

**THE DECAF (DYSPNEA, EOSINOPENIA, CONSOLIDATION, ACIDEMIA,
ATRIAL FIBRILLATION) SCORE IN PREDICTION OF HOSPITAL MORTALITY
IN ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY
AIRWAY DISEASE IN CRITICAL CARE UNIT OF TERTIARY CARE HOSPITAL
IN MANGALORE**

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Abstract

COPD is predominantly a chronic disease but a large number of patients often suffer from acute worsening of respiratory symptoms and lung functions called an acute exacerbation of COPD. Acute exacerbation of COPD has a profound effect on quality of the life and is one of the highly significant causes of death worldwide. In the case of milder diseases, patients can be managed on an outpatient basis, while a patient with severe exacerbations might need ICU care and non-invasive or invasive ventilator support. A clinical prediction tool, which can be easily used on first exposure of the patient to healthcare, can be extremely helpful in prognosticating the disease,

analyzing the severity of illness, and deciding the level of healthcare required for early recovery of the patient, Hence reducing the morbidity and mortality due to acute exacerbations of COPD. This study is aimed at the analysis of DECAF (Dyspnoea, Eosinopenia, Consolidation, Acidaemia and atrial Fibrillation) score in the prediction of hospital mortality in patients of AECOPD in the Indian healthcare setting. The study was conducted in the critical care unit of A.j institute of medical sciences Mangalore from 2018-2019 May. During the correlation of the DECAF score with the in-hospital mortality, It was seen that all patients with scores of 0,1 or 2

at admission were discharged. Out of all the Patients with a score of 3, 8.3% succumbed to the illness while the rest of 91.7% were discharged in a stable state. Out of all the patients with a score of 4, 37.5% died while 62.5% were discharged. However, in patients with a score of 5, as high as 50% succumbed to the current episode of exacerbation. In patients with the highest DECAF score i.e. 6, a huge proportion of patients i.e 75% died while 25% survived. This study concluded that the DECAF score is a simple, robust, accurate, easy to use, and affordable tool to predict prognosis by estimation of in-hospital mortality in patients of AECOPD.

Keywords:DECAF,dyspnea, eosinopenia, Acedimia, COPD

Introduction:

Chronic obstructive pulmonary disease (COPD) is an often encountered disease in the general population that forms a significant part of patients presenting to outpatient departments and emergency rooms. It is expected to become the 3rd highest significant cause of death by 2020 ^[1]. It manifests as persistent respiratory symptoms and chronic airflow limitation due to airway or alveolar pathology secondary to chronic exposure to noxious particulate matter and

gases. COPD consists of small airway disease and parenchyma destruction in the varying proportion of extent and significance, which leads to airflow limitation and mucociliary destruction.^[2]

COPD is predominantly a chronic disease but a large number of patients often suffer from acute worsening of respiratory symptoms and lung functions called an acute exacerbation of COPD. Acute exacerbation of COPD has a profound effect on quality of the life and is one of the highly significant causes of death worldwide ^{[3][4]}. The exacerbation can be of varied intensity, mild to severe, and the management depends on the severity of illness.

Despite the high burden of the disease, the availability of data about the prognosis of exacerbation of COPD is limited. Various studies have been conducted to find a reliable tool to prognosticate the stable COPD and scores like BODE score^[5] are commonly used. However, Researches in the field of prognostic indicators in exacerbations are limited, and there is a limited similarity between predictors of mortality in exacerbations as compared to stable disease^[6].

In a developing country like India, healthcare resources are limited so it is important to analyze the severity of the disease clinically for optimization of clinical management, judicious allocation of resources, planning of palliative care and reducing readmission rates. In the case of milder diseases, the patient can be managed on an out-patient basis, while a patient with severe exacerbations might need ICU care and non-invasive or invasive ventilatory support. A clinical prediction tool, which can be easily used on first exposure of the patient to healthcare, can be extremely helpful in prognosticating the disease, analyzing the severity of illness and deciding the level of healthcare required for early recovery of the patient, Hence reducing the morbidity and mortality due to acute exacerbations of COPD [6].

This study is aimed at the analysis of DECAF (Dyspnoea, Eosinopenia, Consolidation, Acidaemia, and atrial Fibrillation) score in the prediction of hospital mortality in patients of AECOPD in Indian healthcare settings [7].

Materials and Methods

The study was conducted on 95 patients who were admitted to critical care unit of A.j institute of medical sciences Mangalore from 2018-2019 May. The

institutional ethics committee has approved the study. Informed consent was taken from each participant.

Inclusion criteria

- A clinical diagnosis of AECOPD
- Known case of COPD, (or) clinical diagnosis of chronic bronchitis- "Presence of a chronic productive cough for 3 months during each of 2 consecutive years (other causes of cough being excluded)".
- First exposure to health care or no parenteral antibiotic therapy of more than 24hrs.

Exclusion criteria

- Primary reason for admission other than acute exacerbation of COPD
- Patients on Domiciliary ventilation.
- Asymptomatic after antibiotics.
- Chronic renal or hepatic dysfunction or pulmonary tuberculosis or malignancy.

RESULTS

Gender

A total of 95 patients participated in the study, Out of which 58 were males and 37 were females (Figure-1).

Age

95 patients enrolled in the study, the majority were in the age group of 60-69 years (37%), 28% patients in the age group of 70-79 years, 18% in 50-59 years group, 12% in 80-89 group, 3% in 90-99 group and 2% in 40-49 group. A large number of

patients (65%) were in the age group of 60-79 years (Figure-2).

In-hospital mortality

Out Of 95 patients, 10 died during the current episode of acute exacerbation while the rest of 85 were discharged (Figure-3).

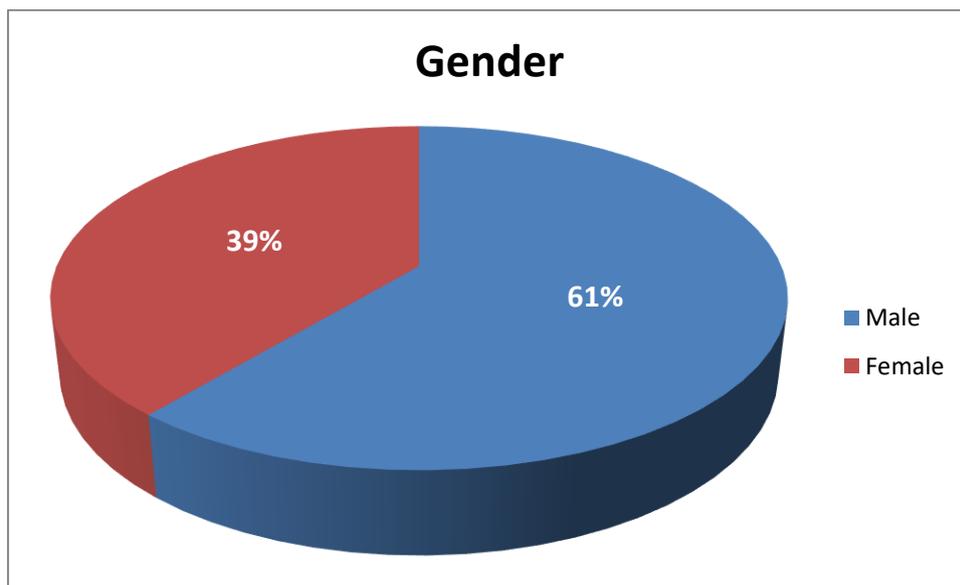


Figure-1: Gender distribution

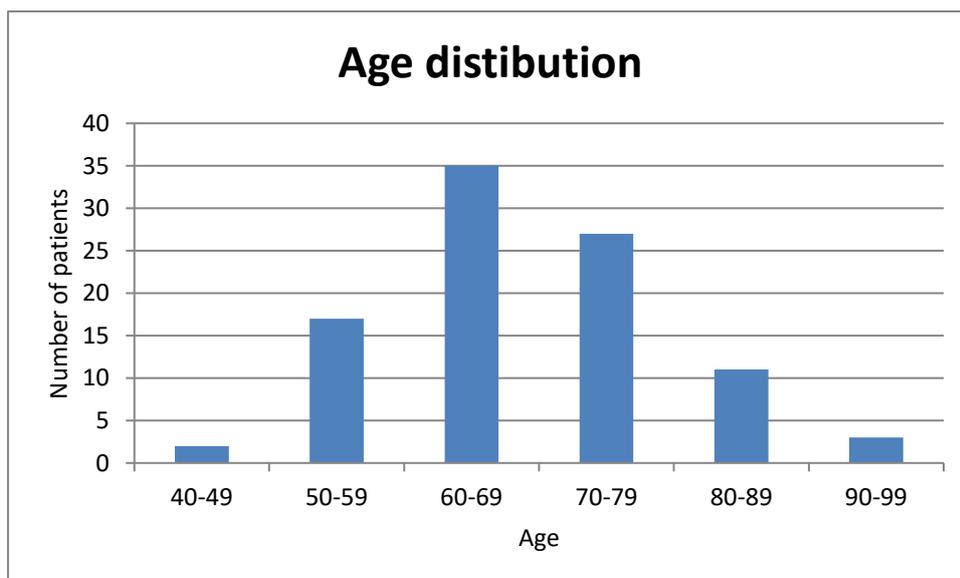


Figure-2: Age characteristics of the study population

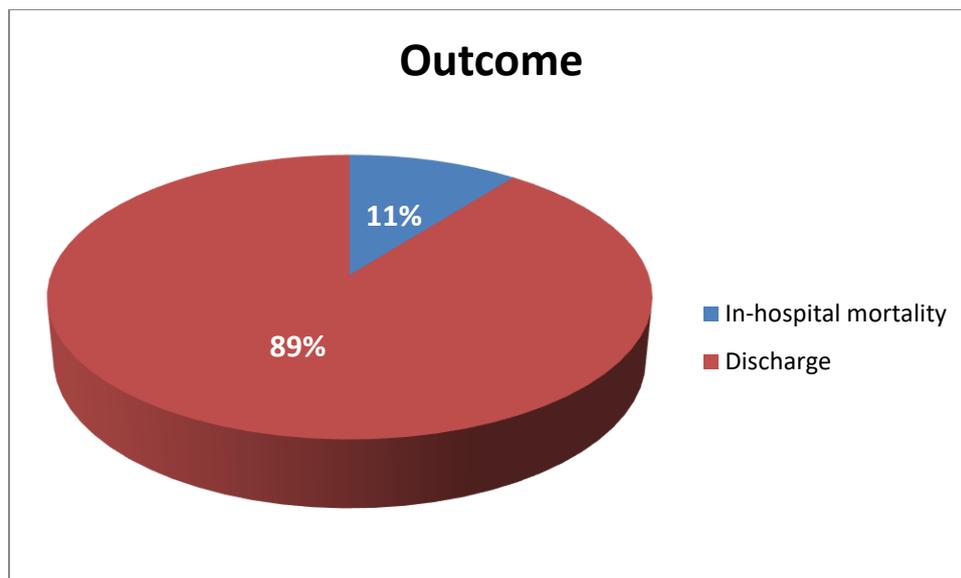


Figure-3: Proportion of in-hospital mortality amongst the study population

Dyspnea

In the study population of 95, “59” patients had a dyspnea score of “0”, while 30 had a score of “1” and 6 had a score of “2”. During independent correlation of dyspnea with in-hospital mortality, It was seen that 20% of the patients with a dyspnea score of 1 died during this episode of exacerbation while the rest of 80% were discharged. With a dyspnea score of 2, 66.7% of patients died while 33.3 % survived. In contrast to that all the 59 patients with a dyspnea score of “0” survived (Table-1).

Eosinopenia

Out of 95 patients, 37 patients had eosinopenia while the rest of 58 had a raised or elevated eosinophil count. During

the correlation of eosinopenia with inhospital mortality. 1.7% of the patients without eosinopenia died during this episode of exacerbation while the rest of 98.3% survived. In patients with eosinopenia, 24.3% died while 75.7% survived (Table-2).

	SCORE	IN-HOSPITAL MORTALITY (%)	
		YES	NO
Dyspnea	0.0	0.0	100.0
	1.0	20	80.0
	2.0	66.7	33.3

Table-1: Correlation between dyspnea and in-hospital mortality

	Score	In-hospital mortality (%)	
		YES	NO
Eosinopenia	0.0	1.7	98.3
	1.0	24.3	75.7

Table-2: Correlation between eosinopenia and in-hospital mortality

Consolidation

Out of the study population of 95 patients, 46 had no evidence of consolidation on chest x-ray on the admission of which 49 had a consolidation. In Independent correlation of lung consolidation with in-hospital mortality, it is seen that out of all patients without any evidence of consolidation on chest Xray taken at admission, 2.3% died during this episode of exacerbation while the rest of 97.7% survived, in contrast to that, in patients with consolidation, 18.4 % succumbed to the illness while 81.6 % survived(Table-3).

Acidemia

Out of 95 patients of AECOPD studied, 31 had acidemia in admission i.e. a pH of less than 7.3 on arterial blood gas while the rest of 64 had pH of more than 7.3. During correlation of acidemia with in-hospital mortality, It is seen that out of all patients without any evidence of acidemia on arterial blood gas analysis at admission,

1.6% died during this episode of exacerbation while the rest of 98.4% survived. However, in patients with acidemia, in-hospital mortality is higher where 29% died while 71% survived (Table-4).

	Score	In-hospital mortality (%)	
		YES	NO
Consolidation on x-ray	0.0	2.3	97.7
	1.0	18.4	81.6

Table-3: Correlation between lung consolidation on x-ray(at admission) and inhospital mortality

	Score	In hospital mortality (%)	
		YES	NO
ACIDEMIA	0.0	1.6	98.4
	1.0	29.0	71.0

Table-4: Correlation between Acidemia and In-hospital mortality

Atrial Fibrillation

On analysis of Electrocardiogram, A total of 80 patients showed atrial fibrillation. During correlation of atrial fibrillation with in-hospital mortality, It is seen that

out of all patients without any evidence of atrial fibrillation in electrocardiogram at admission, 3.8% died during this episode of exacerbation while the rest of 96.3% were discharged. However, in patients with atrial fibrillation, in-hospital mortality is higher where 46.7 % died while 53.3 % survived and are discharged (Table-5).

	Score	In hospital mortality (%)	
		YES	NO
Atrial fibrillation	0.0	3.8	96.3
	1.0	46.7	53.3

Table-5: Correlation between atrial fibrillation and in-hospital mortality

DECAF score

After a complete initial assessment of the patients, the DECAF score was calculated. Out of a total of 95 patients, 28,23 and 14 patients had a score of 0, 1, and 2 respectively. 12 patients had a score of 3, 8 had a score of 4, 6 patients had a score of 5 and 4 patients had a score of 6.

During the correlation of the DECAF score with the in-hospital mortality, It was seen that all patients with a score of 0,1 or 2 at

admission were discharged. Out of all the Patients with a score of 3, 8.3% succumbed to the illness while the rest of 91.7% were discharged in a stable state. Out of all the patients with a score of 4, 37.5% died while 62.5% were discharged. However, in patients with a score of 5, as high as 50% succumbed to the current episode of exacerbation. In patients with the highest DECAF score i.e. 6, a huge proportion of patients i.e 75% died while 25% survived (Table-6).

	Score	In hospital mortality (%)	
		YES	NO
DECAF SCORE	0.0	0.0	100.0
	1.0	0.0	100.0
	2.0	0.0	100.0
	3.0	8.3	91.7
	4.0	37.5	62.5
	5.0	50.0	50.0
	6.0	75.0	25.0

Table-6: Correlation between DECAF score and in-hospital mortality

Discussion

Males formed the majority of the study population with more than half of them in an age group of 60 to 79 years in the present study. A simple robust prognostic index, DECAF score are analyzed to predict the inhospital mortality in patients admitted with acute exacerbation of COPD. The components of the score were also analyzed individually and they fared well at the prediction of in-hospital mortality.

DECAF score is a simple tool, which uses clinical and laboratory details available routinely at the time of admission in almost all the patients of AECOPD, for accurate prediction of in-hospital mortality. Although in patients with severe disease, palliative care and end-of-life care is also considered in many setups but in our research settings, most of the patients with severe disease requiring aggressive management like non-invasive or invasive ventilation received it. Most of the prognostic parameters predicting a higher incidence of in-hospital mortality have already been proven to be associated with poor outcomes. Almost all co-morbid illnesses further worsen the outcome in patients with AECOPD, AECOPD leads to the decompensation of the stable co-morbid illness leading to worsening of the outcome.

Holland et al in a study^[8] concluded that eosinopenia is associated with poor outcomes in patients with AECOPD. However, it doesn't prove the positive impact of eosinophilia on the outcome of the illness. One of the biggest drawbacks was that in this study, The population recruited was small and the role of confounders was not evaluated thoroughly.

Steer J et al in a study published in 2011^[9] concluded that in patients admitted with AECOPD, the stable state dyspnea as per eMRCD scale is a far better predictor of the outcome as compared to the presenting state of dyspnea. It also concluded that eMRCD scale stable state dyspnea is a better prognostic factor than CURB -65 in patients with pneumonia-complicated COPD.

DECAF score is a better prognostic tool than CURB-65 not only in AECOPD alone but also in AECOPD cases complicated by pneumonia. CURB-65 is significant only in pneumonia cases not associated with COPD. This study shows promising evidence regarding substantial usage of DECAF score in management of AECOPD, especially for risk stratification. ROC analysis proves its significance as a predictor of in-hospital mortality.

The in-hospital mortality and their corresponding DECAF scores help in classifying the patient as low, moderate, and high risk. DECAF score 0-2 being low risk, score 3 being moderate risk, score 4-6 being high risk. In our study approximately 65-70% were at low risk, 10-15% at moderate risk and around 15 - 20 % of patients were at high risk. With a majority of patients being predicted to be at low risk, unnecessary usage of intensive care can be avoided. Moreover, it also helps in the promotion of shorter hospital stays and early discharges hence better utilization of healthcare resources. The accurate prediction of high risk, not only helps in planning aggressive management and early escalation of therapy but also in decision making regarding palliative and end-of-life care. A High DECAF score not only indicates a high risk of death but also a short time to death in patients who die indicating a narrow window for intervention.

Indian population has a high incidence of COPD exacerbations with poor outcomes as compared to the western countries, AECOPD puts a massive strain on the inefficient and limited resource healthcare system of our country. In such a state, utilization of the DECAF score at its optimization can be a boon for optimal utilization of healthcare resources. It not

only reduces the financial burden on the country's healthcare but also on the patient. Moreover, the use of the DECAF score by primary care physicians can help in decision making regarding referring the patients to a higher centre. It has also been concluded that the prognostication scores for community acquired pneumonia and acute exacerbation of COPD differ. It is because of the marked difference between the etiopathogenesis of both diseases. Community acquired pneumonia(CAP) is essentially an infectious disease while more than 50% of the AECOPDs are not associated with infections. In CAP, there is marked infection of parenchyma while AECOPD is predominantly due to obstruction of the airway following inflammation. Hence DECAF score is not applicable for pneumonia. In patients with acute exacerbation of COPD associated with consolidation, it has been proven that the DECAF score is a far better predictor of in-hospital mortality as compared to the CURB-65 score which holds good for community acquired pneumonia.

The strength of the DECAF score includes the easy availability of the analysis of the constituents. It includes clinical examination which can be easily performed by a general practitioner. Since in India, the majority of the population resides in rural and sub-urban areas, the

main patient load is dealt by the primary healthcare physicians. The easy to use, simple and robust indicator like the DECAF score is very helpful in deciding the level of care the patient requires if the patient can be managed at the primary care center or needs to be referred to a higher center. This scoring system includes atrial fibrillation which needs an electrocardiogram on admission and it's easy to interpret. Arterial blood gas analysis is readily available at the majority of healthcare centers these days. A chest x-ray is also routinely available. All the variables are available at the admission and there is no delay due to processing by lab, like in cases of bio-markers, where it takes hours after admission for the reports to be ready thus delaying the prognostication. Hence, The main strength of the DECAF score lies in the ease of availability, calculation, and wide applicability.

The use of biological markers like leucocyte counts, C-reactive protein, etc. can improve the quality of the prognostic score but delays the calculation and application of the score which leads to the loss of the main essence of the prognostic score hence it comprises of only the data readily available on admission.

Limitation

The study was conducted in a small population. The vastness of the nation, rural-urban divide, socio-economic and cultural differences, and varying climate add to the challenges in carrying out a study that can be applied to a large population in India. Hence, a larger population study for validation of DECAF score is expected to be more accurate and hence, more useful.

Conclusion

This study concluded that the DECAF score is a simple, robust, accurate, easy to use, and affordable tool to predict prognosis by estimation of in-hospital mortality in patients of AECOPD. It utilizes the clinical and laboratory data routinely available at the time of admission, making it affordable by not increasing the financial burden on the patients which is highly significant in Indian healthcare settings. It can be easily used even at primary healthcare centers as it involves basic clinical skills. We recommend the use of the DECAF score for stratification of the patients, which helps in planning the management and deciding the level of healthcare, by predicting the in-hospital mortality risk, especially in a resource constrained healthcare settings

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