

A COMPARATIVE STUDY TO EVALUATE THE EFFICACY OF BRONCHIECTASIS SEVERITY SCORE INDEX [BSI] AND FACED SCORE IN ASSESSMENT OF SEVERITY OF BRONCHIECTASIS.

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ABSTRACT

Background: Bronchiectasis is a heterogeneous respiratory disease requiring multidimensional assessment of clinical burden. The Bronchiectasis Severity Index (BSI) and FACED score incorporate overlapping but differently weighted characteristics and may assign different severity categories to the same patient. Understanding these differences is relevant to their interpretation in clinical practice. The objective is to compare the distribution and within-participant agreement of recorded BSI and FACED severity classifications among adults with bronchiectasis attending a tertiary care hospital in South India. **Materials and Methods:** This cross-sectional study prospectively recruited 100 adults with high-resolution computed tomography-confirmed bronchiectasis from the outpatient department and inpatient wards of ACSR Government Medical College and Hospital, Nellore, between May 2023 and April 2024. Demographic characteristics, body mass index, spirometric measurements, dyspnoea grade, radiological involvement, microbiological findings, and previous-year exacerbation and hospitalisation histories were recorded. Descriptive statistics and a paired cross-tabulation were used to summarise the recorded severity classifications. **Result:** Participants had a mean age of 62.0 ± 12.7 years, and 73% were male. Body mass index was below 18.5 kg/m^2 in 46%. Mean forced expiratory volume in one second was $51.1 \pm 19.4\%$ predicted, with 49% having values below 50% predicted. More than two pulmonary lobes were affected in 35%. Previous-year exacerbations and hospitalisation were recorded in 68% and 43%, respectively. BSI classified 4%, 31%, and 65% of participants as having mild, moderate, and severe disease, compared with 9%, 44%, and 47% using FACED. Exact category agreement was 77%. Among the 23 discordant records, BSI assigned a higher category in every case: five participants moved from mild to moderate and 18 from moderate to severe. No disagreement spanned two severity categories. The proportion classified as severe was 18 percentage points higher with BSI. These findings remain provisional because inconsistencies in score-component definitions and recorded classifications require reconciliation. **Conclusion:** Recorded BSI classifications indicated greater severity than FACED in nearly one-quarter of this hospital cohort. Differences in score composition may contribute to this pattern, but unresolved scoring discrepancies prevent definitive interpretation. The study describes classification agreement and does not establish superior predictive accuracy of either instrument. Verified score reconstruction and longitudinal assessment are required before drawing conclusions about comparative prognostic performance.

INTRODUCTION

Bronchiectasis is a chronic respiratory disease characterised by permanent bronchial dilatation accompanied by symptoms such as persistent cough, sputum production and recurrent respiratory infections. Its clinical course is heterogeneous: some patients remain relatively stable, whereas others experience frequent exacerbations, progressive functional impairment and repeated hospitalisation. This variability makes reliable assessment of disease burden essential for clinical evaluation and follow-up. Contemporary management therefore requires consideration of multiple clinical characteristics rather than reliance on radiological abnormalities or airflow limitation alone.^[1]

The Bronchiectasis Severity Index (BSI) and FACED score were developed to provide multidimensional assessment using routinely available clinical information.^[2,3] BSI incorporates age, body mass index, forced expiratory volume in one second (FEV₁), dyspnoea, previous exacerbations and hospital admissions, airway microbiology, and radiological extent. Its original derivation and validation study evaluated its ability to identify patients at increased risk of mortality and hospitalisation.^[2] FACED comprises five variables: FEV₁, age, chronic *Pseudomonas aeruginosa* colonisation, radiological extent and dyspnoea. It was developed primarily to predict five-year all-cause mortality and offers a comparatively concise approach to risk stratification.^[3]

Although the instruments share several components, their different variables, weightings and thresholds mean that their severity categories cannot be assumed to be interchangeable. Nutritional status and previous exacerbation and hospitalisation history contribute to BSI but are absent from the original FACED score.^[2,3] These differences may influence classification in patients whose clinical burden is characterised by recurrent disease activity or low body mass index. In a comparison involving seven European cohorts, both instruments demonstrated prognostic value for mortality, while BSI performed more consistently across several additional outcomes, including hospitalisation, exacerbations and health-related quality of life.^[4] Such findings indicate that comparative performance depends on the outcome being assessed and support distinguishing agreement in severity classification from accuracy in predicting subsequent events.

Population characteristics also warrant consideration when applying these instruments across healthcare settings. The EMBARC/Respiratory Research Network of India registry demonstrated a substantial burden of bronchiectasis associated with previous tuberculosis and documented differences in clinical and microbiological characteristics from those commonly described in European populations.^[5] Subsequent longitudinal analysis identified previous exacerbation burden, comorbid disease and

microbiological characteristics as relevant predictors of adverse outcomes in Indian patients.^[6] These observations provide a rationale for examining how established severity instruments classify patients in Indian clinical practice. However, differences in population characteristics alone do not establish that either instrument requires modification or that one is superior.

A comparison within the same patient population can clarify whether BSI and FACED assign similar severity categories and identify the extent and direction of disagreement. This is relevant when severity classifications are used to communicate disease burden or characterise research populations. Agreement between instruments, however, addresses a different question from prognostic validity; demonstrating superior prediction requires independently measured longitudinal outcomes.

Therefore, this study aimed to compare the severity classifications assigned by BSI and FACED in adults with high-resolution computed tomography-confirmed bronchiectasis attending a tertiary care hospital in South India. The comparison focused on the distribution and concordance of severity categories, providing a local assessment of the relationship between these two multidimensional instruments.

MATERIALS AND METHODS

This cross-sectional study with prospective recruitment was conducted in the Department of Pulmonary Medicine, ACSR Government Medical College and Hospital, Nellore, Andhra Pradesh, India, between May 2023 and April 2024. Participants were recruited from the outpatient department and inpatient wards. The study compared bronchiectasis severity classifications assigned by the Bronchiectasis Severity Index (BSI) and FACED score within the same patient population.

Study population: Patients aged >18 years with bronchiectasis confirmed by high-resolution computed tomography (HRCT) of the chest were eligible for inclusion, provided they had not received antibiotics during the preceding four weeks. Exclusion criteria comprised pregnancy, severe illness, human immunodeficiency virus infection, lung cancer, previous long-term antibiotic treatment and unwillingness to provide informed consent. A total of 100 patients were included.

Sample size: The sample-size calculation assumed an expected correlation coefficient of 0.30, a two-sided significance level of 0.05 and 80% statistical power. Using the Fisher z-transformation approach, the minimum required sample was approximately 85 participants. The target sample was increased to 100.

Clinical assessment: Demographic information and clinical history were recorded using the study proforma. Height and weight were obtained to calculate body mass index. Spirometry was performed, and forced expiratory volume in one

second (FEV₁) was recorded as a percentage of the predicted value. Breathlessness was assessed using the modified Medical Research Council dyspnoea scale, as specified in the study methodology.

A history of exacerbation and hospitalisation during the preceding year was obtained. The study protocol described exacerbation as acute clinical deterioration involving increased sputum volume and purulence and/or systemic disturbance.

Radiological and microbiological assessment: HRCT findings were reviewed to document the number of affected pulmonary lobes and the morphological pattern of bronchiectasis, categorised as cylindrical, varicose or cystic. Sputum culture and antimicrobial susceptibility testing were performed, and the isolated organisms were recorded.

Assessment of bronchiectasis severity: Both BSI and FACED assessments were recorded for each participant. BSI incorporates age, body mass index, FEV₁ percentage predicted, dyspnoea, previous hospitalisation, exacerbation frequency, airway microbiology and radiological involvement. The published BSI categorises scores of 0–4 as mild, 5–8 as moderate and ≥ 9 as severe disease.^[2]

FACED incorporates FEV₁ percentage predicted, age, chronic *Pseudomonas aeruginosa* colonisation, radiological extent and dyspnoea. Its total score ranges from 0 to 7, with scores of 0–2, 3–4 and 5–7 corresponding to mild, moderate and severe disease, respectively.^[3]

Statistical analysis: Data was tabulated and analysed using R for Windows version 4.6.1. Continuous variables were summarised using means and standard deviations or medians, as reported in the thesis. Categorical variables were expressed as frequencies and percentages. A significance threshold of $P < 0.05$ was specified.

Ethical considerations: The study was approved by the Institutional Ethics Committee of ACSR Government Medical College and Hospital, Nellore, on 28 April 2023 (reference number: ECR/961/Inst/AP/2017/RR-20/83-08/28-04-23). Written informed consent was obtained after participants were informed about the purpose of the study. Participants were permitted to withdraw consent at any stage. Study investigations were provided without charge, and no monetary or additional benefits were offered for participation.

RESULTS

The study included 100 adults with HRCT-confirmed bronchiectasis. The mean age was 62.0 ± 12.7 years, with an age range of 32–84 years. Almost half of the participants were aged 50–69 years, and 32% were aged ≥ 70 years. Men constituted 73% of the cohort. A body mass index below 18.5 kg/m^2 was recorded in 46 participants [Table 1].

Table 1: Demographic and nutritional characteristics of the study population

Characteristic	Value
Age, years, mean $\pm$ SD	62.0 $\pm$ 12.7
Age group, years	
<50	19 (19.0)
50–69	49 (49.0)
70–79	25 (25.0)
≥ 80	7 (7.0)
Sex	
Male	73 (73.0)
Female	27 (27.0)
Recorded BMI category, kg/m^2	
<18.5	46 (46.0)
≥ 18.5	54 (54.0)

Values are n (%) unless otherwise specified; N=100. BMI, body mass index; SD, standard deviation. BMI categories reproduce the patient-level entries. Exact BMI measurements were unavailable in the master chart; the category $>18.5 \text{ kg/m}^2$ must not be interpreted as indicating overweight or obesity.

Clinical and radiological characteristics: Mean FEV₁ was $51.1 \pm 19.4\%$ predicted, ranging from 20% to 89%. Forty-nine participants had FEV₁ $<50\%$ predicted, including 11 with FEV₁ $<30\%$ predicted. Recorded dyspnoea grades 3 and 4 accounted for 72% of participants.

HRCT involvement was most frequently limited to two lobes, occurring in 46 participants. More than two lobes were affected in 35 participants. A history of at least one exacerbation during the preceding year was recorded in 68 participants, while previous-year hospitalisation was recorded in 43. The patient-level chart recorded the presence or absence of these

events but did not provide individual exacerbation counts.

Pseudomonas were recorded in 58 participants, and other microorganisms were recorded in 18. Twelve participants had positive entries in both microbiological categories; these categories were therefore not mutually exclusive [Table 2].

Recorded severity classifications: The recorded BSI classifications categorised 4 participants as having mild diseases, 31 as moderate and 65 as severe. The corresponding FACED classifications were mild in 9 participants, moderate in 44 and severe in 47 [Table 3]. Thus, the proportion assigned to the severe category was 18 percent higher with BSI

than with FACED. These distributions describe the classifications entered in the master chart and do not

represent independently validated recalculations of either score.

Table 2: Physiological, clinical, radiological and microbiological characteristics

Characteristic	Value
FEV ₁ , % predicted, mean $\pm$ SD	51.1 $\pm$ 19.4
FEV ₁ category, % predicted	
>80	13 (13.0)
50–80	38 (38.0)
30–49	38 (38.0)
<30	11 (11.0)
Recorded dyspnoea grade	
1	6 (6.0)
2	22 (22.0)
3	53 (53.0)
4	19 (19.0)
Number of affected lobes on HRCT	
1	19 (19.0)
2	46 (46.0)
3	30 (30.0)
4	5 (5.0)
Clinical history during the preceding year	
Exacerbation recorded	68 (68.0)
Hospitalisation recorded	43 (43.0)
Microbiological entries	
Pseudomonas recorded	58 (58.0)
Other microorganisms recorded	18 (18.0)
Both categories recorded	12 (12.0)

Values are n (%) unless otherwise specified; N=100. FEV₁, forced expiratory volume in one second; HRCT, high-resolution computed tomography; SD, standard deviation. Dyspnoea grades are reproduced from the master chart, which labels the variable as modified Medical Research Council grade; its application within the scoring systems requires verification. Microbiological entries do not independently establish chronic infection. The “both categories” row represents the overlap between the preceding two rows.

Table 3: Distribution of recorded bronchiectasis severity classifications

Severity category	BSI, n (%)	FACED, n (%)
Mild	4 (4.0)	9 (9.0)
Moderate	31 (31.0)	44 (44.0)
Severe	65 (65.0)	47 (47.0)
Total	100 (100.0)	100 (100.0)

BSI, Bronchiectasis Severity Index. Both classifications were recorded for the same 100 participants. Categories are provisional pending verification of score components and calculations.

Within-participant agreement: The two recorded classifications agreed with 77 participants: 4 were classified as mild by both instruments, 26 as moderate and 47 as severe. Discordance occurred in 23 participants, all of whom received a higher severity category with BSI. Five participants

classified as mild by FACED were classified as moderate by BSI, and 18 classified as moderate by FACED were classified as severe by BSI. No participant received a lower category with BSI, and no disagreement spanned two severity categories [Table 4].

Table 4: Cross-tabulation of recorded FACED and BSI severity categories

FACED category	BSI mild	BSI moderate	BSI severe	Total
Mild	4	5	0	9
Moderate	0	26	18	44
Severe	0	0	47	47
Total	4	31	65	100

Values are numbers of participants. Exact agreement was 77/100 (77.0%); BSI assigned a higher category in 23/100 (23.0%). These are descriptive calculations from the recorded labels. They do not establish the validity of the underlying scores or the predictive superiority of either instrument.

DISCUSSION

This study compared the recorded BSI and FACED severity classifications in 100 adults with HRCT-

confirmed bronchiectasis attending a tertiary care hospital in South India. The principal observation was a directional difference between the instruments: BSI assigned a higher severity category than FACED in 23% of participants, while the classifications agreed in 77%. The proportion categorised as severe was consequently greater with BSI. These findings occurred in a cohort with substantial physiological impairment, frequent low body mass index and considerable previous exacerbation and hospitalisation burden. However, the classifications

remain provisional because discrepancies between the recorded categories and their component data require reconciliation. The present findings therefore describe classification patterns and cannot establish the prognostic superiority of either instrument.

Interpretation of differences between BSI and FACED: The observed discordance is compatible with differences in the construction and intended applications of the two scores. BSI incorporates nutritional status, previous exacerbations and hospitalisation, and microbiological information beyond *Pseudomonas aeruginosa*, in addition to variables shared with FACED.^[2,3] These additional domains may increase the BSI classification of patients whose disease burden is characterised by recurrent clinical events or low BMI. Nevertheless, this explanation remains a hypothesis in the present cohort. Establishing which components account for the observed discordance requires verification of individual score calculations and examination of the characteristics of discordantly classified participants. The direction of disagreement is particularly relevant. All discordant records received a higher classification with BSI, and none differed by more than one category. This pattern suggests that the difference arose around adjacent severity thresholds rather than from completely opposing assessments. However, a higher classification should not be interpreted as a more accurate classification. Neither instrument served as an independent reference standard, and the study did not measure subsequent outcomes against which their performance could be evaluated. Accordingly, the 18-percentage-point difference in the proportion classified as severe cannot be described as greater sensitivity of BSI or underestimation of severity by FACED.

The findings are directionally consistent with those of Costa and colleagues, who compared the instruments in 40 patients and reported a tendency towards higher severity classification with BSI.^[7] Their observation supports the possibility that differences between the scores extend beyond a single clinical setting. However, comparison of agreement percentages across studies requires caution because agreement depends on the distribution of patients across categories, recruitment procedures and the consistency of component measurement. The higher proportion of severe classifications in the present cohort may reflect differences in population characteristics, but referral patterns and scoring discrepancies are alternative explanations that cannot be separated using the available data.

McDonnell and colleagues found that both instruments discriminated mortality risk, while BSI performed more consistently across several morbidity-related outcomes.^[4] Conversely, Ellis and colleagues reported similar discrimination for five-year mortality but better discrimination by FACED for 15-year mortality in a smaller, long-term cohort.^[8] These findings indicate that comparative performance depends on the outcome and prediction

horizon. They also caution against ranking the instruments solely by the proportion of patients assigned to a severe category. A cross-sectional difference in classification does not reproduce the evidence generated by longitudinal validation.

Nutritional status and physiological impairment: The frequency of low BMI is an important feature of this population. Almost half of the participants had a recorded BMI below 18.5 kg/m², a characteristic that contributes to BSI but not FACED. This creates a plausible pathway through which nutritional differences could influence classification. Nevertheless, the present analysis did not establish whether low BMI was more frequent among participants with discordant scores. Nor were exact BMI values available, preventing assessment of the degree of nutritional depletion or its relationship with lung function and clinical events.

Despotes and colleagues, analysing the US Bronchiectasis Research Registry, found lower lung function among underweight patients but no significant baseline differences between BMI groups in exacerbation frequency or hospitalisation rates.^[9]

This distinction is relevant: nutritional status may relate to some dimensions of bronchiectasis burden without consistently representing all of them. In the present cohort, reduced intake, systemic illness or increased respiratory energy expenditure could contribute to low BMI, but these mechanisms were not investigated. Low BMI should therefore be interpreted as a clinically relevant characteristic rather than an independently demonstrated cause or predictor of severe disease.

The physiological findings also indicate considerable disease burden. Mean FEV₁ was approximately half the predicted value, and almost half of the cohort had FEV₁ below 50% predicted. Recorded dyspnoea grades 3 and 4 were also common. Although both scores incorporate lung function and breathlessness, these measurements do not capture all aspects of functional impairment. Exercise capacity, fatigue and health-related quality of life were not independently evaluated. Consequently, the study cannot determine whether participants assigned different severity categories experienced corresponding differences in daily functioning or perceived health status.

Previous years exacerbations and hospitalisation were recorded in substantial proportions of participants. These observations demonstrate preceding morbidity but require careful interpretation in comparison involving BSI. The documented one-year hospitalisation history does not correspond to the two-year interval used in the original BSI.^[2] These differences are consequential because they can change point allocation and category assignment.

Furthermore, previous clinical events are components of BSI rather than independent validation outcomes. An association between BSI and the same exacerbation or hospitalisation history used to calculate it would partly reflect the score's construction. Evidence that BSI predicts future events more accurately require outcomes measured

after baseline assessment. The longitudinal Indian registry analysis by Dhar and colleagues illustrates this distinction by relating baseline characteristics to subsequent exacerbations, hospital admissions and mortality.^[6] Its findings support the relevance of event history in Indian bronchiectasis populations, but they do not validate the recorded classifications in the present study.

Pseudomonas was recorded in 58% of participants, while other microorganisms were recorded in 18%, with overlap between these groups. These findings describe the microbiological entries in the study records; they do not establish chronic infection without information on repeated cultures and the timing of sampling. This distinction matters because the scores incorporate chronic microbiological status. A single positive culture and persistent infection are not interchangeable measurements. Differences from the microbiological distribution reported in the multicentre Indian registry could reflect referral selection, sampling practices, previous treatment or underlying aetiology.^[5]

The patient-level records showed involvement of more than two lobes in 35 participants, while two-lobe involvement was the most frequent pattern. Correctly distinguishing “two or more” from “more than two” lobes is essential because threshold errors can alter severity scores. The separate radiological severity variable in the master chart also requires clarification before it can be interpreted as evidence of extensive or cystic bronchiectasis. These issues demonstrate the importance of standardised radiological definitions when comparing composite instruments.

The cohort was predominantly male and included a substantial proportion of older adults. These characteristics describe the recruited hospital population but do not establish sex-specific susceptibility or age-related progression. Both instruments include age, so an association between age and the resulting score would partly arise by design. More broadly, the Indian registry has documented the relevance of previous tuberculosis and heterogeneous disease characteristics in Indian bronchiectasis.^[5] However, the current analysis did not provide sufficiently detailed aetiological information to attribute its classification pattern to post-tuberculosis disease or another specific cause.

Strengths and limitations: A principal strength is the assessment of both instruments in the same participants, permitting direct examination of within-person disagreement. HRCT confirmation supports diagnostic ascertainment, while the defined recruitment period and inclusion of outpatient and inpatient services provide a clear clinical context. Availability of patient-level records allowed verification of descriptive counts and identification of discrepancies that were not apparent from the aggregate tables alone.

The most important limitation is the unresolved consistency of scoring data. Differences in dyspnoea coding, clinical-event definitions, microbiological

chronicity and radiological thresholds can affect the primary comparison. The cross-sectional design precludes assessment of predictive accuracy or causal relationships. Single-centre recruitment, modest sample size and eligibility restrictions also limit generalisability.

Clinical implications and future research: The findings support interpreting BSI and FACED in relation to their constituent variables and intended purposes. A severity category can summarise selected clinical information, but it should be considered alongside the patient’s symptoms, functional limitations, microbiology and previous disease activity. Current European Respiratory Society guidance similarly places management within a broader assessment of clinically relevant characteristics and risk. The present study does not demonstrate that using either instrument to guide treatment improves outcomes.

The immediate research priority is reproducible score reconstruction using verified source data and explicit operational definitions. Subsequent multicenter follow-up should compare discrimination and calibration for prespecified outcomes, including exacerbations, hospitalization and mortality, while incorporating patient-reported health status. Attention should be given to discordantly classified participants: establishing whether their subsequent outcomes differ would clarify the clinical meaning of reclassification. Such work should distinguish descriptive agreement, prognostic performance and the impact of score-guided care, since these represent separate questions requiring different study designs.

CONCLUSION

The recorded BSI and FACED classifications agreed in most participants, but BSI assigned a higher category in nearly one-quarter of this cohort. Differences in score composition provide a plausible explanation, although unresolved component-level discrepancies prevent a definitive interpretation. Following data reconciliation, the study may contribute useful local evidence on classification agreement. Longitudinal validation remains necessary to determine whether either instrument more accurately predicts clinically important outcomes in this population.

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