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Research Article

PREVALENCE AND CLINICAL CHARACTERISTICS OF ASTHMA–COPD OVERLAP AMONG PATIENTS ATTENDING A TERTIARY CARE HOSPITAL

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Abstract

Background: Asthma and chronic obstructive pulmonary disease (COPD) are common chronic airway disorders with distinct clinical and pathological characteristics. However, a substantial proportion of patients exhibit overlapping features of both conditions, referred to as asthma–COPD overlap (ACO). Patients with ACO experience greater symptom burden, frequent exacerbations, accelerated decline in lung function, poorer quality of life, and increased healthcare utilization compared to patients with asthma or COPD alone. Despite its clinical significance, the prevalence of ACO varies considerably because of differences in diagnostic criteria and study populations. Limited data are available from tertiary care hospitals in India regarding the burden of ACO.

Objectives: To determine the prevalence of asthma–COPD overlap among patients attending a tertiary care hospital and to evaluate their demographic and clinical characteristics.

Methods: This hospital-based cross-sectional study was conducted among adult patients diagnosed with chronic airway disease attending the Department of Pulmonary Medicine of a tertiary care hospital. Patients were evaluated using detailed clinical history, smoking status, physical examination, spirometry with bronchodilator reversibility testing, and relevant laboratory investigations. Asthma–COPD overlap was diagnosed according to the Global Initiative for Asthma (GINA) and Global Initiative for Chronic Obstructive Lung Disease (GOLD) recommendations. Demographic

characteristics, comorbidities, symptom profile, and pulmonary function parameters were analysed. Data were analysed using appropriate descriptive and inferential statistical methods, with statistical significance set at $p<0.05$.

Results: The prevalence of ACO and its association with demographic variables, smoking history, respiratory symptoms, spirometric findings, and clinical characteristics were evaluated. The study also assessed the distribution of risk factors and comorbid conditions among patients diagnosed with ACO.

Conclusion: Estimation of the prevalence of asthma–COPD overlap in a tertiary care setting will facilitate early diagnosis, optimise therapeutic strategies, and improve long-term outcomes. The findings may contribute to evidence-based management protocols and resource planning for chronic airway diseases.

Keywords: Asthma–COPD overlap, ACO, COPD, asthma, prevalence, spirometry.

INTRODUCTION

Asthma and chronic obstructive pulmonary disease (COPD) are among the leading chronic respiratory diseases worldwide and contribute substantially to morbidity, mortality, and healthcare expenditure. Although traditionally regarded as distinct clinical entities, many patients present with characteristics of both diseases, giving rise to asthma–COPD overlap (ACO), a condition associated with persistent airflow limitation and features of both asthma and COPD. ACO has gained increasing recognition because affected patients experience more severe respiratory symptoms, frequent exacerbations, accelerated decline in lung function, and poorer quality of life than patients with either disease alone.[1–3]

Asthma is characterised by chronic airway inflammation, variable respiratory symptoms, and reversible airflow limitation, whereas COPD is characterised by persistent airflow obstruction resulting from chronic exposure to noxious particles, particularly tobacco smoke and biomass fuel exposure. Despite these differences, both diseases share several inflammatory pathways, environmental risk factors, and structural airway changes, resulting in overlapping clinical manifestations in a subset of patients.[2,4] The coexistence of asthma and COPD presents diagnostic and therapeutic challenges because these patients often require treatment strategies that address components of both diseases.

The prevalence of ACO varies widely across different populations, ranging from approximately 10% to 35% among patients with chronic airway diseases, depending on the diagnostic criteria used and study setting.[5] Patients with ACO have been shown to experience higher rates of hospitalisation, increased healthcare utilisation, poorer health-related quality of life, and greater mortality compared with those having asthma or COPD alone.[6,7] Early identification of ACO is therefore essential for optimising treatment, reducing exacerbations, and improving long-term outcomes.

Current recommendations from the Global Initiative for Asthma (GINA) and the Global Initiative for Chronic Obstructive Lung Disease (GOLD) emphasise recognising overlapping clinical features rather than relying on a single diagnostic criterion. Comprehensive clinical

assessment combined with spirometry remains the cornerstone for diagnosing ACO and differentiating it from isolated asthma or COPD.[2,8]

Data regarding the prevalence of ACO in the Indian population remain limited, particularly from tertiary care hospitals. Estimating the burden of ACO and understanding its clinical profile are essential for improving disease recognition, facilitating early intervention, and developing evidence-based management strategies. Therefore, the present study was undertaken to determine the prevalence of asthma–COPD overlap among patients attending a tertiary care hospital and to describe their demographic and clinical characteristics.[9]

MATERIALS AND METHODS

Study Design

This was a hospital-based cross-sectional study conducted to determine the prevalence of asthma–COPD overlap (ACO) among patients diagnosed with chronic obstructive pulmonary disease (COPD) in a Tertiary Care Teaching Hospital, Tamilnadu, India,

Study Duration

The study was carried out over a period of one year.

Study Population

The study included patients with a confirmed diagnosis of COPD attending the outpatient and inpatient services of the Department of Pulmonary Medicine.

Sample Size

A total of **124 patients** with COPD were included in the study. The sample size was calculated considering an allowable alpha error of 7% with a confidence level of 95%.

Sampling Technique

Simple random sampling was used for selecting eligible participants.

Inclusion Criteria

- Patients aged ≥40 years.
- Confirmed diagnosis of COPD based on post-bronchodilator spirometry (FEV1/FVC <0.70).
- Patients willing to provide written informed consent.

Exclusion Criteria

- Patients with acute exacerbation requiring intensive care.
- Patients with active pulmonary tuberculosis or other significant respiratory disorders.
- Patients unable to perform acceptable spirometry.
- Patients unwilling to participate.

Data Collection

After obtaining informed consent, all participants underwent detailed clinical evaluation using a structured proforma.

The following information was collected:

- Demographic characteristics (age and sex) : Body Mass Index (BMI) , Respiratory symptoms: Past medical history: Personal history:

Clinical Evaluation

All participants underwent:

- Detailed physical examination , Chest radiograph (Postero-anterior view) , Spirometry with

bronchodilator reversibility testing and Absolute eosinophil count (AEC)

Diagnostic Criteria for Asthma–COPD Overlap

Diagnosis of ACO was established according to the International Journal of Pulmonary and Respiratory Medicine criteria.

Major Criteria

1. Persistent airflow limitation (post-bronchodilator FEV1/FVC <0.70) in patients aged >40 years.
2. Smoking history ≥10 pack-years or equivalent biomass smoke exposure.
3. Documented asthma before 40 years of age or bronchodilator reversibility (BDR) >400 mL in FEV1.

Minor Criteria

1. History of atopy or allergic rhinitis.
2. Bronchodilator reversibility ≥200 mL and ≥12% on at least two occasions.
3. Peripheral blood eosinophil count ≥300 cells/μL.

A diagnosis of ACO was made when **three major criteria and at least one minor criterion** were fulfilled.

Outcome Measure

The primary outcome was the prevalence of asthma–COPD overlap among COPD patients.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using SPSS software. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Associations between categorical variables were analysed using the Chi-square test or Fisher's exact test wherever appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 124 patients with chronic obstructive pulmonary disease (COPD) were included in the study. The age of the participants ranged from 40 to 75 years, with a mean age of 54.15 ± 8.2 years. The majority of patients belonged to the 51–60 years age group (55; 44.4%), followed by the 41–50 years group (47; 37.9%), 61–70 years (17; 13.7%), and >70 years (5; 4.0%). A history of atopy was present in 59 patients (47.6%), while 65 (52.4%) had no history of atopy. Regarding smoking history, 54 patients (43.5%) had smoked for 10–19 years, 52 (41.9%) for 20–29 years, and 18 (14.5%) for ≥30 years. Absolute eosinophil count (AEC) was ≥300 cells/mm³ in 88 patients (71.0%) and <300 cells/mm³ in 36 patients (29.0%). (Table 1)

Among the study population, emphysema was the predominant COPD subtype, accounting for 64 patients (51.6%), while 60 patients (48.4%) had chronic bronchitis. With respect to COPD phenotypes, the exacerbator with emphysema phenotype was the most common (38; 31.0%), followed by the non-exacerbator phenotype (31; 25.0%), exacerbator with chronic bronchitis phenotype (30; 24.0%), and asthma-COPD overlap (ACO) phenotype (25; 20.0%). Pulmonary function test (PFT)

reversibility analysis showed that 62 patients (50.0%) had no significant reversibility (1–14%), 37 (29.8%) had no reversibility (0%), and 25 (20.2%) demonstrated significant reversibility (≥15%). Overall, 25 patients (20.0%) were diagnosed with asthma-COPD overlap, while 99 (80.0%) had COPD without overlap. (Table 2)

There was no statistically significant association between age category and asthma-COPD overlap ($p > 0.05$). Although the highest proportion of ACO cases was observed among patients aged 51–60 years (13/25; 52.0%), followed by those aged 41–50 years (6/25; 24.0%), 61–70 years (4/25; 16.0%), and >70 years (2/25; 8.0%), the distribution across age groups was not statistically significant ($p > 0.05$). (Table 3)

A statistically significant association was observed between history of atopy and asthma-COPD overlap ($p < 0.05$). Among patients with ACO, 18 (72.0%) had a history of atopy compared with 41 (41.4%) of those without ACO, whereas only 7 (28.0%) ACO patients had no history of atopy. These findings indicate that a history of atopy was significantly associated with asthma-COPD overlap. (Table 4)

Smoking duration was significantly associated with asthma-COPD overlap ($p < 0.05$). Among patients with ACO, 14 (56.0%) had smoked for 20–29 years, 6 (24.0%) for 10–19 years, and 5 (20.0%) for ≥30 years. In comparison, among patients without ACO, 48 (48.4%) had smoked for 10–19 years, 38 (38.4%) for 20–29 years, and 13 (13.1%) for ≥30 years. These findings suggest that increasing duration of smoking was significantly associated with the occurrence of asthma-COPD overlap. (Table 5)

Absolute eosinophil count demonstrated a statistically significant association with asthma-COPD overlap ($p < 0.05$). All 25 patients (100%) with ACO had an AEC ≥300 cells/mm³, whereas none had an AEC <300 cells/mm³. Among patients without ACO, 63 (63.7%) had an AEC ≥300 cells/mm³ and 36 (36.3%) had an AEC <300 cells/mm³. These findings indicate that elevated blood eosinophil count is strongly associated with asthma-COPD overlap. (Table 6)

Table 1. Baseline demographic and clinical characteristics of the study population (n = 124)

Variable	Category	n	%
Age group (years)	41–50	47	37.9
	51–60	55	44.4
	61–70	17	13.7
	>70	5	4.0
History of atopy	Yes	59	47.6
	No	65	52.4
Smoking duration (years)	10–19	54	43.5
	20–29	52	41.9
	≥30	18	14.5
Absolute eosinophil count (cells/mm³)	<300	36	29.0
	≥300	88	71.0

Mean age: 54.15 ± 8.2 years (Range: 40–75 years)

Table 2. Distribution of COPD types, phenotypes, pulmonary function reversibility, and asthma-COPD overlap (n = 124)

Variable	Category	n	%
COPD type	Chronic bronchitis	60	48.4
	Emphysema	64	51.6
COPD phenotype	Non-exacerbator	31	25.0
	Asthma-COPD overlap	25	20.0
	Exacerbator with chronic bronchitis	30	24.0
	Exacerbator with emphysema	38	31.0
Pulmonary function test reversibility	No reversibility (0%)	37	29.8
	No significant reversibility (1–14%)	62	50.0
	Significant reversibility (≥15%)	25	20.2
Study classification	Asthma-COPD overlap	25	20.0
	COPD without overlap	99	80.0

Table 3. Association between age category and asthma-COPD overlap (n = 124)

Age group (years)	Asthma-COPD overlap n (%)	COPD without overlap n (%)	Total	P value
41–50	6 (24.0)	41 (41.4)	47	**>0.05 (NS)**
51–60	13 (52.0)	42 (42.4)	55	
61–70	4 (16.0)	13 (13.1)	17	
>70	2 (8.0)	3 (3.0)	5	
Total	**25 (100)**	**99 (100)**	**124**	

Chi-square/Fisher's exact test; df = 2. No statistically significant association.

Table 4. Association between history of atopy and asthma-COPD overlap (n = 124)

History of atopy	Asthma-COPD overlap n (%)	COPD without overlap n (%)	Total	P value

Yes	18 (72.0)	41 (41.4)	59	**<0.05***
No	7 (28.0)	58 (58.6)	65	
Total	**25 (100)**	**99 (100)**	**124**	

**Chi-square test; df = 1. *Statistically significant.*

Table 5. Association between smoking duration and asthma-COPD overlap (n = 124)

Smoking duration (years)	Asthma-COPD overlap n (%)	COPD without overlap n (%)	Total	P value
10–19	6 (24.0)	48 (48.4)	54	**<0.05***
20–29	14 (56.0)	38 (38.4)	52	
≥30	5 (20.0)	13 (13.1)	18	
Total	**25 (100)**	**99 (100)**	**124**	

**Chi-square test; df = 2. *Statistically significant.*

Table 6. Association between absolute eosinophil count and asthma-COPD overlap (n = 124)

Absolute eosinophil count (cells/mm³)	Asthma-COPD overlap n (%)	COPD without overlap n (%)	Total	P value
<300	0 (0.0)	36 (36.3)	36	**<0.05***
≥300	25 (100.0)	63 (63.7)	88	
Total	**25 (100)**	**99 (100)**	**124**	

**Chi-square/Fisher's exact test; df = 1. *Statistically significant.*

DISCUSSION

The present cross-sectional study evaluated the prevalence of asthma–COPD overlap (ACO) among 124 patients with COPD attending a tertiary care hospital. The overall prevalence of ACO was 20%, indicating that one in every five patients with COPD fulfilled the diagnostic criteria for overlap syndrome. This prevalence is consistent with previous international studies reporting that ACO affects approximately 15–30% of patients with COPD, although reported prevalence varies depending on the diagnostic criteria used. Gibson and McDonald emphasized that ACO represents a clinically important phenotype because these patients exhibit greater symptom burden, frequent exacerbations, and poorer quality of life than patients with COPD alone.[10]

The majority of participants in the present study belonged to the 51–60-year age group, with a mean age of 54.15 ± 8.2 years. Although ACO was numerically more frequent in this age group, the association between age and ACO was not statistically significant. Similar observations were reported by Uchida et al., who found that ACO predominantly affects middle-aged and older adults because both cumulative smoking exposure and long-standing asthma contribute to the development of persistent airflow limitation, while age itself may not independently predict ACO.[11]

A significant association was observed between history of atopy and ACO in the present study. Nearly three-fourths of patients with ACO had a history of atopy, highlighting the important contribution of allergic airway inflammation in overlap syndrome. Likewise, Sin et al. proposed that eosinophilic inflammation, allergic rhinitis, and atopy are distinguishing clinical features that help differentiate ACO from COPD alone and recommended their inclusion in diagnostic algorithms.[12]

Smoking remains the most important environmental risk factor for COPD and also contributes significantly to the development of ACO. In the present study, longer duration of smoking was significantly associated with ACO. Patients with smoking exposure exceeding 20 years had a greater prevalence of overlap syndrome than those with shorter exposure. Similar findings were reported by Menezes et al., who demonstrated that smoking, when superimposed on underlying asthma, accelerates airflow limitation and substantially increases the risk of developing ACO and respiratory exacerbations.[13]

Peripheral eosinophilia was another important finding in the present study. All patients diagnosed with ACO had an absolute eosinophil count ≥300 cells/μL, which showed a statistically significant association with overlap syndrome. This finding supports the concept that eosinophilic airway inflammation is an important biomarker for identifying ACO. Christenson et al. demonstrated that eosinophilic inflammation reflects type-2 immune activation and predicts corticosteroid responsiveness in patients with ACO.[14]

Significant bronchodilator reversibility (>15%) was observed in all patients classified as having ACO, reflecting the coexistence of reversible airflow obstruction within persistent fixed airway limitation. Miravitlles et al. reported that bronchodilator reversibility, together with eosinophilia and a previous history of asthma, represents one of the strongest clinical indicators of overlap syndrome and facilitates early diagnosis and individualized therapy.[15]

Among COPD phenotypes, the exacerbator with emphysema phenotype constituted the largest proportion, followed by non-exacerbators and exacerbators with chronic bronchitis, whereas ACO accounted for 20% of patients. Similar phenotype distributions have been reported by Barrecheguren et al., who suggested that recognising COPD phenotypes enables clinicians to select targeted pharmacological treatment and improve long-term outcomes.[16]

Overall, the findings of the present study reinforce current evidence that ACO is a common and clinically relevant phenotype among COPD patients. Barnes emphasized that early recognition of overlap syndrome is essential because these patients benefit

from timely initiation of inhaled corticosteroid-based therapy and comprehensive risk factor modification, resulting in fewer exacerbations and improved quality of life.[17] Furthermore, recent systematic reviews continue to support the importance of standardized diagnostic criteria using clinical history, spirometry, bronchodilator reversibility, and blood eosinophil count for accurate identification of ACO.[18]

CONCLUSION

The present study demonstrated that 20% of patients with COPD had asthma–COPD overlap, indicating that ACO is a relatively common phenotype in tertiary care practice. History of atopy, prolonged smoking exposure, peripheral eosinophilia, and significant bronchodilator reversibility were significantly associated with ACO, whereas age was not significantly associated. Early identification of overlap syndrome using clinical evaluation, spirometry, bronchodilator reversibility testing, and blood eosinophil count may facilitate prompt initiation of appropriate therapy, reduce exacerbations, improve quality of life, and optimise long-term clinical outcomes.

Author Contributions

All authors contributed substantially to the conception and design of the study, data collection, statistical analysis, interpretation of results, manuscript preparation, critical revision of the article, and approval of the final manuscript.

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Conflicts of Interest

The authors declare that there are no conflicts of interest.

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