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CORRELATION OF BODE INDEX AND FRACTIONAL EXHALED NITRIC OXIDE (FeNO) IN COPD PATIENTS: A CROSS-SECTIONAL STUDY

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ABSTRACT **Background:** Chronic Obstructive Pulmonary Disease (COPD) is a heterogeneous disorder with systemic manifestations. The BODE index is a multidimensional tool for severity assessment, while fractional exhaled nitric oxide (FeNO) reflects eosinophilic airway inflammation. **Methods:** A cross-sectional study was conducted in 100 COPD patients at a tertiary care centre in Telangana. All patients underwent spirometry, body mass index (BMI) calculation, modified Medical Research Council (mMRC) dyspnea grading, six-minute walk test (6MWT), BODE index calculation, and FeNO measurement using NIOX VERO. **Results:** The mean age was 61.2 ± 7.23 years with male predominance (90%). Elevated FeNO (≥25 ppb) was observed in 56.25% of patients. BODE index showed significant association with age, smoking index, duration of illness, and exercise capacity. A statistically significant association was observed between FeNO levels and BODE severity ($p < 0.001$). **Conclusion:** BODE index is a reliable multidimensional severity assessment tool in COPD. FeNO may serve as a useful non-invasive biomarker to identify eosinophilic phenotype in COPD patients.

KEYWORDS : COPD, BODE Index, FeNO, Spirometry, Six Minute Walk Test

INTRODUCTION

COPD is characterized by persistent airflow limitation and chronic respiratory symptoms. Severity assessment based solely on FEV1 has limitations. The BODE index incorporates nutritional status, airflow obstruction, dyspnea, and exercise capacity, thereby offering better prognostic value. FeNO reflects eosinophilic airway inflammation and may help in phenotyping COPD patients.

MATERIALS AND METHODS

Study Design: Cross-sectional study

Study Period: November 2023 – October 2024

Study Population: 100 COPD patients attending a tertiary care centre in Hyderabad.

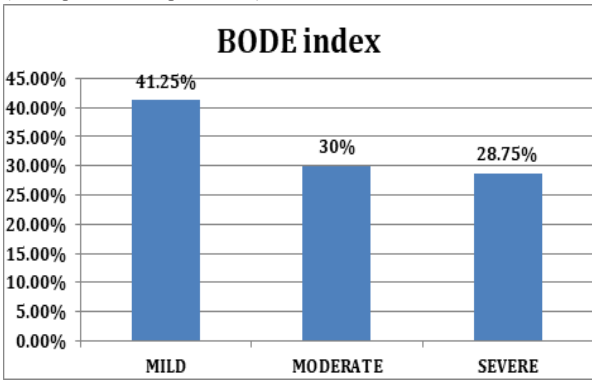
Inclusion Criteria: Age 18–80 years, post-bronchodilator FEV1/FVC <0.70.

Exclusion Criteria: Bronchiectasis, unstable cardiac disease, pregnancy, significant bronchodilator reversibility.

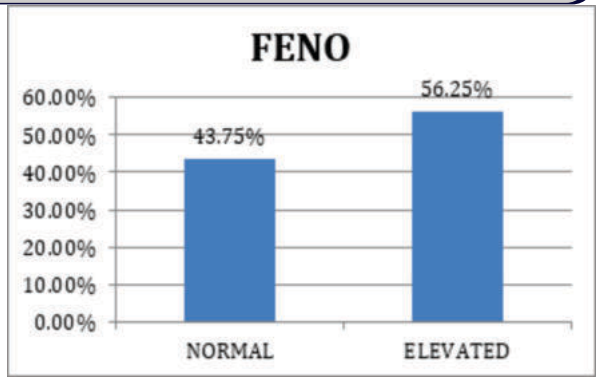
Assessments included spirometry, BMI, mMRC dyspnea grading, 6MWT, BODE index calculation and FeNO measurement. Statistical analysis was performed using SPSS version 19. Descriptive statistics and Chi-square test were applied.

RESULTS

BODE index increased significantly with age, smoking index, disease duration, declining BMI, FEV1, and six-minute walk distance. Elevated FENO was observed in 56.25% cases, more common in mild COPD, showing a significant association with BODE severity and suggesting eosinophilic airway inflammation in a subset of patients (Chi-square = 18.7, p = 0.0008)



Graph 1: Distribution of COPD Severity Based on BODE Index



Graph 2: Distribution of COPD cases based on FENO

Table 1: Distribution Of Patients On Comparison Of Bode Index With FENO

BODE INDEX	FENO		TOTAL
	ELEVATED	NORMAL	
MILD	28(84.84%)	5(15.16%)	33(100%)
MODERATE	9(37.5%)	15(62.5%)	24(100%)
SEVERE	8(34.78%)	15(65.21%)	23(100%)

DISCUSSION

The present study evaluated the role of the BODE index and fractional exhaled nitric oxide in assessing disease severity among COPD patients.

Study population predominantly consisted of elderly males, consistent with the higher prevalence of smoking in the Indian population. Advancing age showed a significant association with increasing BODE index, indicating progressive functional limitation with age. Smoking index demonstrated a strong positive correlation with disease severity, highlighting the cumulative impact of tobacco exposure on airflow limitation, dyspnea, and exercise capacity.

A significant inverse relationship was observed between body mass index and COPD severity, with lower BMI seen in patients with higher BODE scores. Exercise capacity, assessed using the six-minute walk test, declined significantly with increasing BODE index, emphasizing its value as a functional marker.

FeNO levels were elevated in a substantial proportion of patients and showed a significant association with BODE severity. Higher FeNO values were more commonly observed in patients with milder disease, possibly due to reduced smoking-related suppression of nitric oxide and lower corticosteroid exposure. These findings suggest variability in airway inflammatory phenotypes across COPD severity.

CONCLUSION

BODE index is an effective and comprehensive tool for assessing disease severity in patients with Chronic Obstructive Pulmonary Disease. By incorporating body mass index, airflow obstruction, dyspnea, and exercise capacity, the BODE index provides a more holistic evaluation compared to spirometry alone. Higher BODE scores were significantly associated with advancing age, greater smoking exposure, longer duration of illness, lower body mass index, and reduced six-minute walk distance. These associations reinforce the multidimensional nature of COPD and the importance of functional and systemic assessment in routine clinical practice.

Fractional exhaled nitric oxide was elevated in a significant proportion of patients and showed a meaningful association with disease severity. Elevated FeNO levels were more frequently observed in patients with mild COPD, suggesting the presence of eosinophilic airway inflammation in this subgroup. This has potential clinical relevance in identifying patients who may benefit from inhaled corticosteroid therapy.

The combined use of the BODE index and FeNO measurement may improve disease characterization, risk stratification, and individualized management of COPD patients. Incorporation of multidimensional indices and non-invasive inflammatory biomarkers into routine evaluation may enhance clinical decision-making and optimize therapeutic outcomes.

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