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Influence of Age on Functions and Quality of Life in COPD Patients: A Cross-Sectional Survey

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ABSTRACT

***Background of the study*:** Chronic obstructive pulmonary disease (COPD) is caused by prolonged inhalation of tobacco smoke and other toxic substances. The number of COPD cases is increasing globally, and COPD was the world's third leading cause of death in 2019, according to the 2020 World Health Organization (WHO). ***Methodology*:** 175 patients with a clinical diagnosis of COPD based on the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria (FEV1/FVC < 0.7) participated in this cross-sectional observational study, which was carried out across three hospitals in Chennai, India. Adult's ≥35 years old with stable COPD and verified spirometry data satisfied the inclusion criteria; individuals with acute exacerbations, musculoskeletal impairments, significant heart disease, or recent lung surgery were not included. Clinical information, smoking history, and demographics were gathered. The COPD Assessment Test (CAT), which covers eight areas, was used to measure the burden of symptoms. Pearson correlation and independent t-tests/Mann-Whitney U tests were used in the statistical study to look at relationships between age and gender and CAT scores ($p < 0.05$). ***Results*:** Participants ranged in age from 36 to 79 years old, with a mean age of 53.3 ± 12.7 years. The gender distribution of the 175 patients was 22.3% female and 77.7% male. Compared to women (28%), a greater percentage of men (69%) indicated a history of smoking. With a mean CAT score of 23.5 ± 4.6, the symptom burden was moderate to severe. The load of symptoms was substantially higher in males (23.9) than in females (21.8, $p = 0.01$). Age and CAT scores were shown to be positively correlated ($r = 0.193$, $p = 0.011$), suggesting that as people aged, their functional decline and symptom severity increased. ***Conclusion*:** Age and gender have an impact on the substantial symptom burden experienced by COPD patients. These results emphasise the necessity of tailored, demographically aware management strategies.

Keywords: Chronic Obstructive Pulmonary Disease, GOLD criteria, COPD Assessment Test, Observational study, Functional decline

INTRODUCTION

COPD is marked by progressive and partially reversible airflow limitation caused by an abnormal inflammatory response in the lungs to harmful particles or gases. The disease impacts daily life by reducing lung function, causing dyspnea (shortness of breath), and limiting exercise capacity. A considerable contributor to disability-adjusted life years (DALYs) and premature mortality, chronic obstructive pulmonary disease (COPD) is a major worldwide health concern. Low- and middle-income countries, where exposure to tobacco smoke, biomass fuel, and occupational risks is common, are disproportionately affected by the illness burden, which is not limited to high-income countries [1-3].

Patients with COPD frequently exhibit coughing, phlegm production, dyspnea, exhaustion, and decreased tolerance to physical exertion. Effective management and prognostication depend on the evaluation of symptom load. Numerous aspects of the burden of the condition are captured by the well validated COPD Assessment Test (CAT), which is a patient-reported outcome measure [4,5]. According to Sørheim et al. (2010), demographic factors like age and gender have an impact on how people perceive the condition, how severe the symptoms are, and how functionally impaired they are. Comorbidities may hasten the decline of older persons, and gender disparities in physiology, smoking habits, and health-seeking behavior may influence different results. The COPD

Assessment Test (CAT) is one of the few studies that have carefully looked at age in the Indian context [6-8].

Age-related diseases have become more common as life expectancy has increased globally, placing a significant strain on society and health care systems. Every essential organ deteriorates with age, and after the age of 25, the lungs' pulmonary performance gradually declines. Increased cellular senescence and oxidative stress, changes in the extracellular matrix, and other age-related characteristics are present in a relatively prevalent lung disease like COPD. The steady loss of homeostasis that happens after life's productive period is over and raises the risk of illness or death is known as ageing [9-11].

Studies have demonstrated that higher CAT scores are associated with increased risk of exacerbations, hospitalizations, and reduced quality of life (Jones et al., 2012). Identifying demographic influences such as age and gender on symptom burden is essential for tailoring management strategies (Sørheim et al., 2010; Han et al., 2010). Age-related lung function decline, comorbidities, and gender-based differences in physiology and health behaviors can significantly shape disease outcomes [12-14]

Productive cough affects 30% of patients d yspnea on exertion worsens the symptoms and health-related QOL (HRQOL) by impairing the respiratory function, resulting in decreased physical activity, muscle dysfunction, deconditioning, and dyspnea.The main treatments for COPD are pharmacological and non-pharmacological, mainly including smoking cessation, bronchodilators, infection prevention, respiratory rehabilitation, and self-management education; the non-pharmacological therapies are a core part of the comprehensive respiratory rehabilitation[15,16].

In India, COPD prevalence is rising steadily, with an estimated 55 million people affected, making it the second leading cause of death in the country (WHO, 2023). Despite this, few studies have investigated the role of demographic factors in shaping symptom burden using standardized tools like the CAT. This study therefore aims to explore the influence of age and gender on symptom burden and functional outcomes among COPD patients[4].

METHODOLOGY

This cross-sectional observational study was conducted at pulmonary out department across three different hospitals in Chennai, India.

A total of 175 clinically diagnosed COPD patients were enrolled based on GOLD criteria (FEV1/FVC < 0.7). Inclusion criteria included adults over 35 years, stable condition, and confirmed spirometry results. Exclusion criteria were severe cardiac disease, musculoskeletal disability, acute exacerbations, or recent pulmonary surgery.

Demographic details, smoking history, and clinical information were collected. Symptom burden was assessed using the COPD Assessment Test (CAT), covering eight domains (cough, phlegm, chest tightness, activity limitation, daily living, confidence, sleep, and energy). Independent t-tests/Mann–Whitney U tests and Pearson correlation were used to examine associations of age and gender with CAT scores. Statistical significance was set at $p < 0.05$.

Study Design and Setting

Design: Cross-sectional observational study conducted from December 2024 to May 2025.

Settings: Pulmonary outpatient departments of three tertiary care hospitals in East Chennai, India.

Study Population: COPD patients aged above 35 years meeting specific criteria on GOLD

Inclusion Criteria:

- Clinically stable COPD patients (no exacerbations in the past 4 weeks)
- Diagnosis confirmed by spirometry per GOLD criteria (post-bronchodilator $FEV_1/FVC < 0.70$).
- Ability to understand and complete the assessment tool

Exclusion Criteria:

- Severe or unstable cardiac conditions
- Major musculoskeletal disabilities restricting activity
- Recent thoracic or pulmonary surgery
- Acute exacerbations or respiratory hospitalization within the last 4 weeks

Data Collection

Demographic, clinical, and smoking history recorded via structured data sheet. Symptom burden assessed with the COPD Assessment Test (CAT), which covers 8 health domains.

Statistical Analysis: SPSS was used to enter and analyse the data (version 26.0). For continuous variables, descriptive statistics were displayed as mean ± standard deviation; for categorical variables, they were displayed as frequencies and percentages. The Shapiro-Wilk test was used to determine whether continuous data was normal. The Mann–Whitney U test for non-normally distributed data and the independent t-test for regularly distributed continuous variables were used for group comparisons. The association between age and CAT score was assessed using Pearson's correlation coefficient. P-values below 0.05 were regarded as statistically significant.

The mean age of participants was 53.3 ± 12.7 years (range: 36–79). Among the 175 patients, 77.7% were male and 22.3% female. Smoking history was reported in 69% of males compared to 28% of females.

The mean CAT score was 23.5 ± 4.6, indicating a moderate to severe burden. Males demonstrated higher symptom burden (23.9) compared to females (21.8, p = 0.01). Age correlated positively with CAT scores (r = 0.193, p = 0.011), suggesting functional decline with advancing age.

Domains most affected included energy levels and activity limitation, followed by sleep and confidence.

Demographic Data Analysis:

Gender:

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	136	77.7	77.7	77.7
Female	39	22.3	22.3	100.0
Total	175	100.0	100.0	

Age:

	Mean	Std. Deviation	N
Age	53.33	12.681	175
Total Score	23.47	4.621	175

Descriptive Statistics:

	N	Minimum	Maximum	Mean	Std. Deviation
Age	175	35	82	58.5	12.681
Q1_Frequency of Cough	175	0	5	3.47	.896
Q2_ Phlegm Secretion	175	0	5	3.11	.988
Q3_Chest Tightness	175	0	5	3.02	1.147
Q4_Climbing upstairs	175	0	5	2.89	1.275
Q5_ Activities of daily living	175	0	5	2.81	1.288
Q6_Confidence before leaving home	175	0	5	2.63	1.219
Q7_State of Sleepiness	175	0	5	2.75	1.046
Q8_Energy level	175	0	5	2.77	1.177
Total Score	175	13	34	23.47	4.621
Valid N (listwise)	175				

Correlations:

		Age	Total Score
Age	Pearson Correlation	1	.193*
	Sig. (2-tailed)		.011
	N	175	175
Total Score	Pearson Correlation	.193*	1

*. Correlation is significant at the 0.05 level (2-tailed).

RESULT

The study comprised 175 participants with a clinical diagnosis of COPD. The mean age of the participants was 53.3 ± 12.7 years, with a range of 36 to 79 years. According to the gender distribution, there were more men (77.7%, n = 136) than women (22.3%, n = 39).

In terms of smoking history, men were substantially more likely than women to report having smoked in the past or currently. In particular, just 28% of female participants reported smoking, while 69% of male participants had a history of smoking. In line with previously documented gender-specific smoking trends in COPD populations, this discrepancy emphasises the higher frequency of tobacco use among men in this group.

The total cohort's mean score on the COPD Assessment Test (CAT) was 23.5 ± 4.6, which indicates a moderate to severe burden of symptoms. Gender analysis revealed that the mean CAT score for male patients was substantially higher (23.9 ± 4.7) than for female patients (21.8 ± 3.9, p = 0.01). This result implies that the male grouping experienced a greater degree of symptom load and perception.

Age and CAT score showed a statistically significant positive correlation (r = 0.193, p = 0.011) according to correlation analysis. This suggests a cumulative load of COPD symptoms in older people, as growing age was linked to increased symptom severity and functional impairment.

Overall, the findings highlight three major trends: (1) the COPD cohort's preponderance of male patients; (2) smoking prevalence and symptom burden are higher among males than females; and (3) the effect of ageing on deteriorating COPD-related symptoms.

DISCUSSION

Three significant patterns in COPD populations are highlighted by the current survey: a higher frequency of smoking and symptom load among men than women, a preponderance of male patients, and the growing impact of ageing on COPD-related symptoms. These results have significant ramifications for focused disease care and are in line with epidemiological and clinical data.

First, the over-representation of men in the COPD cohort is a result of occupational exposures as well as historical and societal factors that influence smoking behaviour. Men have historically used tobacco more frequently than women in various areas, which strongly correlates with a higher risk and severity of COPD[17,18].

Males are more likely than women to get COPD, according to large epidemiological cohorts like the COPD Gene project. This is especially true in low- and middle-income environments where smoking is more common among men.[8]. However, research from high-income nations indicates that the gender difference in prevalence is closing, with more women receiving diagnoses in recent decades. This is probably because smoking habits have changed and people are more aware of female susceptibility.

Second, it was discovered that men were more likely than women to smoke and to experience its symptoms. This is consistent with evidence that male patients frequently report higher pack-year histories and cumulative smoking exposure, both of which are linked to rapid deterioration of lung function and symptom progression. .[19,20] Male patients often frequently put off seeking medical attention, which results in more advanced diagnoses and a greater load of symptoms.

On the other hand, other research indicates that women with COPD may have a disproportionately high rate of dyspnoea, anxiety, and depression in comparison to their smoking history, indicating a biological vulnerability unique to one sex. These divergent trends highlight how crucial it is to incorporate gender-sensitive methods into the diagnosis and treatment of COPD.

Lastly, this study demonstrated the negative impact of ageing on symptoms associated with COPD. The consequences of COPD are exacerbated by structural and functional changes in the lung brought on by physiological ageing, such as a decrease in chest wall compliance, a loss of elastic recoil, and weakness in the respiratory muscles. Comorbidities that are prevalent in older age groups, like sarcopenia, osteoporosis, and cardiovascular disease, worsen functional impairment and lower quality of life. Despite identical spirometric impairment, older COPD patients exhibit worse physical function, more dyspnoea, and lower quality-of-life scores when compared to younger cohorts, according to longitudinal studies from the SPIROMICS and COPD Gene cohorts. This cumulative effect emphasises how ageing is a significant moderator of the outcomes of COPD.[21]

The lung ages with progressive functional deterioration and a diminished ability to withstand environmental stressors and injuries, much like any other organ. As an age-related illness, COPD may be linked to a global process of accelerated ageing, according to mounting data.The majority of patients with symptomatic COPD are in their late middle or advanced years because airflow limitation, as indicated by a decreased FEV1, develops extremely slowly over several decades. The age-dependent prevalence of COPD indicates a close connection between ageing and the pathophysiology of COPD[22].

Therefore, it would appear that older COPD patients would have a lower FEV1 than younger ones. Interestingly, we found that the FEV1 and FVC values were better in the older patient group. In contrast to our findings, Vestbo et al.[23] discovered that in over 50% of their patients, the rate of FEV1 loss over a three-year period was not higher than that of individuals without lung illness. It is important to note that we did not examine the same patients, thus other variables such the length of time since the first diagnosis, the course of treatment, the frequency of exacerbations, etc., may influence the decline in FEV1.

Despite the widespread belief that physical activity decreases as the disease worsens, little is known about how physical activity naturally changes over time in people with COPD. One way to characterise ageing and decline is as a downward spiral of worsening symptoms, disease severity, and declining functional performance and capacity. According to a study that examined the differences in physical activity between healthy people and people with COPD, older people and those with the condition showed a considerable decline in activity, with the decline in the latter group being more severe and correlated with the severity of the illness [24,25].

The study's findings highlight three noteworthy epidemiological trends that have direct bearing on COPD prevention and management tactics. First, the COPD cohort's apparent male predominance is a reflection of long-standing gender differences in smoking habits and occupational exposure to airborne pollutants, which have historically been more common among males. Second, the sex-specific impact of modifiable risk factors is further reinforced by the higher smoking prevalence and symptom load among male patients, underscoring the necessity of gender-sensitive public health measures. Lastly, the exacerbating effect of aging on COPD-related symptoms is consistent with previous longitudinal data that demonstrate how physiological changes brought on by aging, such as decreased lung compliance, loss of elastic recoil, and an increased burden of comorbidities, lead to increased symptom severity, functional decline,

and a lower quality of life in older adults.All of these results emphasize how crucial it is to incorporate demographic factors—especially age and gender—into individualized COPD management paths.

CONCLUSION

COPD patients experience substantial symptom burden and functional limitations, with notable influences of age and gender. These results underscore the importance of demographic-sensitive management strategies. Future studies should investigate longitudinal outcomes and interventions tailored to gender and age-related needs.

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