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**Original Research Article**

# Body mass index as a predictor of quality of life of patients with chronic obstructive pulmonary disease: a cross-sectional study

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## ABSTRACT

**Background:** Chronic obstructive pulmonary disease (COPD) is a major public health problem with increasing mortality worldwide. Obesity is well known to be associated with increased morbidity and mortality in the general population but in the case of COPD, a phenomenon known as the "obesity paradox" is observed. Nutritional status is a good prognostic indicator in patients with COPD.
**Methods:** A cross-sectional study was conducted in a tertiary care hospital of Lucknow with 250 COPD patients to assess their body mass index (BMI) using Quetelet's formula. Study subjects were selected using a systematic random sampling method.
**Results:** The mean BMI was observed to be 24.93±4.0. Health-related quality of life of undernourished patients was most affected. A statistically significant relation was seen across all the components of SGRQ.
**Conclusions:** The results of the study indicated that the malnourished COPD patients had poor health-related quality of life and severe limitation in airflow.

**Keywords:** BMI, COPD, Health related quality of life, St. George's respiratory questionnaire

## 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.1 More than 90% of deaths are observed to occur in low- and middle-income countries (LMIC).[1]

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.[2]

Severity of disease increases with decreasing body mass index. Malnutrition is common in COPD as there is increased metabolic demand due to consumption of basal oxygen and release of cytokines (TNF α, IL 6) known to cause cachexia. COPD causes respiratory muscle weakness as obesity is associated with dyspnoea, obese patients receive medical attention quite earlier than normal and underweight patients. 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.

### *Objectives*

The objective of the study was to assess the BMI of COPD patients, its distribution and relationship with various factors.

## METHODS

### *Study area*

The study was conducted in Lucknow, Uttar Pradesh.

### *Study period*

The study was conducted from September 2018 to August 2019.

### *Study unit*

The study unit was individual COPD patient.

### *Study setting*

Respiratory medicine OPD of King George's medical university, Lucknow, Uttar Pradesh.

### *Inclusion criteria*

Subjects above 18 years, diagnosed with COPD for ≥3 months and residents of Lucknow for ≥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.

### *Sampling technique*

A systematic random sampling method was used to select the patients for the study and a target to enrol 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=weight (kg)/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.

### *Sample size estimation*

Using the formula, $n=(Z\ 1-\alpha/2)^2 \times \frac{(SD)^2}{d^2}$,

with confidence interval 95%, standard deviation 19.3 and margin of error 2.5, the minimum sample size was calculated to be 227, keeping 10% non-response rate, final sample size for the study came out to be 250.3

### *Pre-testing*

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.

### *Data analysis*

Data were tabulated and analysed using the Statistical Package for Social Sciences (SPSS) version 24.0.

## RESULTS

Out of a total of 250 subjects enrolled in the study, majority (48.4%) were obese followed by 35.2% overweights and 7.2% underweights. The mean BMI among study subjects was 24.93±4.0 $kg/m^2$ (Table 1).

**Table 1: Distribution of BMI among the study subjects, (n=250).**

| BMI ($kg/m^2$)* | Total | |
|---|---|---|
| | N | % |
| **Underweight (<18.5)** | 18 | 7.2 |
| **Normal (≥18.5-22.9)** | 23 | 9.2 |
| **Overweight (≥23.0- 24.9)** | 88 | 35.2 |
| **Obese (≥ 25)** | 121 | 48.4 |
| **Mean ± SD** | 24.93±4.0 | |

*Asia-Pacific BMI classification.

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 3), BMI was found to have a statistically significant association with airflow limitation severity of the study subjects.

Multiple linear regression model (Table 4) showed that $FEV_1$, 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 2: Relation between BMI and components of SGRQ[#] of study subjects, (n=250).**

| Components of SGRQ[#] | BMI* | | | | |
|---|---|---|---|---|---|
| | Underweight, (n=18) | Normal, (n=23) | Overweight, (n=88) | Obese, (n=121) | P value |
| **Symptom score** | 53.65±14.1 | 39.73±10.3 | 40.33±15.2 | 39.42±14.0 | 0.001 |
| **Activity score** | 86.32±17.8 | 60.54±18.3 | 51.23±18.7 | 53.73±16.4 | <0.001 |
| **Impact score** | 58.13±13.9 | 32.89±14.2 | 28.12±13.6 | 31.04±15.5 | <0.001 |
| **Total score** | 65.93±12.3 | 42.41±13.1 | 37.15±12.4 | 38.11±11.6 | <0.001 |

*Asia-Pacific BMI Classification, [#]St. George's Respiratory Questionnaire

**Table 3: Relation of BMI of study subjects with airflow limitation severity, (n=250).**

| Airflow limitation severity[$ #] | BMI* | | | | |
|---|---|---|---|---|---|
| | Underweight, (n=18) | Normal, (n=23) | Overweight, (n=88) | Obese, (n=121) | P value |
| **Mild** | 0 | 1 | 3 | 8 | <0.001 |
| **Moderate** | 6 | 11 | 54 | 63 | |
| **Severe** | 2 | 10 | 31 | 48 | |
| **Very severe** | 9 | 1 | 0 | 2 | |

*Asia-Pacific BMI Classification, [$]$FEV_1$ (Post Bronchodilator % Predicted), [#]GOLD Grading

**Table 4: Multiple linear regression analysis between predictors and total score component of SGRQ.***

| Variables | Unstandardized coefficient | | Standardized coefficient | T | P value | Confidence interval (95%) | |
|---|---|---|---|---|---|---|---|
| | B | Std. error | Beta | | | Lower | Upper |
| **$FEV_1$** | -0.242 | 0.052 | -0.219 | -4.673 | <0.001 | -0.344 | -0.140 |
| **BMI** | -0.994 | 0.163 | -0.289 | -6.115 | <0.001 | -1.314 | -0.674 |
| **Poor sleep** | 1.271 | 1.655 | 0.041 | 0.768 | 0.443 | -1.989 | 4.53 |
| **Non-worker** | -7.610 | 1.635 | -0.254 | -4.654 | <0.001 | -10.831 | -4.38 |
| **Hospitalization history** | 3.126 | 1.352 | 0.104 | 2.312 | 0.022 | 0.462 | 5.79 |
| **Female gender** | 7.022 | 1.664 | 0.229 | 4.219 | <0.001 | 3.743 | 10.30 |
| **Age (Years)** | 0.177 | 0.064 | 0.127 | 2.772 | 0.006 | 0.051 | 0.30 |
| **Biomass smoke exposure** | 8.265 | 1.563 | 0.278 | 5.290 | <0.001 | 5.187 | 11.34 |
| **Rural residence** | -7.994 | 1.753 | -0.268 | -4.559 | <0.001 | -11.448 | -4.53 |
| **Hindu religion** | 4.784 | 1.705 | 0.123 | 2.805 | 0.005 | 1.425 | 8.14 |
| **Smoker** | 4.026 | 1.517 | 0.141 | 2.654 | 0.008 | 1.038 | 7.01 |
| **Adjusted $R^2$** | 0.556 | | | | | | |
| **ANOVA f value** | 29.30 | | | | | | |
| **P value** | <0.001 | | | | | | |

*SGRQ- St. George's Respiratory Questionnaire

## DISCUSSION

The present study showed the mean BMI of study subjects as 24.93±4 kg/$m^2$ 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.[4-6] 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.[7] Varied results have been shown by different researchers in this regard.[8] Majority of underweight participants had very severe airflow obstruction which is also demonstrated by studies done in the past.[4] BMI was the significant predictor of HRQOL.[7] Overall results indicated a better prognosis of disease in patients with a higher BMI.

## CONCLUSION

This study highlights 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.

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## REFERENCES

1. WHO_fact_sheet. Available at: https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd). Accessed on 10 January, 2020.
2. Global inititive for chronic obstrictive lung disease. Available at: https://goldcopd.org/wp-content/uploads/2018/11/GOLD-2019-POCKET-GUIDE-FINAL_WMS.pdf. Accessed on 10 January, 2020.
3. 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.
4. 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):2038.
5. 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.
6. Bhardwaj G, Jain VK, Mishra M, Nayyar P. Status of Body Mass Index (BMI) and Waist Circumference (WC) in Patients of Chronic Obstructive Pulmonary Disease(COPD) and Relationship With Severity. IOSR J Dent Med Sci. 2017;16(02):72-4.
7. Hany Assal H, Kamal E. Body mass index and its relation to GOLD grade in chronic obstructive pulmonary disease patients. Egypt J Chest Dis Tuberc. 2016;65(2):411-4.
8. 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.
9. 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.

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