

A Study On Bode Index as A Predictor of the Severity in Chronic Obstructive Pulmonary Disease

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Abstract: This study is conducted to determine whether higher BODE index in Chronic Obstructive Pulmonary Disease correlates with more years of cigarette smoking and also to determine whether higher BODE index is associated with more days of hospitalization. This prospective study was performed using a database with 60 patients with Chronic Obstructive Pulmonary Disease during August 2016- August 2017. Present study showed following results. The average age of participants in the study was 55.71 years. BODE index was found to increase with age with the mild group having a mean age of 53.47 years, moderate group 55.00 years and the severe group with 59.93 years as the mean age. The difference was statistically significant with a p value of 0.005. BODE score was significantly associated with the number of pack years of smoking, 7.42 pack yrs in mildcases, 15.07 in moderate and 26.90 in severe cases. The average BMI of the patients in this study was 22.21 kg/m². The BMI was found to be significantly lower in patients with COPD. It was 22.476 kg/m² (standard deviation -2.455) in the mild group, 21.711 (std. deviation - 2.552) in the moderate group and 20.260 (std. deviation - 3.212) in the severe group. The study results showed that a higher BODE score was associated with a higher incidence of hospital stay due to reasons related to COPD, over the past 2 years. The control group and the mild COPD group did not have any significant hospital admission during the past 2 years. The average duration of stay in the moderate study group was 3.17 days while it was 16 days in the group with severe COPD according to the BODE score. This study concluded that BODE index is directly correlated with the duration and intensity of smoking. Thus this study concludes that BODE index is reliable method to predict hospitalization and the severity of systemic involvement in patients with COPD.

Keywords: COPD, BODE index, cigarette smoking, hospital stay.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD, a common preventable and treatable disease, is characterized by persistent airflow limitation is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients [1]. The major manifestation of airflow obstruction in COPD is the reduction in forced expiratory volume in first second (FEV₁) which form the basis of the classification of COPD severity by the global initiative for chronic obstructive lung disease (GOLD) [2]. The evaluation of lung function by FEV₁ alone does not represent the complex clinical

consequences of COPD [3]. In 2004, Celli *et al.* created a mortality prediction index, known as BODE index (Body mass index, airway Obstruction, Dyspnea and Exercise capacity) which is a multistage scoring system that provides useful prognostic information in patients with COPD [4]. BODE scores greater than 7, 5-6 and less than 5 are associated with a 2-year mortality of 30%, 15% and 10%, respectively. It has been shown that BODE index is better than the FEV₁ at predicting the risk of death among COPD patients [5].

So this study is conducted to analyze BODE index as a predictor of hospitalization and severity in patients with COPD

METHODOLOGY

Study setting

The present study was carried out at Department of Pulmonary Medicine in Chest Hospital Hanmakonda.

Data collection

This prospective study was performed using a database with 60 patients with COPD during August 2016- August 2017. Male patients with diagnosed COPD are included. Patients with Heart diseases, Liver Diseases, Acute exacerbation were excluded.

Procedure

For each enrolled subject, detailed history of smoking, personal and family medical histories were obtained. BMI was calculated. Spirometry was performed with equipment that met the American thoracic society performance criteria. MMRC dyspnea scale was used to score the patient's dyspnea. Six minute walk test was performed twice with a gap of 30 minutes rest in between and the average was taken. The BODE index was calculated for each patient using the BMI, the threshold value of FEV1, the distance walked in 6 min, and MMRC score. A standard 12 lead ECG & Echocardiography was performed using 2D echo. Ejection fraction and pulmonary pressure gradient was assessed

Statistical analysis:

Data was analysed by statistical package for social sciences (SPSS) Version 16.0. Numerical data was summarised by mean ± standard deviation for continuous normal data and median ± Inter-Quartile Range for continuous non normal data/ordinal data. Categorical data was summarised by count and percentages. The association between categorical variables was done by Chi square test. All the P values less than 0.05 were considered as statistically significant.

RESULTS

A total 60 patients with COPD including as cases were enrolled in the study. All the cases were males. Among patients with COPD, there were (35.56%) patients who had mild COPD with a BODE score between 0 – 2. Moderate (BODE score of 3 – 5) and severe COPD (BODE score more than or equal to 6) groups had patients (32.22%) each. The average age of participants in the study was 55.71 years. Among the COPD patients, BODE index was found to increase with age with the mild group having a mean age of 53.47 years, moderate group 55.00 years and the severe group with 59.93 years as the mean age. The difference was statistically significant with a p value of 0.005. The study revealed that the BODE score was significantly associated with the number of pack years of smoking, 7.42 pack yrs in mild cases, 15.07 in moderate and 26.90 in severe cases. On multiple comparison by LSD the difference between control group and mild group was not statistically significant but that of the other 2 groups were highly significant (p =0.000). The average BMI of the patients in this study was 22.21 kg/m². The BMI was found to be significantly lower in patients with COPD. It was 22.476 kg/m² (standard deviation –2.455) in the mild group, 21.711 (std. deviation – 2.552) in the moderate group and 20.260 (std. deviation – 3.212) in the severe group. On multiple comparisons the significance between mild and moderate groups was not found to be significant. All other comparisons showed significant difference. The study results showed that a higher BODE score was associated with a higher incidence of hospital stay due to reasons related to COPD, over the past 2 years. The control group and the mild COPD group did not have any significant hospital admission during the past 2 years. The average duration of stay in the moderate study group was 3.17 days while it was 16 days in the group with severe COPD according to the BODE score.

BODE scores greater than 7, 5-6 and less than 5 are associated with a 2-year mortality of 30%, 15% and 10%.

Table-1: BODE SCORE CALCULATION:

BODE score		1	2	3
FEV ₁	≥65%	50 – 64%	36 – 49%	≤35%
6 min walk test	>350ms	250 – 349 ms	150 _ 249 ms	<149 ms
Dyspnea scale	0-1	2	3	4
BMI	>21kg/m ²	>21kg/m ²		

Table-2: AGE WISE DISTRIBUTION IN YEARS (N)

GROUP	N	MEAN (yrs)	Std. deviation	One way ANOVA F-Test
Mild (0-2)	21	53.47	7.36	F=4.440 p=0.005 significant
Moderate (3-5)	21	55.01	8.62	
Severe (≥6)	18	59.93	7.60	
Total	60	55.71	7.67	

Table-3: SMOKING IN PACK YEARS (N)

GROUP	N	MEAN (yrs)	Std. deviation	One way ANOVA F-Test
Mild (0-2)	21	7.42	7.62	F=26.93 p = 0.001 Significant
Moderate (3-5)	21	15.07	8.62	
Severe (≥ 6)	18	26.90	7.60	
Total	60	13.26	7.67	

Table-4: BODY MASS INDEX (N)

GROUP	N	MEAN (yrs)	Std. deviation	One way ANOVA F-Test
Mild (0-2)	21	22.47	2.45	F=11.43 p= 0.001 Significant
Moderate (3-5)	21	21.71	2.55	
Severe (≥ 6)	18	20.26	3.21	
Total	60	22.21	3.03	

Table-5: DURATION OF HOSPITAL STAY OVER LAST 2YEAR (DAYS)

GROUP	N	MEAN (yrs)	Std. deviation	One way ANOVA F-Test
Mild (0-2)	21	0.13	0.49	F=75.34 p = 0.001 Significant
Moderate (3-5)	21	3.17	2.92	
Severe (≥ 6)	18	16.01	9.17	
Total	60	4.68	8.04	

DISCUSSION

COPD is a disease of early adulthood. In this study 56.66% of cases are between age groups of 50 to 70. Mean age of severe disease group is 66 years (SD-11.8). Celli *et al* [6] and Kian Chung *et al.* [7] have shown in their respective studies that BODE score increases with age. In this study there is a significant correlation between ages and BODE score. As the patient's age increases, the severity of disease increases. This could be due to progression of COPD with age and cumulative effect of smoking. Results from this study go along with most other studies, in the relationship of smoking to BODE index. Studies by Celli *et al.* [6] and Kian Chung *et al.* [7] and Karoli *et al.* [8] have all proven beyond doubt that higher duration of smoking is associated with higher BODE index.. Kian-Chung Ong *et al.* [7], Fanny W.S. Ko *et al.* [9] and B. R. Celli *et al.* [10] have shown that BMI and BODE score are inversely related. This study also shows a significant decrease in BMI as BODE score increases. In this study FEV1 levels of BODE score in severe COPD group correlates well. But there is not much of significant difference between mild and moderate groups. B R Celli *et al.* [10] showed that six-minute walk test is an independent predictor of mortality and morbidity in COPD patients present study also elaborates that the distance walked by patients with higher BODE scores is less when compared to other groups. Our findings of the usefulness of the BODE index in predicting hospitalization for COPD are also supported by the

findings of a prospective study of risk factors of hospital readmissions for COPD exacerbation. In that study, a strong association between usual physical activity and reduced risk of COPD readmission was demonstrated. Patients with COPD who reported an activity equivalent to walking 60 min/d had a reduction in risk of readmission to hospital of almost 50%. Moreover, the association did not change when adjusted for FEV1 or nutritional status.

CONCLUSION

BODE index is directly correlated with the duration and intensity of smoking. Thus this study concludes that BODE index is reliable method to predict hospitalization and the severity of systemic involvement in patients with COPD

REFERENCES

1. Global Initiative for Chronic Obstructive Lung Disease. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. Available from: <http://www.goldcopd.com>. [Last accessed on 9th August, 2013].
2. Seemungal TA, Hurst JR, Wedzicha JA. Exacerbation rate, health status and mortality in COPD—a review of potential interventions. *International journal of chronic obstructive pulmonary disease*. 2009;4:203.

3. Nici L, Donner C, Wouters E, Zuwallack R, Ambrosino N, Bourbeau J, Carone M, Celli B, Engelen M, Fahy B, Garvey C. American thoracic society/European respiratory society statement on pulmonary rehabilitation. *American journal of respiratory and critical care medicine*. 2006 Jun 15;173(12):1390-413.
4. Celli BR, Cote CG, Marin JM, Casanova C, Montes de Oca M, Mendez RA, Pinto Plata V, Cabral HJ. The body-mass index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary disease. *New England Journal of Medicine*. 2004 Mar 4;350(10):1005-12.
5. Shapiro SD, Reilly JJ, Rennard SI. Chronic bronchitis and emphysema. In: Mason RJ, Broaddus VC, Martin TR, King TE Jr, Schraufnagel DE, Murray JF, editors. *Murray and Nadel's Textbook of Respiratory Medicine*. 5th ed. Philadelphia: Saunders Elsevier; 2010. p. 919-76
6. Celli BR, Cote CG, Marin JM, Casanova C, Montes de Oca M, Mendez RA, Pinto Plata V, Cabral HJ. The body-mass index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary disease. *New England Journal of Medicine*. 2004 Mar 4;350(10):1005-12.
7. Ong KC, Earnest A, Lu SJ. A multidimensional grading system (BODE index) as predictor of hospitalization for COPD. *CHEST Journal*. 2005 Dec 1;128(6):3810-6.
8. Karoli NA, Rebrov AP. The BODE index as a predictor of unfavourable prognosis in chronic obstructive pulmonary disease. *TerArkh*. 2007; 79(3):11-4
9. Fanny W.S. Ko, Wilson Tam, Alvin H.M. Tung, Jenny Ngai, Susanna S.S. Ng, Kenneth Lai, Ka-Fai Au, David S.C. Hui. A longitudinal study of serial BODE indices in predicting mortality and readmissions for COPD. 2011;105(2);266-273.
10. B. R. Celli, "Change in the BODE index reflects disease modification in COPD: lessons from lung volume reduction surgery," *Chest*, vol. 129, no. 4, pp. 835–836, 2006.