



"EVALUATING THE ASSOCIATION BETWEEN SEVERITY OF COMMUNITY-ACQUIRED PNEUMONIA AND EXPANDED CURB-65 SCORE"

General Medicine

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ABSTRACT

Introduction- Community-acquired pneumonia (CAP) is one of the most common infectious diseases needing hospitalization. Using age ≥ 65 years, LDH >230 u/L, albumin <3.5 g/dL, platelet count $<100 \times 10^9$ /L, confusion, urea >7 mmol/L, respiratory rate ≥ 30 /min, low blood pressure, we assembled a new severity score named as expanded-CURB-65. **Objective :** To study the correlation of severity with expanded curb 65 score **Materials And Methods-** In our study 150 patients with CAP who met inclusion and exclusion criteria were selected from medical wards and outpatients from General Medicine department. The expanded-CURB-65 score was categorized into three classes as follows: 0–2 as low risk, 3–4 intermediate risk, and 5–8 high risk. Accordingly, patients with one of three tiers of scores should be treated either as outpatient, or inpatients in hospital ward or ICU, respectively. **Results** -In our Study it was observed that elevated serum LDH level (>230 u/L), thrombocytopenia (platelet count $<1,00,000$) and hypoalbuminemia (albumin level <3.5 g/dL) were independent risk factors for severity of disease. **Conclusion-** Expanded CURB-65 is a relatively simpler and more effective marker in assessing the severity of hospitalized patients with CAP. Compared to CURB-65, the expanded-CURB-65 score, which extends independent risk factors to 8 variables in assessing CAP severity, significantly improves identifying high-risk patients.

KEYWORDS

INTRODUCTION

Community acquired pneumonia (CAP) is prominent cause of mortality and morbidity with important clinical impact across globe. India accounts for 23 percent of global pneumonia burden with case fatality rate between 14 and 30 percent, and Streptococcus pneumoniae is considered a major bacterial etiology². Bacterial pathogen implicated in the CAP [Community acquired bacterial pneumonia (CABP)] vary with host characteristics. Community acquired pneumonia is diagnosed in patient when he/she presents with

- One or more symptoms of pneumonia like fever, cough, dyspnea, hemoptysis or chest pain.
- Clinical examination showing features of consolidation
- Radiological features of consolidation¹

Community-acquired pneumonia (CAP) affects over 5 million people annually in the U.S., causing over 55,000 deaths and 1.2 million hospitalizations. Around 70% of cases are treated as outpatients with $<5\%$ mortality, while hospitalized cases have a mortality rate of 12–40%, highest in ICU settings. CAP is the leading infectious cause of death in Americans over 65². In India, CAP accounts for 23% of the global burden, with an estimated 4 million cases annually. Of these, 20% require hospitalization. The incidence ranges from 5–11 per 1,000 people, and mortality increases from $<5\%$ in outpatients to over 30% in ICU cases³.

Microbial Causes of Community-Acquired Pneumonia, by Site of Care⁴

Common Pathogens By Patient Category:

• Outpatients:

The most common pathogens include Streptococcus pneumoniae, Mycoplasma pneumoniae, Haemophilus influenzae, Chlamydia pneumoniae, and various respiratory viruses.

• Hospitalized Patients (Non-ICU):

Frequently identified pathogens are Streptococcus pneumoniae, Mycoplasma pneumoniae, Chlamydia pneumoniae, Haemophilus influenzae, Legionella species, and respiratory viruses.

• Hospitalized Patients (ICU):

In ICU settings, the predominant pathogens include Streptococcus pneumoniae, Staphylococcus aureus, Legionella species, Gram-negative bacilli, Haemophilus influenzae, and respiratory viruses.

Stages Of Pneumonia⁵

Pneumonia progresses through four stages: **congestion** (vascular engorgement, fluid, bacteria), **red hepatization** (fibrin, red cells, neutrophils fill alveoli), **gray hepatization** (disintegration of red cells, persistent exudate gives gray appearance), and **resolution** (macrophages clear debris, lung architecture restores). These stages reflect the pathological evolution of lobar pneumonia.

Alveolar Wall Structure (Blood to Air)⁶

- Capillary Endothelium:** An interwoven network of anastomosing capillaries.
- Basement Membrane & Interstitial Tissue:** Separates alveolar epithelial cells from capillary endothelial cells.
- Alveolar Epithelium:**
 - Type I Pneumocytes:** Flat, plate-like cells covering $\sim 95\%$ of the surface.
 - Type II Pneumocytes:** Rounded cells responsible for surfactant production and repair of epithelium.
- Alveolar Macrophages:** Present freely or attached to epithelial cells, often containing phagocytosed material.

The CURB-65 scoring system—comprising Confusion, elevated Urea levels, increased Respiratory rate, low Blood pressure, and age ≥ 65 years—is a widely utilized tool for assessing the severity of CAP. Its simplicity and ease of use have made it a practical option in various clinical settings. However, the original CURB-65 score may not fully capture the complexities and heterogeneity of CAP presentations, leading to potential under- or overestimation of disease severity in certain populations⁷.

To address these limitations, expanded versions of the CURB-65 score have been proposed, incorporating additional clinical variables such as oxygen saturation, comorbidities, laboratory findings, and radiographic results. These modifications aim to enhance the prognostic accuracy and clinical applicability of the score, particularly in predicting outcomes such as the need for intensive care, mechanical ventilation, or in-hospital mortality⁸.

By comparing the predictive performance of the expanded score with clinical outcomes, this study seeks to determine its utility as a more comprehensive and reliable tool for risk stratification in patients with CAP.

Objective

To study the Association Between Severity of Community-Acquired Pneumonia and Expanded CURB-65 Score

MATERIALS AND METHODS

A cross-sectional study was conducted at Mahadevappa Rampure Medical College, Kalaburagi, between May 2023 and October 2024, involving 150 inpatients diagnosed with community-acquired pneumonia in the Department of General Medicine.

Data were analyzed using appropriate inferential statistics. Informed written consent was obtained in the patient's vernacular language after explaining the study purpose. Detailed history, clinical examination, and relevant laboratory data were recorded at admission and monitored daily as per the proforma, following inclusion and exclusion criteria.

The statistical data was analysed using IBM SPSS 25.0 version software.

Chi square test is used for qualitative analysis .ANOVA test for correlation was applied for significance. P value of <0.05 is considered significant value.

Inclusion Criteria:

1. All patients who fit into the description of community acquired pneumonia
2. Age above 18 yrs and any gender

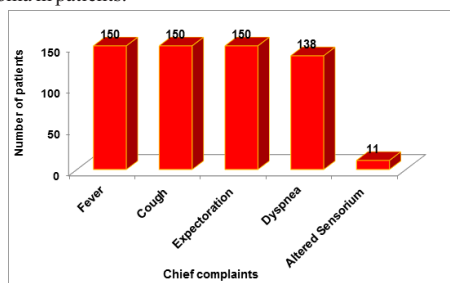
Exclusion Criteria:

1. Patient with the previous history or radiological evidence of pulmonary tuberculosis.
2. Patient with clinical and echo-cardiographical evidence of heart disease.
3. Hospital acquired pneumonia and Aspiration pneumonia.
4. Acute Respiratory Distress syndrome.

RESULTS**Table No. 1 : Chief Complaints Wise Distribution Of Patients**

Chief complaints	Number of patients	Percentage
Fever	150	100.0
Cough	150	100.0
Expectoration	150	100.0
Dyspnea	138	92.0
Altered Sensorium	11	7.3

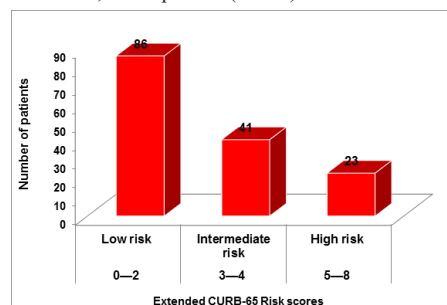
Table 1 illustrates the findings of a study on 150 patients with community-acquired pneumonia. The study revealed that 100% of patients presented with fever as their chief complaint. Additionally, 100% of patients also reported cough and expectoration as their primary symptoms. Furthermore, 92% of patients experienced dyspnea, while 7.3% reported altered sensorium. These results highlight the common symptoms associated with community-acquired pneumonia in patients.

**Bar Diagram Represents Chief Complaints Wise Distribution Of Patients****Table No.2: Extended CURB-65 risk wise distribution of patients**

Extended CURB-65 Score	Risk	Number of patients	Percentage
0—2	Low risk	86	57.4
3—4	Intermediate risk	41	27.3
5—8	High risk	23	15.3
Total	--	150	100.0

Table 2 illustrates the findings of the study. The results indicate that according to the Extended CURB-65 risk assessment, 86 patients

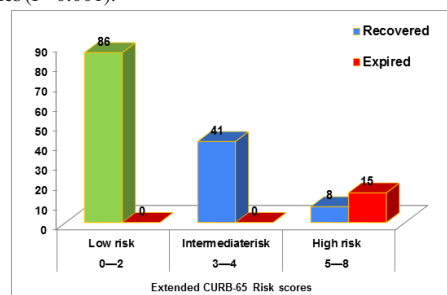
(57.4%) were classified as low risk, 41 patients (27.3%) were classified as intermediate risk, and 23 patients (15.3%) were classified as high risk.

**Bar diagram presents Extended CURB-65 risk wise distribution of patients****Table No.3: Comparison of study out with Extended CURB-65 Risk**

Extended CURB-65 scores	Risk	Total	Recovered Number	%	Expired Number	%
0—2	Low risk	86	86	63.7	0	0.0
3—4	Intermediate risk	41	41	30.4	0	0.0
5—8	High risk	23	8	5.9	15	100.0
Total	---	150	135	100.0	15	100.0
X ² - test, P-value			X ² = 65.608, P = 0.0000, HS			

NS= not significant, S=significant, HS=highly significant

Table 3 illustrates the findings of the study, indicating a statistically significant association between Extended CURB-65 Risk and study outcomes (P<0.001).

**Bar diagram represents comparison of study out with expended CURB-65 risk****Table No.4: Comparison severity/death between CURB-65 and Extended CURB-65 Risk**

Severity Scores CURB-65	Risk score Extended CURB-65	CURB-65		Extended CURB-65	
		No.	%	No.	%
0—1	0—2	2	13.3	0	0.0
2	3—4	2	13.3	0	0.0
3—5	5—8	11	73.4	15	100.0
Total	---	15	100	15	100
X ² - test, P-value		X ² = 4.033, P = 0.0133, S			

NS= not significant, S=significant, HS=highly significant

Table -4 has revealed that there were 11 deaths observed within the CURB-65 severity score interval of 3-5, while all 15 deaths were seen within the Extended CURB-65 severe score interval of 5-8. This difference is statistically significant (P<0.05).

Therefore, it can be concluded that the Extended CURB-65 Risk score is significantly more effective than the CORB-65 score in identifying the severity and predicting deaths related to pneumonia.

DISCUSSION

Our study, which included 150 patients diagnosed with community-acquired pneumonia (CAP), demonstrated that the majority of patients (58; 38.7%) belonged to the 61–70 years age group. This was followed by 32 patients (21.3%) in the 51–60 years age category, 28 patients

(18.7%) aged above 70 years, and 23 patients (15.3%) in the 41–50 years age group. The youngest patient in our study was 32 years old, while the oldest was 88 years old. The mean age of the study population was 61.89 years.

Expanded CURB-65, which includes additional risk factors, has demonstrated superior accuracy in identifying high-risk CAP patients. By adjusting the weight of age and blood pressure and eliminating imaging dependence, it improves risk assessment compared to CURB-65 [7]. Sensitivity for ICU admission in CURB-65 scores (0–2, 3, 4–5) was 17.2%, 37.9%, and 44.0%, respectively, with specificity increasing from 42.2% to 92.9%. In Expanded CURB-65, sensitivity for ICU admission (0–2, 3–4, 5–8) was 13.79%, 24.13%, and 62.06%, with specificity ranging from 50.7% to 92.95%.

When comparing the accuracy of CURB-65 and expanded CURB-65 in predicting 30-day mortality, a statistically significant difference was observed (p -value < 0.05). The specificity and sensitivity of CURB-65 (threshold >3) in predicting 30-day mortality were 87.10% and 66.67%, respectively, with a PPV of 88.8% and an NPV of 66.6%. For expanded CURB-65 (threshold >4), specificity and sensitivity were 90.48% and 83.33%, respectively, with a PPV of 83.3% and an NPV of 90.4%. The accuracy rates for CURB-65 and expanded CURB-65 in predicting 30-day mortality were 76.1% and 87.8%, respectively.

A study by S.M. Shehata et al.¹⁰ demonstrated that the Expanded CURB-65 score provided the most sensitive prediction of mortality (75%) with the highest negative predictive value (NPV) of 95.9%. It was identified as the best predictor of 30-day mortality in CAP patients, as it had the largest area under the curve (AUC = 0.793, P -value < 0.0001). These findings were consistent with the study by Liu et al.⁷, which showed that the overall sensitivity and specificity of the Expanded CURB-65 were superior (AUC = 0.826) compared to other scoring systems. In Liu et al.'s study, the AUC values for PSI and CURB-65 in predicting 30-day mortality were 0.801 and 0.756, respectively.

These findings collectively support the superior predictive accuracy of the Expanded CURB-65 score in determining ICU admission and 30-day mortality among CAP patients. Compared to CURB-65, the expanded model offers enhanced risk stratification, reinforcing its potential utility in clinical decision-making and patient management.

CONCLUSION:

- Community-acquired pneumonia is more common in elderly patients, with male predominance.
- *Streptococcus pneumoniae* is the predominant pathogen in CAP cases.
- Severity of disease, as measured by CURB-65 and Expanded CURB-65 scores, significantly correlates with patient outcomes.
- The majority of patients classified as low-risk (57.4%) had better outcomes, while high-risk patients (15.3%) had increased mortality rates.
- The study emphasizes the importance of early risk stratification using the Expanded CURB-65 score for improved patient management and prognosis.

Limitations:

- The study was conducted in a single tertiary healthcare center, limiting generalizability.
- Sample size was relatively small, which may impact statistical power.
- The study did not assess the impact of early versus delayed treatment on patient outcomes.
- Radiological findings were based on X-rays only; advanced imaging modalities like CT scans were not considered.
- The study did not evaluate the role of viral and atypical pathogens in CAP etiology.
- Long-term follow-up of patients was not performed to assess post-discharge complications.

Recommendations:

1. Early assessment and classification of CAP severity using the Expanded CURB-65 score should be implemented in routine clinical practice.
2. Comorbidities like hypertension and diabetes should be closely monitored in CAP patients for better outcomes.
3. Empirical antibiotic therapy should be tailored considering

Streptococcus pneumoniae as the predominant pathogen.

4. Further studies with larger sample sizes and multi-center data are needed for more robust conclusions.
5. The use of advanced imaging techniques such as CT scans should be explored for better diagnostic accuracy.
6. Long-term follow-up studies should be conducted to assess post-hospitalization morbidity and recurrence rates.

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