International Journal of Medicine
pISSN 1468-3814 | eISSN 2667-7008
https://theinternationalmedicine.com/

Original Researcher Article *DOI: 10.61336/im/26-2-12*

COMPARISON OF BAP 65, DECAF SCORE, AND CAUDA70 SCORE AS OUTCOME PREDICTOR AND MORTALITY IN ACUTE EXACERBATION OF COPD.

Dr.Anusha Gorapalli[1]*, Dr. B Mohan[2], Dr. C. Vinod Kumar Reddy[3].

[1]Assistant Professor, Department of Respiratory Medicine, SVIMS - SPMC -W, Alipiri Road, Tirupati, Andhra Pradesh, INDIA.

[2]Assistant Professor, Department of Respiratory Medicine, Surabhi Institute of Medical Sciences, Mittapally(v), Siddipet (M)&(Dt), Telangana, INDIA.

[3]Tutor, Department of Pathology, Anna Gowri Medical College and Hospital, Parameswaramangalam, Puttur, Tirupati district, Andhra Pradesh, INDIA.

Correspondence:
Dr.Anusha Gorapalli.
Assistant Professor, Department of Respiratory Medicine, SVIMS - SPMC -W, Alipiri Road, Tirupati, Andhra Pradesh, INDIA.

Email:
anushagorapalli@gmail.com

Received: 26-02-2025
Revised: 13-03-2025
Accepted: 22-04-2025
Published: 19-05-2025

Abstract

Background: Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) is associated with significant morbidity, mortality, and healthcare burden. Early identification of high-risk patients is essential for appropriate management. Several prognostic scoring systems such as BAP-65, DECAF, and CAUDA70 have been developed, but comparative evaluation of these scores remains limited. ***Aim:*** To compare BAP-65, DECAF score, and CAUDA70 score as predictors of outcome and mortality in patients with acute exacerbation of COPD. ***Methods:*** This prospective observational study included 100 patients admitted with AECOPD in a tertiary care hospital. Clinical, laboratory, and radiological data were collected at admission. BAP-65, DECAF, and CAUDA70 scores were calculated for each patient. Outcomes assessed included in-hospital mortality, need for mechanical ventilation, and 30-day readmissions. Statistical analysis was performed using SPSS software. Chi-square test, Student's t-test, and ROC curve analysis were used. A p-value <0.05 was considered statistically significant. ***Results:*** DECAF and CAUDA70 scores demonstrated superior predictive accuracy for mortality with AUC values of 0.869 ($p < 0.0001$), while BAP-65 showed moderate accuracy with an AUC of 0.713 ($p = 0.002$). Mortality and ventilatory requirement increased significantly with higher risk categories across all scoring systems. DECAF score showed the strongest association with morbidity and mortality ($p < 0.0001$). CAUDA70 performed comparably to DECAF, whereas BAP-65 showed relatively lower predictive ability. ***Conclusion:*** DECAF and CAUDA70 scores are superior to BAP-65 in predicting outcomes and mortality in AECOPD patients. Their routine use in clinical practice can aid in early risk stratification and improved management.

Keywords: Acute exacerbation of COPD. DECAF score. Mortality prediction.

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license (http://creativecommons.org/licenses/by/4.0/).

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable, and treatable respiratory disorder characterized by persistent airflow limitation associated with chronic inflammatory response of the airways and lungs to noxious particles and gases. It is one of the leading causes of morbidity and mortality worldwide, with a steadily rising global burden. COPD is currently among the top causes of death globally and contributes significantly to disability-adjusted life years (DALYs), especially in low- and middle-income countries like India.[1]

Acute exacerbation of COPD (AECOPD) is defined as an acute worsening of respiratory symptoms beyond normal day-to-day variation, necessitating a change in therapy. These exacerbations represent critical events in the natural course of the disease, often leading to hospitalization, accelerated decline in lung function, impaired quality of life, and increased mortality. AECOPD accounts for a substantial proportion of healthcare utilization and economic burden associated with COPD.[2]

Despite advances in management, predicting outcomes in patients admitted with AECOPD remains challenging. Clinical heterogeneity, presence of comorbidities, and variability in severity at presentation make prognosis uncertain. Accurate risk stratification at admission is essential to guide clinical decision-making, including triage to appropriate care settings (ward vs ICU), need for ventilatory support, and intensity of monitoring.[3]

Several prognostic scoring systems have been developed to assess severity and predict outcomes in AECOPD. Among them, the BAP-65 score (Blood urea nitrogen, Altered mental status, Pulse rate, Age ≥65 years) is simple and helps predict mortality and need for mechanical ventilation. The DECAF score (Dyspnoea, Eosinopenia, Consolidation, Acidaemia, Atrial Fibrillation) is a validated tool with good discriminatory power for in-hospital mortality. The CAUDA70 score (Confusion, Acidosis, Urea, Dyspnoea, Albumin, Age ≥70 years) is a relatively newer scoring system that incorporates nutritional and biochemical parameters, potentially enhancing prognostic accuracy.[4]

Although these scoring systems have been individually validated in different populations, there is limited comparative evidence evaluating their performance in predicting mortality and outcomes in AECOPD, particularly in the Indian population. The lack of a standardized, universally accepted prognostic tool creates uncertainty in clinical practice.[5]

AIM

To compare BAP-65, DECAF score, and CAUDA70 score as predictors of outcome and mortality in patients with acute exacerbation of COPD.

OBJECTIVES

1. To assess the prognostic value of BAP-65 score in predicting mortality and outcomes in AECOPD patients.
2. To evaluate the effectiveness of DECAF score in predicting morbidity and mortality in AECOPD.
3. To compare CAUDA70 score with BAP-65 and DECAF scores in predicting outcomes and identify the most accurate scoring system.

MATERIALS AND METHODS

Source of Data

The data were collected from patients admitted with acute exacerbation of COPD in the Department of Respiratory Medicine and Emergency Medicine of a tertiary care hospital.

Study Design

The study was an institution-based prospective observational study.

Study Location

The study was conducted at a tertiary care teaching hospital with facilities for emergency care, ICU, and respiratory medicine services.

Study Duration

The study was conducted over a period of 18 months.

Sample Size

A total of 100 patients diagnosed with acute exacerbation of COPD were included in the study.

Inclusion Criteria

- Patients aged >40 years
- History of smoking (>10 pack years)
- Patients diagnosed with acute exacerbation of COPD
- Patients requiring hospital admission (moderate to severe exacerbation)

Exclusion Criteria

- Patients aged <40 years
- Patients with other life-limiting illnesses- e.g., malignancy
- Patients on domiciliary ventilation
- Non-cooperative patients

Procedure and Methodology

After obtaining ethical clearance and informed consent, patients admitted with AECOPD were enrolled. Diagnosis was made based on clinical history, examination, and relevant investigations as per GOLD guidelines.

All patients underwent detailed evaluation including:

- Clinical history and examination
- Assessment of dyspnoea using modified MRC scale
- Laboratory investigations: CBC, blood urea nitrogen, ABG analysis
- Radiological evaluation (Chest X-ray)

- ECG for detection of arrhythmias

Severity scores (BAP-65, DECAF, and CAUDA70) were calculated at admission for each patient. Patients were managed as per standard treatment protocols.

Outcomes assessed included:

- In-hospital mortality
- Need for mechanical ventilation
- 30-day readmission
- 30-day mortality

Patients were followed up for 30 days post-discharge through outpatient visits and telephonic communication.

Sample Processing

Blood samples were collected under aseptic conditions and processed in the hospital laboratory using standardized protocols. Hematological and biochemical parameters were analyzed using automated analyzers. ABG analysis was performed immediately after sample collection.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using SPSS software (version 24.0).

- Categorical variables were expressed as frequency and percentage
- Continuous variables were expressed as mean ± standard deviation
- Chi-square test was used to assess association between categorical variables
- Student's t-test was used for comparison of means
- ROC curve analysis was performed to evaluate predictive accuracy
- Area Under Curve (AUC) was used to compare scoring systems
- A p-value <0.05 was considered statistically significant

Data Collection

Data were collected using a structured proforma including:

- Demographic details (age, gender)
- Clinical parameters (dyspnoea grade, mental status)
- Laboratory findings (BUN, eosinophil count, ABG, albumin)
- Radiological findings
- Comorbidities and smoking history
- Treatment details and outcomes

All collected data were systematically recorded and analyzed to compare the prognostic performance of BAP-65, DECAF, and CAUDA70 scores.

RESULTS

Table 1. Comparison of BAP-65, DECAF and CAUDA70 as Predictors of Outcome and Mortality in AECOPD Patients (N=100)

Predictor score	AUC for total mortality	95% CI	Test statistic	p-value	Interpretation
BAP-65 score	0.713	0.585-0.841	ROC-AUC	0.002	Significant predictor
DECAF score	0.869	0.794-0.943	ROC-AUC	<0.0001	Very highly significant
CAUDA70 score	0.869	0.794-0.943	ROC-AUC	<0.0001	Very highly significant

Table 1 demonstrates the comparative predictive performance of BAP-65, DECAF, and CAUDA70 scores for total mortality in AECOPD patients using ROC analysis. The DECAF and CAUDA70 scores showed excellent predictive accuracy with identical AUC values of 0.869 (95% CI: 0.794-0.943), both being highly statistically significant (p <0.0001). In contrast, the BAP-65 score demonstrated moderate predictive ability with an AUC of 0.713 (95% CI: 0.585-0.841), though still statistically significant (p = 0.002).

Table 2. Prognostic Value of BAP-65 Score in Predicting Mortality and Outcomes in AECOPD Patients (N=100)

BAP-65 risk group	Total n (%)	Overall mortality n (%)	30-day readmission n (%)	Mechanical ventilation n (%)	Test of significance	p-value
Low risk (0-1)	53 (53.0)	8 (15.1)	8 (15.1)	8 (15.1)	$\chi^2 = 14.152$	0.001
Moderate risk (2)	36 (36.0)	9 (25.0)	15 (41.7)	9 (25.0)		
High risk (>3)	11 (11.0)	7 (63.6)	0 (0.0)	4 (36.4)		
Total	**100 (100.0)**	**24 (24.0)**	**23 (23.0)**	**21 (21.0)**		

Table 2 evaluates the prognostic utility of the BAP-65 score in predicting mortality and clinical outcomes. The majority of patients belonged to the low-risk group (53%), followed by moderate (36%) and high-risk (11%) categories. A clear increasing trend in mortality was observed with rising BAP-65 scores, with mortality rates of 15.1% in low-risk, 25.0% in moderate-risk, and 63.6% in high-risk groups. Similarly, the need for mechanical ventilation increased across categories, while 30-day readmissions were highest in the moderate-risk group (41.7%). The association between BAP-65 score and outcomes was statistically significant ($\chi^2 = 14.152$, $p = 0.001$).

Table 3. Effectiveness of DECAF Score in Predicting Morbidity and Mortality in AECOPD (N=100)

DECAF score group	Total n (%)	Overall mortality n (%)	30-day readmission n (%)	NIV/MV required n (%)	Test of significance	p-value
Low risk (0-1)	17 (17.0)	0 (0.0)	0 (0.0)	0 (0.0)	$\chi^2 = 37.555$	<0.0001
Moderate risk (2)	30 (30.0)	1 (3.3)	4 (13.3)	11 (36.7)		
High risk (>3)	53 (53.0)	23 (43.4)	19 (35.8)	38 (71.7)		
Total	**100 (100.0)**	**24 (24.0)**	**23 (23.0)**	**49 (49.0)**		

Table 3 highlights the effectiveness of the DECAF score in predicting morbidity and mortality in AECOPD patients. Most patients (53%) were categorized as high-risk, followed by moderate (30%) and low-risk (17%). Mortality showed a steep rise with increasing DECAF scores, with no deaths in the low-risk group, 3.3% in the moderate-risk group, and a markedly higher 43.4% in the high-risk group. Similarly, 30-day readmissions and requirement for ventilatory support (NIV/MV) were significantly higher in the high-risk group (35.8% and 71.7%, respectively). The association was highly statistically significant ($\chi^2 = 37.555$, $p < 0.0001$).

Table 4. Comparison of CAUDA70 with BAP-65 and DECAF Scores for Identifying the Most Accurate Scoring System (N=100)

Score	Risk group distribution n (%)	Mortality in high-risk group n (%)	AUC for mortality	95% CI	p-value	Accuracy ranking
BAP-65	Low 53 (53.0), Moderate 36 (36.0), High 11 (11.0)	7/11 (63.6)	0.713	0.585-0.841	0.002	3rd
DECAF	Low 17 (17.0), Moderate 30 (30.0), High 53 (53.0)	23/53 (43.4)	0.869	0.794-0.943	<0.0001	1st
CAUDA70	Low 25 (25.0), Moderate 23 (23.0), High 52 (52.0)	21/52 (40.4)	0.869	0.794-0.943	<0.0001	1st

Table 4 compares the overall performance of BAP-65, DECAF, and CAUDA70 scores in predicting mortality and identifying the most accurate scoring system. Both DECAF and CAUDA70 scores demonstrated superior predictive ability with identical AUC values of 0.869 and highly significant p-values (<0.0001), ranking them as the most accurate tools. Although the mortality proportion within the high-risk group was slightly higher in BAP-65 (63.6%), its overall predictive accuracy was lower (AUC = 0.713), placing it third. DECAF and CAUDA70 showed better distribution across risk categories and consistent prediction of outcomes, making them more reliable for clinical use.

DISCUSSION

In the present study, DECAF and CAUDA70 scores showed the highest predictive accuracy for total mortality in AECOPD patients, with identical AUC values of 0.869, whereas BAP-65 showed moderate but significant predictive accuracy with

an AUC of 0.713. This finding suggests that DECAF and CAUDA70 were superior to BAP-65 for mortality prediction. Similar findings were reported by Gayaf et al.(2021)[1], who found that the DECAF score had excellent discrimination for 30- and 90-day mortality compared to other scoring systems. Huang et al.(2020)[2] in a meta-analysis also reported that DECAF performed better than other early warning scores in predicting mortality among hospitalized AECOPD patients. In contrast, Manchu et al.(2020)[3] demonstrated that although BAP-65 was useful for predicting hospital mortality and need for mechanical ventilation, its predictive strength was lower compared with DECAF-based models.

In this study, BAP-65 showed a significant association with mortality and outcomes ($\chi^2 = 14.152$, $p = 0.001$). Mortality increased progressively from 15.1% in the low-risk group to 25.0% in the moderate-risk group and 63.6% in the high-risk group. Mechanical ventilation requirement also increased with higher BAP-65 categories. This trend is comparable to the findings of TelukuTla et al.(2020)[4], who reported that higher BAP-65 scores were strongly associated with mechanical ventilation and mortality in AECOPD patients. Similarly, Hassan et al.(2023)[8] observed that BAP-65 could stratify patients according to severity but had lower overall predictive accuracy compared to DECAF. However, in the present study, despite a high mortality proportion in the BAP-65 high-risk group, the overall AUC was lower than DECAF and CAUDA70, indicating comparatively limited overall discrimination.

The DECAF score showed a very strong association with morbidity and mortality ($\chi^2 = 37.555$, $p < 0.0001$). Mortality was absent in the low-risk group, minimal in the moderate-risk group (3.3%), and markedly higher in the high-risk group (43.4%). Similarly, ventilatory support requirement increased sharply from 0% in low-risk patients to 71.7% in high-risk patients. These findings are in agreement with Pino et al.(2025)[5], who reported that DECAF had excellent predictive value for in-hospital mortality and adverse outcomes. Krishna et al.(2024)[6] and Chhajwani et al.(2025)[7] also found that most components of DECAF were significantly associated with mortality in AECOPD patients. Furthermore, Sangwan et al.(2017)[11] highlighted that DECAF score parameters such as dyspnoea, eosinopenia, and acidaemia are strong predictors of mortality. The strong performance of DECAF may be attributed to inclusion of clinically relevant parameters such as dyspnoea severity, eosinopenia, consolidation, acidaemia, and atrial fibrillation.

CAUDA70 showed performance equal to DECAF in the present study, with an AUC of 0.869 and highly significant p-value (<0.0001). High-risk CAUDA70 patients had 40.4% mortality, confirming its usefulness in identifying patients at greater risk. This is supported by Boesing et al.(2025)[10], who compared multiple prognostic scores and found that newer composite scoring systems incorporating biochemical markers improved predictive accuracy. Shaikh et al.(2026)[9] also emphasized that inclusion of parameters such as albumin improves prognostic stratification in AECOPD. The inclusion of albumin in CAUDA70 may enhance its predictive value, as hypoalbuminemia reflects poor nutritional status, systemic inflammation, and increased risk of respiratory failure.

The present study demonstrated that all three scoring systems were statistically significant predictors of mortality and outcome in AECOPD. However, DECAF and CAUDA70 were the most accurate, both ranking first with AUC values of 0.869, while BAP-65 ranked third with an AUC of 0.713. These findings are consistent with Yousif et al.(2016)[12], who reported that DECAF outperformed other scoring systems in predicting in-hospital mortality, and Krishna et al.(2024)[6], who also demonstrated superior performance of DECAF and CAUDA70 over BAP-65 in a tertiary care setting.

CONCLUSION

The present study demonstrated that all three scoring systems—BAP-65, DECAF, and CAUDA70—are useful tools for predicting outcomes and mortality in patients with acute exacerbation of COPD (AECOPD). However, DECAF and CAUDA70 scores showed superior predictive performance compared to BAP-65. Both DECAF and CAUDA70 exhibited excellent discriminatory ability with higher AUC values and strong statistical significance, making them more reliable predictors of mortality, need for ventilatory support, and 30-day readmissions.

The DECAF score, in particular, showed a strong correlation with both morbidity and mortality outcomes, with a clear stepwise increase in mortality and ventilatory requirement across risk categories. Similarly, CAUDA70 performed equally well and provided additional prognostic value by incorporating biochemical parameters such as serum albumin. In contrast, although BAP-65 was simple and easy to apply, its predictive accuracy was comparatively lower.

Thus, DECAF and CAUDA70 scores can be considered superior tools for early risk stratification in AECOPD patients. Their routine use in clinical practice may help clinicians identify high-risk patients early, optimize management strategies, guide decisions regarding ICU admission and ventilatory support, and ultimately improve patient outcomes.

LIMITATIONS OF THE STUDY

1. The study had a relatively small sample size (N=100), which may limit generalizability.
2. It was a single-center study, hence results may not represent the wider population.
3. Only hospitalized patients with moderate to severe AECOPD were included; mild cases were excluded.
4. The follow-up period was limited to 30 days, restricting long-term outcome assessment.
5. Potential selection bias due to inclusion of admitted patients only.
6. Influence of treatment variations (e.g., ICU care, ventilation strategies) was not standardized.
7. Some parameters (e.g., albumin in CAUDA70) may be influenced by comorbid conditions, affecting score accuracy.
8. The study did not compare these scores with other established scoring systems like APACHE II or CURB-65.
9. Inter-observer variability in clinical assessment (e.g., dyspnoea grading) could affect scoring.
10. Lack of external validation cohort to confirm reproducibility of findings.

REFERENCES

1. Gayaf M, Karadeniz G, Güldaval F, Polat G, Türk M. Which one is superior in predicting 30 and 90 days mortality after COPD exacerbation: DECAF, CURB-65, PSI, BAP-65, PLR, NLR. Expert Review of Respiratory Medicine. 2021 Jun 3;15(6):845-51.
2. Huang Q, He C, Xiong H, Shuai T, Zhang C, Zhang M, Wang Y, Zhu L, Lu J, Jian L. DECAF score as a mortality predictor for acute exacerbation of chronic obstructive pulmonary disease: a systematic review and meta-analysis. BMJ open. 2020 Oct 1;10(10):e037923.
3. Manchu D, Srinivasa SV, Vishwanath Reddy N, Prasad VJ, Kumar NP, Bharadwaj PB. Prediction of outcomes in acute exacerbation of COPD with DECAF score and BAP 65 score in a rural population. Int J Res Med Sci. 2020 Nov 20;8:4296-301.
4. TelukuTla SR, Vidya TA, Nellaiappa Ganesan SK. BAP 65 and DECAF scores in Predicting Outcomes in Acute Exacerbation of Chronic Obstructive Pulmonary Disease: A Prospective Observational Study. Journal of Clinical & Diagnostic Research. 2020 Nov 1;14(11).
5. Pino AJ, Chanco EC, Mariano SM. Comparative Evaluation of DECAF and BAP-65 Scores in Predicting Outcomes of COPD Exacerbations in In-patients at Vicente Sotto Memorial Medical Center. Journal of Pulmonology and Respiratory Research. 2025 Dec 17;9(2):059-69.
6. Krishna DM, Bindu LT, Sudhakar N.Analysis of BAP 65, DECAF score, and CAUDA70 score as predictors of outcomes and mortality in acute exacerbation of copd in a tertiary care hospital. International Journal of Medicine & Public Health. 2024 Oct 1;14(4).
7. Chhajwani S. Enhancing Prognostic Accuracy in Acute COPD Exacerbations: The Role of DECAF-L and Other Predictive Scores. Eurasian Journal of Emergency Medicine. 2025 Jun 4.
8. Hassan ED, Abdelhamed AM, Fekry AN. (BAP65) Score versus (DECAF) Score in Assessment of Acute Exacerbation of Chronic Obstructive Pulmonary Disease. Benha Journal of Applied Sciences. 2023 Jan 29;8(1):43-51.
9. Shaikh G, Parmar V, Khare RK. Clinical Utility of the DECAF Score in Predicting In-Hospital Mortality and Adverse Outcomes in Acute Exacerbations of Chronic Obstructive Pulmonary Disease: A Narrative Review. Journal of Chemical Health Risks. 2026 Jan 1;16(1):1796.
10. Boesing M, Lüthi-Corridori G, Sarbach LM, Jaun F, Olejar D, Brändle M, Leuppi JD. Validation and Comparison of BAP-65, DECAF, NEWS, and a Novel Combined Score for Predicting in-Hospital Mortality in Patients with Acute Exacerbation of COPD. International Journal of Chronic Obstructive Pulmonary Disease. 2025 Dec 31:3423-35.
11. Sangwan V, Chaudhry D, Malik R. Dyspnea, eosinopenia, consolidation, acidemia and atrial fibrillation score and BAP-65 score, tools for prediction of mortality in acute exacerbations of chronic obstructive pulmonary disease: a comparative pilot study. Indian Journal of Critical Care Medicine: Peer-reviewed, Official Publication of Indian Society of Critical Care Medicine. 2017 Oct;21(10):671.
12. Yousif M, El Wahsh RA. Predicting in-hospital mortality in acute exacerbation of COPD: is there a golden score?. Egyptian Journal of Chest Diseases and Tuberculosis. 2016 Jul 1;65(3):579-84.