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A Prospective Observational Study Comparing the Prognostic value of DECAF and BAP65 Scores in Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease presenting to the Emergency Department of a Tertiary Care Centre in Chennai

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Abstract

Introduction: Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease that is characterized by persistent, progressive airflow limitation and chronic inflammatory response in the lungs. COPD is currently the fourth leading cause of death globally. Acute exacerbation of COPD (AECOPD) represents a sudden worsening of symptoms that exceeds normal daily variation and requires changes in treatment.These exacerbations are linked to accelerated lung function decline, increased morbidity and higher mortality. Early risk stratification is eesentinal for timely intervention and improved patient outcomes.

Aim: To compare DECAF and BAP-65 scoring system in predicting the outcomes in patients with acute exacerbation of chronic obstructive pulmonary disease.

Objective: To evaluate the effectiveness of DECAF and BAP65 scores in forecasting key outcomes—such as mortality, duration of hospital stay, and need for ventilatory support—and to determine which score provides better prognostic accuracy.

Expected Outcome and Benefit of Study: To identify high risk patient earlier with the better scoring system so as to assess the need for early intervention and easier risk stratification.

Methodology

Study Design: Hospital based prospective observational study.

Study Centre: ED, Government Stanley Medical College and Hospital.

Study Period: July 2021 to September 2022.

Study Population: Patients presenting to the emergency department with acute exacerbation of chronic obstructive pulmonary disease.

Result: A total of 130 patients were included in the study.

Among patients with DECAF scores >3, the mortality rate was 58.8%. DECAF had higher sensitivity (86.21%) and specificity (68.32%) for predicting the need for mechanical ventilation, compared to BAP65 (sensitivity 72.41%, specificity 31.68%). The overall accuracy was 72.31% for DECAF and 40.77% for BAP65. A statistically significant positive correlation was observed between DECAF score and BAP65 class ($r = 0.293$, $p = 0.001$).

Conclusion: In conclusion, a clinical prediction tool must be applicable, reliable, and beneficial. Both scores are practical in the sense that they can be easily calculated by asking simple questions and conducting routine laboratory tests. The BAP65 scoring system includes variable that are noninvasive and quick to apply on a patient that is presenting to the ED, but it is also seen that its ease of use has not proven it to be a better scoring system in our analysis. In spite of the small sample size, DECAF score excels in predicting the mortality and the need for mechanical ventilation.

Keywords: Acidemia, Cerebrovascular Disease, Dyspnoea, Higher Mortality, Ischemic Heart Disease.

Introduction

Chronic obstructive pulmonary disease (COPD) is a disease that can be prevented and treated that is characterised by persistent airflow limitation that is typically progressive and associated with enhanced chronic inflammatory response in the airways and lungs to noxious particles or gases. COPD can be prevented by maintaining a healthy weight, quitting smoking, and getting regular exercise. Worldwide, chronic obstructive pulmonary disease (COPD) is a common cause of death and illness, as of now it is the number 4th cause of death worldwide.

Diagnosis of acute exacerbation of chronic obstructive pulmonary disease is mainly based on clinical presentation of increasing dyspnoea, increasing quantity and change in quality of sputum. A panel of bio markers are yet to be identified for diagnosing an exacerbation. Multiple prognostic indices related to poorer outcomes and higher death rates in AECOPD have been developed. Two such scoring systems are the DECAF and BAP65 scores. The DECAF score includes dyspnoea, eosinopenia $<0.05 * 10^9$ /L, consolidation on chest X-ray, acidemia pH <7.30, atrial fibrillation. BAP-65 score includes BUN >25 mg/dL, altered mental status (initial GCS<14, or disorientation, stupor, or coma), pulse >109 beats /min, age 41-64 or 65. Both scores predict morbidity and mortality in AECOPD and help in risk stratification of patients and thereby assessing the need for earlier intervention.

Aim and Objectives

Aim: To compare DECAF and BAP-65 SCORE in predicting the outcomes and prognosis in patients admitted with acute exacerbation of chronic obstructive pulmonary disease to the ED.

Objective: To apply DECAF and BAP65 scoring systems on patients who present with acute exacerbation of COPD and to study the outcomes and to predict the better prognostic scoring system, thereby helping in better risk stratification of patient**.**

Material and Methods

Study Design: Hospital based prospective observational study.

Study Centre: ED, Government STANLEY Medical College and Hospital

Study Period: JULY 2021 TO SEPTEMBER 2022

Study Population: Patients presenting to the emergency department with acute exacerbation of chronic obstructive pulmonary disease.

Inclusion Criteria

1. Patients with a primary diagnosis of acute exacerbation of COPD
2. Adults>40 years
3. Patients giving informed consent.

Exclusion Criteria

1. Patients in whom primary reason for admission were causes other than acute exacerbation of COPD were excluded from the study. Hence patients with the following disease were excluded from the study

- bronchial asthma - acute exacerbation
- bronchiectasis - acute exacerbation
- interstitial lung disease – exacerbation
- lung cancer
- traumatic pneumothorax.
- congestive cardiac failure
- Acute on chronic decompensated liver or renal disease

2. Patient who do not wish to participate.
3. Pregnant patient.

Sample size

Formula

$n = Z^2pq / d^2$

Where Z = 1.96 (statistical significant constant for 95% CI)

p =58.8 % (Mortality rates patients hospitalised with acute exacerbation of Chronic Obstructive Pulmonary Disease with DECAF scores > 3 (4 & 5) from previous study.)

q = 41.2 % (100-p)

d = 15% relative precision (ie 15% of 58.8=8.9)

On substituting, in the formula n = 3.84 x 58.8 x 41.2 / 79.2

n = 117

Adding 10% non-response rate (ie 10% of 117 = 12) n = 129 (minimum sample size)

Therefore, Sample size n = 130 (1 group).

Statistical analysis

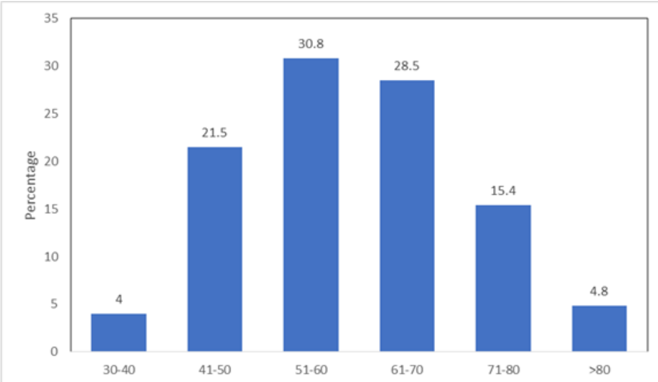
After collection, the data were compiled and entered in Microsoft Excel sheet. Analysis were done using Statistical software version 16. All continuous variables were expressed as Mean and Standard Deviation. All categorical variables were expressed as percentages and proportions. Chi-Square test is used as test of significance. P value of <0.05 Confidence Interval (CI).

Results

Table 1: Distribution of age among the study participants (N=130)

Sn	Age	Frequency	Percentage
1	41-50	28	21.5
2	51-60	40	30.8
3	61-70	37	28.5
4	71-80	20	15.4
5	>80	5	4.8

Figure 1: Distribution of age among the study participants (N=130)

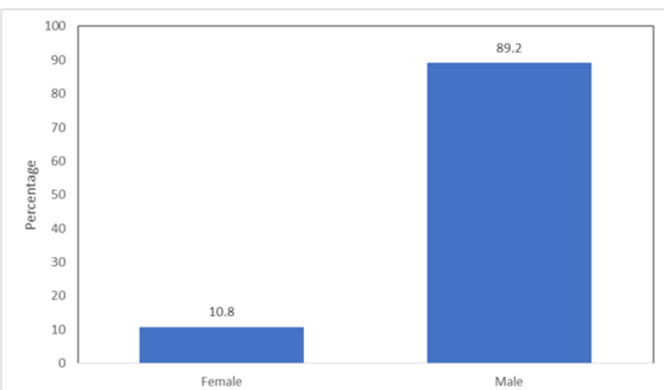


Around 21.5% 41-50 years, 30.8% 51-60 years, 28.5% 61-70 years, 15.4% 71-80 years and 4.8% >80 years.

Table 2: Distribution of gender among the study participants (N=130)

Sn	Gender	Frequency	Percentage
1	Female	14	10.8
2	Male	116	89.2

Figure 2: Distribution of gender among the study participants (N=130)

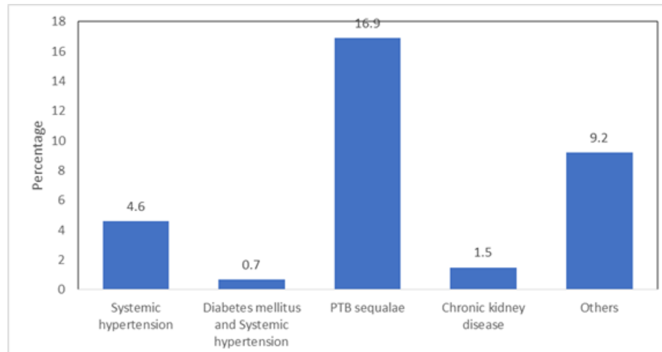


Around 10.8% were females and 89.2% males.

Table 3: Distribution of comorbidities among the study participants (N=130)

Sn	Comorbidities	Frequency	Percentage
1	Systemic hypertension	6	4.6
2	Diabetes mellitus and Systemic hypertension	1	0.7
3	PTB sequalae	22	16.9
4	Chronic kidney disease	2	1.5
5	Others	12	9.2

Figure 3: Distribution of comorbidities among the study participants (N=130)

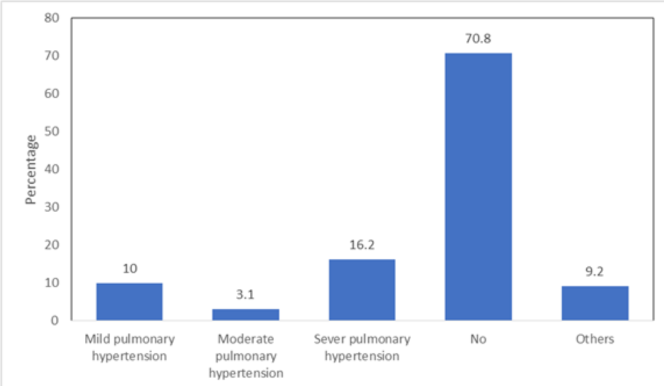


Around 4.6% were having systemic hypertension, 0.7% Diabetes mellitus and Systemic hypertension, 16.9% PTB sequalae, 1.5% Chronic kidney disease and 9.2% others.

Table 4: Distribution of corpulmonale among the study participants (N=130)

Sn	Corpulmonale	Frequency	Percentage
1	Mild pulmonary hypertension	13	10.0
2	Moderate pulmonary hypertension	4	3.1
3	Sever pulmonary hypertension	21	16.2
4	No	92	70.8

Figure 4: Distribution of corpulmonale among the study participants (N=130)

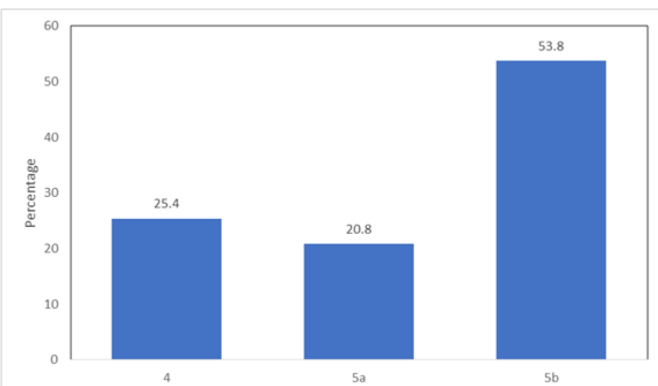


About 10% with Mild pulmonary hypertension, 3.1% Moderate pulmonary hypertension and 16.2% Sever pulmonary hypertension.

Table 5: Distribution of dyspnea among the study participants (N=130)

Sn	Dyspnea	Frequency	Percentage
1	4	33	25.4
2	5a	27	20.8
3	5b	70	53.8

Figure 5: Distribution of dyspnea among the study participants (N=130)



Around 25.4% with grade 4 dyspnea, 20.8% with grade 5a and 53.8% with grade 5b.

Table 6: Distribution of DECAF score among the study participants (N=130)

Sn.	DECAF score	Frequency	Percentage
1	0	31	23.8
2	1	13	10
3	2	15	11.5
4	3	14	10.8
5	4	51	39.2
6	5	6	4.6

Figure 6: Distribution of DECAF score among the study participants (N=130)

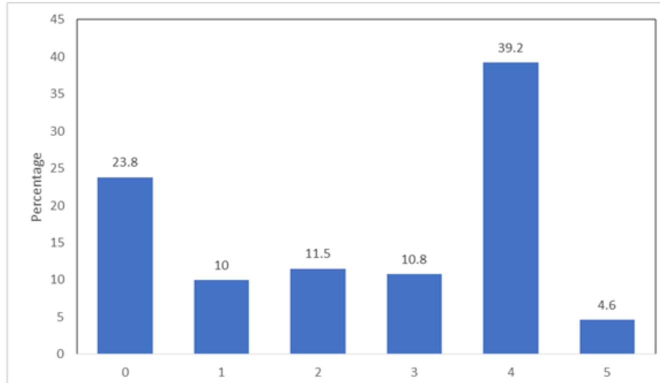


Table 7: Distribution of altered mental status among the study participants (N=130)

Sn.	Altered mental status	Frequency	Percentage
1	Yes	52	40
2	No	78	60

Figure 7: Distribution of altered mental status among the study participants (N=130)

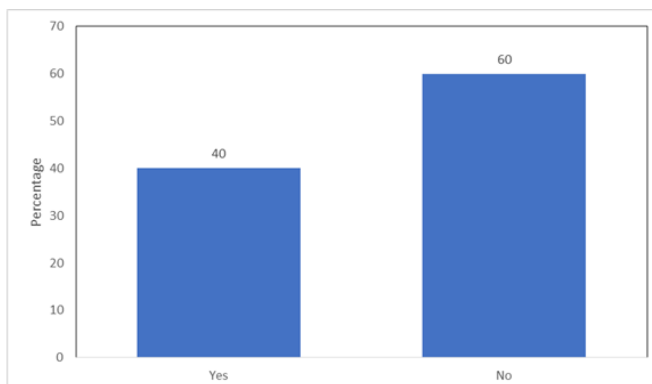


Table 8: Distribution of pulse rate among the study participants (N=130)

Sn.	Pulse rate	Frequency	Percentage
1	≥ 109 beats/min	65	50
2	<109 beats/min	65	50

Figure 8: Distribution of pulse rate among the study participants (N=130)

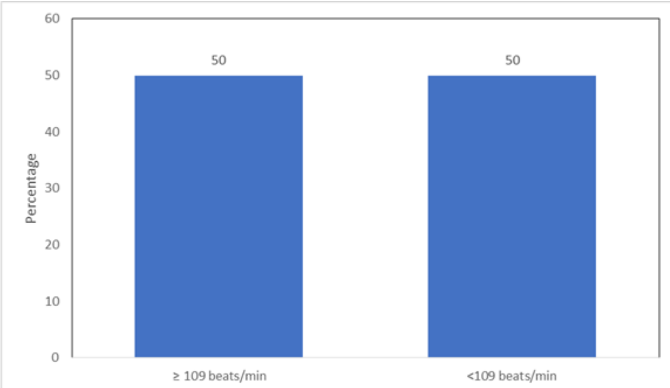
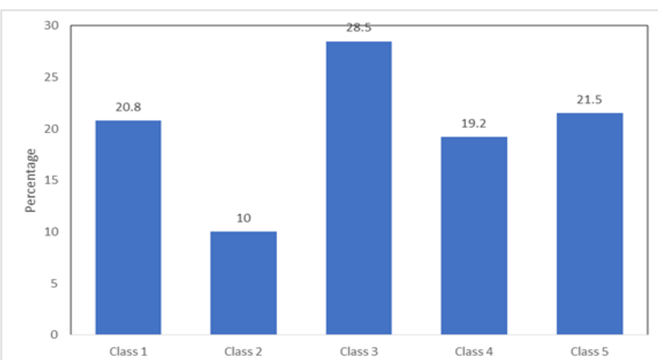


Table 9: Distribution of BAP65 class among the study participants (N=130)

Sn.	BAP65	Frequency	Percentage
1	Class 1	27	20.8
2	Class 2	13	10
3	Class 3	37	28.5
4	Class 4	25	19.2
5	Class 5	28	21.5

Figure 9: Distribution of BAP65 score among the study participants (N=130)

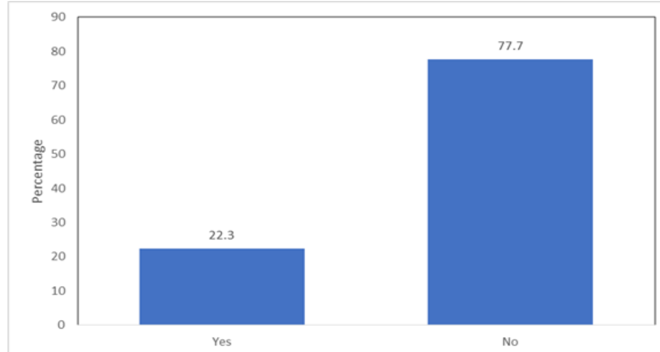


Around 20.8% in class 1, 10% in class 2, 28.5% Class 3, 19.2% Class 4 and 21.5% in Class 5.

Table 10: Distribution of use of ventilation among the study participants (N=130)

Sn.	Ventilation	Frequency	Percentage
1	Yes	29	22.3
2	No	101	77.7

Figure 10: Distribution of use of ventilation among the study participants (N=130)



Around 22.3% had ventilation.

Table 11: Distribution of BAP65 class in predicting the outcome among the study participants (N=130)

Sn.	BAP65 class	Outcome	
		Mortality	No mortality
1	≥ 3	13	77
2	<3	7	33

Statistic	Value	95% CI
Sensitivity	65.00%	40.78% to 84.61%
Specificity	30.00%	21.63% to 39.48%
Positive Likelihood Ratio	0.93	0.66 to 1.31
Negative Likelihood Ratio	1.17	0.60 to 2.26
Disease prevalence	15.38%	9.66% to 22.76%
Positive Predictive Value	14.44%	10.69% to 19.24%
Negative Predictive Value	82.50%	70.86% to 90.14%
Accuracy	35.38%	27.20% to 44.25%

Figure 11: Distribution of BAP65 class in predicting the outcome among the study participants (N=130)

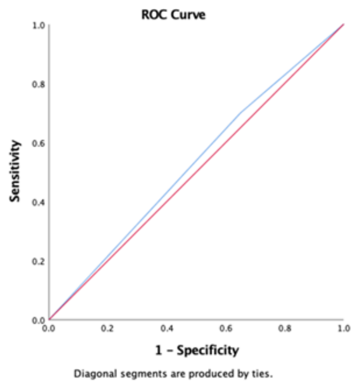


Table 12: Association of outcome between DECAF and BAP65 score among the study participants (N=130)

Sn.	Variable	Mortality	Status quo	Improved	X^2 (df), p
1	DECAF Score ≥ 3 <3	20 (100) 0 (0)	6 (54.4) 5 (45.5)	31 (31.3) 68 (68.7)	32.44 (1) <0.001
2	BAP65 Class ≥ 3 <3	13 (65) 7 (35)	9 (81.8) 2 (18.2)	68 (68.7) 31 (31.3)	1.00 (1) 0.61

It was seen that patients with a higher DECAF score predicted mortality of the patients at the time of admission better than the DECAF score. It is seen that the BAP class of less than 3 had also shown mortality.

Table 13: Association of ventilation between DECAF and BAP65 score among the study participants (N=130)

Sn.	Variable	Ventilation		p
		Yes	No	
1	DECAF Score ≥ 3 <3	25 (86.2) 4 (13.8)	32 (31.7) 69 (68.3)	27.21 (1), <0.001
2	BAP65 Class ≥ 3 <3	21 (72.4) 8 (27.6)	69 (68.3) 32 (31.7)	0.65 (1), 0.72

The need of use of ventilation was predicated by the DECAF scoring system better than by the BAP65 scoring system.

Discussion

Research on the prognosis of hospitalization-required exacerbations of chronic obstructive pulmonary disease (COPD) has been limited, and there appears to be little overlap between predictors of mortality in stable disease and AECOPD. In addition, none of the prognostic tools developed for stable disease have been evaluated on hospitalised patients, and the majority of them require clinical measurements that are not routinely available at hospital admission.

Our study is aimed to compare DECAF and BAP-65 SCORE in predicting the outcomes and prognosis in patients admitted with acute exacerbation of chronic obstructive pulmonary disease to the Emergency department of a tertiary care centre in Chennai.

In our study for AUROC for predication for DECAF score was 0.83. A Study conducted Sashideep Reddy et al revealed that DECAF had higher sensitivity and higher chance of prediction of mortality than the BAP 65 score.

The sensitivity of DECAF and BAP65 scores for prediction of mechanical ventilation need was 86.21% and 72.41%, respectively, whereas the specificity of was 68.32% and 31.68%, respectively, with 72.31% accuracy in DECAF score and 40.77% accuracy in BAP65 class. A positive significant correlation was found between DECAF score and BAP65 class (r=0.293, p=0.001).

Conclusion

Though both the scoring systems have been proven to have good predictive values when individually analyzed, in our study we conclude that DECAF score has good prediction of mortality, hospital stay and the need for mechanical ventilation than BAP65 class scoring system. In conclusion, a clinical prediction tool must be applicable, reliable, and beneficial. Both scores are practical in the sense that they can be easily calculated by asking simple questions and conducting routine laboratory tests.The BAP65 scoring system inculdes variable that are noninvasive and quick to apply on a patient that is presenting to the ED, but it is also seen that its ease of use has not proven it to be a better socring system in our analysis. In spite of the small sample size, DECAF score excels in predicting the mortality and the need for mechanical ventilation. Therefore, DECAF score may be used routinely in clinical judgement and patient triage, i.e., to determine which patients should receive ventilator support.

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