

# Body Mass Index as a Predictor of Quality of life of Patients with Chronic Obstructive Pulmonary Disease

Akash Subhashrao Yende

Assistant Professor, Department of Community Medicine, Index Medical College, Hospital and Research Centre, Indore, Madhya Pradesh, India.

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## Abstract

**Background and Aim:** Studies have reported that excessive weight and obesity are common in the early stages of COPD, and malnutrition is common in moderate and severe COPD. COPD is known to show “obesity paradox” i.e., obese and overweight COPD patients have better outcome of disease as compared to underweights. The aim of the study was to assess the BMI of COPD patients, its distribution and relationship with various factors.

**Material and Methods:** Present study was conducted at tertiary care institute of India for the duration of one year. Total 400 COPD patients were selected to assess their body mass index (BMI) using Quetelet’s formula. Study subjects were selected using a systematic random sampling method. Study subjects were categorized as per WHO’s classification of BMI for Asian populations.

**Results:** Out of a total of 400 subjects enrolled in the study, majority (49%) were obese followed by 35% overweights and 7% underweights. Health-related quality of life of undernourished patients was most affected. A statistically significant relation was seen across all the components of SGRQ.

**Conclusion:** Present research established that, the disease related malnutrition is common in COPD patients, therefore, BMI might be a useful indicator to predict the prognosis of disease. This calls for an urgent need by our primary care physicians to provide simultaneous weight management interventions in COPD patients so as to improve their nutritional status, enhance the strength of respiratory muscles and reduce the inflammation which will be effective in long-term management of the disease.

**Key Words:** BMI, COPD, Malnutrition, Obesity

## Introduction

Chronic obstructive pulmonary disease (COPD) is a multifactorial disease of lungs with systemic manifestations that alter the course and outcome of the disease. It is an under-diagnosed, life-threatening condition, accounting more than 3 million deaths

globally, which is 6% of all deaths worldwide.<sup>1</sup> More than 90% of deaths are observed to occur in low- and middle-income countries (LMIC).<sup>2</sup> Current evidence showed some drugs and interventions could partially delay COPD progression. So it is essential to find indicators to predict the prognosis and outcome

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**Corresponding Author:** Akash Subhashrao Yende, Assistant Professor, Department of Community Medicine, Index Medical College, Hospital and Research Centre, Indore, Madhya Pradesh, India.

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of COPD. Depending on the stage of the disease, dyspnea and fatigue are the leading symptoms restricting the daily life activities of individuals and seriously affecting their social life.<sup>3-5</sup> It is reported in the literature that dyspnea has a prevalence between 69%-98% and fatigue between 43%-97% in individuals with COPD.<sup>6-8</sup>

Studies have reported that excessive weight and obesity are common in the early stages of COPD, and malnutrition is common in moderate and severe COPD.<sup>8,9</sup> In COPD, as a result of malnutrition, muscle atrophy, and respiratory weakness are observed, and low Body Mass Index (BMI) values negatively affect the prognosis of the disease.<sup>8,10</sup> In addition, although the cause of obesity in the early stages of COPD is not known exactly, it is thought that the reason for the increase in obesity is the decrease in daily living activities due to fatigue.<sup>8</sup> Since obesity or malnutrition leads to fatigue in patients with COPD, it is predicted that the addition of dyspnea may aggravate the situation. Body mass index is one of the factors which determines the prognosis of the disease. COPD is known to show "obesity paradox" i.e., obese and overweight COPD patients have better outcome of disease as compared to underweights.<sup>2</sup> Severity of disease increases with decreasing body mass index. The most common symptoms of COPD are breathlessness or air hunger, excessive sputum production and chronic cough that persists for prolonged duration causing respiratory muscle weakness and impaired immune system.

Considering the impact of nutritional status on prognosis of COPD this study holds much importance in public health domains to provide data on BMI and quality of life of patients with COPD. The aim of the study was to assess the BMI of COPD patients, its distribution and relationship with various factors.

## Material and Methods

Present study was conducted at tertiary care institute of India for the duration of one year.

### Inclusion criteria

Subjects above 18 years, diagnosed with COPD for  $\geq 3$  months and residents of Lucknow for  $\geq 6$  months were included in the study.

### Exclusion criteria

Those with severe mental illness and/or vocal disability or mental retardation, acute exacerbation, organ failure, and those currently on treatment for pulmonary tuberculosis were excluded from the study.

A systematic random sampling method was used to select the patients for the study and a target to enroll five patients per day was set. Every fourth COPD diagnosed patient attending respiratory medicine OPD for follow up was included in the study and, if the selected subject didn't fulfil the inclusion criteria, then the next COPD diagnosed patient was considered. Study subjects were approached considering the inclusion criteria. Purpose and objective of the study were clearly explained before starting the interview. BMI was calculated by using Quetelet's index  $\{BMI = \text{weight (kg)} / \text{height (m}^2)\}$ . Study subjects were categorized as per WHO's classification of BMI for Asian populations. Written informed consent was taken from the patients as well as their queries were addressed at the end of the interview.

The designed interview schedule was pretested on 10% of the total sample. Relevant modifications were made in the schedule to overcome the shortcomings and difficulties faced during pre-testing.

### Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

## Results

Out of a total of 400 subjects enrolled in the study, majority (49%) were obese followed by 35% overweights and 7% underweights. The mean BMI among study subjects was  $24.80 \pm 4.10$  kg/m<sup>2</sup> (Table 1).

Descriptive statistics of HRQL shows the mean SGRQ scores across all components were higher in undernourished subjects, indicating comparatively

poor health-related quality of life. A statistically significant relation was seen between BMI and all the components of HRQOL ( $p < 0.001$ ) (Table 2). In the association between BMI and other variables of study subjects (Table 2), BMI was found to have a statistically significant association with airflow limitation severity of the study subjects. Multiple linear regression model showed that FEV1, BMI, non-working status, history of hospitalization due to exacerbation of COPD, female gender, age, exposure to biomass smoke, rural area of residence, Hindu religion and smoking can predict 55.6% of variability

in the prediction of total score of health-related quality of life. BMI was the strongest factor to predict the total score of SGRQ.

**Table 1: Distribution of BMI among the study subjects, (n=400)**

BMI (kg/m <sup>2</sup> )	Number	Percentage
Underweight (<18.5)	28	7
Normal (≥18.5-22.9)	36	9
Overweight (≥23.0- 24.9)	140	35
Obese (≥ 25)	196	49
Mean ± SD	24.80±4.10	

**Table 2: Relation of BMI of study subjects with airflow limitation severity, (n=400)**

Airflow limitation severity	BMI				P value
	Underweight N=28	Normal N=36	Overweight N=140	Obese N=196	
Mild	0	2	6	20	0.001*
Moderate	9	16	80	95	
Severe	5	15	54	75	
Very severe	14	3	0	6	

## Discussion

The effect of BMI in the progression of COPD drew lots of attention.<sup>11</sup> It is generally accepted that improving nutrition status, enhancing respiratory muscles strength and reducing inflammation level are effective on long-term management of COPD.<sup>12</sup> BMI was considered as an accurate indicator of nutrition in some degree.

It is generally accepted that improving nutrition status, enhancing respiratory muscles strength and reducing inflammation level are effective on long-term management of COPD.<sup>12</sup> BMI was considered as an accurate indicator of nutrition in some degree. The prevalence of sarcopenia was common in COPD patients, especially in severe, elder or underweight patients.<sup>13</sup>

The present study showed the mean BMI of study subjects as 24.80±4.10 kg/m<sup>2</sup> that ranged from a minimum of 12.08 to a maximum of 37.40 which was consistent with the results of the study conducted by various authors.<sup>14-16</sup> Negi et al in their study showed that lower BMI was associated with higher SGRQ total score (or worse HRQOL) which is consistent

with the results of the present study.<sup>17</sup> Varied results have been shown by different researchers in this regard.<sup>18</sup> Majority of underweight participants had very severe airflow obstruction which is also demonstrated by studies done in the past. BMI was the significant predictor of HRQOL. Overall results indicated a better prognosis of disease in patients with a higher BMI.<sup>16,17</sup>

It is acknowledged that low BMI is largely associated with an increased risk of mortality among COPD cases.<sup>19</sup> A significant relationship was found between individuals' BMI and fatigue and dyspnea scores. Low BMI is interpreted as a risk factor for being diagnosed with COPD. A study revealed that underweight and obese patients experience more severe fatigue compared to normal weight or overweight patients.<sup>20</sup> When there is insufficient energy, muscle proteins are destroyed, and weight loss and cachexia are experienced.<sup>21</sup> On the other hand, excessive energy and increased BMI causes excessive CO<sub>2</sub> production and thus dyspnea.<sup>22</sup> The decrease in body weight occurs due to eating disorders, which causes an increase in muscle loss in later times. The development of malnutrition due to

loss of body muscle and respiratory muscles leads to progressive respiratory disorders.

Based on our research findings and literature review, it can be stated that some prospective studies with a sampling procedure including a wider age range are needed to examine the relationship between individuals' body mass index, fatigue, and dyspnea.

### Conclusion

Present research established that, the disease related malnutrition is common in COPD patients, therefore, BMI might be a useful indicator to predict the prognosis of disease. This calls for an urgent need by our primary care physicians to provide simultaneous weight management interventions in COPD patients so as to improve their nutritional status, enhance the strength of respiratory muscles and reduce the inflammation which will be effective in long-term management of the disease.

Ethical approval was taken from the institutional ethical committee and written Informed

**Consent was taken from all the participants.**

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**Conflict of Interest:** None declared

### References

1. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management and prevention of COPD 2019. <https://goldcopd.org/wp-content/uploads/2018/11/GOLD-2019-v1.7-FINAL14Nov2018-WMS.pdf>
2. Global initiative for chronic obstructive lung disease. Available at: [https://goldcopd.org/wp-content/uploads/2018/11/GOLD-2019-POCKET-GUIDEFINAL\\_WMS.pdf](https://goldcopd.org/wp-content/uploads/2018/11/GOLD-2019-POCKET-GUIDEFINAL_WMS.pdf). Accessed on 15 March, 2022.
3. Antoniu, Sabina Antonela et al. "Impact of fatigue in patients with chronic obstructive pulmonary disease: Results from an exploratory study." *Therapeutic Advances in Respiratory Disease* 2016 ;10(1): 26-33.
4. Kentson, Magnus et al. "Factors associated with experience of fatigue, and functional limitations due to fatigue in patients with stable COPD." *Therapeutic Advances in Respiratory Disease* 2016 ;10(5):410-24.
5. Inal-Ince, Deniz et al. "Fatigue and multidimensional disease severity in chronic obstructive pulmonary disease." *Multidisciplinary Respiratory Medicine* 2010 ;5(3):162-67.
6. Chen, Yi-Wen et al. "A comparison of pain, fatigue, dyspnea and their impact on quality of life in pulmonary rehabilitation participants with chronic obstructive pulmonary disease." *COPD: Journal of Chronic Obstructive Pulmonary Disease* 2018;15(1):65-72.
7. Midilli, Tulay Sagkal et al. "An investigation of anemia, fatigue and loneliness in patients with chronic obstructive pulmonary disease and the relationship between them." *Gumushane University Journal of Health Sciences* 2019;8(1):90-97.
8. Turgut, Teyfik and I. N. Erdal. "Obesity and respiratory system." *Firat Medical Journal* 2018;23:35-41.
9. Franssen, F. M. E., et al. "Obesity and the lung: 5 · Obesity and COPD." *Thorax* 2008;63(12) :1110- 17.
10. Kocabas, Ali et al. "Chronic Obstructive Pulmonary Disease (COPD) prevention, diagnosis and treatment report 2014." *Official Journal of the Turkish Thoracic Society* 2014;15(2).
11. Prescott E, Almdal T, Mikkelsen KL, et al. Prognostic value of weight change in chronic obstructive pulmonary disease: results from the Copenhagen City Heart Study. *Eur Respir J* 2002;20:539-44.
12. Vanfleteren LEGW, Spruit MA, Wouters EFM. Management of chronic obstructive pulmonary disease beyond the lungs. *Lancet Respir Med* 2016;4:911-24.
13. Jones SE, Maddocks M, Kon SS, et al. Sarcopenia in COPD: prevalence, clinical correlates and response to pulmonary rehabilitation. *Thorax* 2015;70:213-8.
14. Hong JY, Jung JY, Lee MG, Kim SK, Chang J, Lee CY et al. Changes in the prevalence of COPD in Korea between 2001 and 2011 in the KNHANES data. *Respir Med.* 2017;125:12-8.
15. Gaude NC, Desai AM. Health related quality of life in COPD patients: a cross-sectional study. *Int J Community Med Public Heal.* 2018;5(5):20-38.
16. Wu Z, Yang D, Ge Z, Yan M, Wu N, Liu Y. Body mass index of patients with chronic obstructive pulmonary disease is associated with pulmonary function and exacerbations: A retrospective real world research. *J Thorac Dis.* 2018;10(8):5086-99.
17. Negi H, Sarkar M, Raval A, Pandey K, Das P. Health-related quality of life in patients with chronic obstructive pulmonary disease in North India. *J Postgrad Med.* 2014;60(1):7-11.

18. Lim JU, Lee JH, Kim JS, Hwang Y Il, Kim TH, Lim SY et al. Comparison of World Health Organization and Asia-Pacific body mass index classifications in COPD patients. *Int J COPD*. 2017;12:2465-75.
19. McDonald, Merry-Lynn N, et al. "It's more than low BMI: Prevalence of cachexia and associated mortality in COPD." *Respiratory Research* 2019;20(1):1-9.
20. Goertz, Yvonne MJ, et al. "Fatigue is highly prevalent in patients with COPD and correlates poorly with the degree of airflow limitation." *Therapeutic Advances in Respiratory Disease* 2019;13:17534.
21. Eisner, Mark D., et al. "Body composition and functional limitation in COPD." *Respiratory Research* 2007;8(1):1-10.
22. Vestbo, Jørgen, et al. "Body mass, fat-free body mass, and prognosis in patients with chronic obstructive pulmonary disease from a random population sample: Findings from the Copenhagen City Heart Study." *American Journal of Respiratory and Critical Care Medicine* 2006;173(1): 79-83.