ORIGINAL RESEARCH PAPER

Pulmonary Medicine

ASSESSMENT OF BRONCHIECTASIS USING FACED SCORE AND BRONCHIECTASIS SEVERITY INDEX

KEY WORDS: FACED, Bronchiectasis severity Index, Bronchiectasis, BSI

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ABSTRACT

Introduction: Bronchiectasis is a chronic suppurative lung disease having greater inverse impact on the patient's quality of life. Recently, the FACED score and Bronchiectasis Severity Index (BSI) are two best used multidimensional grading systems capable of classifying the severity of bronchiectasis according to its prognosis. **Objectives:** To compare the severity bronchiectasis as measured by FACED score and by the BSI score. **Materials and Methods:** The prospective observational study was conducted among 82 patients attending to the Department of Pulmonary Medicine, Pondicherry Institute of Medical Sciences, with stable bronchiectasis during the period October 2016 to April 2018. A proforma was used to collect the socio-demographic and clinical variables including age, gender, severity of dyspnoea, history of smoking and number of exacerbations per year. The patient was then subjected to routine laboratory investigations, spirometry, HRCT and sputum culture. FACED score and BSI score for severity. **Results:** The mean FACED score and BSI scores obtained by the study participants (n=82) was 2.46 ± 1.86 and 10.63 ± 4.26 respectively. The severity of bronchiectasis was mild (score≤ 2) for 52.5% (n=43), Moderate (score= 3-4) for 36.6% (n=30) and Severe (score ≥5) for 10.9% (n=9) of the study participants according to FACED scores. Most of the study participants (68.3%) were classified as severe bronchiectasis than mild and moderate categories as 8.5% and 23.2% respectively in BSI. **Conclusion:** The study showed that there was a poor concordance between FACED and BSI scoring system. Both BSI and FACED are compliment to each other, and one neither can replace the other.

INTRODUCTION

Bronchiectasis is a debilitating respiratory disease caused by irreversible dilatation of airway leading to chronic cough, sputum production and recurrent infective exacerbations.

Lungs are exposed to the environmental particulate matter constantly and such exposure is kept away from harm by the efficient tracheo-bronchial defense mechanisms. [1] However continuous insult to the respiratory anatomy by vicious cycle of infection and inflammation arising from a number of causes either acquired or inherited, leads to structural abnormalities including abnormal chronic dilatation of bronchi termed as Bronchiectasis. [2]

Bronchiectasis is etiologically classified into cystic fibrosis and non-cystic fibrosis bronchiectasis (NCFB). NCFB may manifest due to various causes including congenital and acquired, with the later more frequent. Congenital causes include primary immunodeficiencies, situs inversus, primary ciliary dyskinesia, etc. Corticosteroid-dependent asthma, Pulmonary Tuberculosis, lobar pneumonia, inhaled foreign bodies; pulmonary aspiration, allergic broncho-pulmonary aspergillosis and bronchial neoplasia are the major acquired causes of NCFB. [3] Grading the severity would help in targeting treatment to the patients most likely to benefit and improving their quality of life. Recently, the FACED score and Bronchiectasis Severity Index (BSI) are two best used multidimensional grading systems capable of classifying the severity of bronchiectasis according to its prognosis. The FACED score (**F**orced expiratory volume in 1 second (FEV1) % predicted [F], **A**ge [A],

chronic **C**olonization by *Pseudomonas aeruginosa* [C], **E**xtension of the disease by radiological assessment [E] and **D**yspnea [D]) [3] is a five-point score that predicts probability of all-cause mortality after 5 years of follow-up, whereas the BSI [4] is a seven-point score that identifies patients with NCFB at risk for future mortality, hospitalization and exacerbations. The scores measuring severity also contain social variables like number of admissions and exacerbations which definitely have an impact on the quality of life exhibited by the patients living with bronchiectasis. Hence this research was the need of the hour to take multi-dimensional conceptualization in grading the well documented debilitating respiratory morbidity namely bronchiectasis.

Aim & Objective

To obtain FACED score and BSI score for patients with bronchiectasis enrolled in the study and correlate the scores.

MATERIALS AND METHODS

The prospective observational study was conducted among 82 patients attending to the Department of Pulmonary Medicine, Pondicherry Institute of Medical Sciences, with stable bronchiectasis during the period October 2016 to April 2018. A proforma was used to collect the socio-demographic and clinical variables including age, gender, severity of dyspnoea, history of smoking and number of exacerbations per year. The patient was clinically examined for anthropometric and other clinical signs associated with bronchiectasis and then subjected to routine laboratory investigations,

spirometry, HRCT and sputum culture. FACED score and BSI score for severity. Approval from the Institutional Ethics Committee was obtained prior to start of the study

Exclusion Criteria:

1. Active mycobacterial disease
2. HIV infections
3. Malignancies of Lung
4. IPF with secondary traction bronchiectasis
5. Patients on long term antibiotics

The clinical, spirometry, bacteriological and radiology parameters collected for each patient was used to compute two different bronchiectasis severity scores.

1. FACED score
2. BSI score

STATISTICAL ANALYSIS:

The data entry and analysis were done using SPSS version 21.0 [Statistical software for social sciences]. The summary measures were expressed using tables and graphs using percentages and frequencies for categorical variables and mean ± SD for numerical continuous and discrete variables. The statistical significance between two means was tested using Independent Student t-test and between categorical variables was tested using Chi-square test. For all statistical tests of significance, a p-value of less than 0.05 was considered significant within 95% confidence limits.

RESULTS

The prospective observational study was conducted by following-up 82 patients, diagnosed to have bronchiectasis clinically and radiologically, attending to the department of Pulmonary Medicine for evaluation and treatment. The mean age of the study participants was 55.6 ± 14.7 years. There were a comparatively higher proportion of female participants (57.3%) with bronchiectasis included in the study compared to the males (46.3%). There was no significant (p=0.57, df=3) variations in age distribution between males and females. In the 50-69 years age group, there was higher proportion of females but the difference was not statistically significant. Majority of the study subjects had MMRC breathlessness grades III and IV (75.6%, n=62) when compared to the lower grades indicating that there was more parenchymal damage or obstructive airway disease for most of the participants. The patients were interviewed about the number of episodes of severe breathing difficulty they had in the past one year and it was found that the study participants had 2.7 ± 0.9 episodes per year on an average. Majority of the study participants had normal vital parameters and were afebrile. Half of the participants (n=41,50%) were obese (BMI>23 Kg/m^2).

As per the FACED score the number of lobes involved is classified as 1-2 and >2. Accordingly, in the present study 41.5% (n=34) of the patients had involvement of 1-2 lobes in HRCT and 58.5% (n=48) had involvement of more than 2 lobes in HRCT.

Table 1 -Characteristics of Enrolled Patients

CHARACTERISTIC	FRIQUENCES	PERCENTAGES%
AGE		
<50 Yrs	23	28
50-69 Yrs	46	56
70-79 Yrs	12	14
>80Yrs	01	1.2
SEX		
MALE	38	46.3
FEMALE	44	57.3
Mmrc		
1	0	0
2	20	24.4
3	26	31.7
4	36	43.9
Exacerbation in a Year		
1	02	02.4
2	38	46.3
3	25	30.5
4	13	15.9
5	04	04.9
Smoking		
Never Smoking	49	60
Current Smoking	10	12
Former Smoking	23	28
Vaccination		
Influenza	81	98.8
Pneumococcal	11	13.4
BMI		
<23	41	50
>23	41	50
Clubbing		
No Clubbing	23	28
Grade 1	04	04.9
Grade 2	21	25.6
Grade 3	34	41.5
No. Of Lobes-HRCT		
1	13	15.85
2	21	25.61
3	24	29.27
4	24	29.27
Organisms		
Pseudomonas	06	7.3%
E.coli	03	3.65%
No growth	73	89%
FACED Score		
Mild	43	52.5
Moderate	30	36.6
Severe	09	10.9
BSI Score		
Mild	07	08.5
Moderate	19	23.2
Severe	56	68.3

The concordance of severity prediction between FACED and BSI were as follows: Mild: 7/43= 16.3%, Moderate: 19/30= 63.3%, Severe: 9/56= 16.1%. Hence the two scores had poor agreement in predicting mild and severe categories of bronchiectasis severity. (Table 2)

Table 2

	BSI Scores			
FACED Scores	**Mild**	**Moderate**	**Severe**	**Total**
Mild	7(100)	16(84.2)	20(35.7)	43(52.4)
Moderate	0(0)	3(15.8)	27(48.2)	30(36.6)
Severe	0(0)	0(0)	9(16.1)	9(11)
Total	7(100)	19(100)	56(100)	82(100)

Kappa=0.3, p-value=0.455, poor agreement

DISCUSSION

The severity of bronchiectasis in the present study was determined by two separate scoring systems namely FACED and BSI. The study included 82 patients with clinical and radiological evidence of bronchiectasis and their severity index were compared. In the present study, majority of the study participants belonged to the 50 -69 years age group (56.1%). There was less representation of older age group (>70 years) in the study sample (15.8%). There were a comparatively higher proportion of female participants (57.3%) with bronchiectasis included in the study compared to the males (46.3%). There was no significant (p=0.57, df=3) variations in age distribution between males and females. The mean age of the study participants was 55.6 ± 14.7 years. In the study done by Minov *et al.* [3] the mean age of the included participants was 63.4 ± 8.1 years. In the study done by Martinez *et al.* [4]

43.5% were males which was similar in lines to the present study. The study clearly indicated that no particular gender had major participation and this was to ensure no bias in testing the severity scores based on gender induced quality of life variations.

The FACED and BSI scores reflect the severity of bronchiectasis by taking the frequency of exacerbations into consideration. It is documented in previous studies [3,4,5] that BSI is a better predictor of exacerbations than FACED but its specificity is lowered because of including many other variables into the scoring. BSI classifies breathlessness as less than three or more than three episodes whereas the FACED score takes MMRC grading into consideration. In the present study, the patients were interviewed about the number of episodes of severe breathing difficulty they had in the past one year and it was found that the study participants had 2.7 ± 0.9 episodes per year on an average.

The present study documented that half of the participants (n=41, 50%) were obese (BMI>23 Kg/m^2). The number of exacerbations were documented to be higher in the underweight group significantly higher than those in the normal weight and overweight groups (P<0.05). BMI was negatively correlated with the radiographic extent of bronchiectasis according to Spearman rank correlation analysis (r_s=-0.312, P<0.001). Thus, the body weight and BMI play a significant role in determining the severity of Bronchiectasis. Only the BSI scoring takes BMI into consideration not FACED. BSI also gives a score of 2 for underweight (BMI<18.5) and zero for rest which clearly indicates the relationship between underweight and severity of bronchiectasis.

Accordingly, in the present study 41.5% (n=34) of the patients had involvement of 1-2 lobes in HRCT and 58.5% (n=48) had involvement of more than 2 lobes in HRCT. This is concordance with the clinical parameters which showed that severity increased as the number of lobes involved increased resulting in hypoxia reflected as clubbing and more severely cor-pulmonale. In the study done by Qi *et al.* [6] the spirometry values of the participants with bronchiectasis showed FVC (L) was 2.25 ± 0.81; FVC % predicted was 73.16 ± 18.54%; FEV1 (L) 1.48 ± 0.81; FEV1, % predicted 58.51 ± 26.02% and FEV1/FVC 62.96 ± 17.39% respectively. The features suggested a restrictive type of PFT parameters which was almost similar in our study which showed that FeV1 (ml) was 0.99 ± 0.47; FeV1 % predicted was 47.33 ± 15.36; FVC 2.47 ± 0.87; FVC % predicted was 61.38 ± 13.63 and FeVI / FVC was 61.94 ± 10.91. The percentage change pre and post-bronchodilator in FeV1 was 9.12 ± 3.5 %. Both BSI and FACED score incorporated FeV1 as a salient feature in prediction of severity of bronchiectasis.

The FACED score included 5 parameters to determine the severity of bronchiectasis. It classified the participants into Mild- ≤ 2, Moderate- 3-4 and Severe- ≥5 (Total score=7). In the present study, the mean FACED score obtained by the study participants (n=82) was 2.46 ± 1.86. The study showed that the severity of bronchiectasis was mild (score≤ 2) for 52.5% (n=43), Moderate (score= 3-4) for 36.6% (n=30) and Severe (score ≥5) for 10.9% (n=9) of the study participants according to FACED scores. The earlier study by Costa *el al*. [7] showed that, after applying the FACED score, 20 patients (50%) were classifed as mild bronchiectasis, 15 (37.5%) as moderate and 5 (12.5%) as severe bronchiectasis. This was not much different from the findings of the present study.

The Bronchiectasis Severity Index incorporates 9 variables including age, Body mass index (BMI), FEV1 % predicted, hospital admission in previous year, exacerbations in previous year, dyspnea scale by MRC, *Pseudomonas aeruginosa* colonization, and colonization with other microorganisms. The severity is classified viz: Mild: ≤ 4; moderate: 5-8 and severe: ≥9. The study participants obtained scores ranging from 1 to 20. The mean BSI score obtained by the study subjects (n=82) was 10.63 ± 4.26. In the previous study by Rosales-Mayor *et al*. [8], the mean BSI score among those with lesser exacerbations was 7.9±4.6 and those with frequent exacerbations were 13.2±4.0. This again had consensus with the mean BSI score (10.63 ± 4.26) obtained in our study showing that the severity of our study participants was moderate to severe as per BSI.

The characteristic feature of our study was most of the study participants (68.3%) were classified as severe bronchiectasis as per BSI scoring. The mild and moderate categories were 8.5% and 23.2% respectively. This was not coinciding with that of FACED scoring which showed mild (score≤ 2) as 52.5% (n=43), Moderate (score= 3-4) as 36.6% (n=30) and Severe (score ≥5) as 10.9% (n=9).(Fig 1) In the study by Rosales-Mayor *et al*. [8], the proportion of mild, moderate and severe bronchiectasis were 25%, 32 % and 43% respectively which was not similar to that obtained in our study.

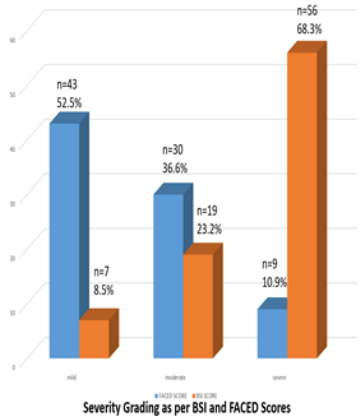

Fig 1

There was no consensus between the two scores namely BSI and FACED in the present study. There was a poor agreement (p=0.45) between the classification of severity (mild, moderate and severe) by FACED and BSI scores. The concordance of severity prediction between FACED and BSI were as follows: Mild: 7/43= 16.3%; Moderate: 19/30= 63.3% and Severe: 9/56= 16.1%. Hence the two scores had poor agreement in predicting mild and severe categories of bronchiectasis severity as tested by kappa statistics. Similar testing was done by Rosales-Mayor *et al*. [8] showing Kappa = 0.166 (p<0.001) and Concordance 36.8% between the two scores. Merely by having a hospital admission due to exacerbation in the previous 2 years, BSI automatically classifies the patient as moderate (5 points out of 5) and contributes to more than 50% (5 points out of 9) to the severe class, while this parameter is not taken into consideration with FACED.

Similarly, suffering 3 exacerbations provides 40% of the punctuation for moderate (2 points out of 5) and more than 20% for the severe class (2 points out of 9). This variable is neither considered in FACED. We also found a greater contribution of other variables to the BSI than to the FACED punctuation, although some of them were not significantly different between the 2 groups: age (for all the divisions 50–69, 70–79 and >80 years), low BMI and chronic bronchial infection by other microorganisms.

CONCLUSION

The study documented the socio-demographic profile of patients with bronchiectasis. The present study is a prototype comparing the severity indices namely BSI and FACED scores. The study concluded that there was a poor concordance between FACED and BSI scoring methods in determining the severity of bronchiectasis. Both BSI and FACED are compliment to each other, and one neither can replace the other.

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