Section: Pulmonology

Original Research Article

CORRELATION OF BLOOD BIOMARKERS WITH FACED SCORE IN PREDICTING OUTCOMES IN BRONCHIECTASIS

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ABSTRACT

Background: Bronchiectasis is a chronic respiratory disease characterized by irreversible dilation of bronchi. This leads to repeated infections and inflammation and progressive lung damage. Accurate disease severity assessment is necessary for prognostication and determining management approaches. FACED is a tool that predicts clinical results. **Aim:** To evaluate the correlation between blood biomarkers and FACED score in predicting disease severity and outcomes in bronchiectasis.

Materials and Methods: A prospective observational study was conducted on 60 patients diagnosed with bronchiectasis. Clinical, radiological, and laboratory parameters were recorded. FACED score was calculated, and its correlation with biomarkers such as serum albumin, bilirubin, CRP, NLR, and PLR was analyzed.

Results: There was a significant inverse relationship between serum albumin and the FACED score. There was also a weaker but significant inverse correlation with bilirubin r = -0.25, p = 0.05. The average score for the FACED was 1.9 ± 1.6. C-reactive protein, NLR and PL.

Conclusion: Serum albumin is an independent predictor of disease severity in bronchiectasis. Integrating biomarkers into the FACED score may improve risk stratification and help with early clinical decisions.

Keywords: Forced Expiratory Volume, Chronic colonization by Pseudomonas aeruginosa, Dyspnea, neutrophil-lymphocyte ratio

INTRODUCTION

The bronchi become damaged, and this damage leads to the symptoms of bronchiectasis. This illness is characterized by repeated infection and inflammation that causes bulging of the bronchi. As a result, the walls of the airway become damaged.[1]

According to the "vicious cycle" model (Cole 1986), infection triggers inflammation, and inflammation damages airway structure which leads to further susceptibility to infection and inflammation.[2]

Often regarded as one entity, bronchiectasis encompasses multiple entities with different pathogeneses. FACED scoring is a prognostic score that combines pulmonary function, age, microbiological status, radiological extent and dyspnoea. Nonetheless, it largely relies on imaging and clinical factors.[3]

Systemic biomarkers that indicate the level of inflammation and nutritional status have attracted interest recently. Serum albumin, bilirubin, CRP(neutrophil-lymphocyte ratio), NLR, PLR and other biomarkers may provide additional information. Combining them with clinical scores is the other option. There is an improved stratification of the risk by means of this method.[4-8]

Aim and Objectives

Aim

To assess the correlation between blood biomarkers and FACED score in predicting outcomes in bronchiectasis.

Objectives

- To evaluate the prognostic significance of serum albumin, total bilirubin, CRP, NLR, and PLR
- To determine whether these biomarkers independently predict disease severity

MATERIALS AND METHODS

Study Design and Setting

The study was done on prospective observational in Bhaskar Medical College and General Hospital.

Study Population

A total of 60 patients diagnosed with bronchiectasis were included.

Inclusion Criteria

- Diagnosis confirmed by HRCT chest
- Compatible clinical features

Exclusion Criteria

- Incomplete imaging or missing pulmonary function tests
- Traction bronchiectasis due to other lung diseases
- Non-tuberculous mycobacterial infection
- Active malignancy

Data Collection

Demographic and clinical data collected included:

- Age, sex, BMI
- FEV1 and pulmonary function parameters
- Dyspnea (MMRC scale)
- Number of affected lobes (HRCT)
- Pseudomonas colonization
- Hospital admissions and exacerbations

Laboratory parameters included:

- Serum albumin and bilirubin
- CRP, hemoglobin, hematocrit
- Total leukocyte count
- NLR and PLR
- Platelet count and uric acid
- FACED score was calculated using standard criteria.

RESULTS

Table 1: Baseline Characteristics

Parameter	Value
Age (years)	62.5 ± 10.1
Female, n (%)	33 (55%)
FEV1 (L)	1.78 ± 0.68
FEV1 (% predicted)	67.8 ± 23.0
Never smokers, n (%)	43 (72%)
Hospital admissions, n (%)	40 (66.7%)
Exacerbations, n (%)	44 (73%)
Pseudomonas colonisation, n (%)	13 (22%)

The mean age of participants was 62.5 ± 10.1 years, with females constituting 55% of the cohort. A majority were non-smokers (72%). Hospital admissions and exacerbations were noted in 66.7% and 73% of patients respectively.

Table 2: Disease Severity (FACED Score)

Disease Severity	FACED Score	Number of Patients
Mild	0–2	40
Moderate	3–4	15
Severe	5–7	5

Disease Severity

- Mild: 40 patients
- Moderate: 15 patients
- Severe: 5 patients
- Mean FACED score: 1.9 ± 1.6

Table 3: Laboratory Parameters

Parameter	Mean ± SD
Serum Albumin (g/dL)	2.75 ± 0.38
Total Bilirubin (mg/dL)	1.3 ± 0.37
Hemoglobin (g/dL)	13.5 ± 1.6
C-reactive Protein (mg/dL)	0.53 ± 0.83
Uric Acid (mg/dL)	5.2 ± 1.4
PLR	110.0 ± 17.8
WBC (×10³/µL)	7.0 ± 2.0
NLR	2.6 ± 1.3
Platelet Count (×10³/µL)	270 ± 77
Hematocrit (%)	39.7 ± 4.6

Other biochemical parameters were moderately variable while, serum albumin level was low (2.75 ± 0.38 g/dl).

Table 4: Correlation with FACED Score

Biomarker	r-value	p-value	Interpretation
Serum Albumin	-0.37	0.02	Significant inverse
Total Bilirubin	-0.25	0.05	Weak inverse
CRP	0.10	0.45	Not significant
NLR	-	>0.05	Not significant
PLR	-	>0.05	Not significant

Correlation Analysis

- **Serum albumin:** Significant inverse correlation (r = -0.37, p = 0.02)
- **Total bilirubin:** Weak inverse correlation (r = -0.25, p = 0.05)
- **CRP, NLR, PLR:** No significant correlation

Table 5: Biomarkers vs Disease Severity

Disease Severity	No. of Patients	Serum Albumin	Total Bilirubin
Mild	40	2.6 ± 0.38	1.3 ± 0.07
Moderate	15	2.0 ± 0.29	1.5 ± 0.05
Severe	5	1.8 ± 0.23	1.6 ± 0.02

Severity-wise Distribution

Lower albumin levels were consistent with greater disease severity.:

- Mild: 2.6 g/dl
- Moderate: 2.0 g/dl
- Severe: 1.8 g/dl

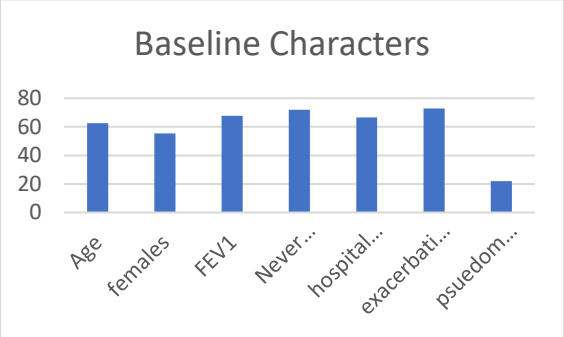

Figure 1

The diagram shows the baseline characteristics of the study population. Most patients were older adults (~62 years)with a slight female predominance (55%) and were predominantly non-smokers (72%). Lung function (FEV_1 ~68%) suggests moderate impairment. A high proportion had exacerbations (~73%) and hospital admissions (~67%), indicating significant disease burden. Around 20% had Pseudomonas colonization, identifying a subgroup with potentially worse prognosis. Overall, the cohort represents clinically significant bronchiectasis cases.

DISCUSSION

In order to improve the prognostic stratification in patients with bronchiectasis, the correlation of selected blood biomarkers with the FACED score was evaluated. Findings of the study suggested a significant negative correlation of serum albumin with disease severity, whereas bilirubin showed only a weak correlation. Other inflammatory biomarkers such as CRP, NLR, and PLR were not significantly related.

The baseline characteristics of the study population (mean age 62.5 ± 10.1 years, female predominance, and majority non-smokers) reflect a clinically relevant bronchiectasis cohort with frequent exacerbations and hospitalizations. Similar demographic patterns have been described by James D. Chalmers and Eva Polverino,[9,10] who reported that bronchiectasis predominantly affects older adults and is associated with recurrent exacerbations contributing to morbidity.

According to the FACED score distribution, most patients in the present study were classified as mild, followed by moderate and severe categories. This is consistent with the original validation study by Miguel Ángel Martínez-García,[2] where a similar predominance of mild cases was observed, highlighting the heterogeneous nature of bronchiectasis. This reinforces the need for sensitive prognostic tools to identify high-risk patients early.

The mean FACED score in our cohort (1.9 ± 1.6) is comparable to previously reported cohorts. The FACED score has been extensively validated as a predictor of mortality and disease progression. However, as emphasized by European Respiratory Society guidelines and studies such as the COPD Gene study, there is increasing recognition that clinical scoring systems should be complemented by systemic biomarkers to improve prognostic accuracy.[10]

A key finding of this study is the statistically significant negative correlation between serum albumin and FACED score (r = –0.37; p = 0.02), with albumin levels decreasing as disease severity increased. This observation aligns with the known pathophysiology of bronchiectasis as a chronic inflammatory condition. James D. Chalmers,[11] has also highlighted the role of systemic inflammation in bronchiectasis severity and outcomes.

Although direct studies linking albumin with FACED score are limited, previous work by Michael I. Polkey,[12] and others in COPD populations has demonstrated that hypoalbuminemia is associated with poor nutritional status, systemic inflammation, and worse clinical outcomes. Thus, serum albumin

may serve as a composite marker reflecting both inflammation and malnutrition.

Total bilirubin showed a borderline inverse correlation with FACED score. The potential protective role of bilirubin due to its antioxidant properties has been discussed in studies by Victor M. Victor,[13] suggesting that lower bilirubin levels may be associated with increased oxidative stress and worse outcomes in chronic diseases. Although bronchiectasis-specific data are limited, this biological plausibility warrants further investigation.

Interestingly, inflammatory markers such as CRP, NLR, and PLR did not show significant correlations with disease severity in this study. This contrasts with findings from studies such as those by Mehmet Ceylan,[14] where NLR was associated with disease severity and exacerbations in chronic respiratory diseases. The discrepancy may be attributed to the relatively small sample size or variability in acute inflammatory states at the time of measurement.

The findings of this study support the concept proposed by Eva Polverino, emphasizing the need for multidimensional assessment in bronchiectasis. While scoring systems like FACED and BSI are clinically useful, incorporating simple, cost-effective biomarkers may enhance risk stratification, especially in resource-limited settings. The observed progressive decline in serum albumin from mild to severe disease further strengthens its role as a marker of disease progression. Given its affordability and availability, routine assessment of serum albumin could be recommended at both primary and tertiary care levels.

Clinically, patients with low serum albumin levels are more likely to have severe disease, frequent exacerbations, and poorer outcomes. Early identification of such patients allows for timely nutritional intervention and closer clinical monitoring. Integrating biomarkers with FACED score may improve individualized patient management. However, this study has limitations, including a small sample size and reliance on baseline biomarker measurements, which may not reflect longitudinal disease status. Larger, multicentric studies are needed for external validation and to further explore the role of biomarkers in bronchiectasis prognosis.

CONCLUSION

Albumin has been recognized as a marker of disease severity in chronic respiratory conditions such as Chronic Obstructive Pulmonary Disease and Cystic Fibrosis. In bronchiectasis, it may serve as a reliable and independent indicator of disease severity, particularly when integrated into existing prognostic tools. Routine assessment of serum albumin could enable early identification of high-risk patients, facilitating timely interventions and more effective clinical management.

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