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Clinical characteristics and outcomes of chronic obstructive pulmonary disease patients with family history of chronic airway disease

Cong Liu[a,b,c,d], Qing Song[a,b,c,d], Ya-ting Peng[a,b,c,d], Wei Cheng[a,b,c,d], Ling Lin[a,b,c,d], Tao Li[a,b,c,d], Xue-shan Li[a,b,c,d], Yu-qin Zeng[a,b,c,d], Ai-yuan Zhou[e], Yan Chen[a,b,c,d], Shan Cai[a,b,c,d] and Ping Chen[a,b,c,d]

[a]Department of Pulmonary and Critical Care Medicine, the Second Xiangya Hospital, Central South University, Changsha, Hunan, China; [b]Research Unit of Respiratory Disease, Central South University, Changsha, Hunan, China; [c]Clinical Medical Research Center for Pulmonary and Critical Care Medicine in Hunan Province, Changsha, Hunan, China; [d]Diagnosis and Treatment Center of Respiratory Disease, Central South University, Changsha, Hunan, China; [e]Department of Respiratory and Critical Care Medicine, Xiangya Hospital, Central South University, Changsha, China

ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is a heterogeneous condition with different risk factors, including family history. This study aimed to explore association between a family history of chronic airway disease and features and outcomes of COPD.

Methods: Participants were obtained from the RealDTC study between December 2016 and December 2022. Data on demographics, pulmonary function, history of exacerbation at baseline, acute exacerbation during 1-year follow-up and survival status during 3-years follow-up were collected.

Results: 5020 patients were enrolled, with 1307 patients (26.0%) having a family history of chronic airway diseases. Compared with patients without a family history of chronic airway diseases, patients with a family history had a lower forced expiratory Volume in one second (FEV1), higher Modified Medical Research Council (mMRC) score and COPD Assessment Test (CAT) score, higher rate of acute exacerbation and hospitalization in the past year ($p < 0.05$) and rate of acute exacerbation and hospitalization during 1 year follow-up period ($p < 0.05$). It was an independent risk factor for acute exacerbation (OR = 2.196; 95% CI =1.873–2.576) and hospitalization (OR = 2.199; 95% CI =1.812–2.670). Over 3 years of follow-up, there were no significant differences in mortality rates and annual changes in FEV1 between two groups.

Conclusion: COPD patients with a family history of chronic airway disease are not rare, and they tend to have more severe symptoms and a higher risk of future deterioration. In the management of COPD, special attention should be paid to patients with a family history of chronic airway disease.

Abbreviations: CAT: COPD assessment test; COPD: Chronic Obstructive Pulmonary Disease; 95% CI: 95% confidence interval; FEV1: forced expiratory Volume in one second; FEV1%pred: forced expiratory volume in one second/estimated value of FEV1; FEF 25-75: forced expiratory flow between 25% and 75%; FVC: Forced Vital Capacity; FAM13A: Family with Sequence Similarity 13 Member A; GOLD: Global Initiative for Chronic Obstructive Lung Disease; GWAS: Genome-Wide Association Studies; mMRC: Modified Medical Research Council; aOR: adjusted Odds Ratio; SERPINA1: Serpin Family A Member 1; TNF: Tumour Necrosis Factor; IL - 6: interleukin - 6; HHIP: Hedgehog Interacting Protein

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Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a chronic airway disease characterized by persistent and progressive airflow limitation [1]. Currently, COPD is the third leading cause of death worldwide, posing a great threat to global human health and economic burden [2]. COPD has complex characteristics, with multiple risk factors (such as genetics, smoking, occupational exposure, indoor and outdoor air pollutants, etc.) and closely associated with various comorbidities (like cardiovascular diseases, lung cancer, malnutrition, etc.) [3]. Meanwhile these factors also have a profound impact on the prognosis of COPD. For example, COPD patients with more comorbidities have worse lung

CONTACT Ping Chen pingchen0731@csu.edu.cn Department of Respiratory and Critical Care Medicine, the Second Xiangya Hospital, Central South University, 139 Renmin Middle Road, Changsha, Hunan 410011, China

function and a higher risk of future death [4]; The presence of malnutrition is associated with a heavier symptom burden and more severe airflow limitation in COPD patients, and leads to a higher risk of acute exacerbation [4]. Therefore, identifying and evaluating the characteristics of COPD will contribute to their management.

Family history of chronic airway disease is one of the risk factors for COPD. Zoller et al. [5] and Hemminki et al. [6] found that, in the Swedish population, the risk of COPD was significantly higher in siblings of COPD patients than in the general population, suggesting that COPD had a genetic predisposition. An epidemiological study on the prevalence of COPD in China found that the prevalence of COPD in people with a family history of chronic airway diseases was 11.3%, which was significantly higher than that in people without [7]. Meta-analysis has shown that individuals with a family history of chronic airway diseases are twice as likely to develop COPD as individuals without [8,9]. A family history of chronic airway diseases was closely related to lung function. DeMeo et al. [10] and Silverman et al. [11] found that first degree relatives of early onset COPD probands had lower values of forced expiratory volume in one second (FEV1), forced expiratory flow between 25% and 75% (FEF 25–75) and FEF25-75/forced vital capacity (FVC) than in controls. However, the impact of a family history of chronic airway diseases on the severity and prognosis of COPD was not yet fully understood. Thus, we utilized a real-world, multicenter, observational cohort study (RealDTC study) to examine the association between family history of chronic airway diseases and clinical characteristics and outcomes (risk of future exacerbations, death, and changes in lung function) in patients with COPD.

Patients and methods

Study participants

The participants were recruited from the RealDTC study (Registration number: ChiCTR-POC-17010431). In brief, RealDTC study was an ongoing multicenter prospective observational cohort study of COPD diagnosis and treatment in a real-world setting [12]. Participants in the RealDTC study, who sought medical care between December 2016 and December 2022, were included. Following the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2023 report [13], COPD was defined as FEV1/FVC < 0.70 after bronchodilator use. Patients with a prior diagnosis of malignancy, severe heart disease, or severe hepatic and renal insufficiency, and mental illness who were unable to cooperate were excluded. The study was conducted in accordance with the STROBE criteria of observational studies and the Declaration of Helsinkiwas, and was approved by the Ethics Committee of the Second Xiangya Hospital of Central South University (approval number: 2016076). All were informed, and agreement was obtained.

Data collection

Baseline data including age, sex, smoking status, biofuel exposure status, family history of chronic airway disease, pulmonary function, COPD assessment test (CAT) score, Modified Medical Research Council (mMRC) score, history of moderate to severe acute exacerbation in the past year, date of acute exacerbation, number of hospitalizations and survival status at 1 year follow-up, and survival status and lung function at 3 years of followed up were collected.

Definition of variables

Current smokers were those with smoking exposure of more than 10 pack-years, while former smokers were smokers for 10 pack-years but had quit smoking for 6 months [14]. Using wood, grass, charcoal, or crop residues for cooking or heating for more than 1 year is defined as biofuel exposure [14]. The mMRC score was used to evaluate the degree of dyspnoea, with a score ≥2 indicating more severe dyspnoea group [13]. The CAT score evaluates the impact of COPD on the daily life of patients, with a score ≥10 indicating a high symptom group [13]. Moderate exacerbations were defined as the need for oral corticosteroids and/or antibiotics, and severe exacerbations led to emergency department visits or hospital admissions. Based on the GOLD 2023 report, GOLD grades was determined by forced expiratory volume in one second/estimated value of FEV1 (FEV1%pred) after bronchodilator use, FEV1%pred ≥ 50% was GOLD grade 1 to 2, FEV1%pred <50% was GOLD grade 3 to 4; and the GOLD groups were based on mMRC, CAT, and acute exacerbation in the past year, and were divided into GOLD A, GOLD B, GOLD E [13]. Subjects were considered to have a family history of chronic airway disease if their father, mother, or immediate sibling had chronic airway diseases including COPD, chronic bronchitis, emphysema, bronchiectasis, or asthma [7,8]. The annual change in

FEV1 was calculated as the annual change over 3 years of follow-up (L/ml).

Statistical analysis

Continuous variables were expressed as mean ± standard deviation or median with interquartile range. The Kolmogorov-Smirnov test was used to verify the normality of the continuous variables. The Student's t-test was used to compare normally distributed continuous variables, and nonparametric tests were used to compare non-normally distributed continuous variables. Categorical variables were described as absolute quantities and percentages, or median and range, and they were compared by the chi-square test. Adjusted odds ratios were calculated using multiple logistic regression analysis. Statistical significance was set at $p < 0.05$. SPSS 26.0 (IBM, Armonk, New York, United States) was used for all statistical analyses.

Results

The clinical features of COPD patients with family history

In this study, 5020 patients were included (Figure 1), of whom 1307 (26.0%) patients had family history of chronic airway diseases, 4253 (84.7%) were male, with an average age of 64.72 ± 9.1 years, the average FEV1 was 1.37 ± 0.5L, and 2161 (43.0%) patients were GOLD grade 3 to 4, while 3268 (65.1%) patients had an mMRC ≥2. COPD patients with a family history of chronic airway diseases had higher CAT and mMRC scores and numbers of hospitalization in the past year, worse FEV1 and FEV1%pred, as well as higher proportions of patients with GOLD grade 3–4, GOLD E group, mMRC score ≥2, CAT score ≥10, acute exacerbation, and hospitalization in the past year than COPD patients without a family history of chronic airway diseases ($p < 0.05$) (Table 1).

The clinical features associated with COPD patients with family history independently

Logistics regression analysis showed that GOLD 3–4 (OR = 1.348; 95% CI = 1.175–1.547), GOLD B group (OR = 1.224; 95% CI = 1.014–1.477) and group E (OR = 1.294; 95% CI = 1.072–1.562), acute exacerbation of the past year (OR = 1.152; 95% CI = 1.007–1.317), severe acute exacerbation of the past year (OR = 1.157; 95% CI = 1.004–1.333), CAT score ≥10 (OR = 1.221; 95% CI =1.042–1.430) and mMRC score ≥2 (OR = 1.216; 95% CI =1.046–1.412) were positively associated with family history of chronic airway diseases ($p < 0.05$), while age showed a negative associated (OR = 0.992; 95% CI =0.985–0.999) ($p < 0.05$) (Table 2).

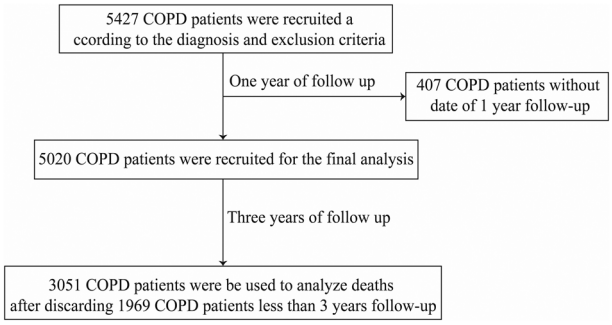

Figure 1. Flow chart for patient selection. COPD: chronic obstructive pulmonary disease.

Table 1. Clinical characteristics of COPD patients with family history.

	Total	Without family history, n (%)	With family history, n (%)	*p* value
Total	5020	3713 (74.0%)	1307 (26.0%)	
Gender				0.29
Male	4253 (84.7%)	3134 (84.4%)	1119 (85.6%)	
Female	767 (15.3%)	579 (15.6%)	188 (14.4%)	
Age, years	64.72 ± 9.1	64.86 ± 9.1	64.32 ± 9.1	0.06
<65	2282 (45.5%)	1672 (45.0%)	610 (46.7%)	0.31
≥65	2738 (54.5%)	2041 (55.0%)	697 (53.7%)	
Smoke status				0.12
Never smoker	979 (19.5%)	728 (19.6%)	251 (19.2%)	
Ex-smoker	1767 (35.2%)	1277 (34.4%)	490 (37.5%)	
Current smoker	2274 (45.2%)	1708 (46.0%)	566 (43.3%)	
Biofuel exposure				0.97
No	3081 (61.4%)	2280 (61.4%)	801 (61.3%)	
Yes	1939 (38.6%)	1433 (38.6%)	506 (38.7%)	
FEV1 (L)	1.37 ± 0.5	1.39 ± 0.5	1.29 ± 0.5	<0.001
FEV1%pred	54.86 ± 20.8	55.93 ± 21.1	51.72 ± 19.6	<0.001
FEV1/FVC	48.24 ± 12.4	48.97 ± 12.3	46.27 ± 12.2	<0.001
GOLD grades				<0.001
1 to 2	2859 (57.0%)	2191 (59.0%)	668 (51.1%)	
3 to 4	2161 (43.0%)	1522 (41.0%)	639 (48.9%)	
GOLD group				0.007
A	1065 (21.2%)	826 (22.2%)	239 (18.3%)	
B	1914 (38.1%)	1409 (38.0%)	505 (38.6%)	
E	2041 (40.7%)	1478 (39.8%)	63 (43.1%)	
Exacerbation in the past year	1 (0,2)	0 (0,2)	1 (0,2)	0.393
No	2491 (49.6%)	1879 (50.6%)	612 (46.8%)	0.019
Yes	2529 (50.4%)	1834 (49.4%)	695 (53.2%)	
Sever exacerbation in the past year	0 (0,1)	0 (0,1)	0 (0,1)	0.006
No	3518 (70.1%)	2639 (71.1%)	879 (67.3%)	0.009
Yes	1502 (29.9%)	1074 (28.9%)	428 (32.7%)	
CAT	14.07 ± 6.7	13.84 ± 6.7	14.68 ± 6.78	<0.001
<10	1411 (28.1%)	1088 (29.3%)	323 (24.7%)	0.002
≥10	3609 (71.9%)	2625 (70.7%)	984 (75.3%)	
mMRC	1.93 ± 1.0	1.89 ± 1.1	2.06 ± 1.0	<0.001
0–1	1752 (34.9%)	1356 (36.5%)	396 (30.3%)	<0.001
2–4	3268 (65.1%)	2357 (63.5%)	911 (69.7%)	

Abbreviations: CAT, COPD assessment test; COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in 1 s; FVC, forced vital capacity; GOLD, Global Initiative for Chronic Obstructive Lung Disease; mMRC, modified Medical Research Council Dyspnoea Scale.

Table 2. Multivariate analysis of independently relative factors for COPD patients with family history.

Variable	aOR	95% CI	*p* value
Age, years	0.992	0.985–0.999	0.042
GOLD grades			
1 to 2	Reference		
3 to 4	1.348	1.175–1.547	<0.001
GOLD group			
A	Reference		
B	1.224	1.014–1.477	0.035
E	1.294	1.072–1.562	0.007
Exacerbation in the past year			
No	Reference		
Yes	1.152	1.007–1.317	0.039
Hospitalization in the past year			
No	Reference		
Yes	1.157	1.004–1.333	0.044
CAT			
<10	Reference		
≥10	1.221	1.042–1.430	0.014
mMRC			
0–1	Reference		
2–4	1.216	1.046–1.412	0.011

Note: aOR were adjusted for age, sex, GOLD grades, GOLD group, exacerbation, CAT, and mMRC.
Abbreviations: CAT, COPD assessment test; COPD, chronic obstructive pulmonary disease; GOLD, Global Initiative for Chronic Obstructive Lung Disease; mMRC, modified Medical Research Council dyspnoea scale; aOR, adjusted Odds Ratio; 95% CI, 95% confidence interval.

The outcome of the COPD patients with family history during follow-up

In the first year of follow-up, patients with a family history of chronic airway diseases had a higher number of acute exacerbation and hospitalization and higher proportion of acute exacerbation (15.6% vs. 28.8%) and hospitalization (8.7% vs. 17.6%) than those without ($p < 0.05$). During 3 years of follow-up, there was no difference between the two groups in terms of mortality rate and FEV1 annual change (Table 3).

Multivariate analysis of relative factors for exacerbation and hospitalization during follow-up

Through logistic regression analysis, ≥65 years old (OR = 1.902; 95% CI = 1.630–2.219), GOLD grade 3–4 (OR = 1.198; 95% CI =1.023–1.402), GOLD E group (OR = 2.820; 95% CI = 1.253–3.351), acute exacerbation of past year (OR = 2.936; 95% CI = 2.490–3.462), CAT score ≥10 (OR = 1.291; 95% CI =1.079–1.545), mMRC score ≥2 (OR = 1.421; 95% CI =1.189–1.697) and having family history of chronic airway diseases (OR = 2.196; 95% CI =1.873–2.576) were positively associated with experiencing an acute exacerbation in the next year ($p < 0.05$) (Table 4). At the same time, age ≥65 years, GOLD classification, GOLD grouping, acute exacerbation in the past year, CAT score, mMRC score, and family history of chronic airway disease were also identified as independent risk factors for hospitalization during 1-year follow-up ($p < 0.05$) (Table 5).

Table 3. Clinical outcomes of COPD patients with family history during follow-up.

	without family history, n (%)	with family history, n (%)	*p* value
Exacerbation in the first year, n (%)	0 (0,1)	0 (0,2)	<0.001
No	3134 (84.4%)	930 (71.2%)	<0.001
Yes	579 (15.6%)	377 (28.8%)	
Hospitalization in the first year, n (%)	0 (0,0)	0 (0,1)	<0.001
No	3390 (91.3%)	1077 (82.4%)	<0.001
Yes	323 (8.7%)	230 (17.6%)	
Mortality in the first year, n (%)			0.98
No	3655 (98.7%)	1290 (98.7%)	
Yes	48 (1.3%)	17 (1.3%)	
Mortality in the third year, n (%)			0.42
No	2092 (92.6%)	739 (93.4%)	
Yes	168 (7.4%)	52 (6.6%)	
change in annual FEV1 over 3 years, L/years	−0.022 ± 0.08	−0.012 ± 0.07	0.37

Abbreviations: COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in 1 s.

Table 4. Multivariate analysis of relative factors for exacerbation during one year of follow-up of COPD.

Variable	aOR	95% CI	*p* value
Age, years			
<65	Reference		
≥65	1.902	1.630–2.219	<0.001
GOLD grades			
1 to 2	Reference		
3 to 4	1.198	1.023–1.402	0.025
GOLD group			
A	Reference		
B	1.093	0.860–1.390	0.467
E	2.820	1.253–3.351	<0.001
Exacerbation in the past year			
No	Reference		
Yes	2.936	2.490–3.462	<0.001
CAT			
<10	Reference		
≥10	1.291	1.079–1.545	0.005
mMRC			
0–1	Reference		
2–4	1.421	1.189–1.697	<0.001
Family history			
No	Reference		
Yes	2.196	1.873–2.576	<0.001

Note: aOR were adjusted for age, sex, smoking status, GOLD grades, GOLD group, exacerbation in the past year, CAT, mMRC, and family history.
Abbreviations: CAT, COPD assessment test; COPD, chronic obstructive pulmonary disease; GOLD, Global Initiative for Chronic Obstructive Lung Disease; mMRC, modified Medical Research Council dyspnoea scale; aOR, adjusted Odds Ratio; 95% CI, 95% confidence interval.

Discussion

This study found that 26% of outpatient patients with COPD had a family history of chronic airway disease in

Table 5. Multivariate analysis of relative factors for hospitalization during one year of follow-up of COPD.

Variable	aOR	95% CI	*p* value
Age, years			
<65	Reference		
≥65	1.399	1.153–1.699	<0.001
GOLD grades			
1 to 2	Reference		
3 to 4	1.353	1.113–1.646	0.002
GOLD group			
A	Reference		
B	1.005	0.723–1.397	0.977
E	3.251	2.416–4.373	<0.001
Exacerbation in the past year			
No	Reference		
Yes	3.077	2.495–3.795	<0.001
CAT			
<10	Reference		
≥10	1.293	1.030–1.623	0.027
mMRC			
0–1	Reference		
2–4	1.335	1.070–1.665	0.010
Family history			
No	Reference		
Yes	2.199	1.812–2.670	<0.001

Note: aOR were adjusted for age, sex, smoking status, GOLD grades, GOLD group, exacerbation in the past year, CAT, mMRC, and family history.
Abbreviations: CAT, COPD assessment test; COPD, chronic obstructive pulmonary disease; GOLD, Global Initiative for Chronic Obstructive Lung Disease; mMRC, modified Medical Research Council dyspnoea scale; aOR, adjusted Odds Ratio; 95% CI, 95% confidence interval.

the real-world. And they tend to have more severe symptoms and a higher risk of future deterioration during the 1-year follow-up period. Over 3 years of follow-up, there were no significant differences in mortality rates and annual changes in FEV1 between COPD patients with and without a family history of chronic airway disease. Age, GOLD grades, GOLD B group and E group, acute exacerbation of the past year, CAT score and mMRC score were associated with family history of chronic airway diseases independently.

Family history of chronic airway disease is a risk factor for COPD. A recent epidemiological study in China investigating the prevalence of COPD found that 21% of COPD patients had a family history of chronic airway diseases [7]. In addition, a systematic review found that 19% to 58% of COPD patients had a family history of COPD [15]. Our finding that 26% of the patients had a family history of chronic airway diseases is consistent with prior studies. This means that the distribution of family history of chronic airway diseases as a risk factor for COPD is not uncommon and deserves attention.

The study found that COPD patients with a family history of chronic airway diseases had more severe symptoms, airflow limitation, and more exacerbation events in the past year. Hersh et al. found that patients with COPD whose parents had COPD had a similar clinical phenotype, with lower lung function, more severe dyspnoea, and frequent exacerbations [16]. Moll et al. included COPD subjects from the COPD Gene study and ECLIPSE study for retrospective analysis and found that family history was closely related to the severity of COPD [17]. Multivariate analysis revealed that symptoms, acute exacerbation, severe exacerbation in the previous year, and lung function were independently associated with a family history of chronic airway diseases. The potential pathophysiological mechanisms may be related to the fact that it reflected both genetic factors and shared environmental exposures (such as environmental cigarette smoke exposure and biofuel exposure). To date, hundreds of genetic variants associated with the risk of COPD had been identified [18], and the most common of which was a mutation in the Serpin Family A Member 1 (SERPINA1) gene, leading to hereditary deficiency of alpha-1 antitrypsin [19,20]. Genome-Wide Association Studies (GWAS) techniques for COPD had identified an increasing number of genomic regions that were significantly associated with lung function, COPD, and COPD phenotypes [18,21]. Patients with a family history of chronic airway diseases may have an accumulation of these genetic susceptibilities. Current epidemiological studies indicated that early - life exposures (such as early - life respiratory infections, childhood passive smoking, and occupational exposures) could severely impair lung growth in children and accelerate the decline of lung function [22,23]. Hersh et al. found that compared with COPD patients without a family history, those with a family history had a higher proportion of childhood environmental tobacco exposure [16]. In addition, the interaction between early - life exposures and genetic susceptibilities may lead to an overly strong inflammatory response in the body, accelerate the deterioration of lung function, and significantly increase the risk of a more severe COPD trajectory [24,25]. Therefore, patients with a family history of chronic airway diseases had worse lung function, more severe symptoms, and were more likely to experience more acute exacerbations.

Otherwise, our results showed that the younger the COPD patients, the more likely they were to have a family history of chronic airway disease. Similar to the findings of Cosio et al. young patients with COPD tended to report a greater family history of respiratory diseases [26]. Age was negatively associated with family history, and genetic factors were likely the primary underlying cause. Zhang et al. found that genetic susceptibility was significantly associated with an earlier age at diagnosis of COPD [27]. The COPD Gene study

found that variants in genes such as Hedgehog Interacting Protein (HHIP) and Family with Sequence Similarity 13 Member A (FAM13A) were more common in early - onset COPD and are associated with an increased risk of developing COPD at a young age [18]. Patients with a family history may be more prone to having variants in these genes, leading to the premature onset of COPD. Secondly, compared to the elderly, young people generally had a higher level of health awareness and a better understanding of the importance of family medical history. They were more likely to report their family history. Researchers and clinicians need to take these two factors into account when interpreting this association and studying the epidemiology of COPD.

Previous studies revealing a family history of chronic airway disease as a risk factor for COPD were mainly cross-sectional. The association between a family history of chronic airway disease and the prognosis of COPD is unclear. Thus, the most novel aspect of this study was to analyze the association between a family history of chronic airway diseases and future outcomes (risk of exacerbations, risk of death, and change in lung function) among COPD patients. The results showed that COPD patients with a family history of chronic airway disease had a higher risk of acute exacerbation and hospitalization in the following year. After adjustment for age, sex, smoking status, history of acute exacerbation in the past year, GOLD classification, GOLD grouping, CAT, and mMRC, a family history of chronic airway disease remained a risk factor for future acute exacerbations and hospitalizations. However, the mechanistic explanations remain unclear. The possible reasons were as follows: (1) A greater systemic inflammatory burden. In COPD, there were polymorphisms in cytokine genes such as interleukin-6 (IL-6) and tumour necrosis factor (TNF)-alpha and these polymorphisms caused excessive production of these mediators, which in turn promotes airway inflammation, excessive mucus secretion, and bronchoconstriction, leading to disease exacerbation and a higher need for frequent hospitalizations [28,29]. Patients with a family history were more likely to inherit these gene polymorphisms. Meanwhile, the interaction between shared environmental exposures and genetics further increased the systemic inflammatory load. (2) A higher incidence of undiagnosed asthma overlap. Asthma and other chronic airway diseases shared overlapping genetic risk factors [28]. Those with a family history of chronic airway diseases may have undetected subclinical features of asthma, thereby increasing the risk of acute exacerbations. (3) Differences in healthcare - seeking behaviour. Family health concepts, habits of using medical resources, etc., had a certain degree of inheritance [30]. If the family had a low level of disease awareness and a healthcare - seeking habit of not emphasizing early disease intervention, then patients with a family history may be similarly affected, increasing the risk of disease exacerbation and hospitalization.

Moll et al. included non-Hispanic white and African-American subjects with COPD and found that family history did not increase the risk of all-cause death [17]. Consistent with our findings, there was no difference in the two groups in mortality rate. Although patients with a family history of chronic airway disease had worse baseline lung function than those without a family history, there was no difference in the annual change in FEV1 between the two groups during 3 years follow-up. Future studies are needed to determine whether family history exacerbates the rate of lung function decline.

This study has certain limitations. Other factors, including parental smoking history, early life events, and second-hand smoke exposure in childhood, are also risk factors for COPD [31]. Failure to adjust for these confounding factors may have influenced the results.

Conclusions

COPD patients with a family history of chronic airway diseases not rare, and tend to have more severe symptoms and a higher risk of future deterioration. Age, GOLD grades, GOLD B group and E group, acute exacerbation of the past year, CAT score and mMRC score were associated with family history of chronic airway diseases independently. In the early screening and management of COPD, the presence of a family history of chronic airway disease deserves attention.

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Ethics approval and informed consent

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of the Second Xiangya Hospital of Central South University (approval number: 2016076). Written informed consent was obtained from all subjects.

Authors contributions

CRediT: **Cong Liu**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Qing Song**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Ya-ting Peng**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing; **Wei Cheng**: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Software, Visualization, Writing – original draft, Writing – review & editing; **Ling Lin**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Visualization, Writing – original draft, Writing – review & editing; **Tao Li**: Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Xue-shan Li**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Yu-qin Zeng**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Ai-yuan Zhou**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Yan Chen**: Conceptualization, Formal analysis, Investigation, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Shan Cai**: Conceptualization, Formal analysis, Investigation, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Ping Chen**: Conceptualization, Formal analysis, Funding acquisition, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Declaration of generative AI in scientific writing

Generative AI- and AI-assisted technologies were not used in the writing process.

Disclosure statement

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ORCID

Yan Chen http://orcid.org/0000-0002-7713-6913
Ping Chen http://orcid.org/0000-0001-6707-8636

Data availability statement

The data that support the findings of this study are available from the corresponding author, [ping chen], upon reasonable request.

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