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EFFECT OF AGE AND PACK YEARS OF SMOKING ON BODE INDEX

Respiratory Medicine

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) the third leading cause of death in the world, causes 3.1 million deaths worldwide, and is characterized by non reversible limitation in airflow. The BODE index was devised to better reflect the multisystem effects of COPD, allowing for better prognostic estimation than that provided by FEV1 alone. This grading system based on four parameters-(B) Body mass index, (O) Airflow obstruction, (M) Modified Medical Research Council dyspnea score and (E) 6 min walk distance. This is a 10-point scale in which higher scores indicate a severe disease and higher risk of death **Materials and Methods:** This study was a cross sectional study conducted in department of respiratory medicine, Rajshree Medical Reseach Instituite Bareilly. A total of 105 COPD patients who met the inclusion criteria were randomly chosen from the outpatient department and were evaluated via FEV1% ,Six Minute walk test ,Body mass index and MMRC dyspnea score and the BODE score was calculated. **Results:** This study shows a significant association between increasing age, smoking and BODE index. We found that with increasing age BODE score also increases ($p < 0.001$). This study revealed that there was a significant increase in the BODE index in patients with a longer duration of smoking (Pack years). This study also shows inverse relation between BODE score and distance walked in 6 minute and FEV1. **Conclusion:** We believe that the BODE index is useful because it includes one domain that quantifies the degree of pulmonary impairment (FEV1), one that captures the patient's perception of symptoms (the MMRC dyspnea scale), and two independent domains (the distance walked in six minutes and the bodymass index) that express the systemic consequences of COPD. BODE score in follow up is a powerful tool in assessing the effect of treatment and progression of the disease.

KEYWORDS

BODE index, COPD, Age, Pack years.

INTRODUCTION:

COPD is a preventable and treatable disease that is identified via constant respiratory symptoms and airflow obstruction which is caused by persistent exposure to toxic particles or gases, resulting in small airway narrowing and damage to lung parenchyma (emphysema) resulting in chronic airway limitation and reduces elasticity of the lung.[1]

The pathophysiological changes of COPD are not limited to pulmonary changes, but also systemic changes like decrease in weight, muscle-wasting, hypo-proteinemia and tissue depletion are usually seen in COPD patients.[2]

Current estimated prevalence of COPD in India is 7.4% and is higher among males, and in northern population.[3]The annual treatment costs for COPD in India were estimated to be more than Rs. 35,000 cores in 2011 and Rs. 48,000 corers in 2016.[4]

Identification and reduction of exposure to risk factors are important in prevention and management of COPD. Reduction of total personal exposure to occupational dusts, fumes, and gases and to indoor and outdoor air pollutants is more difficult but should be tried.[5]

COPD severity is typically evaluated by a solo variable FEV1 (FORCED EXPIRATORY VOLUME1), but COPD patients also contain systemic manifestation that are not reflected by FEV1 alone. Therefore, a multivariable scoring structure – BODE INDEX (body mass index, airflow obstruction, dyspnoea, and exercise capacity) which assesses both the respiratory and systemic expression of COPD. BODE index includes a parameter that suggests about the level of pulmonary impairment (FEV1), also tells about symptoms perception (the mMRC dyspnea scale), and two other domains (the distance walked in six minutes and the body-mass index) that express the systemic consequences of COPD, [6] these four variables used to construct a 10-point index and higher scores point toward a higher risk of death.[7] BODE quartile is a good predictor of both the number and severity of exacerbations in patients with COPD.[8]

Decision makers need a rational and consistent scoring system that is designed to identify those who are maximally in need of a diagnostic or a therapeutic intervention under a healthcare budget constraint. BODE index has been proposed to serve this purpose in patients with chronic obstructive pulmonary disease (COPD).[9]

In our study we analyzed correlation between patient's age, pack year and BODE index.

AIM:

To Study Effect of Patient's Age and Pack Years of Smoking on BODE Index.

OBJECTIVES:

1. To determine whether higher scoring in BODE index in COPD correlates with more pack years of smoking.
2. To determine whether higher scoring in BODE index in COPD correlates with increasing patient's age.

METHODS AND MATERIALS:

Study Design – Cross Sectional Study Design.

Place Of Study -

The present study was conducted in department of respiratory medicine, RAJSHREE MEDICAL RESEACH INSTITUTE, BARIELLY

Period Of Study-

The data was collected from 10/01/2020 to 31/6/2022 (18 months of time period)

Sample Size:

All patients who are diagnosed as a case of COPD during study period in department of respiratory medicine RMRI, Bareilly, fulfilling the inclusion and exclusion criteria and are willing to participate in the study, are enrolled and approximately 105 confirmed COPD cases are included in this study.

Inclusion Criteria:

According to GOLD recommendations, any patient exhibiting chronic cough, sputum output, and dyspnea.

The post-bronchodilator ratio of forced expiratory volume in the first second to forced vital capacity (FEV1/FVC) should be lower than 0.7 (70%)

Exclusion Criteria

Unwilling patients, non-cooperative patients, seriously ill patients, known case of carcinoma, active pulmonary tuberculosis, recent myocardial infarction, patient unable to perform proper PFT, 6MWT. Patient already on Non invasive ventilation device or oxygen therapy at home for past 6 months, spirometry showing reversibility (increase in FEV1 by more than a 15% increase above the baseline value or of 200 ml after inhalation of a bronchodilator).

METHODOLOGY-

For each enrolled subject, detailed history of smoking, personal and family medical history was obtained. On the day of enrollment, weight and height were measured twice during the examination. Weight was measured to the nearest 100 grams with bare foot. Height was measured to the nearest mm with the stadometer. Body mass index (BMI) was calculated by the formula. BMI = Weight in Kg / (Height in Mtrs square). Spirometry was performed with equipment that met the American Thoracic Society performance criteria. The test was done as per the ATS guidelines after giving salbutamol nebulization in all cases. Predicted FEV1 and forced vital capacity (FVC) standardized for ethnicity, height, age and sex were used. FEV1 and FVC were calculated. The procedure was repeated on two occasions and the average value was taken. A detailed history of the dyspnea experienced by the patient was taken. MMRC dyspnea scale was used to score the patients dyspnea. Six-minute walk test was performed as per ATS guidelines of 2002, twice with a gap of 30 minutes rest in between and the average was taken. Patients were asked to walk on a level ground for maximum possible distance within duration of 6 minutes. Periods of rest taken were also included in the 6 minutes test period. BODE index is calculated from four variable FEV1, 6 min walk test, MMRC dyspnea scale and Body Mass Index. The patients received points ranging from 0 (lowest value) to 3 (maximal value). The points for each variable were added, so that the BODE index ranged from 0 to 10 points in each patient as per the table.

VARIABLES	0	1	2	3
FEV1	>/=65%	50-64%	36-49%	</=35%
6MWT	>350mts	250-349mts	150-249mts	<149mts
dyspnea SCALE	0-1	2	3	4
BMI	>21kg/m2	<21kg/m2		

SEVERITY OF COPD BASED ON BODE SCORE

- Mild - 0 – 2.
- Moderate - 3 – 5.
- Severe - ≥ 6.

Statistical Analysis:

The analyses were performed using SPSS for Windows, version 20. P-values of <0.05 were considered statistically significant, and all tests were two-tailed.

OBSERVATIONS AND RESULTS:

The study comprised 105 patients in total who met the eligibility requirements.

After calculating the BODE index score, the patients were categorized into mild, moderate, and severe groups, and study comprises of only male patients.

Table; 1 Categorize Patient's According to BODE Score.

BODE INDEX	Number	Percentage
MILD(0-2)	42	40 %
MODERATE(3-5)	32	30.476 %
SEVERE(≥ 6)	31	29.52 %
Total	105	100 %

Table; 2 Age Wise Distribution of Patients According to BODE Score

GROUP	N	MEAN (yrs)	Std. DEVATION	ANOVA F-Test
MILD	42	47.69	3.63	F=193.57 P=0.00 Significant
MODERATE	32	57.34	4.28	
SEVERE	31	66.16	4.15	
TOTAL	105	56.09	8.65	

Table; 3 Distribution of Patients According to Patients Pack years with Respect to BODE Score

Pack Years	BODE 1	BODE 2	BODE 3	TOTAL
<10	12	1	0	13(105)
10-20	29	20	2	51(105)
>20	1	11	29	41(105)

Table; 4 Categorize Patients According to Their Pack Years

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum	
Mild	42	14.07	3.872	.598	6	22	VALUE-83.92, P VALUE-0.0
Moderate	32	20.44	5.279	.933	10	34	
Severe	31	28.87	5.463	.981	15	40	
Total	105	20.38	7.771	.758	6	40	

Table; 5 Distribution of Patients According to BMI with Respect to BODE Score.

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum	P VALUE
Mild	42	22.55	2.098	.324	18	25	VALUE-25.19, P VALUE-0.0, SIGNIFICANT
Moderate	32	20.59	2.138	.378	17	25	
Severe	31	19.32	1.514	.272	16	23	
Total	105	21.00	2.370	.231	16	25	

Table; 6 Distribution of Patients According to the Distance Walked in 6 minutes.

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum	P VALUE
Mild	42	429.69	69.106	10.663	256	550	VALUE-130.36, P VALUE-0.0, SIGNIFICANT
Moderate	32	331.75	91.308	16.141	175	500	
Severe	31	161.13	41.338	7.425	110	240	
Total	105	320.55	131.474	12.831	110	550	

Table; 7 Distribution of Study Subjects According to their FEV1

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum	
Mild	42	75.36	5.141	.793	66	95	F VALUE-104.80, P VALUE-0.0, NON SIGNIF
Moderate	32	68.13	8.273	1.462	50	89	
Severe	31	51.87	7.446	1.337	42	75	
Total	105	66.22	11.959	1.167	42	95	

DISCUSSION

Continuous respiratory symptoms and airflow restriction brought on by exposure to hazardous particles or chemicals are characteristics of COPD. It is anticipated to be one of the leading, population-wide, life-threatening diseases.

To diagnose, spirometry is necessary; the presence of a post-bronchodilator FEV1/FVC ratio of less than 70% verifies the existence of a chronic airflow limitation.

FEV1 is the only variable used to measure the severity of COPD, but has poor relationships with systemic disease symptoms, quality of life, exacerbation frequency, and exercise intolerance. As a result, the systemic effects of COPD are expressed by the BODE index includes the FEV1, mMRC dyspnea rating, distance covered in six minutes, and BMI. [2]

According to BODE index score COPD patients were categorized into mild, moderate and severe with BODE scores of 0 to 2, 3 to 5, and 6 or more, respectively, high score correlates with severity in terms of hospitalisation and death, according to studies by **Celli et al.** [6] and **Kian Chung et al.** [10]

Mean Age

COPD disease prevalence rises with increasing age, in this study for mild, moderate and severe group mean age was 47.69, 57.34 and 66.16 years respectively. There was a statistically significant difference here. **Celli et al.** [6], **Kian Chung et al.** [10] and **Mahajan M et al**. [11] have shown that higher BODE score with increasing age .Age and BODE score have a substantial link in this study.

Smoking

Smoking is a well-known risk factor for COPD. Results from this study go along with most other studies like **Kian-chung et al**[10] **, Celli et al** [6] **and Karoli et al** [12], that higher duration of smoking is associated with higher BODE index score. The present study reveales that the BODE score increases as pack years of smoking increases, it was 14.07, 20.44, 28.87 pack yrs in mild, moderate and severe cases.

BMI

COPD is more commonly present in underweight patients. **Kian-Chung Ong et al**[10] and **B. R. Celli et al**[6] have shown that BMI and BODE score are inversely related. This study also shows a significant decrease in BMI as BODE score increases. In the present study, mean BMI (Kg/m^2) in the mild, moderate, severe group was 22.55, 20.59, 19.32 and it is statistically significant**.**

FEV1

In the current study, the mean FEV1 (%) for the mild, moderate, and severe groups was 75.36, 68.13, and 51.87 respectively, demonstrating a substantial correlation between FEV1 level of BODE score and COPD. According **to Huib A M Kerstjens et al**. [13] shows accelerated fall in FEV1 in smoker when compared with non smoker (40–50 ml per year in smoker that is 15ml extra than in non-smokers per year).

Six- minute walk test

The distance walked in six minutes is a standalone BODE INDEX domain that represents the systemic effects of COPD and displays an individual's performance level

According to **Celli et al.** [6] six-minute walk test is a reliable indicator of morbidity and mortality in patients of COPD and also captures systemic consequences of disease.

This study also explains that patients with higher BODE scores walk shorter distances than other groups—429.69 meters in mild instances, 331.75 meters in intermediate cases, and 161.13 meters in severe cases.

CONCLUSIONS

After obtaining informed consent, 105 patients were registered in this study who meets up the inclusion criteria

The study's findings led to the following conclusions:

- The multidimensional grading system BODE index which includes FEV1,6 minute walk test and the body-mass index that tells about systemic consequences of disease and mMRC dyspnea scale, which helps to better predict hospitalization for COPD
- The BODE Index is an accurate way to estimate the severity of COPD in patients.
- As assessing BODE score is relatively simple and easy to calculate, it is of great practical value at primary level of health care where other diagnostics measures are not available
- As a result, individuals with COPD can be wisely referred using the BODE index, avoiding waste of the scarce resources existing in developing nations like India.

Limitations

Since this study was conducted in a hospital, the general community may not be represented.

Since there haven't been any systematic comparisons of the various geographical symptoms of COPD, the findings of this study should only be utilized with extreme caution outside of India.

Insufficient patients were enrolled, and a large sample size was needed to identify a significant difference.

Because only men were included in our study, the findings may be biased towards women and cannot be applied to COPD patients with females.

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