ORIGINAL RESEARCH

Impact of Indacaterol/Glycopyrrolate on Pulmonary Function and St. George's Respiratory Questionnaire Score in Individuals with Stable Chronic Obstructive Pulmonary Disease

Jie Chen, MM; Qihui Hu, BM; Ying Wu, MM; Lina Xu, BM

ABSTRACT

Objective • This study aims to investigate the impact of indacaterol/glycopyrrolate on pulmonary function and St. George's Respiratory Questionnaire (SGRQ) scores in patients with stable chronic obstructive pulmonary disease (COPD).

Methods • A prospective randomized controlled trial (RCT) was conducted. A total of 100 stable COPD patients admitted to our hospital between September 2020 and October 2022 were selected as study participants. They divided into a conventional group (n=50) and a combined compound preparation (CCP) group (n=50) using a random number table. The conventional group received oral carbocisteine tablets, while the combined compound preparation group received indacaterol/glycopyrrolate inhalation powder spray in addition to the conventional treatment. Clinical efficacy, pulmonary function indices, serum inflammatory factors, psychological resilience, and quality of life were compared between the two groups.

Results • The CCP group exhibited a significantly higher total effective rate (92.00%) compared to the conventional group (76.00%) ($P < .05$). Post-treatment, both groups showed increased values in forced expiratory volume in the first second (FEV_1), forced vital capacity (FVC), FEV_1/FVC ratio, and FEV_1% with a more substantial improvement in the CCP group ($P < .05$). Additionally, the CCP group demonstrated decreased post-treatment levels of serum inflammatory factors (TNF-α, IL-6, CRP, and PCT), elevated scores on the Connor Davidson Resilience Scale (CD-RISC), and reduced SGRQ scores compared to the conventional group ($P < .05$).

Conclusions • In treatment of stable COPD patients, the combination of indacaterol/glycopyrrolate with carbocisteine tablets enhances pulmonary function, alleviates airway inflammatory reactions, improves clinical efficacy, enhances psychological resilience, and elevates the quality of life compared to carbocisteine tablets alone. These findings underscore the potential therapeutic benefits of the combined compound preparation in managing stable COPD. (*Altern Ther Health Med.* [E-pub ahead of print.])

Jie Chen, MM; **Lina Xu**, BM; Department of Respiratory and Critical Care Medicine; Yongkang First People's Hospital; Yongkang; Zhejiang; China. **Qihui Hu**, BM, Department of Emergency General; Yongkang First People's Hospital; Yongkang; Zhejiang; China. **Ying Wu**, MM, Department of Oncology; Yongkang First People's Hospital; Yongkang; Zhejiang; China.

Corresponding author: Jie Chen, MM
E-mail: chen757627569@outlook.com

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a prevalent chronic lung condition primarily associated with prolonged exposure to noxious particles or gases. COPD is characterized by airflow limitation, which is not completely reversible and not treatable but preventable.[1] Initially, COPD primarily affects the lungs, but as the disease advances, it can extend to extrapulmonary organs, leading to various complications that detrimentally impact patients' quality of life and impose a significant economic burden.[2]

Clinically, even during stable periods, patients with COPD commonly experience varying degrees of wheezing, dyspnea, cough, expectoration, and other symptoms.[2,3] If left untreated, these symptoms can exacerbate, potentially resulting in progressive deterioration and eventual disability or death.[3] Presently, standard clinical management for stable COPD typically involves the administration of bronchodilators, antioxidants, expectorants, glucocorticoids, and other pharmacological agents.[4]

The compound preparation comprising two bronchodilators, indacaterol/glycopyrrolate, has garnered significant attention and application in COPD treatment since its introduction.[5,6] Specifically, indacaterol, a long-acting β_2 adrenergic receptor agonist (LABA), interacts with β_2 adrenergic receptors, thereby elevating cyclic adenosine monophosphate levels, activating potassium K^+ channels,

and subsequently inducing relaxation of the airway smooth muscle.[7]

Glycopyrrolate is classified as a long-acting muscarinic antagonist (LAMA), an anticholinergic drug that functions by blocking the interaction between the M-cholinergic receptor and acetylcholine. This action promotes the relaxation of bronchial smooth muscle, reduces airway mucus secretion, and enhances lung function.[8] Studies indicate that the combination of indacaterol/glycopyrrolate produces a synergistic effect by blocking the M-cholinergic receptor and augmenting β_2 receptor activation. This combined therapy demonstrates a significant therapeutic impact in alleviating clinical symptoms and enhancing pulmonary function in COPD patients.[9,10]

Pulmonary function serves as a crucial indicator for assessing the progression of COPD, providing a direct reflection of airflow limitation in affected individuals. Alongside traditional pulmonary function indices utilized in clinical evaluation, auxiliary scales such as the Connor Davidson Resilience Scale (CD-RISC) and St. George's Respiratory Questionnaire (SGRQ) offer valuable insights into the lateral progression of COPD. These scales assess patients' resilience levels and quality of life, providing a comprehensive understanding of their condition.[11,12]

The SGRQ comprises 76 items divided into three sections. The initial segment encompasses eight inquiries relating to symptomatology, aiming to assess patients' experiences with cough, expectoration, asthma, dyspnea, and related episodes. The subsequent sections primarily involve true/false judgments, focusing on the repercussions of the disease on daily activities and employment. The calculation is executed through a weighted average method, with higher weights indicating a more profound impact on quality of life.[12]

The SGRQ scale demonstrates high efficacy in assessing the severity of COPD in patients. Therefore, we employed the SGRQ scale as a reliable, effective, and sensitive assessment tool to evaluate the therapeutic efficacy of indacaterol/glycopyrrolate in stable COPD. Specifically, we aimed to investigate the impact of indacaterol/glycopyrrolate on both pulmonary function and SGRQ scores among patients with stable COPD. This study adhered to standardized diagnostic criteria, testing protocols, evaluation criteria, and data collection methods. Relevant research protocols were carefully implemented, and the subsequent research findings are reported to help inform clinical decision-making and potentially improve patient outcomes.

MATERIALS AND METHODS

Study Design

The study employed a prospective randomized controlled trial (RCT) design to investigate the therapeutic effects of indacaterol/glycopyrrolate in stable COPD patients. A total of 100 stable COPD patients admitted to our hospital between September 2020 and October 2022 were selected as study participants. Patients were randomly allocated into two groups using a random number table: a conventional treatment group and a combined compound preparation group (CCP group), each consisting of 50 patients. The conventional group received oral carbocisteine tablets, while the combined compound preparation group received indacaterol/glycopyrrolate inhalation powder spray in addition to the conventional treatment. All patients provided written informed consent, and the study protocol received approval from the Medical Ethics Committee of our hospital.

Inclusion and Exclusion Criteria

Inclusion criteria were as follows: (1) Clinically confirmed COPD in a stable phase as defined in the 2011 Guidelines for the Diagnosis and Treatment of Stable Chronic Obstructive Pulmonary Disease;[13] (2) Age ranging from 35 to 75 years, with a body mass index (BMI) between 19 kg/m^2 and 28 kg/m^2; (3) Lung function graded at 2 to 3 according to the 2020 edition of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines;[14] (4) Demonstrated good compliance and ability to be trained in the correct usage of drug inhalers.

Exclusion criteria were as follows: (1) Individuals with serious diseases affecting the digestive, immune, or blood systems (2) Patients with asthma, bronchiectasis, pulmonary sarcoidosis, or other respiratory disorders; (3) History of pneumonectomy or lung volume reduction surgery; (4) Patients with poorly controlled diabetes or hypertension; (5) Those with a documented history of neurological or mental disorders; (6) Individuals diagnosed with infectious diseases such as hepatitis B, syphilis, or acquired immune deficiency syndrome (AIDS); (7) Pregnant or lactating women; (8) Patients considered unsuitable for inclusion by the investigator.

Treatment Regimens

Both groups underwent treatment for a duration of three months.

Conventional Group. Patients in the conventional group received oral carbocisteine tablets. The tablets had National Drug Approval No. H23022408 and were manufactured by Harbin Pharmaceutical Group General Pharmaceutical Factory. Each tablet had a specification and model of 250 mg × 30 tablets. The recommended usage and dosage were 2 tablets per time, three times a day.

Combined Compound Preparation Group (CCP Group). Patients in the CCP group were administered indacaterol/glycopyrrolate inhalation powder spray in addition to their conventional treatment. This preparation had registration certificate No. HJ20170390 and was manufactured by Siegfried Barbera, S.L. Each capsule contained indacaterol maleate 110 μg (calculated as $C_{24}H_{28}N_2O_3$) and glycopyrrolate 50 μg (calculated as $C_{19}H_{28}NO_3$). The package specification comprised 12 capsules per box, along with one Bis Haile powder inhaler. The recommended usage and dosage involved inhalation with the provided powder inhaler, with one capsule per administration once a day.

Evaluation Indicators

Assessment of Clinical Efficacy. After treatment, the clinical efficacy of patients in both groups was assessed based on predefined criteria. Clinical responses were categorized as follows: (1) Significant Effect, denoting notable relief of clinical symptoms and signs; (2) Effective, indicating a reduction in clinical manifestations; and (3) Ineffective, representing either no change or exacerbation of symptoms. The total effective rate was calculated using the formula: (Number of cases showing Significant Effect + Effective) / Total number of cases × 100%.

Assessment of Pulmonary Function. (1) Measurement method: the Quark PET3 pulmonary function tester (manufactured by Koshmar, Italy) was employed to assess pulmonary function parameters before and after treatment. (2) Parameters measured: for each patient in both groups, forced vital capacity (FVC), forced expiratory volume in the first second (FEV_1), the ratio of FEV_1 to FVC (FEV_1/FVC), and FEV_1 percentage of the predicted value (FEV_1%) were measured.

Serum Inflammatory Factor Analysis. A fasting venous blood sample of 4 mL was obtained from each patient before and after treatment. The blood samples were centrifuged for 10 minutes, and the resulting supernatant was carefully collected. Subsequently, the supernatant was stored in a refrigerator at -60 °C for future analysis. The contents of procalcitonin (PCT), C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor-α (TNF-α) in the serum of the patients were determined using enzyme-linked immunosorbent assay (ELISA).

Assessment of Resilience Level. The Connor Davidson Resilience Scale (CD-RISC)[15] was utilized to evaluate the mental resilience level of patients in both groups before and after treatment. The CD-RISC scale comprises three dimensions: toughness, strength, and optimism, encompassing a total of 25 items. Each item was scored on a scale of 0 to 4, where 0 represented "never," 1 represented "rarely," 2 represented "sometimes," 3 represented "often," and 4 represented "always." The toughness aspect comprised 13 items, scoring from 0 to 52. In the strength aspect, there were 8 items, scoring from 0 to 32. The optimism aspect included 4 items, with scores ranging from 0 to 16. Overall, the CD-RISC score ranged from 0 to 100, where a higher score reflected a higher level of mental resilience.

Quality of Life Assessment. The quality of life of patients in both groups was assessed using the St. George's Respiratory Questionnaire (SGRQ) before and after treatment.[16] The SGRQ comprises three main domains: symptom, activity, and impact, totaling 50 items. Specifically, the symptom domain contains 8 items, the activity domain includes 16 items, and the impact domain encompasses 26 items. Each item within the SGRQ carries a different weight, and the weighted average method is employed to calculate the scores for each domain, ranging from 0 to 100. The total score of the SGRQ is derived as the arithmetic mean score of the symptom, activity, and impact domains, also ranging from 0 to 100. Higher scores on the SGRQ indicate poorer quality of life.

Table 1. Intergroup Comparison of General Data

General data		Conventional Group (n=50)	CCP Group (n=50)	t/χ^2 value	*P* value
Gender (cases)	Male	32	30	0.170	.680
	Female	18	20		
Age (years)		62.72±6.96	63.86±7.24	0.803	.424
Body Mass Index (kg/m²)		22.82±2.36	23.06±2.27	0.519	.605
The Course of Disease (years)		7.30±1.76	7.68±1.99	1.009	.315
Smoking Rate [cases (%)]		10 (20.00%)	13 (26.00%)	0.508	.476
Education Level (Cases)	Primary School	23	21	0.843	.839
	Junior High School	14	16		
	Senior High School Or Technical Secondary School	6	8		
	Junior College Or Above	7	5		
Pulmonary Function Assessment	GOLD Grade 2	42	41	0.071	.790
	GOLD Grade 3	8	9		

Note: Data are presented as mean ± standard deviation ($\bar{x} \pm s$) for continuous variables and as frequency [n (%)] for categorical variables. *P* values were calculated using the *t* test for continuous variables and χ^2 test for categorical variables. Significance was set at $P < .05$.

Statistical Analysis

The research data were analyzed using SPSS 23.0 (International Business Machines, Corp., Armonk, NY, USA) statistical software. Continuous variables such as age, disease duration, pulmonary function indexes, and others were expressed as means ± standard deviation ($\bar{x} \pm s$) and analyzed using *t* tests. Categorical variables, including gender, smoking status, clinical efficacy, and others, were presented as counts and percentages [n (%)] and analyzed using the chi-square test (χ^2). A significance level of $P < .05$ was considered statistically significant.

RESULTS

Comparison of General Data between Groups

The comparison of general data between the groups did not reveal any statistically significant differences ($P > .05$), indicating comparability. Details can be found in Table 1.

Intergroup Comparison of Clinical Efficacy

The total effective rates in the CCP group and the conventional group were 92.00% and 76.00%, respectively. Significantly, the CCP group demonstrated a higher total effective rate ($P < .05$). Refer to Table 2 for a detailed comparison.

Intergroup Comparison of Pulmonary Function Indexes

After treatment, both groups exhibited increases in FEV_1, FVC, FEV_1/FVC, and FEV_1% compared to pre-treatment values. Remarkably, these improvements were more pronounced in the CCP group than in the conventional group ($P < .05$). Detailed results are presented in Table 3.

Intergroup Comparison of Serum Inflammatory Factors

Post-treatment, both groups exhibited reductions in serum inflammatory factors TNF-α, IL-6, CRP, and PCT compared to pre-treatment levels. Notably, these reductions were more significant in the CCP group than in the conventional group ($P < .05$). Refer to Table 4 for a detailed comparison.

Table 2. Intergroup Comparison of Clinical Efficacy

Groups	Number of Cases	Significant Effect	Effective	Ineffective	Total Effective Rate
Conventional Group	50	22	16	12	38 (76.00%)
CCP Group	50	29	17	4	46 (92.00%)
χ^2 value					4.762
P value					0.029

Note: CCP: Combined Compound Preparation Group. The total effective rate is calculated as the sum of significant effect and effective cases divided by the total number of cases multiplied by 100%. Chi-squared (χ^2) test was used for comparison, with significance set at $P < .05$.

Table 3. Intergroup Comparison of Pulmonary Function Indexes

	FEV_1 L		FVC L		FEV_1/FVC %		FEV_1%	
Group	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment
Conventional Group	1.232±0.453	1.542±0.412	2.217±0.365	2.442±0.517	54.1%±12.1%	57.2%±13.2%	58.1%±18.1%	60.2%±13.2%
CCP Group	1.242±0.323	1.732±0.454	2.237±0.456	2.732±0.531	54.2%±14.4%	60.1%±16.5%	58.2%±14.3%	62.9%±17.6%

Note: CCP: Combined Compound Preparation Group; FEV_1: Forced Expiratory Volume in 1 second; FVC: Forced Vital Capacity. Values are presented as mean ± standard deviation ($\bar{x}\pm s$)*

Table 4. Intergroup Comparison of Serum Inflammatory Factors Before and After Treatment

	TNF-α ng/mL		IL-6 ng/L		CRP mg/L		PCT mg/L	
Group	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment
Conventional Group	8.032±1.253	7.542±1.447	179.217±21.335	164.437±31.212	3.521±0.654	3.179±0.654	0.641±0.123	0.572±0.132
CCP Group	8.042±1.356	7.133±1.424	180.237±23.453	151.712±21.345	3.571±0.694	2.601±0.379	0.652±0.123	0.519±0.115

Note: CCP, Combined Compound Preparation Group; TNF-α represents Tumor Necrosis Factor-alpha; IL-6 denotes Interleukin-6; CRP stands for C-reactive Protein; and PCT signifies Procalcitonin. Data are presented as mean values with standard deviations ($\bar{x} \pm s$)

Table 5. Intergroup Comparison of Mental Resilience Level Before and After Treatment

	Toughness Score		Strength Score		Optimism Score		Total Score of CD-RISC	
Group	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment
Conventional Group	33.032±4.213	35.542±6.431	15.217±2.348	17.425±2.234	7.521±0. 946	8.379±1.154	60.641±9.123	65.572±11.132
CCP Group	32.042±6.352	39.133±7.498	15.937±3.417	19.733±2.387	7.621±0.894	9.601±1.379	60.652±10.123	71.519±12.115

Note: CCP, Combined Compound Preparation Group; CD-RISC: Connor-Davidson Resilience Scale. The values presented are mean scores with corresponding standard deviations ($\bar{x}$ ±s) for toughness, strength, optimism, and the total score of CD-RISC before and after treatment in both the Conventional and Combined Compound Preparation groups.

Table 6. Intergroup Comparison of Quality of Life Before and After Treatment

	Symptom Score		Activity Score		Impact Score		Total Score of SGRQ	
	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment	Before Treatment	After Treatment
Conventional Group	60.532±4.265	55.522±5.432	60.213±7.348	54.415±6.234	50.532±6. 241	45.322±4.133	60.432±7.119	54.335±6.137
CCP Group	61.242±6.367	49.233±5.418	60.937±7.423	49.723±5.387	49.523±6.823	39.623±4.371	59.613±6.189	49.212±7.887

Note: CCP: Combined Compound Preparation Group; SGRQ: St. George's Respiratory Questionnaire. The values provided represent the mean scores with corresponding standard deviations for the symptom, activity, impact, and total scores of SGRQ before and after treatment in both the Conventional and Combined Compound Preparation groups.

Intergroup Comparison of Mental Resilience Level

After treatment, both groups exhibited increases in toughness score, strength score, optimism score, and total score of CD-RISC compared to pre-treatment levels. Notably, these scores were higher in the CCP group than in the conventional group after treatment ($P < .05$). Please refer to Table 5 for a detailed comparison.

Intergroup Comparison of Quality of Life

After treatment, both groups experienced reductions in symptom score, activity score, impact score, and total score of SGRQ compared to pre-treatment values. Notably, these scores were lower in the CCP group than in the conventional group after treatment ($P < .05$). Detailed comparison results are provided in Table 6.

DISCUSSION

COPD is a chronic, progressive respiratory ailment characterized by the prolonged infiltration of chronic inflammatory factors. This infiltration can detrimentally impact lung tissue, bronchi, and pulmonary vessels, leading to airway remodeling, airflow restriction, and subsequent impairment of pulmonary function[17,18] Clinically, COPD predominantly affects individuals aged over 60 years, significantly impacting their quality of life due to the frequent presence of dyspnea, asthma, fatigue, and other associated symptoms.[19]

Currently, in clinical practice, the primary approach for managing stable COPD involves pharmacological interventions aimed at mitigating inflammatory reactions within the lung tissue and airways.[20,21] This treatment approach targets the reduction of symptoms like cough and shortness of breath, with the goal of slowing down the progression of COPD.[20] Indacaterol/glycopyrrolate, a compound preparation comprising two bronchodilators, has emerged as a prominent choice for maintenance therapy in COPD management.[21] Studies have demonstrated that indacaterol/glycopyrrolate exerts beneficial effects by relaxing bronchial smooth muscle, thereby enhancing patients' exercise tolerance and improving lung function.[22,23]

Considering the reported benefits of the use of indacaterol/glycopyrrolate for COPD maintenance therapy, this study investigated its impact on pulmonary function and SGRQ score among stable COPD patients. The total effective rates observed in the CCP group and the conventional group were 92.00% and 76.00%, respectively, with the former exhibiting a significantly higher total effective rate ($P < .05$).

Our findings suggest that combining indacaterol/glycopyrrolate with carbocisteine tablets can enhance treatment efficacy for stable COPD compared to carbocisteine tablets alone. This finding confirms the conclusions drawn by HUA Cai-hong et al.,[24] indicating the superior clinical benefits of indacaterol/glycopyrrolate in treating stable COPD patients. This insight serves as a valuable reference for clinicians managing maintenance treatments.

In terms of pulmonary function, the post-treatment values of FEV_1, FVC, FEV_1/FVC, and FEV_1% were significantly higher in the CCP group compared to the conventional group ($P < .05$). Among these, the pulmonary function indexes, including FEV_1, FVC, FEV_1/FVC, and FEV_1%, typically exhibit a decline in COPD patients with airflow restriction.[25,26] The values of these relevant pulmonary function indexes were higher post-treatment in the combined compound preparation group compared to the conventional group, suggesting that indacaterol/glycopyrrolate can enhance pulmonary function indexes, such as FEV_1, FVC, FEV_1/FVC, and FEV_1%, in stable COPD patients.

It is evident in the results that indacaterol/glycopyrrolate benefits the improvement of pulmonary function in stable COPD patients. This improvement is manifested through enhancements in key pulmonary function indexes, such as FEV_1, FVC, FEV_1/FVC, and FEV_1%, thereby alleviating pulmonary airflow restriction and overall enhancing pulmonary function. This finding aligns with the observations made by Tashkin et al.[33] in their research, suggesting a potential mechanism by which indacaterol/glycopyrrolate contributes to the clinical therapeutic efficacy in stable COPD patients.

Furthermore, regarding serum inflammatory factors, the post-treatment levels of TNF-α, IL-6, CRP, and PCT were notably lower in the combined compound preparation group compared to the conventional group ($P < .05$). Notably, TNF-α, IL-6, CRP, and PCT serve as sensitive indicators reflecting the degree of systemic inflammation in stable COPD patients, with their levels typically demonstrating an upward trend.[27,28]

In this study, the post-treatment levels of serum inflammatory factors were lower in the CCP group compared to the conventional group. This result suggests that indacaterol/glycopyrrolate may effectively reduce inflammation levels in stable COPD patients. This finding aligns with the analysis by Banerji et al.,[34] indicating that indacaterol/glycopyrrolate can mitigate airway inflammation in stable COPD patients. Consequently, this intervention may contribute to reducing the occurrence of airway remodeling, improving airflow restriction, and alleviating symptoms such as dyspnea and cough. These observed clinical benefits may be attributed to the mechanism of action of indacaterol/glycopyrrolate.

Additionally, regarding the psychological resilience level, post-treatment assessments revealed that the toughness score, strength score, optimism score, and total score of CD-RISC were higher in the CCP group compared to the conventional group ($P < .05$). It is noteworthy that a higher total score on CD-RISC indicates a better resilience level for the patient.[29,30] Our findings indicate that indacaterol/glycopyrrolate contributes to enhancing the resilience level of stable COPD patients, fostering improved toughness, strength, and optimism. This effect may be linked to the medication's capacity to enhance lung function and alleviate airway inflammation.

Regarding quality of life, post-treatment assessments revealed lower symptom scores, activity scores, impact scores, and total scores of SGRQ in the CCP group compared to the conventional group ($P < .05$). Considering that a higher total score of SGRQ indicates a poorer quality of life, as established in previous studies,[31,32] it aligns with the findings of Tashkin et al.,[35] who demonstrated the beneficial impact of indacaterol/glycopyrrolate on enhancing the quality of life in stable COPD patients. This improvement is closely associated with the medication's ability to restore lung function and mitigate airway inflammation.

All these findings demonstrate that indacaterol/glycopyrrolate treatment significantly improves clinical efficacy, pulmonary function indexes, serum inflammatory factors, psychological resilience, and quality of life in stable COPD patients. These findings support the therapeutic value of indacaterol/glycopyrrolate in COPD maintenance treatment, underscoring its multifaceted benefits in managing this chronic respiratory condition.

Study Limitations

This study has several limitations that warrant acknowledgment. Firstly, the sample size was relatively small, potentially limiting the generalizability of the findings. Future research with larger, multi-center cohorts is warranted to provide more robust evidence. Secondly, COPD patients often present with comorbidities such as hypertension, diabetes, and coronary heart disease, which may influence treatment response. However, this study did not analyze potential differences in treatment response among patients with different comorbidities. Utilizing variance analysis could facilitate a deeper understanding of these variations in treatment response, thereby enhancing the clinical relevance of the findings.

CONCLUSION

In conclusion, this study demonstrates that the combination of indacaterol/glycopyrrolate with carbocisteine tablets offers notable benefits in the management of stable COPD. Notably, this combination therapy leads to improvements in pulmonary function, effectively reducing airway inflammation and enhancing overall clinical efficacy. Additionally, patients receiving this combination therapy exhibit enhanced psychological resilience and experience an improved quality of life compared to those receiving carbocisteine tablets alone. These findings underscore the potential of indacaterol/glycopyrrolate as a valuable therapeutic option for enhancing the management and outcomes of stable COPD patients.

COMPETING INTERESTS
The authors report no conflict of interest.

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None.

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DATA AVAILABILITY STATEMENT
The datasets used and/or analyzed are available from the corresponding author upon reasonable request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE
All patients signed the informed consent form, and the Medical Ethics Committee approved the study.

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