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The Study of Correlation Between Bronchiectasis Severity Index and FACED Score for Assessment of Severity of Bronchiectasis

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ABSTRACT

Introduction: Two different validated scores are currently used to assess the severity of bronchiectasis: the FACED score and the Bronchiectasis Severity Index (BSI). The study was conducted to evaluate clinical etiology in bronchiectasis patients. And to compare the results of the assessment of bronchiectasis severity obtained via FACED and BSI scores.

Methods: The study was conducted at a tertiary care hospital in the outpatients of the department of respiratory medicine. Detailed clinical history and necessary investigations were done. BSI and the FACED score were calculated. Statistical analysis was performed using the SPSS package.

Results: According to the FACED score, we found 28 patients with mild bronchiectasis, 17 with moderate, and 5 with severe bronchiectasis. The frequency of patients with low, intermediate, and high BSI was 24, 21, and 5, respectively. Moreover, we observed a weak but statistically significant association of 43% agreement between FACED and BSI scores: Fisher's exact test(p=0.399), tau-b de Kendall (-0.123; p = 0.337) and kappa test (0.032; p = 0.878).

Conclusions: There is a small but significant correlation between the two scales (BSI and FACED). a tendency is observed for patients to be classified with a higher BSI compared to the FACED score.

Keywords: Bronchiectasis**,** Bronchiectasis Severity Index, FACED Score

INTRODUCTION

Bronchiectasis is defined as an irreversible dilatation and destruction of one or more bronchi, with a reduction in clearance of secretions and the expiratory airflow. This disease can lead to recurrent lower respiratory tract infections, worsening pulmonary functions, respiratory failure, and pulmonary hypertension, resulting in deterioration in the quality of life, with increased morbidity and premature mortality.[1,2,3,4]

The incidence and prevalence of Bronchiectasis are generally not well known and are underestimated in developing countries.[5] Although the prevalence once declined over the past years in societies with high socioeconomic status, probably due to the development of preventive medicine, especially childhood immunizations, and movement of the living conditions and, widespread use of antibiotics, nowadays Bronchiectasis has been recognized more, mainly due to the frequent use of high-resolution computerized tomography (HRCT).[6,7] Compared to developed countries, its prevalence was suggested to be higher in developing countries, especially in patients with less access to healthcare; however, it is probably underestimated[8] when based on healthcare claims or physician-reported cases. In a retrospective analysis, chest computerized tomography findings in health

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screening examinees revealed a very high prevalence of Bronchiectasis (9.1%) in Korean adults, including asymptomatic and mild cases.[9] Bronchiectasis has still been considered an "orphan" disease because of low clinical suspicion, commercial interest, and research activity.[10] As a consequence, scientific concern in non-cystic fibrosis Bronchiectasis diminished, with limited literature about this issue compared to other "obstructive lung diseases "and" pneumonia".[11]

As it is a chronic and progressive disease, the establishment of management strategies is essential for the control of this pathology. Several individual variables were used to assess the severity of bronchiectasis, but the prognosis cannot be adequately assessed through a single variable analysis. Two multidimensional severity indexes were recently developed: the FACED score and the Bronchiectasis Severity Index (BSI). The FACED score corresponds to a scale that evaluates the severity and prognosis of BRE through the analysis of five parameters/variables: functional (FEV1% predicted), physiological (age), microbiological (chronic colonization by Pseudomonas aeruginosa), radiological (number of lobes affected) and clinician (degree of dyspnea, evaluated by the mMRC scale).[12] The BSI corresponds to a scale that evaluates the severity and prognosis of BRE by analysing nine parameters/variables: age, body mass index (BMI), FEV 1% predicted, hospitalization and exacerbations before the study, degree of dyspnea, chronic colonization by P. aeruginosa and other microorganisms and radiological extension of the disease.[13]

This study has reviewed our current understanding of clinical, radiological aspects, and microbiological profiles to assess patients' severity index and quality of life.

METHODOLOGY

This was a cross-sectional study conducted at the Department of Respiratory Medicine; AMC MET MEDICAL COLLEGE, L.G. Hospital, Ahmadabad, Gujarat. The patients enrolled were from the outpatients of the department of respiratory medicine. The study was conducted after getting approval from the institute's ethical committee. Written informed consent in the native language was obtained from each patient before enrolling in the study.

Eligibility criteria: All cases with respiratory complain visiting outpatient department of the hospital were included in the study. All such cases were investigated thoroughly by taking in-depth history, clinical findings, and HRCT of the chest. Any cases above 18 year of age and showing radiologically confirmed diagnosis of Bronchiectasis and giving written consent were included in the study. Enrollment of the cases were continued till the sample size of 50 achieved.

Detailed relevant history was obtained, including name, age, sex, residence, occupation, and addictions.

Clinical assessments and calculation of severity scores

According to the British Thoracic Society (BTS) guidelines, patients were assessed and managed. The underlying etiology of bronchiectasis was determined following testing recommended by BTS guidelines. [14] All patients underwent evaluation of the variables incorporated in the FACED and BSI scores, in the last appointment. Patients were classified according to severity cut-offs described in original publications.

The FACED score: This score incorporates 5 dichomatic variables (Appendix A). The total score is calculated by summing the scores for each variable and can range from 0 to 7 points. This score classifies bronchiectasis into three severity classes: mild bronchiectasis (global score 0–2 points), moderate bronchiectasis (global score 3–4 points), and severe bronchiectasis (global score 5–7 points).

BSI score: This score incorporates 9 variables (Appendix B). The total score is calculated by summing the scores for each variable and can range from 0 to 26 points. According to the overall score, patients are classified into three classes: patients with low BSI score (0–4 points), intermediate BSI score (5–8 points), and high BSI score (≥9 points).

Evaluation of patients in the sample

Patients were asked about the presence and frequency of productive cough, and sputum volume. Details were also obtained about the presence of rhinosinusitis, chest pain, hemoptysis in the past 5 years, fatigue/lethargy, frequency of exacerbations (defined by a sustained worsening in their clinical state with at least one of: increase in sputum volume, dyspnea, or fever) and symptoms of dyspnea using the Medical Research Council (mMRC) dyspnea grade. Subjects were asked about the initial onset and progression of their symptoms, childhood respiratory disease, general health (including questioning about symptoms of autoimmune disease and arthritis), and tobacco consumption. History of any past significant illnesses such as pulmonary tuberculosis with details of diagnosis and treatment and other co-morbid conditions such as diabetes mellitus, hypertension, and ischemic heart disease was obtained. Clinical examination included the presence of clubbing with its grade, Pedal edema, and presence of crackles and or rhonchi on respiratory system examination and then subjected to routine laboratory investigations, spirometry, HRCT, and sputum culture. FACED score and BSI score for severity for QOL (quality of life) were computed for each patient and correlated.

Statistical analysis: A descriptive analysis of the quantitative variables was performed and is represented as means and standard deviation (Mean ± SD). For the categorical variables, absolute frequencies and percentages of the total and conditioned were obtained.

The statistical treatment of the data was performed through the Microsoft Excel® and IBM SPSS® v23. Fisher's exact test (chi-square test not adequate for the sample size), the Wilcoxon test for paired samples, and the tau de Kendell test were used to analyse the data. All hypothesis tests were considered significant whenever their respective test value (*p*-value, *p*) did not exceed the significance level of 5%.

RESULT

The characteristics of the patients included in the study are described in Table 1. In terms of the etiology of bronchiectasis, data analysis revealed that 33 patients (66%) had tuberculosis followed by idiopathic 7 (14%), pneumonia 4(8%), and ABPA 4 (8%). The least common aetiology is measles 2 (4%).

The FACED and BSI score variables are shown in Tables 2 and 3 (respectively). After applying the FACED score, 28 patients were classified as mild BC, 17 as moderate, and 5 patients as severe BC. When using the BSI score, 24 patients were classified as low BSI, 21 as intermediate BSI, and 5 as high BSI.

Table 1: Characterization of study participations

Patients	Cases (n=50) (%)
Age	42±14
Sex	
Male	28 (56%)
Female	22 (44%)
Smoking history	
Current smoker	9 (18%)
Ex-smoker	4 (8%)
Never smoker	37 (74%)
Dyspnea (Mean by mmmrc)	1.48
FEV1% predicted (mean)	76.74
Pseudomonas colonization	11 (22%)
Colonization with other organisms	26 (42%)
No. of affected lobe (mean ± sd)	2.48±1.12

Table 2: FACED score variables

Variables	Cases (n=50) (%)
Faced score	N-50
Fev1% predicted	
≤50%	27 (13.5)
>50%	23 (11.5)
Age	
>70	1 (0.5)
≤70	49 (24.5)
Pseudomonas aeruginosa colonization	
Yes	11 (5.5)
No	39 (19.5)
Radiological extension of disease: no of affected lobe	
>2 involved lobes	24 (12.0)
≤2 involved lobe	26 (13.0)
MMRC Dyspnoea Score	
>2(3&4)	2 (1.0)
≤2(0-2)	48 (24.0)
Severity grade	
Mild	28 (14.0)
Moderate	17 (8.5)
Severe	5 (2.5)

Statistical analysis was also performed to assess how the scores match in predicting BC severity (% conditioned by each of the scores). As demonstrated in Table 4, 47.6% of patients with intermediate BSI were found to have mild BC by FACED and 100% of patients with high BSI had mild BC by FACED. Moreover, 35.7% of patients with mild BC by FACED had at least moderate BSI and about 47.05% of patients with moderated BC by FACED had elevated BSI.

A weak but statistically significant association between FACED and BSI scores was also detected using Fisher's exact test (p=0.399) and tau-b de Kendall (-0.123; p=0.337). Upon applying the Wilcoxon test for paired samples, it was found that the two scales were significantly different (p=0.558), with the BSI scale showing the highest scores (Table 4). With this test, a 43% agreement between the two scales (22 ties/50) was also detected (Table 4). Similarly, using the Cohen's Kappa test (κ=0.032, p=0.878) a 43% agreement between the two scales was also found.

DISCUSSION

Currently, the medical community faces two major challenges in the management of bronchiectasis: (1) identifying patients with a high symptom burden, those at risk of frequent exacerbations or rapid lung function decline, and (2) identifying low-risk patients, who could be suitable for non-specialist follow-up or simpler treatment regimes, to reduce health costs and improve patient satisfaction.

At present, two scales can be used to assess the severity and the prognosis of bronchiectasis: FACED and BSI. Both scales have clear advantages and disadvantages. The FACED score is easy to obtain, calculate and interpret as it incorporates five dichotomous variables. The BSI is a relatively more complex scale since it incorporates nine variables with different values for each. Both stratify patients into severity risk categories to predict the likelihood of mortality. Moreover, these two scales have also different objectives: while the FACED was developed specifically to predict the likelihood of mortality in the five-year follow-up of bronchiectasis of any aetiology, thus providing a quick assessment of the initial severity, the BSI was developed to predict mortality, severe exacerbations requiring hospitalization, frequency of exacerbations, and quality of life.

As a multidimensional heterogeneous disease, bronchiectasis is not a disease in which impact is primarily measured in terms of mortality. Although the FACED score has demonstrated a great prognostic capacity in the evaluation of bronchiectasis, it does not include the number or severity of exacerbations so, to evaluate the predictive capacity of exacerbations and mortality, a new scale, E-FACED,[15] was recently constructed and validated. This score significantly increases the FACED capacity to predict future yearly exacerbations while maintaining the score's simplicity and prognostic capacity for death.[15]

Table 3: Value of BSI Score Variables

Variables	Cases (n=50)(%)
Age in years	
<50	39 (19.5)
50-69	10 (5.0)
70-79	1 (0.5)
Body mass index (BMI) ≥18.5	
≥18.5	44 (22.0)
<18.5	6 (3.0)
FEV1% predicted	
>80%	2 (1.0)
50---80%	22 (11.0)
30---49%	25 (12.5)
<30%	1 (0.5)
Hospital admission in the preceding 2 years	
No	31 (15.5)
Yes	19 (9.5)
Exacerbations in the previous year	
0---2	34 (17.0)
≥3	16 (8.0)
Dyspnoea --- MRC scale	
1---3	37 (18.5)
4	0 (0.0)
5	0 (0.0)
Colonization with other microorganisms	
No	14 (7.0)
Yes	36 (18.0)
Pseudomonas aeruginosa colonization	
No	39 (19.5)
Yes	11 (5.5)
Radiological severity (> 3 lobes involved or cystic BC)	
No	26 (13.0)
Yes	24 (12.0)
BSI grading	
Low	24 (12.0)
Intermediate	21 (10.5)
High	5 (2.5)

Table 4.a: Percentage FACED score conditioned by BSI Score

FACED Score	BSI score		
	Low (n=24)	Intermediate (n=21)	High (n=5)
Mild bronchiectasis	54.16%	47.61%	64.17%
Moderate bronchiectasis	33.33%	42.85%	17.45%
Severe bronchiectasis	12.50%	9.52%	18.38%

Table 4.b: Percentage BSI score conditioned by FACED Score

BSI Score	Bronchiectasis (FACED score)		
	Mild (n=28)	Moderate (n=19)	Severe (n=3)
Low BSI	46.42%	52.94%	47.19%
Intermediate BSI	35.71%	37.05%	44.16%
High BSI	17.85%	10.01%	8.65%

Table 4.c: Wilcoxon test for paired samples

BSI – FACED	Cases
Positive ranks (BSI>FACED)	15
Negative ranks (BSI<FACED)	13
Ties (BSI=FACED)	22
Total	50

An observational prospective study by McDonnell et al. (2016), developed to compare the predictive utility of BSI and FACED in assessing clinically relevant disease outcomes across seven European cohorts with 1612 patients, demonstrated that both tools accurately predict mortality in bronchiectasis, but that the BSI is superior to FACED in predicting multiple clinically useful outcomes including hospital admissions, exacerbations, quality of life, respiratory symptoms, exercise capacity, and lung function decline.[16]

A retrospective study by Ellis et al. (2016), developed to assess the ability of these scores to predict long-term mortality in a cohort of 91 patients, showed that both scoring systems had similar predictive power for 5-year mortality. [17] In addition, both scores were able to predict 15-year mortality providing further validation for the prediction of mortality in bronchiectasis and demonstrating their utility over a longer period than originally described. However, the predictive capacity of FACED was superior for 15-year mortality.[17]

Our study found a small but significant association between the two scales since there is a tendency for patients to be classified with a higher BSI relative to the FACED. This could be explained by the fact that the BSI (and not FACED) assesses parameters including BMI, hospitalization, and exacerbations before the study, chronic colonization by other microorganisms, and development of cystic bronchiectasis. The fact that the BSI score performs a different stratification of the parameters age, dyspnea degree, and FEV1% predicted can also be a contributing factor.

This study has limitations that must be mentioned. The limited number of patients, the fact that these scores applied to the last appointment and there have been no deaths until now, did not provide for a more exhaustive analysis, specifically the capacity of these scores to predict mortality. Despite these limitations, our results are similar to results from other studies, which show that the BSI provides an accurate assessment of disease severity enabling decision-making in terms of identifying high-risk patients who may benefit from aggressive treatment and low-risk patients who could receive non-specialist follow-up or simpler treatment regimes.

CONCLUSION

The BSI and FACED scores were not "born" alone, so their usefulness in predicting future risks of mortality may also be found together. Apart from the slight superiority in predicting 15-year mortality for the FACED score, current evidence coupled with the experience of clinical practice suggests the complementary roles of both scoring systems. The extension of future work is expected to impart these scores with new elements that more comprehensively represent the genuine underlying pathophysiology of bronchiectasis; only then will we gain sufficient insights into

the pathogenesis of bronchiectasis leading to significantly improved patient healthcare.

REFERENCE

1. King PT, Holdsworth SR, Freezer NJ, Villanueva E, Holmes PW. Characterization of the onset and presenting clinical features of adult bronchiectasis. Respir Med. 2006;100:2183–2189.
2. Martinez-Garcia MA, Soler-Cataluna JJ, Perpina-Tordera M, Roman-Sanchez P, Soriano J. Factors associated with lung function decline in adult patients with stable non-cystic fibrosis bronchiectasis. Chest. 2007;132:1565–72. [PubMed] [Google Scholar]
3. Alzeer AH, Al-Mobeirek AF, Al-Otair HA, Elzamzamy UA, Joherjy IA, Shaffi AS. Right and left ventricular function and pulmonary artery pressure in patients with bronchiectasis. Chest. 2008;133:468–73. [PubMed] [Google Scholar]
4. King PT, Holdsworth SR, Freezer NJ, Villanueva E, Gallagher M, Holmes PW. The outcome in adult bronchiectasis. COPD. 2005;2:27–34. [PubMed] [Google Scholar]
5. Alzeer AH, Masood M, Basha SJ, Shaik SA. Survival of bronchiectasis patients with respiratory failure in ICU. BMC Pulm Med. 2007;7:17. [PMC free article] [PubMed] [Google Scholar]
6. Tsang KW, Tipoe GL. Bronchiectasis: Not an orphan disease in the East. Int J Tuberc Lung Dis. 2004;8:691–702. [PubMed] [Google Scholar]
7. O'Donnell AE. Bronchiectasis. Chest. 2008;134:815–23. [PubMed] [Google Scholar]
8. Cohen M, Sahn SA. Bronchiectasis in systemic diseases. Chest. 1999;116:1063–74. [PubMed] [Google Scholar]
9. Kwak HJ, Moon JY, Choi YW, Kim TH, Sohn JW, Yoon HJ, et al. High prevalence of bronchiectasis in adults: Analysis of CT findings in a health screening program. Tohoku J Exp Med. 2010;222:237–42. [PubMed] [Google Scholar]
10. Barker AF, Bardana EJ., Jr Bronchiectasis: Update of an orphan disease. Am Rev Respir Dis. 1988;137:969–78. [PubMed] [Google Scholar]
11. Martínez García MA. Bronchiectasis: Still an orphan disease? Arch Bronconeumol. 2005;41:407–9. [PubMed] [Google Scholar]
12. M. Martınez, J. Gracia, M. Vendrell, R. Giron, L. Maiz, D. Carrillo, *et al*. A multidimensional approach to BQNFQ the FACED score. Eur Respir J, 43 (2014), pp. 1357-1367
13. J. Chalmers, P. Goeminne, S. Aliberti, M. McDonnell, S. Lonni, J. Davidson, *et al*. The Bronchiectasis Severity Index. Am J Respir Crit Care Med, 189 (2014), pp. 576-58
14. M. Pasteur, D. Bilton, A. Hill. British Thoracic Society guideline for non-CF bronchiectasis. Thorax, 65 (2010), pp. i1-i58
15. M. Martinez, R.A. Athanazio, R. Girón, L. Máiz-Carro, D. De la rosa, C. Olveira, *et al*. Predicting high risk of exacerbations in bronchiectasis: the E-FACED score. Int J COPD, 12 (2017), pp. 275-284
16. M.J. McDonnell, S. Aliberti, P.C. Goeminne, K. Dimakou, S. Zucchetti, J. Davidson, *et al*. Multidimensional severity assessment in bronchiectasis: an analysis of seven European cohorts. Thorax, 71 (2016), pp. 1110-1118
17. H. Ellis, S. Cowman, M. Fernandes, R. Wilson, M. Loebinger. Predicting mortality in bronchiectasis using bronchiectasis severity index and FACED scores: a 19-year cohort study. Eur Respir J, 47 (2016), pp. 482-489

Appendix A

FACED score

This score incorporates 5 dichotomic variables:

F: FEV1% predicted (forced expiratory volume in first second): functional evaluation – cut-off 50% (>50%: 0 points; ≤50%: 2 points).

A: Age: physiological parameter – cut-off 70 years (≤70: 0 points; >70: 2 points).

C: Chronic colonization by pseudomonas *aeruginosa*: microbiological parameter – dichotomic parameter: maximum value 1 point.

E: Radiological extension of the disease – number of affected lobes: radiological evaluation – cut-off 2 lobes (≤2 affected lobes: 0 points; >2 affected lobes: 1 point).

D: Dyspnea – mMRC (modified Medical Research Council Dyspnea Scale): clinical evaluation – cut-off grade II of the MRC scale (≤II: 0 points; >II: 1 point).

Appendix B

BSI score

This score incorporates 9 variables:

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 (0 points); <18.5 (2 points).

3.FEV1% predicted: >80% (0 points); 50–80% (1 point); 30–49% (2 points); <30% (3 points).

4.Hospital admission in the preceding 2 years: No (0 points); Yes (5 points).

5.Exacerbations in the previous year: 0–2 (0 points); ≥3 (2 points).

6.Medical Research Council Dyspnea Scale (MRC): 1–3 (0 points); 4 (2 points); 5 (3 points).

7.*Pseudomonas aeruginosa* colonization: No (0 points); Yes (3 points).

8.Colonization with other microorganisms: No (0 points); Yes (1 point).

9.The radiological extension (≥3 involved lobes or cystic bronchiectasis): No (0 points); Yes (1 point).