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Study of Factors Associated with Sarcopenia in COPD Patients

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Abstract

Introduction: *Sarcopenia is frequently associated with chronic diseases such as chronic obstructive pulmonary disease (COPD). Sarcopenia can be classified as physical frailty where frailty is associated with adverse health outcomes. Sarcopenia was found to be associated with worsening lung function in male COPD patient. Objective was to find out the factors associated with sarcopenia in COPD patients.* ***Materials & Methods:*** *This was cross-sectional observational study was carried out Different Privet Medical in Chandpur and Chandpur Medical College Hospital, Chandpur. Patients diagnosed with COPD according to Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD) guidelines were included in this study. Exclusion criteria were unstable cardiac disease, an exacerbation within the preceding 4 weeks, predominant neurological limitation to walking (eg, significant hemiplegia) or contraindication to bioelectrical impedance analysis (BIA) including an implanted pacemaker or defibrillator. All participants gave written informed consent. EWGSOP criteria were applied to outpatients with stable COPD.* ***Results:*** *In uniavariate analysis, age, moderate COPD, severe COPD, obesity, non-elective admission over the past 12 months, MMRC scale and MAP were significantly associated with sarcopenia. In multivariate analysis, age, moderate COPD, severe COPD, obesity and MMRC scale were significantly associated with sarcopenia.* ***Conclusion:*** *Prevalence of sarcopenia was 26%. Independent factors associated with sarcopenia Age (>70 years) years (adjusted odds ratio (AOR) 4.387. Sarcopenia affects about one-quarter of COPD patients. Age, severity of COPD, MMRC scale, and BMI status were the factors associated with sarcopenia.*

Keywords: *Airway obstruction, Body composition, Sarcopenia, COPD.*

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Introduction:

Sarcopenia is frequently associated with chronic diseases such as chronic obstructive pulmonary disease (COPD) and cancer. COPD, which is characterized by an irreversible airflow limitation, exacerbates respiratory distress as the disease progresses. The prevalence of sarcopenia in stable COPD was reported to be 15% to 25% in previous foreign studies[1]. Chronic obstructive pulmonary disease (COPD) has been described as a systemic disease. Sarcopenia is one of the systemic effects that are related to several adverse outcomes.

Sarcopenia can be classified as physical frailty where frailty is associated with adverse health outcomes[2,3]. Sarcopenia was found to be associated with worsening lung function in male COPD patients[4]. COPD patients also have relative or an absolute increase in fat mass which might contribute to systemic inflammation, loss of fat-free mass, and insulin resistance. Fat-free mass index, not body mass index (BMI), was significantly related to pulmonary function, dyspnea severity, quality of life, and reflected reduced skeletal muscle mass[5,6].

In patients with COPD, such changes have been shown to be related to exercise intolerance, impaired quality of life, and increased mortality[7]. Few studies in the literature have correlated the prevalence of sarcopenia with indices of COPD severity. In addition, to date, there have been no studies correlating sarcopenia with the prognosis of COPD or correcting sarcopenia by the BMI to avoid misdiagnosis in overweight patients.

Materials and Methods:

This was cross-sectional observational study was carried out Different Privet Medical in Chandpur and Chandpur Medical College Hospital, Chandpur during January 2019 to December 2019. Among 100 patients diagnosed with COPD according to Global Initiative for Chronic Obstructive Pulmonary Disease (GOLD) guidelines were included in this study. Exclusion criteria were unstable cardiac disease, an exacerbation within the preceding 4 weeks, predominant neurological limitation to walking (eg, significant hemiplegia) or contraindication to bioelectrical impedance analysis (BIA) including an implanted pacemaker or defibrillator. All participants gave written informed consent. EWGSOP criteria were applied to outpatients with stable COPD. Body composition, exercise capacity,

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functional performance, physical activity and health status were assessed. Using a case–control design, response to PR was determined in patients with sarcopenia and a propensity score-matched non-sarcopenic group for Uniavariate and multivariate analysis. Data collected was analysed using SPSS software version 23 and p value was considered <0.05 as significant.

Results:

Thirty eight (38.0%) patients were belonged to age 61-70 years, 94(94.0%) were male, 42(42.0%) were complete primary education level, 91(91.0%) were smoker, 53(53.0%) were moderate COPD, 39(39.0%) were hypertension, 94(94.0%) patients used inhaled corticosteroid, 64(64.0%) had normal BMI, mean MMRC scale was found 0.73±0.64, mean barthel scores was 18.0±2.1, mean MAP was 96.2±10.8 mmHg, 38(38.0%) was found osteoporosis and 26(26.0%) was sarcopenia (Table-I).

Table I: Baseline characteristics of the study population.

	Number of patients	Percentage
Age (years)		
≤60	27	27.0
61-70	38	38.0
>70	35	35.0
Sex		
Male	94	94.0
Female	6	6.0
Educational level		
Illiterate	16	16.0
Primary	42	42.0
SSC	24	24.0
HSC	13	13.0
Graduate	5	5.0
Smoking status		
Smoker	91	91.0
Non smoker	9	9.0
Severity of COPD		
Mild	26	26.0
Moderate	53	53.0
Severe	21	21.0
Comorbid diseases		
Diabetes mellitus	10	10.0
Hypertension	39	39.0
Dyslipidemia	10	10.0
Chronic arthritis	9	9.0
Cancer	3	3.0
Medication uses		
Inhaled corticosteroid	94	94.0
Systemic steroid	1	1.0
Oral hypoglycemic drugs	6	6.0
Statin	10	10.0
NSAIDs	1	1.0
BMI (kg/m^2)		
Underweight (<18.5)	11	11.0
Normal (18.5–24.9)	64	64.0
Over weight (25.0–29.9)	18	18.0
Obesity (≥30.0)	7	7.0
History of fall at least two times over the past 12 months	1	1.0
Nonelective admission over the past 12 months	25	25.0
Mean MMRC scale	0.73	±0.64
Mean Barthel scores	18.0	±2.1
Mean Chula IADLs scores	9.1	±0.3
Mean MAP (mmHg)	96.2	±10.8
Mean Gait speed (m/s)	1.4	±0.2
Mean Handgrip strength (kg)		
Male	26.8	±6.0
Female	22.0	±3.8
Mean skeletal mass index (kg/m^2)		
Male	7.0	±0.8
Female	6.5	±0.5
Osteoporosis	38	38.0
Sarcopenia	26	26.0

In uniavariate analysis, age, moderate COPD, severe COPD, obesity, non-elective admission over the past 12 months, MMRC scale and MAP were significantly associated with sarcopenia (Table-II).

Table II: Uniavariate analysis for sarcopenia.

	OR	95% CI (lower-upper)	P value
Age (>70 years)	4.387	1.430-9.703	0.027^s
Male	1.121	0.472-3.497	0.741^{ns}
Smoker	0.157	0.022-1.143	0.068^{ns}
Moderate COPD	8.479	1.245-46.726	0.009^s
Severe COPD	0.158	0.027-0.930	0.041^s
Diabetes mellitus	3.961	0.392-40.034	0.243^{ns}
Hypertension	2.719	0.162-45.721	0.487^{ns}
Dyslipidemia	0.791	0.042-14.823	0.875^{ns}
Chronic arthritis	3.258	0.509-20.860	0.212^{ns}
Cancer	2.027	0.159-11.697	0.838^{ns}
Inhaled corticosteroid	1.084	0.430-2.730	0.864^{ns}
Systemic steroid	0.808	0.169-3.996	0.087^{ns}
Oral hypoglycemic drugs	0.257	0.044-1.506	0.132^{ns}
Statin	1.160	0.482-2.795	0.740^{ns}
NSAIDs	1.045	0.136-8.034	0.967^{ns}
Obesity (≥30.0kg/m^2)	0.265	0.127-0.793	0.036^s
History of fall at least two times over the past 12 months	1.226	0.143-9.566	0.983^{ns}
Nonelective admission over the past 12 months	1.942	1.027-2.930	0.047^s
MMRC scale (>0.4)	1.572	1.132-3.434	0.048^s
MAP (>100 mmHg)	6.479	1.124-24.976	0.018^s
Osteoporosis	1.784	0.783-3.465	0.274^{ns}

In multivariate analysis, age, moderate COPD, severe COPD, obesity and MMRC scale were significantly associated with sarcopenia (Table-III).

Table III: Multivariate analysis for sarcopenia.

	OR	95% CI (lower-upper)	P value
Age (>70 years)	2.408	1.624-8.471	0.039[s]
Moderate COPD	6.448	1.338-39.812	0.011[s]
Severe COPD	1.685	1.031-2.382	0.048[s]
Obesity (≥30.0 kg/m^2)	0.462	0.219-0.970	0.043[s]
Nonelective admission over the past 12 months	0.933	0.651-1.479	0.124[ns]
MMRC scale (>0.4)	1.885	1.031-2.738	0.048[s]
MAP (>100 mmHg)	0.764	0.204-0.986	0.581[ns]

Discussion:

In this study observed that thirty eight (38.0%) patients were belonged to age 61-70 years, 94(94.0%) were male, 42(42.0%) were complete primary education level, 91(91.0%) were smoker, 53(53.0%) were moderate COPD, 39(39.0%) were hypertension, 94(94.0%) patients used inhaled corticosteroid, 64(64.0%) had normal BMI, mean MMRC scale was found 0.73±0.64, mean barthel scores was 18.0±2.1, mean MAP was 96.2±10.8 mmHg, 38(38.0%) was found osteoporosis and 26(26.0%) was sarcopenia. In study of Limpawattana et al.[8] reported that the majority of them were men (112 cases, 92.6%) with an age older than 65 years old (maximum age was 92 and minimum age was 47 years old). Most of them were ex-smokers with a moderate degree in severity of COPD. Hypertension was the most common comorbid disease. Low skeletal muscle mass was the main component, followed by low handgrip strength. Low gait speed was found in the minority. The possible explanations are the differences in body composition of different ethnicities and Asian people appear to have a higher prevalence of sarcopenia than other regions[9]. The study in Brazil regarding the prevalence of sarcopenia in COPD using DXA was 40%; however, this report diagnosed sarcopenia using only low skeletal muscle mass which was defined as pre-sarcopenia in the current study. These figures were comparable to the report herein (48 cases, about 40%)[10]. Overall, the prevalence of pre-sarcopenia in this study is consistent with the previous data that reported the prevalence of sarcopenia in COPD using only low skeletal muscle mass that varied from 20% to 40% [4,11]. The prevalence of sarcopenic obesity in Asia in existing studies is about 15%; however, this current study used only skeletal muscle mass to detect sarcopenia[4,12].

In current study observed in uniavariate analysis, age, moderate COPD, severe COPD, obesity, non-elective admission over the past 12 months, MMRC scale and MAP were significantly associated with sarcopenia. Limpawattana et al.[8] also reported univariate analysis were entered in the multiple regression models: age, severity of COPD, MMRC scale, nonelective admission over the past 12 months, BMI, MPA, and presence of osteoporosis. Advancing age and severity of COPD showed high magnitudes of associations. Commonly, a progressive loss of muscle mass occurs at the age of 40 and is greater after 70 years[13]. Higher MMRC scale represented poorer pulmonary function that is also found its association with sarcopenia in this study[14,15]. Being underweight increased the risk of sarcopenia compared to obesity, the results support the findings that lower BMI was related to lower lean mass in COPD patients[10]. Subsequently, cigarette smoking alone did not show a significant association with sarcopenia[10,16]. Sarcopenia has been studied as an independent factor for decreased bone mineral density (BMD) due to the systemic consequences of COPD[17].

In multivariate analysis, age, moderate COPD, severe COPD, obesity and MMRC scale were significantly associated with sarcopenia. Limpawattana et al.[8] reported after multicollinearity was checked, advanced age (>75 years), greater severity of COPD, MMRC scale, and nonobese patients were the factors associated with sarcopenia in this study. There were factors associated with sarcopenia using multivariate analyses: age, severity of COPD, MMRC scale, and BMI. Advancing age and severity of COPD showed high magnitudes of associations. Commonly, a progressive loss of muscle mass occurs at the age of 40 and is greater after 70 years[18]. The decline in gait speed and grip strength was faster than muscle mass especially after the age of 70 years[18,19]. The MMRC scale increased the risk of sarcopenia. This finding was similar to the prior report[20,21]. This scale had been widely studied regarding its correlation with pulmonary function tests. Additionally, it could predict morbidity and mortality in COPD patients[22]. Higher MMRC scale represented poorer pulmonary function that is also found its association with sarcopenia in this study[22].

Conclusion:

Prevalence of sarcopenia was 26%. Independent factors associated with sarcopenia Age (>70 years) years (adjusted odds ratio (AOR) 4.387. Sarcopenia affects about one-quarter of COPD patients. Age, severity of COPD, MMRC scale, and BMI status were the factors associated with sarcopenia.

Conflict of Interest: None.

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