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Original Research Article

Clinical Profile and Risk Factors of Chronic Obstructive Pulmonary Disease in Adult Patients: A Cross-Sectional Study from a Tertiary Care Hospital in South India

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Abstract: ***Background:*** Chronic Obstructive Pulmonary Disease (COPD) is a leading cause of morbidity and mortality in India, yet region-specific data on clinical presentation and risk factor profiles from South India remain limited. ***Objective:*** To describe the clinical profile, spirometric severity, and associated risk factors of COPD among adult patients attending a tertiary care hospital in South India. ***Methods:*** A hospital-based cross-sectional observational study was conducted from January 2016 to March 2016 among 36 adults with spirometry-confirmed COPD (post-bronchodilator $FEV_1/FVC < 0.70$, per GOLD 2015). Demographic, clinical, exposure, and spirometric data were collected using a structured proforma. Descriptive statistics and chi-square tests were applied. ***Results:*** The mean age was 60.2 ± 9.8 years; 83.3% were male. Dyspnoea (94.4%), chronic cough (86.1%), and sputum production (72.2%) were the predominant symptoms. Tobacco smoking was reported by 72.2% (mean pack-years 32.5 ± 18.4), and biomass fuel exposure by 47.2%; 22.2% had no smoking history but significant biomass or occupational exposure. According to GOLD 2015 spirometric grading, 11.1% were mild, 38.9% moderate, 33.3% severe, and 16.7% very severe. Hypertension (38.9%), diabetes mellitus (19.4%), and past pulmonary tuberculosis (22.2%) were the most frequent comorbidities. ***Conclusion:*** COPD in this South Indian cohort predominantly affected middle-aged to older males with a heavy smoking burden, although a substantial proportion of nonsmokers had biomass or occupational exposure. Most patients presented with moderate-to-severe airflow limitation and a high comorbidity burden. Integrated tobacco cessation, clean-fuel initiatives, and comorbidity screening are essential.
Keywords: Chronic Obstructive Pulmonary Disease; Risk Factors; Clinical Profile; Spirometry; South India; Biomass Exposure; Tobacco Smoking.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable, and treatable chronic respiratory condition characterised by persistent respiratory symptoms and progressive airflow limitation that is not fully reversible [1]. According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2015, the diagnosis requires a post-bronchodilator forced expiratory volume in one second to forced vital capacity ratio (FEV_1/FVC) below 0.70 [2]. COPD is a major contributor to the global burden of non-communicable diseases and is projected to become the third leading cause of death worldwide by 2030 [3]. In India, the absolute number of COPD cases increased from 28.1 million in 1990 to 55.3 million in 2016, with an age-standardised prevalence rise from 3.3% to 4.2% [4]. The condition imposes substantial direct and indirect economic costs and significantly impairs health-related quality of life.

The risk factor landscape for COPD in India differs markedly from that of high-income countries. While tobacco smoking remains the single most important modifiable risk factor, with smokers having approximately a three- to four-fold higher risk of developing COPD compared with nonsmokers [5], a large proportion of COPD in India occurs among nonsmokers. Exposure to biomass fuel smoke from the burning of wood, dung cakes, and crop residues for domestic cooking is a major contributor, particularly among rural women [6,7]. More than three-quarters of Indian households rely on biomass fuel as their primary domestic energy source, and biomass smoke exposure has been independently associated with an elevated risk of chronic bronchitis and fixed airflow obstruction [8]. Occupational exposures to dusts, fumes, and particulate matter in agricultural, industrial, and informal sectors further compound the risk [9]. The contribution of ambient air pollution to the COPD burden is also increasingly recognised; in 2016, 53.7% of disability-

adjusted life years due to COPD in India were attributable to air pollution [4].

The clinical presentation of COPD in Indian patients is heterogeneous. Dyspnoea, chronic cough, and sputum production are the cardinal symptoms, but the frequency and severity of each vary across studies. A tertiary care–based observational study from western India reported dyspnoea in 90%, cough in 85%, and sputum production in 70% of patients [10]. COPD is frequently accompanied by extrapulmonary comorbidities, including hypertension, diabetes mellitus, cardiovascular disease, and past pulmonary tuberculosis, which influence disease severity, exacerbation frequency, and mortality [11,12]. In India, where the tuberculosis burden remains high, the overlap between past tuberculosis and COPD presents a distinct clinical challenge [13].

Despite the high and rising burden of COPD in India, region-specific data from South India on the clinical profile, spirometric severity distribution, and risk factor patterns remain relatively scarce, particularly from tertiary care settings where patients often present at advanced stages. The present study was therefore undertaken to characterise the demographic and clinical features, spirometric severity, and associated risk factors of COPD among adults attending a tertiary care hospital in South India, using the GOLD 2015 diagnostic and grading framework [2].

OBJECTIVE

The primary objective of this study was to describe the clinical profile of adult patients diagnosed with COPD at a tertiary care hospital in South India, including demographic characteristics, symptomatology, and spirometric severity according to the GOLD 2015 classification [2]. A secondary objective was to identify the distribution of major risk factors tobacco smoking, biomass fuel exposure, and occupational exposure among the study population and to examine their association with disease severity.

By documenting the clinical and risk factor profile of COPD in this regional context, the study aimed to generate locally relevant evidence that could inform targeted screening, early diagnosis, and risk-factor modification strategies. Characterising the burden of comorbidities in this cohort was an additional focus, given the recognised impact of comorbid conditions on COPD outcomes and the limited South Indian data in this domain [11,12].

METHODOLOGY & MATERIALS

This hospital-based cross-sectional observational study was conducted in the Department of Pulmonary Medicine at a tertiary care teaching hospital in South India over a four-month period, from January 2016 to March 2016. The study protocol was reviewed and approved by the Institutional Ethics Committee prior to commencement. All participants provided written informed consent after the nature and purpose of the study had been explained to them in their native language. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Inclusion criteria were: (i) adults aged 30 years or older of either sex; (ii) a physician diagnosis of COPD based on clinical symptoms (dyspnoea, chronic cough, or sputum production) and confirmed by post-bronchodilator spirometry demonstrating a FEV_1/FVC ratio < 0.70, consistent with the GOLD 2015 criteria [2]; (iii) stable disease state at the time of assessment, defined as no acute exacerbation within the preceding four weeks; and (iv) willingness to participate and provide informed consent. Exclusion criteria were: (i) a primary diagnosis of bronchial asthma, bronchiectasis, active pulmonary tuberculosis, or lung malignancy; (ii) restrictive lung disease or a known alternative cause of chronic respiratory symptoms; (iii) inability to perform technically acceptable spirometry; and (iv) severe cognitive impairment or unwillingness to provide consent. Patients with a history of treated pulmonary tuberculosis were included, as past tuberculosis is a recognised risk factor and comorbidity in the Indian COPD population [13].

Data collection procedure employed a structured, pre-tested proforma administered by trained research personnel. Demographic details (age, sex, residence, occupation), clinical history (symptoms and their duration, exacerbation history), and exposure history (tobacco smoking in pack-years, biomass fuel use, occupational dust or fume exposure) were recorded. Spirometry was performed using a calibrated spirometer according to American Thoracic Society/European Respiratory Society standards, with post-bronchodilator measurements obtained 15–20 minutes after the inhalation of 400 µg salbutamol via a spacer. Spirometric severity was graded according to GOLD 2015: mild ($FEV_1 \geq 80\%$ predicted), moderate ($50\% \leq FEV_1 < 80\%$), severe ($30\% \leq FEV_1 < 50\%$), and very severe ($FEV_1 < 30\%$) [2]. Comorbidity data, including hypertension, diabetes mellitus, and past pulmonary tuberculosis, were obtained from clinical records and patient interview. Body mass index was calculated from measured height and weight.

Statistical data analysis was performed using IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range, as appropriate for distribution. Categorical variables were summarised as frequencies and percentages. The chi-square test or Fisher's exact test was used to examine associations between categorical variables, including risk factor categories and GOLD severity groups. A p-value of < 0.05 was considered statistically significant. Given the modest sample size, the analyses were primarily descriptive and

exploratory; no formal sample size calculation was performed, and the study was conceived as a preliminary investigation to characterise the local COPD profile.

RESULTS

Of the 36 patients included in the analysis, 30 (83.3%) were male and 6 (16.7%) were female. The mean age of the cohort was 60.2 ± 9.8 years (range 42–78 years), with the majority (61.1%) aged 60 years or older. Most patients (69.4%) resided in rural or semi-urban areas, and 44.4% reported agricultural work or daily-wage labour as their primary occupation. The mean body mass index was 21.3 ± 3.6 kg/m², and 41.7% of patients were underweight (BMI < 18.5 kg/m²). The mean duration of respiratory symptoms before presentation was 6.8 ± 4.2 years. As shown in Table 1, dyspnoea was the most frequent symptom (94.4%), followed by chronic cough (86.1%) and sputum production (72.2%); 63.9% reported at least one exacerbation requiring medical attention in the preceding year.

Table 1. Clinical and Demographic Profile of COPD Patients (N = 36)

Characteristic	Category	n (%) or Mean ± SD
Age (years)	Mean ± SD	60.2 ± 9.8
	≥60 years	22 (61.1)
Sex	Male	30 (83.3)
	Female	6 (16.7)
Residence	Rural/semi-urban	25 (69.4)
	Urban	11 (30.6)
BMI (kg/m²)	Mean ± SD	21.3 ± 3.6
	Underweight (<18.5)	15 (41.7)
Symptoms	Dyspnoea	34 (94.4)
	Chronic cough	31 (86.1)
	Sputum production	26 (72.2)
	Exacerbation in past year	23 (63.9)

Risk factor assessment revealed that 26 patients (72.2%) were ever-smokers, with a mean smoking burden of 32.5 ± 18.4 pack-years; 19 (52.8%) were current smokers. Among ever-smokers, beedi smoking was reported by 8 patients (30.8% of smokers). Biomass fuel exposure was documented in 17 patients (47.2%), including 4 of the 6 women (66.7%). Occupational exposure to dust or fumes was reported by 13 patients (36.1%). Notably, 8 patients (22.2%) had no history of smoking but had significant biomass or occupational exposure, and 3 patients (8.3%) had no identifiable conventional risk factor other than past pulmonary tuberculosis. The distribution of risk factors is summarised in Table 2.

Table 2. Distribution of Risk Factors (N = 36)

Risk Factor	n (%)
Ever-smoker	26 (72.2)
Current smoker	19 (52.8)
Mean pack-years (smokers)	32.5 ± 18.4
Biomass fuel exposure	17 (47.2)
Occupational dust/fume exposure	13 (36.1)
Nonsmoker with biomass/occupational exposure	8 (22.2)
Past pulmonary tuberculosis	8 (22.2)

Spirometric grading according to GOLD 2015 showed that 4 patients (11.1%) had mild airflow limitation, 14 (38.9%) moderate, 12 (33.3%) severe, and 6 (16.7%) very severe disease; thus, 50.0% of the cohort presented with severe or very severe airflow limitation. The mean post-bronchodilator FEV_1 was 48.2 ± 17.6% of predicted. Comorbidity burden was substantial: hypertension was present in 14 patients (38.9%), diabetes mellitus in 7 (19.4%), and past pulmonary tuberculosis in 8 (22.2%). At least one comorbidity was present in 22 patients (61.1%), and 6 patients (16.7%) had two or more comorbidities. The distribution of GOLD grades and comorbidities is presented in Table 3. Exploratory analysis did not reveal statistically significant associations between risk factor categories and GOLD severity groups, likely reflecting the limited sample size; however, a numerically higher proportion of severe/very severe disease was observed among patients with combined smoking and biomass exposure (66.7%) compared with those with smoking alone (50.0%).

Table 3. Spirometric Severity (GOLD 2015) and Comorbidities (N = 36)

Variable	Category	n (%)

GOLD grade	Mild ($FEV_1 \geq 80\%$)	4 (11.1)
	Moderate ($50\% \leq FEV_1 < 80\%$)	14 (38.9)
	Severe ($30\% \leq FEV_1 < 50\%$)	12 (33.3)
	Very severe ($FEV_1 < 30\%$)	6 (16.7)
Comorbidity	Hypertension	14 (38.9)
	Diabetes mellitus	7 (19.4)
	Past pulmonary tuberculosis	8 (22.2)
	≥1 comorbidity	22 (61.1)

DISCUSSION

This study provides a contemporary snapshot of the clinical and risk factor profile of COPD among adults attending a tertiary care hospital in South India. The cohort was predominantly male, middle-aged to older, and drawn largely from rural and semi-urban backgrounds, consistent with the demographic patterns reported in other Indian COPD studies [10,14]. The male preponderance (83.3%) is higher than that observed in some community-based surveys, where female representation has been greater owing to biomass exposure [7,15], but aligns with tertiary care–based series in which male smokers constitute the majority of referred patients [10,16]. The high proportion of patients presenting with moderate-to-severe airflow limitation (88.9% in GOLD grades II–IV) underscores the problem of delayed diagnosis and late presentation that characterises COPD care in many low- and middle-income settings, where spirometry is often unavailable at the primary care level and symptoms are normalised or misattributed [17].

The risk factor profile observed in this cohort reflects the dual burden of tobacco and biomass exposure that defines the Indian COPD epidemic. Tobacco smoking was the dominant risk factor, with a mean smoking burden exceeding 30 pack-years, and a substantial minority of smokers reported beedi use, a form of smoking associated with particularly high tar and nicotine exposure [5]. However, nearly half of the cohort reported biomass fuel exposure, and more than one-fifth of patients were nonsmokers with biomass or occupational exposure. This pattern is consistent with the Mysuru studies from rural South India, which established a threshold of biomass smoke exposure associated with an elevated risk of chronic bronchitis and demonstrated that biomass exposure contributes independently to airflow obstruction [8]. The finding that 22.2% of patients had past pulmonary tuberculosis is clinically important; India bears the highest global tuberculosis burden, and post-tuberculosis lung disease is increasingly recognised as a distinct COPD phenotype with differing inflammatory and structural characteristics [13]. These observations reinforce the need for risk factor assessment in COPD to extend beyond smoking history to include biomass, occupational, and tuberculosis-related exposures.

The comorbidity burden in this cohort was considerable, with hypertension (38.9%), diabetes mellitus (19.4%), and past tuberculosis (22.2%) being the most frequent conditions. These prevalence estimates are broadly comparable to those reported in larger Indian studies: a hospital-based study of 2,432 COPD subjects found diabetes in 25.9%, hypertension in 37.3%, and cardiovascular disease in 13.9% [11], while a tertiary care study from eastern India reported diabetes in 14% and hypertension in 20% [16]. The presence of comorbidities in COPD is not merely coincidental; shared risk factors such as ageing, smoking, and systemic inflammation contribute to their co-occurrence, and comorbid conditions independently worsen breathlessness, functional capacity, and survival [12]. The high proportion of underweight patients (41.7%) in this cohort is also noteworthy, as low body mass index is a recognised independent predictor of mortality in COPD and may reflect the combined effects of chronic inflammation, reduced caloric intake, and increased work of breathing. From a clinical standpoint, these findings support the routine screening of COPD patients for hypertension, diabetes, and nutritional status, and they highlight the need for integrated care models that address both respiratory and non-respiratory dimensions of the disease.

Limitations of the Study

This study has several limitations that warrant consideration. First, the small sample size (N = 36) limits the precision of prevalence estimates and precludes robust multivariable adjustment for confounding; the exploratory comparisons of risk factors across GOLD grades should therefore be interpreted as hypothesis-generating rather than definitive. Second, the hospital-based design introduces selection bias, as patients attending a tertiary care centre are likely to have more severe disease and a higher comorbidity burden than COPD patients in the community, limiting the generalisability of the findings to the broader South Indian COPD population. Third, the cross-sectional design captures risk factor and clinical data at a single time point and cannot establish temporal or causal relationships. Fourth, exposure assessment relied on self-report, which is subject to recall bias, particularly for biomass and occupational exposures, and no quantitative environmental monitoring was performed. Fifth, spirometry was performed in a single centre using one device; although calibration and quality control procedures were followed, inter-device variability cannot be excluded. Finally, the study did not include a comparison group of non-COPD controls, so risk factor associations could not be quantified using odds ratios. Future multicentre

studies with larger, community-based samples and longitudinal follow-up are needed to confirm and extend these findings.

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CONCLUSION

This study demonstrates that COPD among adults attending a tertiary care hospital in South India is characterised by a male-predominant, middle-aged to older demographic, a high symptom burden at presentation, and a substantial prevalence of moderate-to-severe airflow limitation. Tobacco smoking remains the principal risk factor, but biomass fuel exposure and past pulmonary tuberculosis are important contributors, particularly among nonsmokers and women, reflecting the distinctive aetiological landscape of COPD in India [4,7,13]. The comorbidity burden hypertension, diabetes mellitus, and undernutrition is considerable and reinforces the systemic nature of COPD. These findings have direct implications for clinical practice: opportunistic spirometry should be strengthened in primary and secondary care to enable earlier diagnosis; risk factor assessment must routinely encompass biomass and occupational exposures alongside smoking; and comorbidity screening should be integrated into COPD management protocols.

From a public health perspective, the results support the scaling-up of tobacco cessation services, the promotion of clean cooking fuels and improved stove technologies to reduce biomass smoke exposure, and the implementation of occupational health safeguards in high-risk sectors. Given the limited sample size and hospital-based design of this study, the findings should be viewed as a preliminary characterisation of the local COPD profile. Larger, multicentre, community-based studies with longitudinal follow-up and standardised exposure measurement are needed to quantify risk factor–severity associations and to inform the development of region-specific COPD prevention and management strategies for South India. Such evidence will be essential for achieving the broader goal of reducing the premature mortality and morbidity attributable to chronic respiratory diseases in India.

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