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Original Research Article

Comparative study of CURB-65 and expanded CURB-65 score in community acquired pneumonia in a tertiary care hospital of Assam

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ABSTRACT

Background: Community acquired pneumonia is one of the leading causes of morbidity and mortality in developing countries like India. The presentation of CAP may range from mild pneumonia characterized only by fever and productive cough to severe pneumonia leading to respiratory distress and sepsis syndrome requiring management in ICU. Any delay in ICU admission has been shown to be associated with increased mortality. This study was conducted to compare Expanded CURB-65 with CURB-65 scoring system in a tertiary care centre in Assam for early stratification of patients with CAP based of severity and expected prognosis.
Methods: This hospital based prospective study was conducted between September 2020 to August 2021, and a total of 100 patients were taken and followed up form admission to up to 30 days. CURB65 and expanded CURB 65 score was calculated for each patient and the accuracy of each score was statistically compared.
Results: In our study out of 100 patients mean age of 60±17.97 with Mortality rate of 16%. Total 29% patients were need ICU care. The Sensitivity, Specificity, PPV and NPV for predicting mortality and for ICU admission of Expanded CURB-65 score is found to be superior to CURB-65 Score.
Conclusions: In comparison to the CURB-65 score system, the expanded CURB-65 score prioritises both clinical and laboratory criteria and is a more reliable marker for evaluating CAP severity and may improve the effectiveness of forecasting death in CAP patients.

Keywords: CURB-65, Expanded CURB-65, CAP, ICU, Mortality

INTRODUCTION

Pneumonia is a disease well known to humanity from ancient times. It is an acute inflammation of the pulmonary parenchyma that can be caused by various infective and non-infective origins, presenting with physical and radiological features compatible with the pulmonary consolidation of a part or parts of one or both lungs.[1] Community acquired pneumonia is one of the primary causes of mortality and morbidity in both developing and developed countries, and it is the most common reason for adult and child hospitalization (10%).

In India, there are 4 million cases of CAP reported each year and is responsible for 23% of the worldwide pneumonia burden and 36% of the WHO regional burden.[2-4] In the late twentieth and twenty-first century, newer microbial agents have emerged like - opportunistic lung infection in patients with HIV infection and post organ transplant patients.[3] All these have led to the need

for an understanding of the immunological status of the individual.

The presentation of CAP may range from mild pneumonia characterized only by fever and productive cough to severe fulminant pneumonia leading to respiratory distress and sepsis syndrome requiring management in ICU. Any delay in ICU admission has been shown to be associated with increased mortality.[4,5]

Multiple serum biomarkers and several established risk scores such as CURB-65, CRB-65, Pneumonia Severity Index (PSI), Infectious Diseases Society of America/American Thoracic Society (IDSA/ATS) score and Extended CURB 65 have been used to assess the severity of CAP to optimize the management of CAP patients.[6]

This study was conducted to compare Expanded CURB-65 with the standard confusion, urea, respiratory rate, blood pressure and 65 years of age or older (CURB-65) scoring system in a tertiary care centre in Assam.

CURB-65 which was developed in 2002 at the University of Nottingham by Lim et al included 5 risk factors with each carrying 1 score.[7]

Confusion of new onset (defined as an AMTS of 8 or less). Blood urea nitrogen greater than 7 mmol / l (19 mg/dL). Respiratory rate of 30 breaths per minute or greater. Systolic BP <90 mmHg or Diastolic BP <60 mmHg. Age 65 years or older.

And scores were interpreted as, score of 0-1 = outpatient treatment, score of 2 = admission to medical wards, score of 3-5 = admission to ICU.

Whereas expanded CURB-65 which was developed by Liu et al includes- confusion, urea >7 mmol/l, respiratory rate ≥30/min, blood pressure: low systolic (<90 mmHg) or diastolic (≤60 mmHg), age ≥65 years, LDH >230 u/L, albumin <3.5 g / dL, platelet count <100,000 / cu mm of blood.[8]

And scores were interpreted as, score of 0-2 = outpatient treatment, score of 3-4 = admission to medical wards, score of 5-8 = admission to ICU.

METHODS

This hospital based prospective observational cohort study was done in a tertiary care hospital (Fakhruddin Ali Ahmed Medical College and Hospital, Barpeta) in Assam during for a period of 1 year i.e. from September 2020 to August 2021 after the approval from the institutional ethical committee. The study included 100 CAP patients who fulfilled the inclusion and exclusion criteria. CURB-65 and expanded CURB-65 scores for these patients were calculated and the accuracy of either in predicting outcomes was statistically analysed.

Inclusion and exclusion criteria

Inclusion criteria included patients who were diagnosed with CAP with age >18 years of age and Exclusion criteria included patients with lung malignancies, active tuberculosis, COVID19 pneumonia and hospital acquired pneumonia (hospitalized within previous 14 days or developed >72 hours after admission).

All data were collected in a detailed proforma, which included personal and demographic details of patients, history, clinical findings and investigation findings, written consent was taken for each patient and CURB-65 and extended CURB-65 was score was calculated for each patient.

Statistical analysis

All data was processed and analyzed in Microsoft excel. Descriptive statistical mean and standard deviation for continuous variables and frequency distribution with their percentage for categorical variables have been determined. Sensitivity, positive predictive value (PPV) and negative predictive value (NPV) were calculated for different CURB 65 and extended CURB-65 grades with qualitative variables (Death, ICU entry) as a consequence. Categorical data were expressed as percentages and compared using the chi square test. P value of less than 0.05 was considered to be statistically important.

RESULTS

A total of 100 patients aged above 18 years who visited to Department of Medicine, FAAMCH Barpeta from September, 2020 to August, 2021 were analyzed.

Table 1: Age distribution.

Age in years	No of cases	Percentage	Mean age	SD
<30 year	11	11	60	17.97
31-40	6	6		
41-50	21	21		
51-60	9	9		
61-70	32	32		
71-80	14	14		
81-90	4	4		
91-100	3	3		

Nearly 62% of the patients were >50 years of age. The number of patients within age group of 61-70 years is 32 (32%) which is maximum within age group. Mean age was 60 years. (Table 1). Out of 100 patients under study, 31 (31%) were female and 69 (69%) were male. (Table 2)

Clinical characteristics of survived and expired patients (Table 3) shows the difference of some poor prognostic factors in CAP but only results with respiratory rate, urea, BUN, serum albumin and altered mental status (AMS),

blood pressure was statistically significant in predicting death.

Table 2: Sex distribution.

Sex	No. of cases	Percentage
Male	69	69
Female	31	31
Total	100	100

Table 3: Examination and laboratory finding.

Findings	No. of patients	Percentage
BUN >20 mg/dl	47	47
LDH >230 mg/dl	81	81
Albumin <3.5 mg/dl	69	69
Platelet <1,00,000/cumm	26	26
Total count >11,000/cumm	73	73
Serum creatinine >1.2 mg/dl	17	17
Respiratory rate = 15-30/min	71	71
Respiratory rate = >30/min	29	29
Blood pressure <90/60 mmHg	17	17
Altered mental status	29	29

Total 29 patients were treated in ICU with or without ventilator support, out of which 16 recovered. 71 patients were treated in general ward, out of which 68 patients recovered and others were expired within 30 days of presentation of disease. (Table 4)

Table 5 shows the outcome of the patient in different classes of CURB-65 score, where 46% patient were under low-risk group, (score 0-2), out of which 10.9% got treatment in ICU with mortality of 2.2%. And 36% patient were in medium risk (score 3) group, out of which 30.6% were treated in ICU, with mortality of 13.9%. Lastly 18% were in high risk (score 4-5) group out of which 72.2% were treated in ICU with mortality of 38.9%.

Table 6 depicts the outcome of the patient in different classes of expanded CURB-65 score, where 39% patient were under low-risk group, (score 0-2), out of which 10.3% got treatment in ICU with mortality of 2.7%. And 38% patient were in medium risk (score 3-4) group, out of which 18.4% were treated in ICU, with mortality of 7.9%. Lastly 23% were in high risk (score 5-8) group out of which 78.2% were treated in ICU with mortality of 39.1%.

Table 7, 8 summarize the Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) for predicting 30-day mortality in different groups of CURB-65 and Expanded CURB-65 Score respectively.

Table 9, 10 summarize the sensitivity, specificity, PPV, NPV for predicting need for ICU care in different groups of CURB-65 and expanded CURB-65 score respectively.

On comparing both the system for 30-day mortality, it was found that sensitivity, specificity, PPV, NPV of expanded CURB-65 class ≥3 is higher compared to the CURB-65 class ≥3. The p-value is 0.029516 and 0.042265 for both the system respectively. While on comparing both the system for predicting ICU admission, it was found that sensitivity, PPV, NPV of expanded CURB-65 class ≥3 is higher compared to the CURB-65 class ≥3. The specificity of both system is almost equal with 92.95% and 92.9% respectively. The p-value is 0.032214 and 0.038321 for both the system respectively.

Table 4: Site of treatment and outcome in 30-day.

Site	Total patient		Death patients		Recovered patients	
	No	%	No	%	No	%
ICU	29	29	13	44.9	16	55.2
Ward	71	71	3	4.2	68	95.8
Total	100	100	16	16	82	82

Table 5: 30-day outcome patients with different groups as per CURB-65.

Score	Total		ICU admission		Ward admission	
	Total	Death	Total	Death	Total	Death
0-2	46 (46)	1 (2.2)	5 (10.9)	1 (2.2)	41 (89.1)	0
3	36 (36)	7 (19.4)	11 (30.6)	5 (13.9)	25 (69.4)	2 (5.6)
4-5	18 (18)	8 (44.4)	13 (72.2)	7 (38.9)	5 (27.8)	1 (5.6)
Total	100 (100)	16 (16)	29 (29)	13 (13)	71 (71)	3 (3)

Table 6: 30-day outcome of patients with different groups as per expanded CURB-65.

Score	Total		ICU admission		Ward admission	
	Total	Death	Total	Death	Total	Death
0-2	39 (39)	1 (2.5)	4 (10.3)	1 (2.7)	35 (89.7)	0
3-4	38 (38)	4 (10.3)	7 (18.4)	3 (7.9)	31 (81.6)	1 (2.6)
5-8	23 (23)	11 (47.8)	18 (78.2)	9 (39.1)	5 (21.7)	2 (8.7)
Total	100 (100)	16 (16)	29 (29)	13 (13)	71 (71)	3 (3)

Table 7: Sensitivity, specificity, positive and negative predictive value for different class of CURB-65 score for predicting mortality.

Score	Sensitivity %	Specificity %	PPV %	NPV %	P value
0-1	6.67	46.42	2.17	72.2	0.04141
2	43.75	65.5	19.43	85.93	0.180084
3-5	50	88	44.4	90.2	0.042265

Table 8: Sensitivity, specificity, positive and negative predictive value for different class of expanded CURB 65 score for predicting mortality.

Score	Sensitivity %	Specificity %	PPV %	NPV %	P value
0-2	6.2	54.76	2.25	75.4	0.345217
3-4	25	59.5	10.52	80.6	0.002935
5-8	68.75	85.71	47.8	93.5	0.029516

Table 9: Sensitivity, specificity, positive and negative predictive value for different class of CURB-65 score for predicting ICU admission.

Score	Sensitivity %	Specificity %	PPV %	NPV %	P value
0-2	17.2	42.2	10.86	55.5	0.0074953
3	37.9	64.78	30.5	71.8	0.013305
4-5	44.0	92.9	72.7	80.4	0.0383215

Table 10: Sensitivity, specificity, positive and negative predictive value for different class of expanded CURB-65 score for predicting ICU admission.

Score	Sensitivity %	Specificity %	PPV %	NPV %	P value
0-2	13.79	50.7	10.25	59.01	0.0144702
3-4	24.13	56.33	18.4	64.5	0.0128884
5-8	62.06	92.95	78.26	85.71	0.0322147

DISCUSSION

This prospective observational study was conducted in FAAMCH Barpeta from September 2020 to August 2021, and a total of 100 patients were taken.

The mean age group of the patients was 60, with male to female ratio of 2.23:1. Similar findings were observed in a study conducted by Shehata et al and Mitra et al where the mean age of the study population was 59.17 and 59.09.[9,10] Another study done in AIIMS, India by Dey et al11, which was 50.6 years. They also found male predominance in their study; male female ratio was 1.68:1 and 1.7:1 respectively. In the study by Mitra et al. the mortality rate was 12%, ICU admission was required in 30 % patients and invasive mechanical ventilation was required in 24 % patients.[10]

Laboratory analysis showed increase in WBC with predominant neutrophilia, serum LDH was found to be elevated in 81% of the patients, and serum albumin <3.5 in 69% of the patients. In study by Mitra et al.10 LDH level >230 U / L observed in 45% patients, albumin level <3.5 mg/dl observed in 33 % patients, platelet count <100×103/cu.mm was observed in 23 % patients. Urea level >7 mmol/L observed in 5% patients.

Analysis of CURB-65 and expanded CURB-65 score

On classifying the patient in different classes of CURB-65 score, we found that 46% patient were under low-risk

group (score 0-2), out of which 10.9% got treatment in ICU with mortality of 2.2%. And 36% patient were in medium risk (score 3) group, out of which 30.6% were treated in ICU, with mortality of 13.9%. Lastly 18% were in high risk (score 4-5) group out of which 72.2% were treated in ICU with mortality of 38.9%.

A study by Liu et al found that 74.09% patients with CURB-65 score of (0-1) and these group had 30-day mortality of 4.53%.[8] Score of 2 was found in 20.79% patients, and among them 30 day mortality of 13.49%. Score of (3-5) was found in 5.12% patients and 30-day mortality among them was found to be 45.24%.

And on classifying the patients as per expanded CURB-65 score, we found that 39% patient were under low risk group, (score 0-2), out of which 10.3% got treatment in ICU with mortality of 2.7%, 38% patients were in medium risk (score 3-4) group, of which 18.4% were treated in ICU, with mortality of 7.9%, 23% were in high risk (score 5-8) group out of which 78.2% were treated in ICU with mortality of 39.1%.

The study by Liu et al8 found that 64.15% patients with Expanded CURB-65 score of (0-2) had 30-day mortality of 2.52%. Score of (3-4) was found in 30.30% patients and among them 30-day mortality of 14.18%. Score of (5-8) was found in 5.55% patients and 30-day mortality among them was found to be 41.76%.

Sensitivity for mortality in CURB-65 system we find 6.67%, 43.75%, 50% for score of (0-2), 3, and (4-5) respectively. The Specificity was found to 46.42%, 65.5%, 88% for groups (0-2), 3, (4-5) respectively. Sensitivity for mortality in Expanded CURB-65 system we find 6.2%, 25%, 68.75% for score of (0-2), (3-4), and (5-8) respectively. The Specificity was found to 54.76%,59.5%,85.71% for groups (0-2), (3-4), (5-8) respectively.

In another study by Mitra et al the sensitivity and specificity for 30-day mortality among Community acquired pneumonia for CURB-65 with score >3 to be 66.67% and 87.10% respectively.[10] In another study by Mitra et al the PPV and NPV for 30-day mortality among Community acquired pneumonia for Expanded CURB-65 with score >4 to be 83.33% and 90.48% respectively.[8,7]

Similarly, sensitivity for ICU admission in CURB-65 system we find 17.2%, 37.9%, 44.0% for score of (0-2), 3, and (4-5) respectively. The Specificity was found to 42.2%, 64.78%, 92.9% for groups (0-2), 3, (4-5) respectively and sensitivity for ICU admission in Expanded CURB-65 system we find 13.79%, 24.13% and 62.06% for score of 0-2, 3-4, and 5-8 respectively. The Specificity was found to 50.7%, 56.33%, 92.95% for groups (0-2), (3-4), (5-8) respectively.

In a study by Madhu et al found the PPV and NPV for ICU admission among Community acquired pneumonia for CURB-65 with score >3 to be 55.5% and 82.93% respectively.[12] And In study by Mitra et al found the PPV and NPV for ICU admission among Community acquired pneumonia for Expanded CURB-65 with score >4 to be 87.50% and 76.4% respectively.[10]

In our study the PPV for 30-day mortality was found to be 2.17%, 19.43%, 44.4% and the NPV was found to be 72.2%, 85.93%, 90.2% for CURB-65 scores 0-1, 2, 3-5 respectively. A study by Madhu et al found the sensitivity and specificity for 30-day mortality among community acquired pneumonia for CURB-65 with score >3 to be 41.7% and 89.5% respectively.[12]

In our study the PPV for 30-day mortality was found to be 2.25%, 10.52%,47.8% and the NPV was found to be 75.4%, 80.6%, 93.5% for Expanded CURB-65 scores (0-2), (3-4), (5-8) respectively. In another study by Mitra D. et al.10 the PPV and NPV for 30-day mortality among community acquired pneumonia for Expanded CURB-65 with score >4 to be 83.3% and 90.4% respectively.

Limitations

It was a single centre study with limited number of cases, outpatient department patients were not included and therefore a longer duration study with larger group of study subjects will be required for more conclusive results.

CONCLUSION

Community-acquired pneumonia (CAP) is one of the most common diagnoses in patients admitted to ICUs and emergency rooms. In terms of predicting mortality and ICU admission, both extended CURB-65 and CURB-65 are complementary. Both of these parameters can be used to assess the severity of the patient at centers where laboratory parameters are accessible in a short amount of time. However, on comparing the Expanded CURB-65 Score to the CURB-65 score, the sensitivity, specificity, positive predictive value, and negative predictive value for ICU admission and mortality are superior in the expanded CURB-65 Score in comparison to the present CURB-65 score system, the expanded CURB-65 score offers more weight to both clinical and laboratory indicators, making it a more reliable marker for assessing CAP severity and perhaps improving the accuracy of predicting death in CAP patients. But as both scoring methods have a poor positive predictive value; more patients may end up in the intensive care unit. The high negative predictive value shown in other studies, including ours, implies that these ratings may be more useful in excluding the severity of CAP than in deciding whether or not to admit patients to the ICU.

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