutoff	Sensitivity	Specificity	*P*-value
PSI	0.825 (0.671–0.978)	>115	81.2%	83.3%	**0.001***
CURB-65	0.767 (0.620–0.915),	>2	60.4%	91.7%	**0.004***
CORB	0.784 (0.607–0.960)	>1	70.8%	75%	**0.003***
CRSI 65	0.793 (0.651–0.936)	>1	70.8%	91.7%	**0.002***
SCAP	0.747 (0.580–0.913)	>14	75%	75%	**0.009***
SMART COP	0.750 (0.577–0.923)	>2	83.3%	66.7%	**0.008***
Mortality					
PSI	0.737 (0.607–0.842)	> 162	50%	95.20%	**0.002***
CURB-65	0.693 (0.561–0.806)	>3	44.40%	92.90%	**0.017***
CORB	0.705 (0.573–0.816)	>2	50%	88.10%	**0.01***
CRSI 65	0.734 (0.604–0.840)	>2	50%	90.50%	**0.002***
SCAP	0.710 (0.579–0.820)	>24	77.80%	61.90%	**0.011***
SMART COP	0.697 (0.565–0.809)	>7	33.30%	97.60%	**0.01***
Vasopressor use					
PSI	0.681 (0.548–0.795)	>163	40.00%	95.00%	**0.017***
CURB-65	0.694 (0.562–0.807)	>3	40.00%	92.50%	**0.014***
CORB	0.674 (0.541–0.790)	>1	80.00%	47.50%	**0.015***
CRSI 65	0.706 (0.575–0.817)	>2	40.00%	87.50%	**0.003***
SCAP	0.711 (0.580–0.821)	>21	80.00%	62.50%	**0.002***
SMART COP	0.750 (0.621–0.853)	>5	70.00%	72.50%	**<0.001***
Mechanical Ventilation					
PSI	0.727 (0.597–0.834)	>115	94.10%	41.90%	**0.001***
CURB-65	0.703 (0.571–0.814)	>2	76.50%	60.50%	**0.004***
CORB	0.762 (0.634-0.862)	>1	88.20%	48.80%	**<0.001***
CRSI 65	0.670 (0.537–0.786)	>1	82.40%	51.50%	**0.016***
SCAP	0.763 (0.636–0.864)	>20	88.20%	58.10%	**<0.001***
SMART COP	0.737 (0.608–0.843)	>5	70.60%	69.80%	**0.001***

* indicates significant (*P*<0.05).

Regarding mortality of the studied patients; most of the nonsurvivors were lying in the severe score group with highest percentage for PSI (94.4%).

In Spindler and Örtqvist study a significantly higher mortality (*P* 0.01) was noticed in high-risk compared with low-risk patients: 13 out of 53 (24.5%) versus 0 out of 61 for PSI; 8 out of 22 (36.4%) versus 5 out of 92 (5.4%) for CURB-65; and 11 out of 27 (40.7%) versus 2 out of 87 (2.3%) for mATS [14].

In our study, nonsurvivors demonstrated significantly lower systolic blood pressure pH, ESR, and length of stay. Kolsuz and colleagues studied the relation between acute phase reactants and severity of CAP on 100 patients and found that the disease severity was correlated with admission levels of CRP and leucocytic count, but not with ESR and fibrinogen [19].

As regard Mortality prediction in the current study, the most sensitive score was SCAP which showed a sensitivity of 77.80%,.The least sensitive were CURB-65 (44.40%). In terms of specificity, the most specific score was SMART COP (97%), the least specific was SCAP score (61.9%).

On the contrary, in a study by Williams and colleagues, 618 patients with community-acquired pneumonia who were deemed eligible for invasive therapy, 75 (12.1%) were admitted to the intensive care unit or passed away at 30 days. The ideal sensitivity for the SMART COP and CURXO scores was 85% (95% confidence interval (CI) 75–92), whereas the CORB and CURB-65 scores had the maximum specificity (93 and 94%, respectively) [20]. Williams and colleagues conducted a second analysis in which they found that the 2014 CORB, CURB65, and SMART COP have high NPVs for mortality (92, 90, and 90%, respectively) [21].

Patel found that the CURB-65 score was equal to PSI regarding mortality prediction. Specially, CURB-65 has a higher specificity (74.6) than the PSI (52.2). So he recommended that for patients with high CURB-65 score, sepsis and systemic inflammatory response syndrome should not be missed during initial Evaluation for these cases [17].

In the current work, the most sensitive scores in predicting vasopressor use were CORB and SCAP with sensitivity of 80.00%, CORB score greater than 1 was the best cut-off point, SCAP score optimal cut-off value was greater than 21, the least sensitive scores were PSI, CURB 65, and CRSI 65 with sensitivity 40%. In terms of specificity; the most specific of the scores was PSI, 95%, while the least specific was CORB 47.5%.

These results were consistent with a study on 1,811 patients, 15.1 (273) deceased in hospital, 8.78 needed IMV (159) and 9.77 (177) required vasopressor support. CORB had an AUC of 0.660 (95 CI: 0.623-0.697) for in-hospital mortality; an AUC of 0.657(95 CI: 0.621- 0.692) for 30- day mortality; an AUC of 0.637 (CI 95 0.589- 0.685) for IMV requirement; and an AUC of 0.635(95 CI: 0.589- 0.681) for vasopressor support. CORB performance is better when the SpO_2/FiO_2 rate less than 300 is used as oxygenation standard in predicting the demand for IMV and vasopressor support. CURB-65 score confers an in- hospital mortality AUC of 0.727(95 CI: 0.695-0.759) and 30-day mortality AUC of 0.726 (95 CI: 0.695-0.756). CURB-65 score is superior in the vaticination of mortality [22].

CORB score was proposed by Buising and colleagues, it did not bear the use of invasive measures in its construction, it comprisess consciousness level, oxygen saturation by pulse oximetry, respiratory rate, and blood pressure, reaching a sensitivity of 72.2 and a specificity of 70.1 for a compound outcome of mortality and demand for invasive mechanical ventilation(IMV) and vasopressor support [23].

Chen, in his prospective study at 6 Australian hospitals over 28-months which involved 865 CAP cases, with a mean patient age of 65.1 years. The SMART-COP score was evolved to detect patients who need ICU admission based on risk for IRVS. ICU admission rate was 13.4, IRVS rate was 10.3, and 30-day mortality rate was 5.7. The SMART-COP score had 92.3 sensitivity and 62.3 specificity (AUC = 0.87) for prognosticating the need for IRVS, relative to 73.6 sensitivity for PSI classes IV and V, and 38.5 sensitivity for CURB-65 group 3 patients [24].

In our study, 17 patients needed MV while 43 did not need MV, patients with severe score were more in the mechanically ventilated than non MV group.

Patients who needed mechanical ventilation demonstrated significantly high PSI score CURB 56, CRSI 65, SCAP, and SMART. Although patients who needed and those who did not need mechanical ventilation had the same median CORB, the score range was higher in those who needed mechanical ventilation (1–4 vs. 0–3) (*P*=0.001).

In Diwakar and colleagues study, 33 patients required MV among them 17 (58.6%) were in PSI class IV and 12 (85.7%) in PSI class V with a significant p value. PSI class greater than III has sensitivity of 87.88% and specificity of 48.15% in predicting ventilation with a significant *P* value. Among those patients who needed mechanical ventilation 13 (44.8%) had CURB 65 score I and 12 (60.9%) had CURB 65 score 2. CURB 65 greater than 2 has sensitivity of 60.61% and specificity of 66.67% with a significant *P* value. PSI greater than III has better sensitivity in predicting need for ventilator [25].

The most sensitive predictor for MV use in the current study was the PSI score. A score greater than 115 was considered the best cut-off point, which provides a sensitivity of 94.10%. The least sensitive score was SMART COP with a sensitivity of 70.60%. In terms of specificity; the most specific score was SMART COP (69.8%) and the least specific was PSI (41.9%).

There are several other scores that were assessed by several studies for prediction of severity of CAP; the CRB-65 score can safely decide patients with

CAP who can be treated as outpatients. It does not require blood urea [26]. Rider and Frazee evaluated SAPS II (Simplified Acute Physiology Score), SOFA (Sequential Organ Failure Assessment Score) and MPM (Mortality Prediction Model) for CAP severity and found a good discriminative ability [27]. Systolic blood pressure, respiration rate, heart rate, fever, degree of awareness, and Sao2 level are all components of the National Early Warning Score (NEWS), which is a relatively new score. NEWS-lactate (NEWS-L) is an alternative scoring system that assess both the NEWS score and the lactate level [25].

Conclusion

The severity scoring systems, including PSI, CURB-65, CORB, CRSI 65, SCAP, and SMART COP, are valuable tools for predicting the severity, mortality, ICU admission, and the requirement for mechanical ventilation and vasopressors in patients with CAP. SCAP score was the most valuable. These scoring systems provide clinicians with a standardized approach to assess the severity of the disease, enabling risk stratification and informed decision-making regarding appropriate treatment and level of care required for CAP patients.

Limitation

This study had a fairly small sample size (60 patients), which may limit the generalizability of the findings, the focus was on comparing severity scoring systems without considering other implicit prognostic factors, the lack of investigation into the impact of different treatment strategies on issues, potentially impacting the predictive value of the severity scores, and limited assessment of long-term outcomes, as the study only concentrated on short-term issues during the hospitalization period.

Acknowledgments

There was no source of fund from any agency or body.

Financial support and sponsorship

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contribution

It was equal between authors.

Contribution list: -Study concept: Prof. A. H.A.-A., Assis. Prof. A. H.A. -Data acquisition: Dr. S. S.M. -Writing: Assis. Prof. A. H.A., Dr. E. A.M., Dr. S. S.M. -Reviewing: Prof. A.H.A.-A., Assiss. Prof. A. H.A., Dr. E. A.M. -Publication: Assis. Prof. A. H.A., Dr. S. S.M.

The manuscript has been read and approved by all the authors, the requirements for authorship have been met, and each author believes that the manuscript represents honest work.

Conflicts of interest

There were no conflicts of interest.

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