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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/14455
DOI URL: http://dx.doi.org/10.21474/IJAR01/14455

RESEARCH ARTICLE

STUDY OF BODE INDEX AS A PREDICTOR OF SEVERITY AND SYSTEMIC INVOLVEMENT IN PATIENTS WITH COPD

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Manuscript Info

Manuscript History
Received: 22 January 2022
Final Accepted: 24 February 2022
Published: March 2022

Key words:-
Bode Index, COPD, Spirometry

Abstract

Introduction: Chronic obstructive pulmonary disease (COPD) is defined as a disease that is both preventable and treatable, with some significant extrapulmonary consequences. This study emphasizes the fact that the BODE index can be used to predict hospitalization and the severity of systemic involvement in COPD patients.

Materials and Methods: The present cross-sectional was conducted at KarapagaVinayaga Medical College, Chengalpattu, over a period of 10 months from March 2021 to November 2021, after the due approval of the ethical committee. A total of 120 patients aged 40 to 75 years were recruited by purposive sampling. Patients with symptoms suggestive of COPD as cases were included. Clinical examination and investigation like spirometry, ECG, 2D echo, chest X-ray and BMI were also recorded. Data were analysed using SPSS version 19.0.

Results:A total of 120 patients participated in this study. There wasa total of 80 (66.6%) males and 40 (33.3%) females among the study participants. The mean age of the study population was 57.8 years. The BODE score was significantly associated with the smoking status, the number of packyears of smoking, BMI, duration of hospital stay in the last two years.ECG axis was found to be normal in and mild groups. While 96% of patientsin the severe group are in RAD and 40% of patients in the severe group had LAD.

Conclusion: The BODE index is a reliable method for predicting hospitalization and the severity of systemic involvement in COPD patients. Because calculating the BODE index only requires a spirometer, which is relatively inexpensive and widely available, as a result, the BODE index can be used to guide the referral of COPD patients, preventing the waste of limited resources.

Introduction:-

Chronic obstructive pulmonary disease (COPD), one of the non-communicable diseases, is characterized by persistent airflow limitation that is usually progressive.[1]It is the leading cause of chronic morbidity and mortality worldwide, and it is expected to become the third leading cause of death globally by 2025 and in middle-income countries by 2030.[2] According to the global burden of disease study, COPD is expected to rise to the fifth leading cause of loss of Disability Adjusted Life Year (DALY) by 2020.[3] It also puts a significant economic and social burden on patients. According to a National Commission on Macroeconomics and Health background paper by

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Murthy et al., the annual treatment costs for COPD in India were estimated to be more than Rs. 35,000 crores in 2011 and Rs. 48,000 crores in 2016.[4]

The degree of inflammation, fibrosis and luminal exudates in small airways is related to FEV1, and FEV1/FVC ratio reductions, as well as the accelerated decline in FEV1 characteristic of COPD.[5] COPD was previously defined symptomatically as chronic bronchitis, anatomically as emphysema, and most recently physiologically as airway obstruction. The physiological definition is currently the most widely used.[6] Spirometry is increasingly being used as a criterion for diagnosing chronic obstructive pulmonary disease.[7]

Oxidative stress and altered circulating levels of inflammatory mediators and acute-phase proteins are among the systemic effects of COPD. Weight loss, muscle wasting, hypoproteinaemia, and tissue depletion are common in COPD patients, as they are in other chronic inflammatory conditions.[8] The severity of COPD is usually determined by assessing the respiratory and systemic manifestations of the disease in order to predict the patient's outcome.

The BODE index is a multidimensional tool that takes into account nutritional status, the Body Mass Index (BMI), airflow limitation (FEV1), dyspnea, and functional status as determined by the 6-minute walk distance test (6MWD).[9] BODE provides an integrated assessment of the disease's respiratory and non-respiratory manifestations, which better reflects disease severity.[10] The four factors that best predicted severity was body mass index (B), degree of airflow obstruction (O) and dyspnea (D), and exercise capacity (E), as measured by the six-minute walk test. The BODE index, a multidimensional 10-point scale with higher scores indicating a higher risk of death, was developed using these variables.[11,12]Our study aims to understand the Bode index as a predictor for involvement in patients with COPD.

Materials and Methods:-

The present cross-sectional was conducted at KarapagaVinayaga Medical College, Chengalpattu, over a period of 10 months from March 2021 to November 2021, after the due approval of the ethical committee. A total of 120 patients aged 40 to 75 years were recruited by purposive sampling at the outpatient of General medicine and Respiratory medicine Department. Patients with symptoms suggestive of COPD as cases were included. Spirometry proved bronchial asthma, recent myocardial infarction <4 months, Unstable angina, Congestive heart failure (NYHA class III or IV), inability to perform spirometry or 6-minute walk test were excluded from the study. Informed consent was obtained from study subjects. Detailed clinical history for symptoms, previous hospitalizations, exposure to smoking history was recorded, and a requisite medical examination was done thoroughly. Clinical examination and investigation like spirometry, ECG, 2D echo, chest X-ray and BMI were also recorded. The lung function parameters were assessed by spirometry and they were categorised into mild, moderate and severe COPD cases.

Data were analysed, and statistical calculations were carried out using SPSS version 19.0. Means, range and median were found to represent the data appropriately. Chi-Square tests are used for association. A P-value of <0.05 was considered significant.

Statistical analysis

The data was entered in Microsoft excel (2007) and analysed using SPSS Version 19. Frequencies were obtained using descriptive statistics. Tests of proportions (chi-square), one way ANOVA and correlation were used. A p-value of less than 0.05 was considered statistically significant.

Results:-

A total of 120 patients participated in this study. There wasa total of 80 (66.6%) males and 40 (33.3%) females among the study participants. The mean age of the study population was 57.8 years.

Table 1:- Age wise distribution in years.

Group	N	Mean	SD	One way ANOVA F-Test
Mild (0-2)	40	55.8	6.8	
Moderate (3-5)	38	58.3	7.2	F=6.43
Severe (> 6)	42	59.5	7	P=0.003
Total	120	57.8	7	**(Significant)**

Table 2:- Smoking Status.

Groups	SMOKING STATUS				Total N	Pearson Chi-Square test
	YES		NO			
	N	%	N	%		
Mild (0-2)	17	26.15	23	41.81	40	$X^2 = 3.12$ P =0.004 (Significant)
Moderate (3-5)	22	33.84	16	29.09	38	
Severe (> 6)	26	40	16	29.09	42	
Total	65	54.16	55	45.84	120	

Nearly 54% of our population are smokers, and the difference in proportion for smoking status and study group was statistically significant. (P =0.004) Table 2

Table 3:- Smoking in pack years.

Group	N	Mean Pack years	SD	One way ANOVA F-Test
Mild (0-2)	40	4.37	5.22	$X^2 = 15.82$ P =0.002 (Significant)
Moderate (3-5)	38	9.21	8.66	
Severe (> 6)	42	17.65	12.78	
Total	120	10.41	8.88	

The Mean of the smoking pack in years is 10.41 ± 8.88 years and the difference in proportion for smoking in pack years and study group was statistically significant. (P =0.002) (Table 3)

Table 4:- Body Mass index.

Group	N	Mean (kg/m^2)	SD	Oneway ANOVA F-Test
Mild (0-2)	40	23.54	2.56	$X^2 = 29.63$ P =0.002 (Significant)
Moderate (3-5)	38	22.55	2.33	
Severe (> 6)	42	23.88	2.93	
Total	120	22.99	2.60	

The mean BMI across the group is 22.99 ± 2.60 and the difference in proportion for BMI and study group was statistically significant. (P =0.002) Table 4.

Table 5:- Duration of hospital stay over last two years (days).

Group	N	Mean (days)	SD	Oneway ANOVA F-Test
Mild (0-2)	40	1	0.51	$X^2 = 11.29$ P =0.004 (Significant)
Moderate (3-5)	38	7.13	2.72	
Severe (> 6)	42	12.05	2.23	
Total	120	6.72	1.82	

The mean of the hospital stay over the last two years is 6.72 ± 1.82 days. The difference in proportion for duration of hospital stay over the last two years and the study group was statistically significant. (P =0.004) (Table 5)

Table 6:-Haemoglobin concentration in gm/ dL.

Group	N	Mean (gm/dL)	SD	One way ANOVA F-Test
Mild (0-2)	40	13.47	1.32	$X^2 = 6.88$ P =0.000 (Significant)
Moderate (3-5)	38	12.96	1.59	
Severe (> 6)	42	13.02	1.14	
Total	120	13.15	1.35	

The mean of the hemoglobin concentration is 13.15 ± 1.35 gm/dL and the difference in proportion for hemoglobin concentration and the study group was statistically significant.

(P =0.004) (Table 5)

Table 7:- QRS axis in ECG and BODE score.

Group	ECG Axis						Person Chi-Square test
	Normal		RAD		LAD		
	N	%	N	%	N	%	
Mild (0-2)	34	47.88	0	0	6	27.27	
Moderate (3-5)	30	42.25	1	3.70	7	31.81	
Severe (> 6)	7	9.85	26	96.29	9	40.90	P=0.001 significant
Total	71	59.16	27	22.5	22	18.33	

The ECG interpretation reveals that nearly 59.16% falls under Normal, 22.5% falls in RAD, and 18.33% were on LAD and the study groups were statistically significant with ECG. (P=0.001) (Table 7).

Table 8:- Ejection fraction Vs BODE score.

Group	N	Mean (%)	SD	One way ANOVA F-Test
Mild (0-2)	40	60.78	4.384	
Moderate (3-5)	38	55.29	3.866	
Severe (> 6)	42	52.13	2.879	F= 35.13
Total	120	56.06	11.11	P = 0.214 Significant

The mean between ejection fraction Vs BODE score was 56.06 and the difference in proportion for ejection fraction Vs BODE and study group was statistically significant.
(P =0.0214) (Table 8)

Discussion:-

More emphasis has recently been placed on developing a simple but effective index for assessing the severity of COPD. Researchers discovered that the BODE index would meet this requirement. We attempted to assess its usefulness in predicting the severity of COPD in terms of hospitalisation, systemic involvement, and the level of systemic inflammation in our study.

BODE score increases with age, as demonstrated by Kian-chung et al. [13] and Celli et al. [14] in their respective studies. This study also found a significant increase in the severe and moderately ill across all groups.

Results from this study go along with most other studies in the relationship of smoking to the BODE index. Studies by JJ Soler-Cataluña et[15] al and Celli et al. [14] have proven beyond doubt that a higher smoking duration is associated with a higher BODE index. The study found that patients who smoked for a longer period had a significantly higher BODE index. Our findings on the usefulness of the BODE index in predicting hospitalisation for COPD are supported by the findings of a prospective study[7] of risk factors for hospital readmissions for COPD exacerbation.

In our study, 59.16 % of individuals had a normal axis, 22.5 % had right axis deviation, 18.33% LAD. However, 75.6 % of individuals had the right axis in the severe COPD group, which was significantly higher than other groups. This could be attributed to the higher level of deterioration in lung function and pulmonary hypertension in these individuals.

Conclusion:-

The BODE index can assess the severity of chronic obstructive pulmonary disease. As a result, our study concludes that the BODE index is a reliable method for predicting hospitalisation and the severity of systemic involvement in COPD patients. Because the BODE index assessment requires only a spirometer, which is relatively inexpensive and easily accessible, this index could be of great practical value in a primary health care setting to identify individuals who require further evaluation in a higher centre. As a result, the BODE index can guide the referral of COPD patients, preventing resource waste.

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