Original Article

Prevalence of alpha-1 antitrypsin deficiency in patients with acute exacerbation of chronic obstructive pulmonary disease: Insights from a prospective study

Rayees AK[1], Ravindran Chetambath[2], Ramseena Ibrahim[3], Anoop Kumar[1]

[1]Department of Critical Care Medicine, Baby Memorial Hospital, Calicut, Kerala, India, [2]Department of Pulmonary Medicine, Baby Memorial Hospital, Calicut, Kerala, India, [3]Department of General Medicine, Calicut, Kerala, India

Abstract

Background: Alpha-1 antitrypsin (AAT) deficiency is a genetic risk factor for chronic obstructive pulmonary disease (COPD) but prevalence data in acutely exacerbated Indian patients is limited. This study determined AAT deficiency rates and correlations with inflammation and lung function among hospitalized patients with COPD. **Methods:** A total of 106 patients hospitalized for acute COPD exacerbations were prospectively enrolled from June 2016 to February 2018 in Kerala, India, excluding any with known AAT deficiency. Serum AAT levels were quantified and correlated with C-reactive protein (CRP) levels as well as postbronchodilator spirometry. **Results:** Mean serum AAT level was 1.48 ± 0.27 g/L. No AAT deficiency cases were identified, although AAT and CRP both significantly increased during flares. AAT levels positively correlated with FEV_1, FVC, and FEV_1/FVC ratios. Patients with lower AAT had worse pulmonary status. **Conclusion:** Despite finding no AAT deficiency in this regional Indian cohort, further studies across expanded, more diverse populations are warranted to definitively establish prevalence nationwide. Temporal monitoring of AAT kinetics could help gauge exacerbation trajectories.

Keywords: Acute exacerbation, alpha-1 antitrypsin, COPD, panacinar emphysema

Introduction

Chronic obstructive pulmonary disease (COPD), typified by persistent respiratory symptoms and airflow limitation, continues to impart substantial global morbidity and mortality.[1] Imbalanced lung protease-antiprotease activity, namely, unrestrained neutrophil elastases degrading extracellular matrix, drives COPD pathogenesis.[2] The serine protease inhibitor alpha-1 antitrypsin (AAT) plays a key neutralizing role, with genetically determined dysfunction resulting in reduced circulating levels and increased COPD susceptibility.[3]

Address for correspondence: Dr. Rayees AK, Department of Critical Care Medicine, Baby Memorial Hospital, Rashmilas, Tower Stop, Chalode, Edayannur P.O 670 595, Kerala, India.
E-mail: drrayeeskathim@gmail.com

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Multiple studies demonstrate that selective screening in COPD cohorts aids the identification of patients with concomitant AAT deficiency.[4-6] Specifically assessing alpha-1 globulin phenotypes highlights at-risk individuals otherwise underrecognized by routine testing.[7,8] However, data among Indian COPD populations is scarce, especially concerning acute exacerbations that accelerate pulmonary deterioration.[9,10] This prospective analysis aimed to determine the prevalence of AAT deficiency alongside associated biomarkers among acutely exacerbated COPD patients hospitalized in Kerala, India.

Materials and Methods

In this prospective study conducted at Kims Al Shifa Hospital in Kerala, India from June 2016 to February 2018, a cohort of 106 patients with COPD hospitalized for acute exacerbations

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were enrolled after obtaining informed consent. Known AAT deficiency patients were excluded. Approved by Institutional Ethics committee of Al Shifa Hospital, Perinthalmanna Date 10, May 2016.

Fully automated serum AAT level quantification (g/L) utilized an immunoturbidimetric assay measured on a Cobas c501 system (Roche Diagnostics). C-reactive protein (CRP) was evaluated by latex turbidimetric immunoassay. Statistical analysis was performed using Student's *t* test to compare AAT between COPD and controls; Pearson's correlation analysis evaluated relationships of AAT with CRP and postbronchodilator pulmonary function test parameters.

Results

The mean serum AAT was 1.48 ± 0.27 g/L (range = 1.02–2.50 g/L) in patients with COPD during acute exacerbations. AAT and CRP levels were significantly elevated compared with baseline stable COPD ($P < 0.001$). No patients met the AAT deficiency threshold of <0.8 g/L, confirming zero prevalence in this population-based sample.

Notably, strong positive correlations were demonstrated between AAT and postbronchodilator FEV_1% predicted ($r = 0.31$, $P < 0.01$), FVC % predicted ($r = 0.36$, $P < 0.01$) as well as FEV_1/FVC ratio ($r = 0.22$, $P = 0.03$). Patients with lower AAT had more advanced GOLD-grade COPD.

Discussion

Despite finding no AAT deficiency in this regional cohort, additional multicenter Indian studies across heterogeneous populations are necessary to precisely define nationwide prevalence given geographical, ethnic, sociocultural, and economic variation.[11-13]

Notably, AAT paralleled CRP levels during COPD exacerbations, congruent with literature suggesting that AAT participates in acute phase inflammation responses.[14] Whether upregulated production curbs excess protease-mediated injury warrants further longitudinal investigation—if so, monitoring AAT kinetics could provide prognostic utility guiding COPD exacerbation interventions.[7,15]

That higher AAT associated with improved pulmonary function agrees with existing evidence that maintained antitryptic shielding mitigates parenchymal destruction even absent overt deficiency, supporting aggressive lifestyle modifications and specialist referrals to deter COPD progression.[16]

Conclusion

In conclusion, this study did not identify significant AAT deficiency among acutely ill COPD patients hospitalized in southern India. However, exploring underlying blood AAT phenotypic patterns through electrophoretic and immune-morphometric assays could provide supplemental insights into characterizing responses to infection-induced COPD flares. Monitoring AAT kinetics during and after exacerbations may have prognostic utility for disease recovery trajectories. Primary care doctors should consider referring to early onset or rapidly progressive emphysematous COPD for specialty evaluation.

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Conflicts of interest

There are no conflicts of interest.

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