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Original Research Article

Prediction of outcomes in acute exacerbation of COPD with DECAF score and BAP 65 score in a rural population

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ABSTRACT

Background: Prognostic research in exacerbations of chronic obstructive pulmonary disease (COPD) requiring hospitalization has been limited and there appears to be little common ground between predictors of mortality in stable disease and during AECOPD. Furthermore, none of the prognostic tools developed in stable disease have been tested on hospitalised patients, and most require clinical measurements not routinely available at hospital admission. This study intends to test dyspnoea, eosinopenia, consolidation, acidemia, and atrial fibrillation (DECAF) and biological assessment profile (BAP) 65 Scores on Indian patients in a tertiary care set up and validate the same to be used as a routine and effective score in predicting the outcome in AECOPD.
Methods: Hospital based prospective observational study was carried out in 100 patients with AECOPD who was present to general medicine. DECAF and BAP-65 Scores were calculated. Data was analyzed using SPSS 22 version software.
Results: In our study both DECAF score and BAP-65 score performed equally well for prediction of need for Mechanical Ventilation. The AUROC for need for Mechanical Ventilation was 0.77 (95% CI=0.67–0.84) for DECAF score and 0.77 (95% CI=0.67–0.85) for BAP-65 score. The AUROC for prediction of mortality for DECAF score was 0.83 (95% confidence interval [CI]=0.74–0.89) and for BAP-65 score was 0.79 (95% CI=0.69–0.86).
Conclusions: DECAF and BAP-65 are good and also equal in predicting mortality as well as need for mechanical ventilation. Both scores can be easily applicable in AECOPD patients, so that death during hospitalization for AECOPD and need for mechanical ventilation can be minimized.

Keywords: Predictors of mortality, COPD exacerbation, DECAF score, BAP 65 score, Mechanical ventilation

INTRODUCTION

India is experiencing a continued increase in burden of chronic obstructive pulmonary disease (COPD). With an estimated prevalence of>57 000 000 people suffering from obstructive airway diseases (OADs), at the end of 2016.[1] It will become the third most common cause of death and the fourth cause of disability in the world by the year 2020.[2]

Despite exacerbations of chronic obstructive pulmonary disease (COPD) being both common and often fatal, accurate prognostication of patients hospitalized with an exacerbation is difficult.[3] For exacerbations complicated by consolidation, the CURB-65 (confusion, urea, respiratory rate, blood pressure, age>65) community acquired pneumonia prognostic score is often used to risk assess and guide antibiotic therapy but the CURB-65 as a prognostic tool was found to be suboptimal.[3] Prognostic indices have been thoroughly investigated and tools

predicting mortality risk, such as the BODE score, are also well established. Prognostic research in exacerbations requiring hospitalization has been limited and there appears to be little common ground between predictors of mortality in stable disease and during AECOPD.[4,5] Furthermore, none of the prognostic tools developed in stable disease have been tested on hospitalised patients, and most require clinical measurements not routinely available at hospital admission.[6-8] Of the prognostic tools proposed for use in AECOPD requiring hospital admission, most were derived in highly selected, rather than unselected, patients.[9,10] In the field of AECOPD outside ICUs, it has never been demonstrated that using such a score has an effect on the appropriateness of medical decisions.[11] There are not enough studies available in Indian literature, hence we need to assess the usefulness DECAF score in predicting outcome in Indian subcontinent. This study intents to test a proposed score- dyspnea, eosinopenia, consolidation, acidemia and atrial fibrillation (DECAF) Score on Indian patients in a tertiary care set up and validate the same to be used as a routine and effective score in predicting the outcome in acute exacerbations of COPD.

Objectives

Objectivs were to determine The Hospital outcomes in acute exacerbation of COPD using DECAF score and Comparison of DECAF score with BAP 65 in predicting hospital outcomes.

METHODS

Study setting

A study was conducted in the Department of General Medicine at Sri Devaraj Urs medical college, Kolar, Karnataka.

Design of study

Hospital based prospective observational study

Sample size estimation

Sample size for this study is estimated based on AUC for DECAF score in a study by John S et al, with 95% confidence with margin of error as 7% with AUC 0.85%, the estimated sample size for the cross-sectional study is 77 AECOPD cases. Finally, we have taken 100 subjects.

Method of collecting data

In this study, the patients with acute exacerbation of COPD who was present to general medicine at R.L Jallapa hospital attached to SRI DEVARAJ URS MEDICAL COLLAGE, Tamaka, Kolar, between APRIL 2019 and May 2020. The patients who meet the inclusion and exclusion criteria was taken and subjected to PFT and the DECAF and BAP-65 scores are applied. The findings were then studied and analysed.

Inclusion criteria

Inclusion criteria were primary diagnosis of COPD.

Exclusion criteria

Patients diagnosed with conditions like, bronchiectasis, bronchial asthma, malignancy, tuberculosis, congestive cardiac failure, coronary artery disease, pregnant and lactating women, patients with allergies including allergic reaction to medications or food.

Patients diagnosed with atopic dermatitis, allergic rhinitis, crohns disease, ulcerative colitis, and vasculitis.

Statistical analysis

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test or Fischer's exact test (for 2×2 tables only) was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. Independent t test was used as test of significance to identify the mean difference between two quantitative variables. A receiver operating characteristic (ROC) analysis was calculated to determine optimal cut off value for total DECAF score and total BAP-65 score. The area under the curve, the sensitivity, and the specificity were also calculated to analyze the diagnostic value of total DECAF score and total BAP-65 score.

P value (probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests. Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

RESULTS

In our study 100 subjects were included. Out of which 97 were male and only 3 were female.

Out of 100 subjects 92 subjects were survived to discharge and 8 subjects were dead. 89 subjects didn't require mechanical ventilation and 11 subjects required mechanical ventilation.

Mean age among survived was 67+8 years and Mean age among died was 75+8 years. There was statistically significant difference found between outcome and age. There was no statistically significant difference found between outcome and gender. Mean Duration of COPD among survived was 3+2 years and Mean Duration of COPD among died was 5+2 years, there was no statistically significant difference found between outcome

and Duration of COPD. Mean smoking in pack years among survived was 48+26 pack years and mean smoking in pack years among died was 60+37 pack years, there was no statistically significant difference found between outcome and Smoking in pack years. Mean Duration of ICU stay among survived was 2.25+ 2.19 days and mean duration of ICU stay among died was 6.88+3.52 days, there was a statistically significant difference found between outcome and duration of ICU stay. There was no statistically significant difference found between outcome and duration of hospital stay (Table 1).

From the Table 2 we can summaries that there was statistically significant difference found between survived and died with respect to JVP, PAH, per abdomen and CNS finding.

There was no statistically significant difference found between survived and died with respect to pulse rate, respiratory rate, Spo2, ABG, gold staging, emphysema, secondary infection, corpumonale.

Table 1: Comparison of socio demographic profile between survived and died.

	Survived	Died	P value
AGE in years	67±8	75±8	0.019
Gender (M/F)	90/2	7/1	0.223
Duration of COPD (in years)	3±2	5±2	0.197
Smoking in Pack years	48±26	60±37	0.268
Duration of ICU in days stay	2.25±2.19	6.88±3.52	<0.001
Duration of hospital stay	7.09±2.5	6.88±3.52	0.829

Table 2: Comparison of clinical profile between survived and died.

		Survived	Died	P value
Pulse rate		107±25	86±32	0.111
Respiratory rate		25±5	26±11	0.500
SPO2		87±11	81±14	0.124
JVP	Normal	75	3	0.012
	Raised	17	5	
Emphysema	No	15	1	0.916
	Yes	77	7	
Secondary infection	No	55	2	0.072
	Yes	37	6	
PAH	No	45	0	0.001
	Yes	47	8	
Corpumonale	No	74	3	0.015
	Yes	18	5	
Per Abdomen	Distended	2	0	0.004
	Hepatomegaly	7	5	
	Normal	83	3	
CNS	Drowsy	0	4	<0.001
	Drowsy, flaps	0	2	
	Flaps	7	0	
	Normal	84	1	
	Unconscious	1	1	
ABG	Normal	34	0	0.052
	Respiratory alkalosis	3	0	
	Type 1 respiratory failure	10	0	
	Type 2 respiratory failure	45	8	
GOLDS STAGE	1	12	1	0.130
	2	63	3	
	3	15	4	
	4	2	0	

From the table 3 we can summaries that there was statistically significant difference found between survived and died with respect to Blood urea, PH and PCO2. There was no statistically significant difference found between survived and died with respect to total count, absolute eosinophil count, sodium, potassium, chloride, serum

creatinine, serum albumin, FEV1/FVC, FEVI% predicted. When we compared components of DECAF score according to mortality there was statistically significant difference found between survivors and non survivors with respect to Acidemia and dyspnoea score≥1. eosinopenia, consolidation and atrial fibrillation was not significantly associated with mortality (Table 4).

Table 3: Comparison of investigation between survived and died.

	Survived		Died		P value
	Mean	SD	Mean	SD	
Total count	9379	3724	13570	7196	0.145
Absolute eosinophil count	123	270	68	69	0.150
Sodium	135	6	135	8	0.970
Potassium	6.8587	14.161	4.5375	1.1250	0.132
Chloride	88.9315	14.312	92.00	9.5019	0.423
Serum creatinine	1.03	0.43	1.20	0.40	0.306
Serum albumin	3.5424	.5441	3.3125	.7396	0.286
Blood urea	36	17	61	27	<0.001
PH	7.3636	.1078	7.1995	.0493	<0.001
PCO2	51.7630	15.700	74.112	9.3663	<0.001
FEV1/FVC	1.0577	5.0543	.5775	.0780	0.790
FEVI % predicted	69	14	60	19	0.253

Table 4: Comparison of components of DECAF score according to outcome components of DECAF score and BAP score.

	Survived	Died	P value
According to outcome components of DECAF score			
Dyspnoea score ≥1	24	6	0.010
Eosinopenia <50 (score)	61	5	0.828
Consolidation	33	4	0.463
Acidemia PH<7.3	30	8	<0.001
Atrial fibrillation	3	1	0.287
According to outcome components of BAP-65 score			
BUN >25 mg/dl	14	4	0.033
Altered mental status	2	7	<0.001
Pulse >109 BPM	39	1	0.140
Age >65 years	47	6	0.276

Table 5: Comparison of DECAF score and BAP 65 score in predicting mortality and predicting need for mechanical ventilation.

	Predicting Mortality		Predicting need for mechanical ventilation	
	DECAF Score	BAP 65 Score	DECAF Score	BAP 65 Score
AUC (95% CI)	0.83(0.74-0.89)	0.79(0.69-0.86)	0.77(0.67-0.84)	0.77(0.67-0.85)
Cut off	>3	>3	>2	>2
Sensitivity (%)	62.5	50	63.64	90.91
Specificity (%)	95.65	94.57	77.53	48.31
PPV (%)	55.6	44.4	25.9	17.9
NPV (%)	96.7	95.6	94.5	97.7
P value	<0.001	0.003	<0.001	<0.001

When we compared components of BAP-65 score according to mortality there was statistically significant difference found between survivors and non survivors with respect to BUN>25mg/dl and altered mental status. pulse>109 bpm and age>65years was not significantly associated with mortality (Table 4).

The AUROC for prediction of mortality for DECAF score was 0.83 (95% confidence interval [CI]=0.74–0.89) and for BAP-65 score was 0.79 (95% CI=0.69–0.86). In our study both DECAF score and BAP-65 score performed equally well for prediction of need for mechanical ventilation. The AUROC for need for

mechanical ventilation was 0.77 (95% CI=0.67–0.84) for DECAF score and 0.77 (95% CI=0.67–0.85) for BAP-65 score (Table 5).

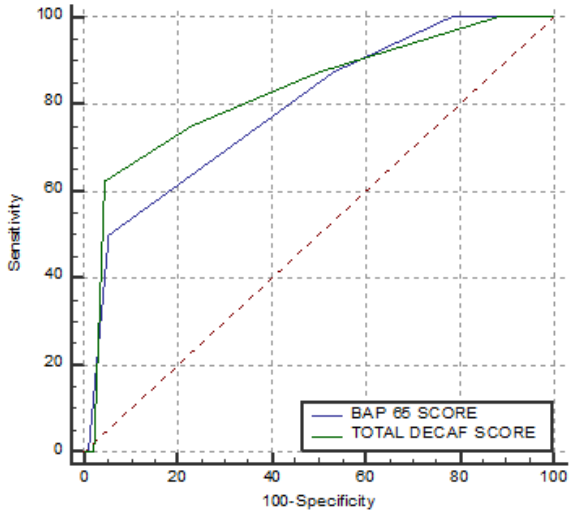

Figure 1: Receiver operator characteristic curve for mortality.

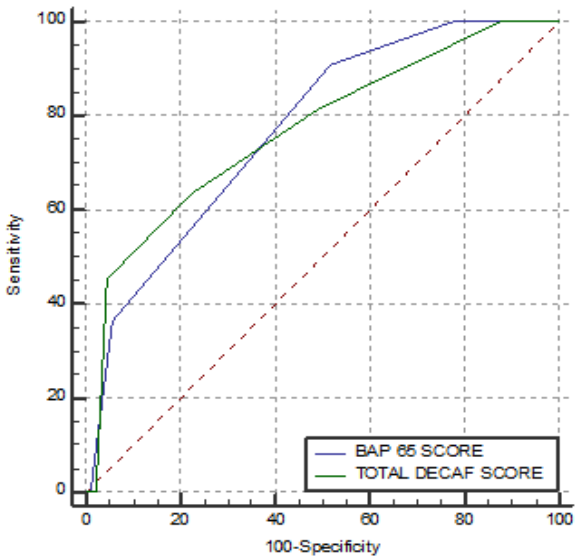

Figure 2: Receiver operator characteristic curve for need for mechanical ventilation.

DISCUSSION

Despite improvements in care, death during hospitalization for AECOPD is a challenging issue AECOPD being both common and often fatal, accurate prognostication of patients hospitalized with an exacerbation is important and difficult.

Several tools have been proposed for prediction of mortality in AECOPD such as CURB-65, BAP-65 score, and DECAF score.[12-14] The use of CURB-65 score for assessment and guidance of therapy in patients hospitalized with AECOPD complicated with consolidation has been shown to be suboptimal.[14] DECAF score has been added very recently to the tools but lacks external validation. According to study by Steer et al DECAF score is a stronger prognostic score than CURB-65, APACHE, or COPD and asthma physiological score predictive tools. We evaluated the use of DECAF score for prediction of mortality in patients admitted to our ICU with AECOPD and also compared DECAF score with already existing BAP-65 score.[14]

In our study mortality among subjects was 8% which can be comparable with the study by Steer et al.[14] mortality among patients with AECOPD was 10.4%. In the study by Shorr et al mortality among patients with AECOPD was 4%, respectively.[12]

Mean age in patients who died is high 75+8years compare to 67+8 years who discharged which was statistically significant which was comparable to study Nafae et al which implies older age has high mortality.[15]

In our study when we compared components of DECAF score according to mortality there was statistically significant difference found between survivors and non survivors with respect to Acidemia and dyspnoea score ≥1. Eosinopenia, consolidation and atrial fibrillation was not significantly associated with mortality.

In a study done by Sangwan et al when individual components of DECAF score were compared between survivors and died patients, statistically significant difference was found in eMRCD Va, eosinopenia <0.05×109/l, consolidation and AF. Comparison of eMRCD Vb and academia pH<7.3 was not found to be significant.[16]

In our study When we compared components of BAP-65 score according to mortality there was statistically significant difference found between survivors and non survivors with respect to BUN>25mg/dl and Altered mental status. Pulse>109bpm and age>65years was not significantly associated with mortality

In a study done by Sangwan et al when individual components of BAP-65 score were compared between survivors and died patients, statistically significant difference was found in BUN>25, pulse>109 bpm and age >65 years.[16] Comparison of altered mental status was not found to be significant.

In our study The AUROC for prediction of mortality for DECAF score was 0.83 (95% confidence interval [CI]=0.74–0.89). similar to the study done by Steer et al.[14] The area under ROC curve for predicting in-hospital mortality was 0.86 (95% CI: 0.82-0.89), indicating good validity.

In our study AUROC for prediction of mortality for BAP-65 score was 0.79(95% CI=0.69–0.86) similar to

the in the study by Shorr et al for prediction of mortality the area under the ROC curve for BAP-65 score was 0.77 (95% CI: 0.76–0.78).[12]

In our study AUROC for need for Mechanical Ventilation was 0.77 (95% CI=0.67–0.84) for DECAF score and 0.77 (95% CI=0.67–0.85) for BAP-65 score.

In the study by Shorr et al for prediction of need for IMV, the area under the ROC curve for BAP-65 score was 0.78 (95% CI: 0.78–0.79).[12]

CONCLUSION

We conclude that both the scores that is DECAF and BAP -65 are good and also equal in predicting mortality as well as need for mechanical ventilation. Both scores can be easily applicable in AECOPD patients so that death during hospitalization for AECOPD and need for mechanical ventilation can be minimized.

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