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Original Research Article

RELATIONSHIP BETWEEN EFACED SCORE AND BRONCHIECTASIS SEVERITY INDEX IN BRONCHIECTASIS ASSESSMENT

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ABSTRACT

Background: Two different validated scores are currently used to assess the severity of bronchiectasis the EFACED score and the Bronchiectasis Severity Index (BSI). The objective is to evaluate the relationship between EFACED score and BSI in assessing bronchiectasis severity and to compare the EFACED and BSI in the evaluation of bronchiectasis severity.

Materials and Methods: A prospective study was conducted among 50 Bronchiectasis patients who visited and admitted at Respiratory Medicine Department, Government General Hospital. The relationship between EFACED and BSI severity categories was analysed statistically using Fisher's exact test. A p-value of <0.05 was considered statistically significant. Data was analysed using SPSS Version 26.

Results: Mean BSI and EFACED scores were 6.48±4.53 and 2.60±2.35, respectively. According to BSI classification, 44% of patients had low severity, 38% intermediate severity, and 18% high severity disease. Based on EFACED scoring 70% had mild bronchiectasis, 24% moderate bronchiectasis, and 6% severe bronchiectasis. A statistically significant association p<0.001 was observed between EFACED and BSI severity categories. All patients with low BSI had mild EFACED severity, whereas higher BSI categories showed greater proportions of moderate and severe EFACED classifications.

Conclusion: A significant association exists between EFACED and BSI scoring systems in assessing bronchiectasis severity. BSI tends to classify patients into higher severity categories due to inclusion of additional clinical parameters. Therefore BSI provide more comprehensive assessment of disease burden, while EFACED remains a simpler and practical tool for routine clinical evaluation.

Keywords: Bronchiectasis Severity Index, EFACED Score, Bronchiectasis, Pulmonary Function Tests.

INTRODUCTION

Bronchiectasis is a chronic suppurative respiratory condition characterised by irreversible dilatation of the bronchi, resulting from recurrent airway inflammation and infection.[1] The aetiology of bronchiectasis is diverse, with contributory causes encompassing prior pulmonary infections such as tuberculosis, immune deficiency states, systemic inflammatory conditions, and, in a notable proportion of patients, no identifiable underlying cause at all.[2,3] Regardless of aetiology, the shared hallmark of persistent airway colonisation by pathogenic microorganisms perpetuates the destructive inflammatory cycle, progressively impairing lung function and reducing exercise tolerance, health-related quality of life, and survival.[4]

The clinical course is heterogeneous, ranging from mild, stable disease to progressive respiratory failure requiring intensive care, with studies demonstrating poor survival outcomes in patients with bronchiectasis-related respiratory failure admitted to the intensive care unit.[5] Beyond its pulmonary manifestations, the systemic impact of bronchiectasis is considerable, with evidence of right and left ventricular dysfunction and elevated pulmonary artery pressures in affected patients, underscoring the cardiovascular burden of this condition.[6]

The advent of high-resolution computed tomography (HRCT) has revolutionised the diagnosis of bronchiectasis, revealing that its prevalence is higher than previously estimated.[7] Increasing awareness and improved diagnostic capabilities now emphasize the need for validated tools to assess disease severity and predict outcomes effectively.

To address this need, multidimensional scoring systems such as the Bronchiectasis Severity Index (BSI) and the FACED score have been developed. The BSI is a composite tool incorporating hospitalisation history, Forced Expiratory volume (FEV1), Pseudomonas aeruginosa colonisation, radiological extent, age, and exacerbation frequency,[8] while the FACED score encompasses FEV_1, age, chronic colonisation, radiological extension, and dyspnoea. The EFACED score is an extended modification of the FACED score that additionally incorporates exacerbations, thereby offering a potentially more comprehensive assessment of disease severity.[9,10] Prior studies have explored the correlation between EFACED and BSI, demonstrating reasonable concordance across severity categories, though discordances exist, particularly in the moderate severity range.[2]

Although both scoring systems are widely used, there is ongoing debate regarding their comparative effectiveness and clinical applicability in different patient populations. Therefore, this study aims to evaluate the relationship between the EFACED score and the BSI in assessing disease severity. Establishing a correlation between these indices may help identify the most practical and reliable tool for routine clinical use, thereby improving risk stratification and guiding management decisions in patients with bronchiectasis.

MATERIALS AND METHODS

We conducted a prospective study among the Bronchiectasis patients who visited and admitted at Respiratory Medicine Department, Government General Hospital, in the period November 2022 – June 2024. The study was conducted after getting approval from the institute's ethical committee. Written informed consent was obtained from each patient before enrolling in the study.

50 Bronchiectasis patients who visited OPD of Respiratory Medicine and admitted, Government General Hospital, Vijayawada, Andhra Pradesh, India. The diagnosis of bronchiectasis was confirmed by computerized tomography (CT) scan of lungs performed previous to study recruitment.

Inclusion criteria:

Radiologically diagnosed patients, Patients of age >12 years, Patients with symptoms and signs suggestive of exacerbation, Patients with ≥1 exacerbation /year.

Exclusion criteria:

Patients with active tuberculosis, HIV, Malignancy, congenital structural malformations, cystic fibrosis, pulmonary interstitial disease with CKD, CAD, pregnant females.

The BSI incorporates 9 variables[8]

1.Age: < 50 years (0 points), 50-69 years (2 points),70-79 years (4 points), > 80 years (6 points)

2. Body mass index (BMI): < 18.5(2 points),> 18.5(0 points).

3.FEV1 % predicted: < 80% (0 points), 50-80% (1 points) 30-49% (2 points) <30% (3 points).

4. Hospital admission in previous year: no(0 points), yes (5 points).

5. Exacerbations in previous year: 0-2(0 points), 3 or more (2 points).

6. MRC dyspnea score: 1-3 (0 points), 4 (2 points), 5 (3 points).

7. Pseudomonas aeruginosa colonization: no (0 points), yes (3 points) Colonization with other microorganisms: no (0 points), yes (1 points).

8. Radiological severity (more than 3 lobes involved or cystic bronchiectasis): no (0 points), yes (1 points).

An overall score is derived as a sum of the scores for each variable and it may range from 0 to 26 points According to the overall score value, the patients with bronchiectasis are classified into 3 BSI classes: patients with low BSI score (overall score 0-4 points), patients with intermediate BSI score (overall score 5-8 points) and patients with high BSI score (overall score 9 or more points)

The EFACED Score: This score assesses severity based on SIX parameters:[10]

1. At least two exacerbations or one hospitalization in the previous year (Yes-2 points, No- 0 point).
2. Predicted Forced expiratory EV1% (FEV1< 50%-2 points, At least 50%- 0 point)
3. Age (<70 years-0 points, At least 70 years- 2 points),
4. Pseudomonas aeruginosa chronic colonisation (yes-1 point, no- 0 point),
5. Radiological extension (1-2 pobes – 0 point .>2 lobes – 1point)
6. Dyspnea (0-II- 0 point, III-IV – 1 point on the Modified Medical Research Council [mMRC] scale.

This score classifies bronchiectasis into three severity classes: mild bronchiectasis (0-3), moderate bronchiectasis (4-6), and severe bronchiectasis (7-9)

Baseline demographic details, clinical history, radiological diagnosis, exacerbation frequency, etiology, and severity scores (BSI and EFACED) were recorded for all participants. Dyspnea was assessed using (mMRC) scale. Pulmonary function

was evaluated by spirometry measuring FEV_1 and FVC, expressed as percentage of predicted values according to European Respiratory Society and American Thoracic Society guidelines. Bacteriological assessment was performed using early morning sputum cultures, with chronic colonization defined by isolation of the same pathogen on at least two occasions within three months. Radiological evaluation assessed the type of bronchial dilatation and number of lobes involved. Patients were followed up for 12 months to monitor exacerbations, dyspnea severity, hospital admissions, and mortality.

Statistical analysis: Data was entered and analysed using Statistical Package for Social Sciences (SPSS) version 26. Continuous variables were summarized as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Comparisons between the two groups were performed using Fisher's exact test for categorical variables. A p-value of ≤0.05 was considered statistically significant.

RESULTS

[Table 1] shows the characteristics of 50 patients with bronchiectasis studied. The mean age of participants was 52.54±14.63 years, with a slight male predominance (52%). Mean BSI and EFACED scores were 6.48±4.53 and 2.60±2.35 respectively.

Table 1: Characteristics of Study Participants

Patients	Cases (n=50) (%)
Age	52.54±14.63
Sex Male Female	 26(52%) 24(48%)
BMI (kg/m2)	26.03±5.61
FEV1	67.18±15.71
Pseudomonas aeruginosa colonization (n(%)	9(18%)
Colonization with other microorganisms n(%)	13(26%)
Number of affected lobes	2.48 ±0.99
Exacerbations in previous year	2.12±0.98
Hospitalisation in the last 2years	0.22±0.41
BSI Score	6.48±4.53
EFACED Score	2.60±2.35

Table 2: Values of BSI score variables.

BSI Variables		Sample(n=50)%
AGE	< 50	19(38%)
	50-69	27(54%)
	70-79	4(8%)
	>80	0
BMI	<18.5	6(12%)
	>18.5	44(88%)
FEV1 % predicted	> 80%	9(18%)
	50%-80%	29(58%)
	30%-49%	12(24%)
	<30%	0
Hospital admission in previous 2 years	No	39(78%)
	Yes	11(22%)
Exacerbations in previous year	NO	23(46%)
	YES[>3]	27(54%)
MRC Dyspnea score	1-3	44(88%)
	4	3(6%)
	5	3(6%)
Pseudomonas aeruginosa colonization	NO	41(82%)
	YES	9(18%)
Colonization with other microorganisms	NO	37(74%)
	YES	13(26%)
Radiological extent (HRCT) > 3 lobes affected or cystic bronchiectasis	NO	24(48%)
	YES	26(52%)

Table 3: Values of EFACED score variables.

EFACED variables		Sample(n=50)%
At least two exacerbations or one hospitalization in the previous	YES	29(58%)
	NO	21(42%)
FEV1 % predicted	< 50%	12(24%)
	> 50%	38(76%)
Age (yrs)	>70	4(8%)
	<70	46(92%)
Chronic colonization by Pseudomonas aeruginosa	YES	9(18%)
	NO	41(82%)

Radiological extent (HRCT)	> 2 lobes affected	26(52%)
	< 2 lobes affected	24(48%)
mMRC Dyspnea score	> 2	6(12%)
	< 2	44(88%)

The EFACED and BSI score variables were shown in Tables 2 and 3 (respectively) after applying the BSI Score 22 patients were classified as low BSI, 19 as intermediate BSI, and 9 as high BSI and when using the EFACED Score, 35 patients were classified as mild bronchiectasis, 12 as moderate bronchiectasis, and 3 patients as severe bronchiectasis.

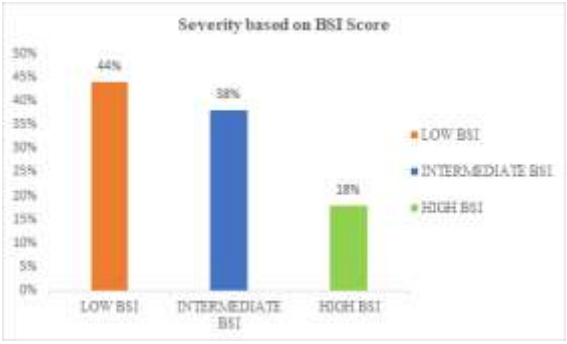

Figure 1: Severity based on BSI Score

As shown in the [Figure 1] in the figure the severity of participants' symptoms, as assessed by the Bronchiectasis Severity Index (BSI), revealed 44% of participants exhibited low BSI severity, while 38% fell into the intermediate category, and 18% were classified as experiencing high BSI severity.

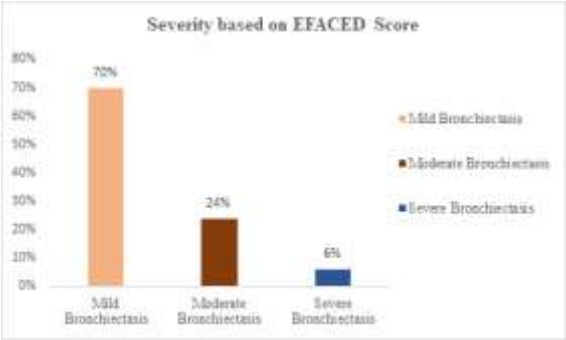

Figure 2: Severity based on EFACED Score

As shown in the [Figure 2] the severity of bronchiectasis, as classified by the extent of bronchiectasis observed through EFACED scoring, Notably, 70% of participants were identified as having mild bronchiectasis, 24% were categorized as having moderate bronchiectasis, and 6% were classified as experiencing severe bronchiectasis.

Table 4: Association Between EFACED And BSI (Fisher's Exact Test)

Severity	Low BSI	Interme diate	High BSI	Total	Pearson Chi Square	Likelihood Ratio	Significance (P value)
Mild Bronchiectasis	22 (100%)	9(47.4%)	4(44.4 %)	35	30.507	30.716	0.000
Moderate Bronchiectasis	0(0%)	10 (52.6%)	2(22.2 %)	12			
Severe Bronchiectasis	0(0%)	0(0%)	3(33.3 %)	3			
Total	22	19	9	50			

As demonstrated in [Table 4], The association between bronchiectasis severity assessed by EFACED scoring and BSI severity categories was analysed to identify patterns in disease presentation. Among patients with low BSI severity, all participants (100%) were classified as having mild bronchiectasis according to the EFACED score. In patients with intermediate BSI severity, moderate bronchiectasis was more commonly observed (52.6%) compared to mild bronchiectasis (47.4%). Among those with high BSI severity, mild bronchiectasis remained the most frequent EFACED category (44.4%), followed by severe (33.3%) and moderate bronchiectasis (22.2%). By Fisher's exact test Pearson chi-Square value calculated to be 30.507, Likelihood ratio is 30.716 and P value is 0.000 suggests a statistically significant relationship between the variables BSI and EFACED.

DISCUSSION

The medical community currently faces two major challenges in managing bronchiectasis:

1. Identifying patients with a high symptom burden who are at risk of frequent exacerbations or rapid lung function decline. These patients may benefit from aggressive treatment early in the disease to reduce complications and enable closer follow-up at specialized centers.
2. Identifying low-risk patients who could be managed with non-specialist follow-up or simpler treatment regimens, which could help reduce healthcare costs and improve patient satisfaction.

The severity and prognosis of bronchiectasis are assessed using two scales, FACED and BSI. FACED has five variables, and it is simple to obtain, compute, and understand the scale's score. Each of the nine variables on the BSI scale has a distinct value. These characteristics make BSI a more sophisticated scale than EFACED. Both scales have severe risk categories. Furthermore, these two scales were

developed for various uses. The FACED was created expressly to forecast the likelihood of death in a five-year bronchiectasis follow-up. Within the Priorities were the creation of the BSI scale, mortality, severe exacerbations necessitating hospitalization, frequency of exacerbations, and quality of life.[9]

The number and severity of exacerbations are not included in the FACED score, despite the fact that it demonstrates a strong prognostic ability in the assessment of bronchiectasis. Due to Because of this characteristic, the FACED scale's death rates and exacerbations are not very predictable. To address this shortcoming, a new scale called E-FACED was created. The E-FACED score maintained the predictive ability for mortality and simplicity while greatly enhancing the FACED's ability to forecast future annual exacerbations.[10]

Both FACED and BSI can accurately predict bronchiectasis mortality, according to McDonnell et al., however BSI is better than FACED for clinical forecasts of respiratory symptoms, exercise capacity, hospital admissions, exacerbations, quality of life, and reduced lung function.[11] According to Ellis et al., the predictive power of both scoring systems used to evaluate long-term mortality predictability is comparable for mortality after five years. The estimated capacity of FACED was found to be superior for 15-year mortality, and both scales predicted 15-year mortality.[12] According to Costa et al., BSI was clinically superior in assessing the severity of bronchiectasis based on the FACED score.[13] Coban and Gungen's analysis revealed that the patient had high heterogeneity categories, where the degree of bronchiectasis was evaluated. The two scores were shown to have a substantial association.[14]

Our study demonstrated a significant association between BSI and EFACED scoring systems, although there was a tendency for some patients to be categorized with a higher severity by BSI compared to EFACED. The BSI score's wider multidimensionality could account for this discrepancy. In contrast to EFACED, BSI takes into account other clinical factors such body mass index, prior hospital stays, exacerbation frequency, colonization with microorganisms other than Pseudomonas aeruginosa, and the existence of cystic or extensive bronchiectasis. Additionally, BSI assigns different weights to factors including age, expected FEV1%, and dyspnea severity, which could lead to differences in the two systems' severity classifications. These results imply that while EFACED mainly focuses on physiological impairment and radiological extent, BSI may offer a more thorough evaluation of overall disease burden and clinical consequences.

CONCLUSION

The BSI and FACED scores were not "born" alone , they may be useful in forecasting future mortality risks. Aside from the FACED score's marginally better 15-year death prediction, recent research and clinical practice experience point to the complementary roles of both scoring systems. Future research is anticipated to add new components to these scores that more fully capture the true underlying pathophysiology of bronchi-ectasis; only then will we have enough knowledge about the pathophysiology of bronchiectasis to significantly improve patient care.

This study has limitations that must be mentioned. Limiting the study population's variety and introducing institutional biases could result from doing the research at a single centre. Excluding certain patient groups such as those with active tuberculosis or HIV may limit the representation of diverse patient populations. Despite these limitations, our findings are consistent with those of other studies, demonstrating that the BSI offers an accurate assessment of disease severity that facilitates decision-making in terms of identifying high-risk patients who might benefit from aggressive treatment and low-risk patients who might benefit from non-specialist follow-up or more straightforward treatment regimens.

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