

# A Study of Occurrence of Frailty in Patients of Chronic Obstructive Pulmonary Disease and its Correlation with the Cognitive Function as Assessed by Montreal Cognitive Assessment Score

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## Abstract

**Introduction:** With increasing life expectancy the diseases of elderly age group such as COPD and frailty are more common nowadays than before. COPD is closely related with frailty with shares common risk factors such as smoking, aging, common mechanism of deregulated inflammation, and endocrine dysfunction. Frailty can be defined as a biological syndrome in which a progressive cumulative decline in the reserve capacity of multiple physiological systems illicit an abnormal vulnerability to normal strainers. It is defined as fried phenotype, meeting three or more of five established criteria.

**Aim of this Study:** To find out the occurrence of frailty in patients of COPD and find out correlation of frailty with cognitive impairment in patients with COPD if any.

**Materials and Methods:** In this one point observational study conducted in chest OPD of UCMS and associated hospital, Delhi. Diagnosis of COPD was made using GOLD 2016 guidelines. Frailty was defined on the basis of Fried criteria. MOCA test (Hindi version) was applied for assessment of cognitive function.

**Study Duration:** The study duration was a August 2016-July 2017.

**Sample size:** In this study, 80 patients who satisfying the criteria were enrolled.

**Result:** Out of 80 patients, 61 were males and rests were females. Among them, 63 (78%) patients had diagnosis of frailty. The mean age among frail group was  $62.29 \pm 10.06$  and among non-frail was  $51.82 \pm 10.98$  years. Out of 63 patients with frailty only 3 (4.7%) has MOCA score  $\geq 26$  (i.e., normal) and around 17 patients of COPD without frailty only 1 (5.8%) has MOCA score  $\geq 26$ . Remaining have MOCA score  $< 26$ , which can be interpreted as the presence of cognitive impairment. *P* value of this data comes out to be 1.00 which is statistically not significant.

**Conclusion:** Frailty is a common occurrence in COPD patients, but for correlating with cognitive impairment larger sample size is needed.

**Key words:** Chronic obstructive pulmonary disease, Handgrip strength, Montreal cognitive assessment score, Frailty

## INTRODUCTION

With advancement in the medical field in the 21<sup>st</sup> century, the lifespan of Indian population has been increased

from 32 years at the time of independence to 68.7 years. It means that more and more peoples are now turning to elderly age group and more suffer from diseases with are prevalent in elderly age group such as COPD and frailty. COPD is reported to have an estimated disease burden of 210 million worldwide.<sup>[1,2]</sup> Globally, COPD was the fourth leading cause of death (5.1%) in 2004 and is projected to occupy the third position (8.6%) in 2030.<sup>[3]</sup> Furthermore, COPD is a major cause of chronic morbidity; it was ranked 11<sup>th</sup> in 2002 and is projected to rise to 7<sup>th</sup> place in 2030.<sup>[4]</sup> By definition, COPD is the common preventable, treatable disease that is characterized by persistent respiratory

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symptoms and airflow which is due to airway and alveolar abnormalities usually caused by significant exposure to noxious particles and gases.

Diagnosis of COPD requires post-bronchodilator pulmonary function test (PFT)  $FEV_1/FVC < 0.7$  and  $FEV_1$  value  $< 80\%$  of normal for that age/gender/ethnicity. The guidelines issued by global initiative for chronic lung disease (GOLD)<sup>[4]</sup> assigns patients with COPD into four groups based on the degree of airflow obstruction, symptoms score (COPD assessment test -CAT), and number of exacerbations in 1 year. This grading system uses objective spirometry and subjective symptoms.

COPD often presents with various symptoms of other body system involvement such as cardiovascular, gastrointestinal, neurological, musculoskeletal, and psychiatric symptoms. Hence, identification and management of these other system illness are key elements in COPD management. In contrast to organ-specific diagnosis and treatment in COPD frailty represents a generalized functional form of physical inability. It can be discussed as a biological syndrome in which a progressive cumulative decline in the reserve capacity of multiple physiological systems illicit an abnormal vulnerability to normal strainers.

Frailty is defined using the fried phenotype as meeting three or more of five established criteria.<sup>[5]</sup> For example, nutritional status, physical activity, mobility, strength, and energy. Individuals with two or less criteria are defined as an intermediate form or prefrail, and about 25% of the will become frail by next 3 years.

COPD is also a disease of the fourth decade or more coincident with frailty occurrence. It is closely related with frailty with shared risk factors, for example: Aging, smoking and common mechanism of deregulated inflammation and endocrine dysfunction.

Prevalence of frailty in respiratory impaired persons was 5.8% using fried phenotypes and in COPD participants 57.8% using a frailty index. Frail COPD patients are more disabled than non-frail. COPD patients have more problems in managing their day-to-day life activities including inhaler taking. Hence, it will be beneficial for the patients to find out which is frail and protect them from adverse risk. To add on cognitive impairment in COPD can be found in up to 77% patients with hypoxemia.<sup>[6]</sup> Several aspects of disease contribute to impaired cognitive function including hypoxemia and comorbid cardiovascular diseases. It is also suggested that impaired performance in neuropsychiatric tests may be a predictor of mortality and disability in certain COPD population.<sup>[7]</sup> Out of many studies, we could not find such studies being done on

Indian patients and particularly in patients presenting in this part of the world, hence we planned this study.

### Aim

1. To find out occurrence of frailty in patients of COPD.
2. To find out correlation of frailty with cognitive impairment in patients with COPD if any.

## MATERIALS AND METHODS

In this one point, observational study conducted in chest OPD of University College of Medical Sciences and associated hospital, Dilshad Garden Delhi. Diagnosis of COPD was made using post-bronchodilator PFT, CAT score, mMRC score, and history of exacerbations in past 1 year as described in GOLD 2016 guidelines. Frailty was defined on the basis of previously validated frailty criteria originally reported by Fried *et al.* and modified by Wilhelm-Leen *et al.*<sup>[5]</sup> as the presence of three out of following five:-

- Unintentional weight loss
- Slow gait
- Weakness
- Low physical activity
- Exhaustion.

MOCA test was done in each study subject. MOCA was designed as a rapid screening instrument. It has different domain such as alternative trial making, visuoconstructional skills (Cube and Clock), naming, memory, attention, sentence repetition, verbal fluency, abstraction, delayed recall, and orientation. It is a 30 point test that takes around 10–15 min to complete and determine several cognitive domains. Cognitive impairment is present when the score is  $< 26$  and score  $\geq 26$  was considered normal.

All patients of stable COPD of age 40–75 years presenting in chest clinic were enrolled for study and illiterate patients, COPD patients in exacerbation and patients with altered sensorium were excluded.

### Study Duration

The study duration was a August 2016–July 2017.

### Sample Size

80 patients who satisfied the above-mentioned criteria were enrolled.

### Procedure

After obtaining informed consent baseline social, demographic data were collected by a trained medical person.

### Statistical Analysis

We performed all statistical analyses using SPSS 23.0 and Epi info 7 for windows. Univariate analysis (Chi-square test)

was performed to find statistical significance ( $P < 0.05$ ) and unadjusted odds ratio. The statistical analysis will comprise calculating means and proportions. Parametric test (t-test analysis variance) was used to calculate group reference for continuous variables. Level of significance would be considered as  $P < 0.05$ .

## RESULT

In this study, 80 patients of COPD were enrolled. Out of them 61 were males and rest were females. Among them, 63 (78%) patients had diagnosis of frailty. The mean age among frail group was  $62.29 \pm 10.06$  and among non-frail patients age was  $51.82 \pm 10.98$  years.

65 (81.25%) patients were married, and 82.5% were financially dependent on other family members and near about the same number, e.g., 83.7% patients were living in joint family. Only 2.5% patients were living alone and rest were living in a nuclear family.

Most of the patients 67 (83.75%) had a history of smoking in their life. The other observed demographic characteristics are given in tabular form in Table 1.

When we assessed the comorbid conditions associated with the diagnosis of COPD, only 4 (5%) has none while rest of 95% patients has one or other comorbid condition. The most common among them is hypertension in 30% cases, and least common was heart failure 6.25%. Other identified comorbid conditions in reducing the order of frequency are gastroesophageal reflux disease, diabetes mellitus, arthritis, coronary artery diseases, pulmonary tuberculosis, chronic kidney diseases, and allergic symptoms. These data are given as tabular form in Table 2.

Among individual parameters of frailty, handgrip strength was measured to be  $12.02 \pm 8.03$  among frail COPD patients compared to  $30.71 \pm 9.15$  in non-frail COPD patients.  $p$  value comes out to be 0.000 which is statistically significant [Table 3].

Likewise walking speed in frail patients was  $12.33 \pm 12.70$  meters per minute and in non-frail patients, speed was  $15.76 \pm 12.48$  m/min.  $p$  value comes out to be 0.324 which is statistically not significant [Table 4].

Out of 63 patients with frailty only 3 (4.7%) has MOCA score  $\geq 26$  (i.e., normal) and around 17 patients of COPD without frailty only (5.8%) has MOCA score  $\geq 26$ . Rest of patients have MOCA score  $< 26$ , which can be interpreted as the presence of cognitive impairment.  $P$  value of this data comes out to be 1.00 which is statistically not significant. This means that presence of cognitive

**Table 1: Baseline demographic characteristics of patients**

Characteristic	n (%)
Frailty	63 (78)
Mean age of frail group (years)	$62.29 \pm 10.06$
Mean age of non-frail group (years)	$51.82 \pm 10.98$
Gender	
Male	61 (76.25)
Female	19 (23.75)
Male with frailty	51.61 (83.60)
Female with frailty	12.19 (63.20)
Religion	
Hindu	44 (55)
Muslim	36 (45)
Others	0 (0)
Marital status	
Married	65 (81.25)
Unmarried	15 (18.75)
Financial status	
Dependent	66 (82.5)
Independent	14 (17.5)
Education	
Illiterate and primary	0 (0)
Middle	24 (30)
Matric	38 (47.5)
Senior secondary	14 (17.5)
Graduate	4 (5)
Family type	
Single	2 (2.5)
Nuclear	11 (13.75)
Joint	67 (83.7)
Smoke exposure	
Bidi/cigarette	67 (83.75)
Other	13 (16.25)
Tobacco use	
Current	18 (22.5)
Past > 1 month	49 (61.2)
None	13 (16.25)

**Table 2: Comorbidities in patients under study**

Comorbidities	n (%)
None	4 (5)
Coronary artery disease	15 (18.75)
Gastroesophageal reflux disease	22 (27.5)
Diabetes mellitus	19 (23.75)
Hypertension	24 (30)
Allergic symptoms	8 (10)
Pulmonary tuberculosis	13 (16.25)
Chronic kidney disease	12 (15)
Arthritis	17 (21.25)
Heart failure	5 (6.25)

impairment does not increase the risk of frailty in patients of COPD [Table 5].

## DISCUSSION

Our study demonstrates that frailty is common (78%) in patients of COPD, although all have stable COPD. Since the diagnosis of acute exacerbation was excluded from the

**Table 3: Handgrip strength**

Frailty criteria	Frail	N	Mean±SD	P value
Handgrip strength	No	17	30.71±9.15	0.000
	Yes	63	12.02±8.03	

**Table 4: Walking speed in COPD**

Frailty criteria	Frailty	N	Mean±SD	P value
Walking speed	No	17	15.76±12.488	0.324
	Yes	63	12.33±12.705	

**Table 5: MOCA score**

MOCA score	Frailty		Total	P value
	No	Yes		
<26				1.000
Count	16	60	76	
% Within MOCA score	21.1	78.9	100.0	
≥26				
Count	1	3	4	
% Within MOCA score	25.0	75.0	100.0	
Total				
Count	17	63	80	
% Within MOCA score	21.3	78.8	100.0	

study. Similar results were also seen in a study conducted by Limpawattana *et al.*<sup>[8]</sup>

The mean age of frail group in our study was 62.29 ± 10.65 years, and among non-frail patients, it was 51.82 ± 10.98 years. This is to mention here that all patients were with a diagnosis of COPD. Similar results of 64 ± 13 years were obtained from the Mittal *et al.*<sup>[9]</sup> and mean age was in patients of frailty was 73.5 ± 8.9 years in a study conducted by Limpawattana *et al.*<sup>[8]</sup> and Matthew *et al.*<sup>[10]</sup>

In our study hypertension (30%) was most common comorbidity followed by gastroesophageal reflux disease (27.5%) and the least common was heart failure (6.25% I). In a study conducted by Mittal *et al.*<sup>[9]</sup> the most common comorbidity was hypertension (46%) followed by CAD (26%) and least common was peripheral vascular disease (4%).

Handgrip strength in our COPD patients with frailty was 12.02 ± 8.03 kg while in another study<sup>[9]</sup> it 22.5 ± 7.9 kg, which is relatively higher than our study. This may be due to the different ethnic population of two studies. Likewise, gait speed in our frail patients was 12.33 ± 12.70 m/min, and in non-frail patients, it was 15.76 ± 12.48 m/min. This parameter was also measures in another study where it was 40.5 ± 11.1 m/min in frail patients and 57.4 ± 13.4 m/min in non-frail patients.<sup>[9]</sup> These values are significantly higher than our study, which may be attributed to baseline

diagnosis of COPD in our patient population and different ethnicity group.

In our study, we also measure cognitive impairment using MOCA score (Hindi version). We found that presence of cognitive impairment in patients of COPD does not affect the occurrence of frailty and both may be independent causes of morbidity in patients of COPD. A study conducted by Verma *et al.* in 2017 about the assessment of cognitive function status in patients of COPD by MOCA and Hindi Version found that cognitive impairment was present in 85 cases out of 95 cases under study this was significantly higher than controls where in 46 patients has cognitive impairment out of 78 controls ( $P = 0.000$ ).<sup>[11]</sup>

### Strength of Study

First time in this area of world frailty was measure in patients of COPD and MOCA score was assessed in patients of COPD with frailty.

### Limitation of Study

A small number of patients limits implications of results to general public use.

## CONCLUSION

Frailty is a common occurrence in chronic obstructive pulmonary disease. Reduced handgrip strength and slowness of gait were the most common satisfying criteria of frailty in our patient. These patients have comorbidities along with COPD; so adequate management of COPD is key to prevent or delay occurrence of frailty.

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