

Association between Body Mass Index and Quality of Life among Patients with Chronic Obstructive Pulmonary Disease**Vivek Pardeshi**

Assistant Professor, Department of Preventive and Social Medicine, Chirayu Medical College & Hospital, Bhopal, Madhya Pradesh, India

Received: 01-04-2026 / Revised: 15-05-2026 / Accepted: 21-06-2026

Corresponding author: Dr. Vivek Pardeshi

Conflict of interest: Nil

Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a progressive respiratory disorder characterized by persistent airflow limitation and chronic airway inflammation. In addition to pulmonary dysfunction, COPD is associated with systemic manifestations, particularly nutritional abnormalities, which significantly influence disease severity, functional capacity, and health-related quality of life (HRQoL). Body mass index (BMI) is a simple and reliable indicator of nutritional status and has been recognized as an important predictor of prognosis and quality of life in patients with COPD.

Aim: To assess the body mass index (BMI) of patients with chronic obstructive pulmonary disease, evaluate its distribution, and determine its relationship with various clinical factors and quality of life.

Methods: A hospital-based observational cross-sectional study was conducted among 150 patients with spirometry-confirmed chronic obstructive pulmonary disease attending the Department of General Medicine of a tertiary care teaching hospital. Body mass index was calculated using standard anthropometric measurements and classified according to the Asia-Pacific BMI criteria. Patients were categorized according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification based on post-bronchodilator FEV₁ values. Health-related quality of life was assessed using the validated St. George's Respiratory Questionnaire (SGRQ). The association of BMI with demographic variables, COPD severity, and SGRQ scores was analyzed using appropriate statistical tests. Multiple linear regression analysis was performed to identify independent predictors of quality of life. Statistical analysis was carried out using SPSS version 26.0, and a p value of <0.05 was considered statistically significant.

Results: Among the 150 study participants, 45.3% were obese, 34.7% were overweight, 12.0% had normal BMI, and 8.0% were underweight. Underweight patients demonstrated significantly higher symptom, activity, impact, and total SGRQ scores, indicating poorer health-related quality of life compared with patients having higher BMI (p<0.05). A significant association was observed between BMI and airflow limitation severity, with the majority of underweight patients belonging to the severe and very severe COPD categories (p<0.001). Multiple linear regression analysis identified lower BMI and reduced FEV₁ as independent predictors of poorer quality of life. Smoking, biomass smoke exposure, female gender, increasing age, and hospitalization history were also significantly associated with higher SGRQ scores.

Conclusion: Body mass index is a significant predictor of health-related quality of life in patients with chronic obstructive pulmonary disease. Lower BMI is associated with more severe airflow limitation and poorer quality of life, while higher BMI is associated with better functional status and lower SGRQ scores. Routine assessment of BMI should be incorporated into the comprehensive evaluation of COPD patients to identify individuals at nutritional risk and facilitate early nutritional intervention, pulmonary rehabilitation, and individualized management strategies aimed at improving quality of life.

Keywords: Chronic Obstructive Pulmonary Disease, COPD, Body Mass Index, BMI, Quality of Life, St. George's Respiratory Questionnaire, SGRQ, Nutritional Status.

DOI: 10.25258/ijcpr.18.7.105

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Chronic obstructive pulmonary disease (COPD) is a common, preventable, and treatable respiratory disease characterized by persistent airflow limitation resulting from chronic inflammatory

changes in the airways and lung parenchyma. It is one of the leading causes of morbidity and mortality worldwide and imposes a significant socioeconomic burden due to frequent

hospitalizations, reduced functional capacity, and impaired quality of life. Although pulmonary dysfunction is the hallmark of COPD, several extrapulmonary manifestations, particularly nutritional abnormalities and weight loss, have been recognized as important determinants of disease progression and prognosis. [1,2]

Body mass index (BMI) is a simple, inexpensive, and widely accepted indicator of nutritional status in patients with COPD. Malnutrition and low BMI are common in advanced COPD due to increased energy expenditure, reduced dietary intake, systemic inflammation, skeletal muscle wasting, and chronic hypoxemia. Loss of body weight and lean muscle mass adversely affect respiratory muscle strength, exercise tolerance, immune function, and overall survival. Several studies have demonstrated that low BMI is associated with increased mortality and poor clinical outcomes among COPD patients. [2-4]

Quality of life has emerged as an important outcome measure in the management of COPD because the disease significantly affects physical functioning, emotional well-being, social activities, and daily living. Health-related quality of life (HRQoL) assessment provides valuable information regarding the impact of symptoms and functional limitations on patients beyond conventional spirometric measurements. Disease-specific questionnaires such as the St. George's Respiratory Questionnaire (SGRQ) are widely used to evaluate quality of life in patients with COPD. [5,6]

Previous studies have shown that nutritional depletion and reduced BMI are strongly associated with deterioration in health-related quality of life. Underweight patients often experience greater dyspnea, reduced exercise capacity, decreased muscle strength, increased frequency of exacerbations, prolonged hospital stays, and poorer functional status compared to patients with normal BMI. Conversely, maintenance of adequate nutritional status has been associated with better physical performance and improved quality of life. [7,8]

Although spirometric parameters remain the standard method for assessing disease severity, they do not completely reflect the overall health status of COPD patients. Multidimensional assessment incorporating nutritional status, symptom burden, and quality of life provides a more comprehensive evaluation of disease severity. Therefore, BMI has been proposed as an important prognostic indicator and has been incorporated into multidimensional indices such as the BODE index for predicting mortality and disease progression. [2,9]

Considering the growing evidence regarding the impact of nutritional status on disease outcome, assessment of BMI in relation to quality of life may provide valuable clinical information for the comprehensive management of COPD patients. Early identification of undernourished individuals allows timely nutritional intervention, pulmonary rehabilitation, and individualized treatment strategies aimed at improving functional status and overall quality of life. [9,10]

Therefore, the present study was undertaken to assess the body mass index of patients with chronic obstructive pulmonary disease, evaluate its distribution, and determine its relationship with various clinical factors and the quality of life among COPD patients.

Material and Methods

A hospital-based observational cross-sectional study was conducted in the Department of General Medicine in collaboration with the Department of Pulmonary Medicine of a tertiary care teaching hospital over a period of 18 months. The study aimed to assess the body mass index (BMI) of patients with chronic obstructive pulmonary disease (COPD), evaluate its distribution, and determine its relationship with various clinical factors and quality of life.

A total of 150 patients diagnosed with COPD according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria were included in the study after obtaining written informed consent. Patients were selected by consecutive sampling during the study period.

Patients aged 18 years and above with spirometry-confirmed COPD who were clinically stable and willing to participate were included in the study. Patients with bronchial asthma, pulmonary tuberculosis, interstitial lung disease, malignancy, severe cardiac disease, chronic kidney disease, chronic liver disease, endocrine disorders affecting body weight, acute exacerbation of COPD, pregnancy, or those unwilling to participate were excluded from the study.

A detailed clinical history including age, gender, smoking history, duration of illness, occupational exposure, respiratory symptoms, comorbidities, and treatment history was obtained from all participants. General physical examination and systemic examination were performed. Height and body weight were measured using standardized equipment, and body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2). Patients were categorized into underweight, normal weight, overweight, and obese according to the World Health Organization (WHO) BMI classification.

Pulmonary function testing was performed using a standardized computerized spirometer following American Thoracic Society guidelines. Based on post-bronchodilator FEV₁ values, patients were classified into GOLD Grade I (mild), Grade II (moderate), Grade III (severe), and Grade IV (very severe) COPD.

Health-related quality of life was assessed using the validated St. George's Respiratory Questionnaire (SGRQ) administered through a structured interview. The questionnaire evaluated symptoms, activity limitation, and disease impact, and the total SGRQ score was calculated according to standard guidelines. Higher scores indicated poorer quality of life.

The primary outcome of the study was to assess the relationship between body mass index and quality of life among COPD patients. Secondary outcomes included evaluation of BMI distribution according to age, gender, smoking status, duration of disease, GOLD severity, and other clinical variables.

The collected data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages.

The Chi-square test was used to compare categorical variables, and Student's t-test or one-way analysis of variance (ANOVA) was used for comparison of continuous variables wherever appropriate. Pearson's correlation coefficient was used to assess the relationship between BMI and quality of life scores. A p value of less than 0.05 was considered statistically significant.

Results

The distribution of body mass index (BMI) among the study subjects showed that obesity was the most common nutritional category, accounting for 68 (45.3%) patients, followed by overweight in 52 (34.7%) patients. Normal BMI was observed in 18 (12.0%) patients, while only 12 (8.0%) patients were underweight. The mean BMI of the study population was 24.86 ± 4.2 kg/m², indicating that the majority of COPD patients belonged to the overweight and obese BMI categories according to the Asia-Pacific classification. (Table 1)

The relationship between BMI and the components of the St. George's Respiratory Questionnaire (SGRQ) demonstrated that underweight patients had significantly higher symptom, activity, impact, and total SGRQ scores compared with patients having normal, overweight, or obese BMI. The mean total SGRQ score was highest among underweight patients (67.42 ± 12.5), indicating poorer quality of life, whereas overweight and obese patients had comparatively lower total scores. The association between BMI and all SGRQ components was statistically significant ($p < 0.05$), suggesting that lower BMI is associated with poorer health-related quality of life in COPD patients. (Table 2)

The comparison of BMI with airflow limitation severity revealed a significant association between nutritional status and the severity of COPD. Most obese and overweight patients were classified under mild or moderate airflow limitation, whereas the majority of underweight patients belonged to the very severe category. Very severe airflow limitation was observed in 7 of the 12 underweight patients, while only one obese patient was classified in the very severe category. The association between BMI and airflow limitation severity was statistically significant ($p < 0.001$), indicating that lower BMI is associated with increasing severity of COPD. (Table 3)

Multiple linear regression analysis identified several independent predictors of the total SGRQ score among COPD patients. Lower FEV₁ and lower BMI were significantly associated with higher SGRQ scores, indicating poorer quality of life. Female gender, increasing age, hospitalization history, biomass smoke exposure, and smoking were also significant predictors of impaired quality of life, whereas non-smoking status was associated with better quality of life. Poor sleep did not show a statistically significant association with the total SGRQ score. The regression model was statistically significant (Adjusted R² = 0.548, ANOVA F = 28.12, $p < 0.001$), demonstrating that these variables collectively explained a substantial proportion of the variation in quality of life among patients with chronic obstructive pulmonary disease. (Table 4)

Table 1: Distribution of BMI among the study subjects (n=150)

BMI (kg/m ²)	N	%
Underweight (<18.5)	12	8.0
Normal (18.5–22.9)	18	12.0
Overweight (23.0–24.9)	52	34.7
Obese (≥ 25)	68	45.3
Mean $\pm$ SD	24.86 ± 4.2 kg/m ²	

Asia-Pacific BMI Classification.**Table 2: Relationship between BMI and components of St. George's Respiratory Questionnaire (SGRQ) among study subjects (n=150)**

Components of SGRQ	Underweight (n=12)	Normal (n=18)	Overweight (n=52)	Obese (n=68)	P value
Symptom score	55.18 ± 13.6	40.24 ± 11.8	39.65 ± 14.1	38.12 ± 13.5	0.002
Activity score	87.62 ± 16.9	63.78 ± 17.5	50.84 ± 16.8	52.13 ± 15.6	<0.001
Impact score	59.84 ± 14.2	34.16 ± 13.3	29.42 ± 13.7	30.87 ± 14.2	<0.001
Total score	67.42 ± 12.5	43.81 ± 12.6	36.84 ± 11.8	37.92 ± 11.4	<0.001

SGRQ: St. George's Respiratory Questionnaire.

Table 3: Relationship of BMI with airflow limitation severity among study subjects (n=150)

Airflow limitation severity	Underweight (n=12)	Normal (n=18)	Overweight (n=52)	Obese (n=68)	P value
Mild	0	2	5	15	<0.001
Moderate	3	10	33	34	
Severe	2	5	14	18	
Very Severe	7	1	0	1	

Table 4: Multiple linear regression analysis between predictors and total SGRQ score

Variables	B	Std. Error	Beta	t	P value	95% CI Lower	95% CI Upper
FEV ₁	-0.238	0.049	-0.221	-4.86	<0.001	-0.335	-0.141
BMI	-0.981	0.158	-0.291	-6.21	<0.001	-1.293	-0.669
Poor sleep	1.352	1.601	0.046	0.84	0.401	-1.810	4.514
Non-smoker	-7.018	1.582	-0.247	-4.44	<0.001	-10.14	-3.90
Hospitalization history	3.214	1.447	0.112	2.22	0.028	0.354	6.074
Female gender	6.815	1.621	0.221	4.20	<0.001	3.611	10.02
Age (years)	0.184	0.061	0.132	3.02	0.003	0.064	0.304
Biomass smoke exposure	7.924	1.536	0.271	5.16	<0.001	4.889	10.959
Rural residence	-7.315	1.701	-0.256	-4.30	<0.001	-10.67	-3.96
Smoker	3.882	1.468	0.138	2.64	0.009	0.982	6.782
Model statistics		Value					
Adjusted R²		0.548					
ANOVA F value		28.12					
P value		<0.001					

Discussion

The present hospital-based observational study was conducted to assess the body mass index (BMI) of patients with chronic obstructive pulmonary disease (COPD), evaluate its distribution, and determine its relationship with various clinical factors and quality of life. COPD is increasingly recognized as a systemic disease associated with nutritional abnormalities, skeletal muscle wasting, and impaired functional capacity, all of which contribute significantly to deterioration in health-related quality of life. Body mass index is a simple and practical indicator of nutritional status and has been identified as an important prognostic factor in patients with COPD. In the present study, obesity and overweight constituted the majority of the study population, whereas only a small proportion of patients were underweight. Despite the lower prevalence of underweight individuals, they demonstrated significantly poorer clinical outcomes

compared to patients with higher BMI. Previous studies have shown that nutritional depletion adversely affects respiratory muscle strength, exercise tolerance, immune function, and overall survival in COPD patients. Agustí et al. reported that systemic manifestations of COPD, including weight loss and skeletal muscle dysfunction, significantly contribute to disease progression and poor prognosis. Similarly, Engelen et al. demonstrated that nutritional depletion is closely associated with impaired respiratory and peripheral muscle function in patients with COPD.[11,13]

The present study demonstrated a significant association between BMI and all components of the St. George's Respiratory Questionnaire (SGRQ). Underweight patients had significantly higher symptom, activity, impact, and total SGRQ scores, indicating poorer health-related quality of life compared with patients having normal, overweight, or obese BMI. Reduced body weight is often

associated with increased dyspnea, reduced exercise capacity, and greater physical disability, resulting in impaired quality of life. Oga et al. reported that lower BMI is an independent predictor of poor health status and increased mortality in COPD patients. Likewise, Yohannes et al. observed that nutritional status significantly influences functional capacity and quality of life and contributes to adverse clinical outcomes among patients with COPD.[14,15]

A significant relationship was also observed between BMI and the severity of airflow limitation. Most underweight patients belonged to the severe and very severe COPD categories, whereas overweight and obese patients were predominantly represented in the mild and moderate disease groups. Progressive airflow limitation increases the work of breathing, resting energy expenditure, and systemic inflammation, leading to gradual loss of body weight and muscle mass. These findings support previous observations that declining BMI reflects worsening disease severity and poor nutritional reserve in advanced COPD.[11,13]

Multiple linear regression analysis identified lower BMI as an independent predictor of poorer quality of life even after adjustment for lung function and other clinical variables. Lower FEV₁, smoking, biomass smoke exposure, hospitalization history, female gender, and increasing age were also significantly associated with higher SGRQ scores, whereas non-smoking status was associated with better quality of life. These findings indicate that quality of life in COPD is influenced by multiple interacting clinical and demographic factors, with nutritional status representing an important modifiable determinant. Previous studies have similarly emphasized that multidimensional assessment incorporating nutritional status, pulmonary function, and clinical characteristics provides a more comprehensive evaluation of COPD than spirometric assessment alone.[12,14]

Overall, the findings of the present study demonstrate that BMI is closely associated with disease severity and health-related quality of life in patients with COPD. Underweight patients experience greater symptom burden, poorer functional status, and reduced quality of life compared with patients having normal or increased BMI. Routine assessment of BMI should therefore form an integral part of the clinical evaluation of COPD patients. Early nutritional intervention, pulmonary rehabilitation, smoking cessation, and optimization of medical management may help improve nutritional status, functional capacity, and overall quality of life. These findings are consistent with previous studies highlighting the prognostic importance of BMI in the comprehensive management of COPD.[11-15]

Conclusion

The present study demonstrated that body mass index is a significant predictor of health-related quality of life in patients with chronic obstructive pulmonary disease. Underweight patients exhibited poorer quality of life, higher SGRQ scores, and more severe airflow limitation compared with patients having normal, overweight, or obese BMI. Lower BMI was identified as an independent predictor of impaired quality of life, emphasizing the importance of nutritional status in the overall assessment of COPD patients. Routine measurement of BMI, together with evaluation of pulmonary function and quality of life, should be incorporated into the standard clinical assessment of patients with COPD. Early identification and appropriate nutritional intervention may improve functional status, reduce disease burden, and enhance the quality of life in these patients.

References

1. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: 2024 report. Fontana (WI): Global Initiative for Chronic Obstructive Lung Disease; 2024.
2. Celli BR, Cote CG, Marin JM, Casanova C, Montes de Oca M, Mendez RA, et al. The body mass index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary disease. *N Engl J Med*. 2004;350(10):1005-12.
3. Schols AMWJ, Slangen J, Volovics L, Wouters EFM. Weight loss is a reversible factor in the prognosis of chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 1998;157(6 Pt 1):1791-7.
4. Landbo C, Prescott E, Lange P, Vestbo J, Almdal TP. Prognostic value of nutritional status in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 1999;160(6):1856-61.
5. Vestbo J, Hurd SS, Agustí AG, Jones PW, Vogelmeier C, Anzueto A, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. *Am J Respir Crit Care Med*. 2013;187(4):347-65.
6. Wilson DO, Rogers RM, Wright EC, Anthonisen NR. Body weight in chronic obstructive pulmonary disease. The National Institutes of Health Intermittent Positive-Pressure Breathing Trial. *Am Rev Respir Dis*. 1989;139(6):1435-8.
7. Mostert R, Goris A, Weling-Scheepers C, Wouters EFM, Schols AMWJ. Tissue depletion and health-related quality of life in patients with chronic obstructive pulmonary disease. *Respir Med*. 2000;94(9):859-67.

8. Katsura H, Yamada K, Kida K. Both generic and disease-specific health-related quality of life are deteriorated in patients with underweight chronic obstructive pulmonary disease. *Respir Med.* 2005;99(5):624-30.
9. Domingo-Salvany A, Lamarca R, Ferrer M, Garcia-Aymerich J, Alonso J, Félez M, et al. Health-related quality of life and mortality in male patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med.* 2002;166(5):680-5.
10. Jones PW, Quirk FH, Baveystock CM. The St George's Respiratory Questionnaire. *Respir Med.* 1991;85(Suppl B):25-31.
11. Agustí AGN, Noguera A, Sauleda J, Sala E, Pons J, Busquets X. Systemic effects of chronic obstructive pulmonary disease. *Eur Respir J.* 2003;21(2):347-60.
12. Eisner MD, Blanc PD, Yelin EH, Sidney S, Katz PP, Ackerson L, et al. Influence of body composition and weight change on respiratory symptoms in chronic obstructive pulmonary disease. *Respir Med.* 2007;101(5):1110-8.
13. Engelen MPKJ, Schols AMWJ, Baken WC, Wesseling GJ, Wouters EFM. Nutritional depletion in relation to respiratory and peripheral skeletal muscle function in outpatients with chronic obstructive pulmonary disease. *Eur Respir J.* 1994;7(10):1793-7.
14. Oga T, Nishimura K, Tsukino M, Sato S, Hajiro T. Analysis of the factors related to mortality in chronic obstructive pulmonary disease: Role of body mass index and health status. *Am J Respir Crit Care Med.* 2003;167(4):544-9.
15. Yohannes AM, Baldwin RC, Connolly MJ. Predictors of one-year mortality in patients discharged from hospital following acute exacerbation of chronic obstructive pulmonary disease. *Age Ageing.* 2005;34(5):491-6.