Review Articles

Acupuncture and Herbal Medicine

Traditional Chinese medicine for chronic obstructive pulmonary disease: treatment strategies, clinical evidence, and mechanistic insights

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Abstract

Chronic obstructive pulmonary disease (COPD) is a prevalent, preventable, and treatable chronic airway disease associated with high morbidity, mortality, and global burden. In this review, we searched PubMed, Web of Science, and major Chinese academic databases for clinical and mechanistic studies of traditional Chinese medicine (TCM) interventions for COPD, emphasizing evidence relevant to the stable phase, acute exacerbation phase, and first 8 weeks after an exacerbation, termed the acute exacerbation of COPD (AECOPD) risk window phase (risk window). Evidence from randomized trials and evidence syntheses indicates that adjunctive herbal formulae, Chinese patent medicines, acupuncture, moxibustion, acupoint-based interventions, and traditional Chinese exercise therapy may improve symptoms, the 6-minute walking distance (6MWD), pulmonary function indices, quality of life, and selected exacerbation-related outcomes. Multicenter trials have also reported benefits of syndrome-based sequential treatment during acute exacerbation and the subsequent risk window. Mechanistic studies suggest coordinated regulation of inflammatory and oxidative stress pathways, immune homeostasis, epithelial barrier integrity, mucus hypersecretion, apoptosis, and airway remodeling. However, confidence in these findings is limited by heterogeneous syndrome definitions and intervention protocols, small samples, incomplete blinding and allocation reporting, and insufficient long-term follow-up. Future research should prioritize standardized diagnostic criteria and outcomes, rigorously designed multicenter trials, and translational studies that link *in vivo* active substances and molecular targets to clinically meaningful outcomes.

Keywords: Acupuncture, Chinese exercise therapy, Chinese herbal medicine, Chronic obstructive pulmonary disease, Traditional Chinese medicine

Graphical Abstract: https://links.lww.com/AHM/A238

Introduction

Chronic obstructive pulmonary disease (COPD) is a chronic airway disease characterized by persistent respiratory symptoms and incompletely reversible airflow limitation, with high prevalence, high mortality, and substantial disease burden[1]. Global epidemiological data indicate that approximately 214 million people are affected by COPD worldwide, resulting in nearly 3.42 million deaths annually and approximately 74.93 million disability-adjusted life years (DALYs)[2]. Over the next 30 years, COPD is projected to cause an estimated global economic loss of approximately USD 4.33 trillion[3]. Although modern medicine has advanced considerably through treatments such as bronchodilators and biological agents[4–5], patients with COPD still experience a progressive decline in lung function, frequent acute exacerbations, and poor prognosis[6–7], underscoring the urgent need for more effective comprehensive intervention strategies. In traditional Chinese medicine (TCM), COPD is classified under "lung distension" (Fei Zhang) and "wheezing disorder" (Chuan Zheng). Based on the core pathogenesis at different disease stages, a diagnostic and therapeutic system featuring stage- and grade-based management, combined internal and external therapies, and comprehensive interventions has gradually been established. TCM interventions for COPD have shown advantages in improving clinical symptoms, delaying lung function decline, reducing acute exacerbations, and enhancing exercise tolerance and quality of life[8–10]. This review synthesizes domestic and international research progress on TCM for COPD, including diagnostic and therapeutic protocols, distinctive TCM techniques, and underlying mechanisms, with the aim of

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providing evidence to optimize clinical decision-making. We searched PubMed, Web of Science, China National Knowledge Infrastructure (CNKI), Wanfang Data, and SinoMed from database inception to June 2026 using combinations of terms for COPD, traditional Chinese medicine, herbal medicine, acupuncture, moxibustion, exercise therapy, clinical trial, and mechanism. Priority was given to guidelines, systematic reviews, randomized controlled trials, multicenter studies, and mechanistic investigations directly relevant to COPD.

Staged and graded diagnosis and treatment strategies for COPD

COPD follows a progressive course. Staged and stratified prevention and treatment strategies that target the distinct characteristics and key links of each disease phase can leverage the advantages of TCM and improve clinical efficacy. Based on clinical practice and evidence-based research, Li et al.[11–12] systematically described the clinical characteristics, pathogenesis patterns, and syndromes of the stable phase, acute exacerbation phase, and risk window phase of COPD. They proposed a staged and stratified TCM prevention and treatment strategy that meets clinical needs and provides a new paradigm for COPD prevention and management[11–12]. COPD pathogenesis is generally characterized by deficiency in origin and excess in superficiality. During the stable phase, the core mechanism is "deficiency of healthy *qi* with accumulated impairment"; treatment aims to stabilize symptoms, delay lung function decline, and improve quality of life. During acute exacerbation, pathogenesis involves phlegm accumulation, including phlegm-heat and phlegm turbidity, or mutual obstruction of phlegm and blood stasis, together with *qi* and *yin* impairment and often impaired fu-qi circulation. Mutual obstruction of phlegm and blood stasis is considered the key factor. Treatment aims to control the current exacerbation, reduce symptoms, and lower mortality risk. Acute exacerbations of COPD (AECOPD) do not occur as isolated random events; recurrent exacerbations tend to cluster after an acute exacerbation, mostly within 8 weeks. This interval, from resolution of AECOPD to return to the stable phase, is termed the AECOPD risk window phase (risk window)[13–14]. Li and Wang[15] first proposed this concept in 2011. The pathogenesis is characterized by a combination of deficiency and excess, mainly presenting as *qi* deficiency or *qi-yin* deficiency, often accompanied by phlegm and blood stasis. Treatment, therefore, involves simultaneously supporting healthy *qi* and eliminating pathogens[15]. The stable phase, acute exacerbation phase, and risk window phase form a continuous process shaped by changes in healthy *qi* and pathogenic factors. Pathogenesis shifts from deficiency with phlegm and blood stasis in the stable phase to phlegm accumulation and phlegm-blood stasis obstruction with *qi-yin* injury during acute exacerbation, and then to residual pathogens, unrecovered healthy *qi*, and persistent phlegm and blood stasis during the risk window phase[11–16]. Ding et al. proposed that lung *qi* deficiency is the primary mechanism in stable COPD and that the key pathomechanism during acute exacerbation is invasion of external pathogens that triggers latent illness[16]. Deficiency, phlegm, and blood stasis are the core pathological factors throughout disease progression. Treatment emphasizes stage- and syndrome-based differentiation and intervention. On this basis, Wu and Li[17] used Yiqi Wenyang Huatan Decoction combined with auricular point seed-pressing therapy for patients in the risk window phase, providing clinical support for syndrome-based intervention during this phase. These strategies provide insight into TCM treatment for COPD. Although current theories differ in emphasis, they share the view that COPD is characterized by deficiency in origin and excess in superficiality, with deficiency, phlegm, and blood stasis running through the disease course[11–12,16]. In addition, the TCM syndrome diagnostic criteria used in clinical trials remain inconsistent, especially regarding syndrome names, symptom combinations, and identification of concurrent syndromes, which limits comparison and evidence synthesis[18–22]. Future studies should further standardize syndrome diagnosis based on existing guidelines and diagnostic criteria. Figure 1 shows the staged and stratified diagnosis and treatment strategy for COPD.

Staged and graded treatment regimens for COPD

Stable phase

In patients with stable COPD, TCM syndrome-based therapies added to conventional treatment have shown potential benefits over conventional treatment alone or conventional treatment plus placebo by improving symptom control, reducing acute exacerbation frequency, enhancing exercise tolerance, and improving quality of life[22–24]. In patients

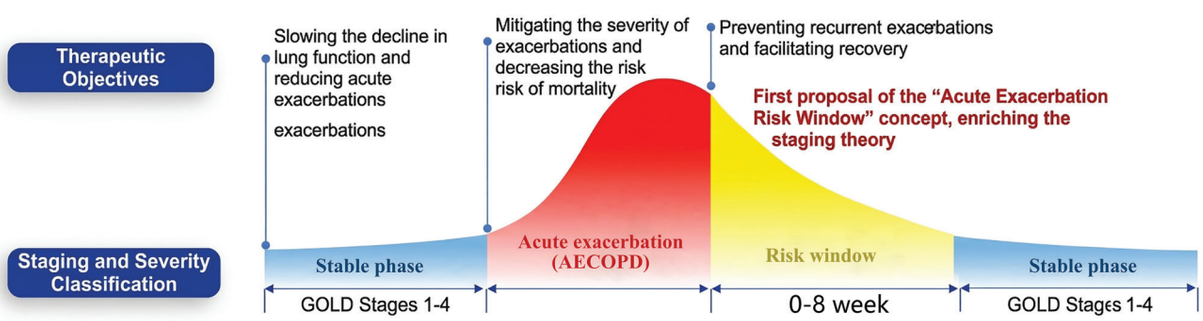


Figure 1. Staged and graded treatment strategies for COPD. COPD: Chronic obstructive pulmonary disease.

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with mild-to-moderate disease, randomized, double-blind, placebo-controlled trials have shown that Bufei Formula, Bufei Jianpi Formula, and Bufei Yishen Formula significantly reduce acute exacerbations, increase 6-minute walking distance (6MWD), alleviate dyspnea, and slow the decline in forced expiratory volume in 1 second (FEV_1)[25]. Another multicenter, randomized, double-blind trial reported that add-on Bufei Granules markedly improved clinical symptoms, pulmonary function, and quality of life[26]. For patients with severe-to-very severe disease, adding TCM syndrome–based therapies, including Bufei Jianpi Formula, Bufei Yishen Formula, and Yiqi Zishen Formula, or proprietary Chinese medicines, including Jianpi Yifei II Granules and Jinshui Liujun Decoction, to conventional Western medicine reduces the frequency and severity of acute exacerbations, alleviates dyspnea, and improves exercise tolerance and quality of life[8,27–28]. In older adults with severe COPD, modified Qiwei Duqi Pills effectively relieve clinical symptoms, improve pulmonary function and blood gas parameters, and help modulate inflammatory and immune responses[29]. A network meta-analysis of 113 randomized controlled trials involving 8,265 patients suggested outcome-specific differences among 14 Chinese patent medicines used as add-on treatments for stable COPD. Jinshuibao Capsules ranked highest for improving FEV_1/FVC (SUCRA, 82.0%), FEV_1% predicted (SUCRA, 89.3%), and 6MWD (SUCRA, 97.2%); Yifei Capsules ranked highest for clinical response (SUCRA, 87.2%); Bufei Granules ranked highest for reducing COPD Assessment Test (CAT) scores (SUCRA, 99.7%); and Yupingfeng Capsules ranked highest for reducing the annual frequency of AECOPD (SUCRA, 76.7%)[30]. Studies on active pharmaceutical ingredients have further shown that Astragalus improves pulmonary function[31]. Collectively, these findings support the important role of internal TCM therapies, ranging from compound formulae and proprietary medicines to single herbal ingredients, in stable COPD management.

However, the available evidence is not consistent across all interventions and outcomes. In the network meta-analysis of Chinese patent medicines, different interventions ranked highest for different outcomes, and no single medicine showed consistent superiority across pulmonary function, symptoms, exercise capacity, and exacerbation-related outcomes. The evidence networks also lacked closed loops and direct head-to-head comparisons between active treatments. Methodological limitations, including insufficient reporting of randomization, allocation concealment, and blinding, together with limited long-term follow-up, further reduced confidence in the comparative rankings[30]. Therefore, current evidence supports the potential benefits of Chinese patent medicines as add-on therapies but does not establish the definitive superiority of any single intervention.

AECOPD phase

During acute exacerbation of COPD, patients experience rapid clinical deterioration, swift disease progression, and increased mortality risk. Studies have confirmed that combining TCM with conventional Western medicine can improve the overall response rate, alleviate symptoms, shorten hospital stays, and reduce acute exacerbation frequency[32]. A multicenter randomized controlled trial in patients with moderate-to-severe AECOPD used a syndrome-based regimen, including Sanhanhuayin Granule for external cold and internal fluid syndrome, Qingrehuatan Granule for phlegm-heat congesting the lung syndrome, and Zaoshihuatan Granule for phlegm-dampness amassing in the lung syndrome. The regimen significantly reduced acute exacerbation frequency and improved dyspnea[33]. For wind-cold attacking the lung syndrome, modified San'ao Decoction combined with Zhisou San alleviates clinical symptoms[20,34]. For external cold and internal fluid syndrome, Modified Minor Green Dragon Decoction increases 6MWD, improves pulmonary function, and lowers inflammatory cytokine levels[35]. For phlegm turbidity obstructing the lung syndrome, modified Sanzi Yangqin Decoction reduces the modified Medical Research Council (mMRC) dyspnea score[36]. For phlegm-heat obstructing the lung syndrome, modified Qingqi Huatan Wan improves blood gas parameters[37]. A meta-analysis confirmed that Qingjin Huatan Formula combined with conventional Western medicine improves pulmonary function and inhibits inflammatory mediator expression[38]. Regarding proprietary Chinese medicines, Qingke Pingchuan Granules reduce mMRC and CAT scores, increase 6MWD, and shorten hospital stay[39–40]. Shiwei Longdanhua Capsule and Feilike Mixture improve related symptoms and scores[41–42]. Qingfei Xiaoyan Pills shorten the time to symptom and sign resolution in patients with phlegm-heat accumulating in the lung pattern[43]. A network meta-analysis indicated that Dengzhanxixin Injection combined with conventional Western medicine ranked highest for clinical efficacy (SUCRA, 80.47%) and improvement in FEV_1/FVC (SUCRA, 98.55%). Shengmai Injection combined with conventional Western medicine ranked highest for shortening hospital stays (SUCRA, 94.70%; mean difference [MD], –6.90 days; 95% confidence interval [CI], –10.89 to –2.90). Closed-loop analyses did not indicate significant inconsistency between direct and indirect evidence. However, most pairwise comparisons between Chinese medical injections were not statistically significant, only 31.07% of included trials reported an appropriate randomization method, and potential publication bias was detected for clinical efficacy. Therefore, these rankings should be interpreted cautiously and should not be considered definitive evidence of comparative superiority[44].

Risk window phase

The proposed risk window phase provides a new approach to disease management, with therapeutic goals focused on facilitating the transition from the acute phase to the stable phase and preventing recurrent acute exacerbations[15]. An integrative sequential treatment regimen established by Li et al.[45] comprised syndrome-based treatment, including Sanhanhuayin Formula, Qingrehuatan Formula, or Zaoshihuatan Formula, for 1 to 3 weeks during the acute exacerbation phase, followed by 4 weeks of syndrome-based treatment during the risk window phase. This regimen showed superior efficacy compared with conventional Western medicine alone by prolonging the interval to recurrent acute exacerbations, improving dyspnea, and enhancing

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quality of life. Another multicenter randomized controlled trial (six centers, 336 patients) demonstrated that adding TCM syndrome–based treatment, including Yiqiwenfei Granules, Fuzhengzaohua Granules, or Fuzhengqinghua Granules, to conventional Western medicine reduced the acute exacerbation rate, prolonged the time to first acute exacerbation, alleviated clinical symptoms, and improved quality of life[46]. Based on the risk window phase concept proposed by our team, several clinical studies have focused on pathogenesis characterized by deficiency complicated with excess and have used self-developed or empirical formulae, all of which showed favorable efficacy. Ningfeidingchuan Formula combined with conventional Western medicine reduced CAT scores and alleviated clinical symptoms in patients with moderate-to-very severe *qi* deficiency and phlegm-heat pattern[47]. Xuanfei Huatan Tongluo Formula combined with Western medicine showed good efficacy in improving clinical symptoms and pulmonary function and reducing thrombosis risk, thereby helping patients transition smoothly to the stable phase[48].

External TCM therapies across different stages of COPD

External TCM therapies are an important component of comprehensive COPD management and have been used during the stable phase, acute exacerbation phase, and risk window phase. To distinguish this section from the internal herbal therapies discussed in Staged and Graded Treatment Regimens for COPD, this section focuses mainly on acupuncture, moxibustion, acupoint-based interventions, and traditional Chinese exercise therapy. Table 1 summarizes the main study designs, intervention protocols, and clinical findings.

Stable phase

In patients with stable COPD, acupuncture, moxibustion, traditional Chinese exercise therapy, and acupoint-based interventions are commonly used to regulate *qi* and blood, dredge the lung collaterals, strengthen the spleen and kidneys, and resolve phlegm and blood stasis. These interventions have mainly been evaluated for their effects on clinical symptoms, acute exacerbations, exercise tolerance, and quality of life. Regarding acupuncture, a multicenter randomized controlled trial involving patients with mild-to-severe COPD demonstrated that acupuncture combined with conventional medication was superior to monotherapy in improving 6MWD, St George's Respiratory Questionnaire (SGRQ) scores, and mMRC scores, with a favorable safety profile[49]. For patients with moderate-to-very severe COPD, long-term acupuncture therapy can further improve quality of life, exercise tolerance, nutritional status, and inflammatory markers, while helping to reduce acute exacerbations and lower the BODE index[70]. Press needle exercise therapy combined with pulmonary rehabilitation training effectively alleviates clinical symptoms, including cough, sputum production, wheezing, and chest tightness, improves lung function, and enhances quality of life[71]. Among moxibustion interventions, lung-benefiting moxibustion significantly improves quality of life and treatment satisfaction, with sustained benefits during long-term follow-up[50]. Governor Vessel moxibustion and Wenfei Guyuan umbilical moxibustion also significantly and durably alleviate clinical symptoms, improve lung function, and enhance immune function in patients with lung–kidney *qi* deficiency syndrome[51–52,72]. Warming needle therapy has also been shown to enhance exercise capacity and reduce inflammatory responses[73]. Traditional Chinese exercise therapy encompasses diverse forms and embodies the rehabilitation principle of graded adaptation. In patients with mild-to-moderate COPD, practices such as Tai Chi, Baduanjin, and Mawangdui Daoyin significantly improve exercise tolerance, clinical symptoms, and quality of life[53–55]. In patients with moderate-to-very severe COPD, supervised breathing-guided training also significantly enhances exercise capacity[56]. A network meta-analysis of 57 randomized controlled trials involving 4,294 patients found that Baduanjin ranked highest for improving FEV_1, whereas Liuzijue ranked highest for improving FEV_1% predicted and FEV_1/FVC. Compared with conventional treatment, Baduanjin was associated with a 0.27 L improvement in FEV_1 (95% CI, 0.14–0.40), whereas Liuzijue improved FEV_1% predicted by 8.60 percentage points (95% CI, 5.92–11.16) and FEV_1/FVC by 7.35 percentage points (95% CI, 4.51–10.02)[57]. Although effect estimates for Tai Chi and Wuqinxi were numerically favorable compared with conventional treatment for some pulmonary function outcomes, the differences were not statistically significant. In addition, despite their relatively high probability rankings, the difference between Baduanjin and Liuzijue in improving FEV_1 was not statistically significant. Evidence certainty ranged from very low to moderate, with additional concerns regarding small sample sizes, risk of bias, and potential publication bias. Therefore, probability rankings should not be interpreted as definitive evidence that one traditional Chinese exercise therapy is superior to another. Acupoint application therapy has also demonstrated efficacy in alleviating symptoms such as cough and dyspnea and in improving lung function parameters[58]. Acupressure significantly alleviates dyspnea and anxiety[59]. Combination strategies have also been evaluated in stable COPD. A systematic review of 12 randomized controlled trials involving 841 participants found that acupoint injection plus pharmacotherapy improved pulmonary function and clinical response compared with pharmacotherapy alone[74]. Nevertheless, heterogeneity in injected agents, acupoints, treatment schedules, and outcome definitions limits the certainty and generalizability of this evidence.

AECOPD phase

During AECOPD, external TCM therapies are mainly used as adjuncts to conventional treatment and early pulmonary rehabilitation. A systematic review indicated that acupuncture combined with conventional Western medicine may provide additional benefits over conventional treatment alone in pulmonary function, dyspnea, exercise tolerance, and quality of life[60]. Traditional Chinese exercise therapies are commonly used in Chinese medicine healthcare and rehabilitation. Studies have shown that various forms of traditional Chinese

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Table 1

Techniques with Chinese medicine characteristics

Disease phase	TCM technique	Study design	Intervention	Details of the intervention	Session duration	Treatment duration	Conclusion
Stable phase	Acupuncture[49]	6 centers, 150 participants	T: acupuncture *vs.* C: conventional treatment *vs.* Combined: acupuncture + conventional treatment	Main points: BL13, GV14, and BL12. Syndrome-specific additions: LU9 + ST36 (lung *qi* deficiency); LU9 + BL20 + ST36 (lung–spleen *qi* deficiency); LU9 + BL23 + ST36 (lung–kidney *qi* deficiency); BL43 + BL23 + KI3 + CV4 (lung–kidney *qi-yin* deficiency). Symptom-specific points were permitted. Disposable needles: 0.30 × 25/40/50 mm	30 min/session, 3 sessions/week	Treatment: 12 weeks; follow-up: 12 weeks	Increased 6MWD; improved SGRQ scores; reduced mMRC scores
	Yifei moxibustion[50]	Meta-analysis	T: Yifei moxibustion + conventional treatment *vs.* C: conventional treatment	/	/	/	Improved dyspnea; reduced CAT scores; decreased acute exacerbation frequency; increased 6MWD; improved clinical symptoms and pulmonary function
	Umbilical moxibustion[51]	3 centers, 220 participants	T: Wenfei Guyuan umbilical moxibustion + conventional treatment *vs.* C: conventional treatment	At Shenque (CV8), with the patient supine. A powder containing clove (Dingxiang), Pinellia (Banxia), Ephedra (Mahuang), Asarum (Xixin), and white mustard seed (Baijiezi) was placed in an umbilical ring; a cone-shaped moxa unit was ignited over the powder. After treatment, the powder was retained using an acupoint patch	60 min/session, 2 sessions/week	Treatment: 13 weeks; follow-up: 26 weeks	Decreased acute exacerbation frequency; increased 6MWD; reduced mMRC scores; improved clinical symptoms
	Governor vessel moxibustion[52]	1 center, 40 participants	T: Governor Vessel moxibustion + conventional treatment *vs.* C: conventional treatment	Moxibustion applied along the Governor Vessel region from GV14 (Dazhui) to GV2 (Yaoshu).	60 min/session, 1 session/week	8 weeks	Improved cardiopulmonary endurance; increased 6MWD; improved pulmonary function; reduced Borg and CAT scores
	Tai Chi[53]	1 center, 120 participants	T: Tai Chi + conventional treatment *vs.* C: pulmonary rehabilitation + conventional treatment	Participants initially learned 2–3 movements per day and generally mastered the complete form within 2 weeks, with each instructor supervising 2–3 participants. They subsequently joined larger group sessions led by one instructor, with instructions relayed by real-time video streaming. Educational input was also provided	60 min/session, 5 sessions/week	12 weeks	Improved SGRQ scores; reduced mMRC scores; increased 6MWD
	Baduanjin[54]	10 centers, 217 participants	T: Baduanjin + conventional treatment *vs.* Combined: combined training + conventional treatment *vs.* C1: three-ball breathing training + conventional treatment *vs.* C2: conventional treatment	Standard eight-movement Baduanjin. Participants first received five nurse/therapist-led 30-min training sessions in week 1, followed by video-supported home practice. In the combined arm, Tri-Ball breathing training was added as a second component	30 min, twice daily, 5 days/week	12 weeks	Improved pulmonary function; increased 6MWD; reduced CAT and mMRC scores
	Mawangdui exercise[55]	2 centers, 54 participants	T: Mawangdui exercise + conventional treatment *vs.* C: conventional treatment	Standard Health Qigong Mawangdui Daoyin exercise set, delivered as a structured rehabilitation program.	30 min, twice daily, 5 days/week	12 weeks	Increased 6MWD; reduced CAT and mMRC scores; improved SGRQ scores
	Pulmonary Daoyin[56]	11 centers, 464 participants	T: supervised Pulmonary Daoyin + conventional treatment *vs.* C: conventional treatment	Controlled breathing coordinated with specially designed arm and body movements; sessions were supervised.	10 supervised sessions/week	3 months	Increased 6MWD; improved quality of life
	Liuzijue[57]	Meta-analysis	Tai Chi/Wuqinxi/Liuzijue/Baduanjin	/	/	/	Improved pulmonary function; Liuzijue showed advantages over Tai Chi, Wuqinxi, and Baduanjin for selected pulmonary function outcomes
	Acupoint application[58]	1 center, 180 participants	T: acupoint application + conventional treatment *vs.* C: Yiqi Tongluo Jianpi Bushen formula + conventional treatment *vs.* Combined: acupoint application + Yiqi Tongluo Jianpi Bushen formula + conventional treatment	The acupoint application formula contained Asarum (Xixin) 15 g, Ephedra (Mahuang) 15 g, and stir-fried white mustard seed (Chao Baijiezi), stir-fried Perilla seed (Chao Zisuzi), Schisandra fruit (Wuweizi), and vinegar-processed Corydalis rhizome (Cu Yanhusuo), 30 g each. Applications were placed at bilateral EX-B1 (Dingchuan), CV17 (Shanzhong), bilateral BL13 (Feishu), bilateral BL17 (Geshu), GV14 (Dazhui), and bilateral KI1 (Yongquan). The Yiqi Tongluo and Jianpi Bushen decoction contained Rougui 6 g; Zhi Gancao 12 g; Dangshen, Chao Baizhu, Chenpi, Qing Banxia, Shudihuang, Lujiaojiao, Danggui, and Chuanxiong 15 g each; and Fuling 20 g. It was decocted to 400 mL and administered as 200 mL per dose	Acupoint application: 4–6 h/session, 3 sessions/week; decoction: 200 mL/dose, twice daily	9 months	Increased 6MWD; reduced CAT and mMRC scores; relieved fatigue severity and inflammatory responses; improved blood gas parameters
	Acupressure[59]	1 center, 60 participants	T: acupressure *vs.* C: conventional treatment	Manual acupressure at LI4, HT7, LU1, and ST36.	2 min, once daily, 5 days/week	4 weeks	Reduced dyspnea and anxiety symptoms

(Continued)

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Table 1

(Continued)

Disease phase	TCM technique	Study design	Intervention	Details of the intervention	Session duration	Treatment duration	Conclusion
Acute exacerbation	Acupuncture[60]	Meta-analysis	T: acupuncture + conventional treatment *vs.* C: conventional treatment	/	/	/	Improved pulmonary function; reduced Borg scores; increased 6MWD
	Liuzijue[61]	1 center, 80 participants	T: Liuzijue + conventional treatment *vs.* C: conventional treatment	A sitting-and-lying adaptation of Liuzijue performed by patients receiving non-invasive ventilation	30 min, twice daily, 5 days/week	3 months	Improved pulmonary function; increased 6MWD; improved SGRQ scores; reduced mMRC scores; shortened non-invasive ventilation time; reduced acute exacerbation rate
	Seated Baduanjin combined with Hand-Taiyin Lung Meridian patting[62]	1 center, 86 participants	T: seated Baduanjin + Hand-Taiyin Lung Meridian patting + conventional treatment *vs.* C: conventional pulmonary rehabilitation nursing + conventional treatment	/	30 min, twice daily, 5 days/week	2 weeks	Improved TCM syndrome response; reduced CAT and mMRC scores; improved pulmonary function
	Tuna Huichun exercise[63]	1 center, 80 participants	T: Tuna Huichun exercise + conventional treatment *vs.* C: conventional treatment	/	30 min, 5 days/week	12 weeks	Increased 6MWD; improved SGRQ scores; reduced CAT and mMRC scores
	Breathing Tuna exercise[64]	1 center, 120 participants	T: breathing Tuna exercise + conventional treatment *vs.* C: conventional treatment	Structured exhalation–inhalation exercise added to conventional Western medical treatment.	30 min, 5 days/week	12 weeks	Increased 6MWD; improved clinical symptoms and pulmonary function; reduced CAT and mMRC scores; improved SGRQ scores
	Supine Daoyin[9]	5 centers, 228 participants	T: Supine Daoyin + conventional treatment *vs.* C: conventional treatment	Controlled breathing coordinated with specially designed arm and body movements; sessions were supervised	10 supervised sessions/week	14 days	Improved CCQ scores; increased 6MWD; reduced Borg scores; improved quality of life
	Thunder-fire moxibustion[65]	1 center, 99 participants	T: thunder-fire moxibustion + respiratory rehabilitation training + conventional treatment *vs.* C1: thunder-fire moxibustion + conventional treatment *vs.* C2: respiratory rehabilitation training + conventional treatment	Thunder-fire moxibustion was applied at ST36, CV17, BL23, EX-B1, BL13, BL20, and CV8 using suspended moxibustion approximately 2 cm above the skin until comfortable warmth and local erythema developed	30 min, once/day	4 weeks	Improved clinical symptoms and pulmonary function; increased 6MWD; reduced CAT and mMRC scores; improved SGRQ scores
	Acupoint application[66]	1 center, 92 participants	T: acupoint application + Qingfei Huatan Quyu formula + conventional treatment *vs.* C: conventional treatment	The treatment group received conventional Western therapy plus an oral Qingfei Huatan Quyu decoction and acupoint application. Xixin, Baijiezi, Yanhusuo, and Gansui (2:2:1:1) were powdered and prepared as 3 × 5 cm medicated patches, which were applied to BL13, BL43, GV14, EX-B1, and BL12	4–6 h once daily	14 days	Improved pulmonary function; reduced inflammatory response levels
Risk window phase	Liuzijue[67]	1 center, 76 participants	T: Liuzijue + basic pulmonary rehabilitation + Shenqi Qilong Dingjin powder *vs.* C: basic pulmonary rehabilitation	A sitting-and-lying adaptation of Liuzijue performed by patients receiving non-invasive ventilation	30 min, twice daily, 5 days/week	24 weeks	Improved clinical symptoms and pulmonary function; reduced inflammatory response levels; improved coagulation status; reduced CAT and mMRC scores
	Breathing Turtle work[68]	1 center, 106 participants	T: Breathing Turtle work + conventional treatment + TCM nursing care *vs.* C: conventional treatment + TCM nursing care	Breathing Turtle exercise comprised warm-up and stretching of the neck, shoulders, upper limbs, and trunk, followed by individually tailored continuous practice under instructor supervision	20 min/session, once daily, 4 days/week	8 weeks	Improved pulmonary function; increased 6MWD; reduced CAT and mMRC scores; improved SGRQ scores
	Baduanjin[69]	1 center, 80 participants	T: Baduanjin + conventional treatment *vs.* C: conventional treatment	Standard eight-movement Baduanjin. Participants first received five nurse/therapist-led 30-min training sessions in week 1, followed by video-supported home practice. In the combined arm, Tri-Ball breathing training was added as a second component	30 min, twice daily, 5 days/week	Treatment: 8 weeks; follow-up: 3 months	Prolonged interval to recurrent acute exacerbations; increased 6MWD; improved clinical symptoms, exercise tolerance, and lower-limb muscle strength

6MWD: 6-Minute walking distance; Borg: Borg dyspnea scale; C: Control group; CAT: COPD Assessment Test; Combined: Combined intervention group; mMRC: Modified Medical Research Council dyspnea scale; SGRQ: St George's Respiratory Questionnaire; T: Treatment group; TCM: Traditional Chinese medicine; CCQ: Clinical COPD Questionnaire.

"/" indicates that the corresponding information was not reported or was not applicable in the original study.

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exercise therapy, including Liuzijue[61], Baduanjin[62], Tunachun Gong[63], and exhalation–inhalation exercise[64], have favorable effects on lung function, exercise tolerance, and quality of life in patients with AECOPD. Supine Daoyin improves exercise tolerance, alleviates symptoms, and enhances quality of life in patients with AECOPD, with a favorable safety profile[9]. In addition, Chinese medicine techniques such as moxibustion and acupoint application offer advantages as adjunctive therapies for AECOPD. Geng et al.[65] demonstrated that respiratory rehabilitation training effectively improves clinical symptoms, cardiopulmonary function, and exercise tolerance in patients with AECOPD. Shen et al.[66] showed that therapy for clearing the lung and removing phlegm and blood stasis combined with acupoint application significantly improves TCM syndrome scores and reduces inflammatory responses in patients with AECOPD. Evidence for combined acupuncture and herbal treatment during AECOPD remains limited. In a randomized study of 100 patients with the phlegm-heat constraint in the lung pattern, acupuncture plus herbal atomization added to conventional therapy improved pulmonary function indices and reduced C-reactive protein and interleukin-6 levels without an observed increase in adverse events[75]; confirmation in larger, independently conducted trials is needed.

Risk window phase

Chinese medicine techniques also have important application value for patients in the risk window phase. Wu and Li[17] applied Yiqi Wenyang Huatan Decoction combined with auricular point seed-pressing therapy to patients with lung–kidney *qi* deficiency complicated by turbid phlegm obstructing the lung syndrome during the risk window phase. The treatment improved clinical symptoms, lung function, and exercise tolerance, regulated immunity, and reduced inflammatory levels. For early pulmonary rehabilitation during the risk window phase, Liuzijue combined with Shenqi Qilong Dingjin Powder significantly improved clinical symptoms, accelerated lung function recovery, and enhanced quality of life[67]. Breathing Turtle work can improve lung function, enhance exercise tolerance, and improve quality of life[68]. Baduanjin, a traditional Chinese health qigong practice, is an important component of TCM pulmonary rehabilitation. A prospective non-randomized concurrent controlled trial[69] found that Baduanjin, when used during the risk window phase, prolonged the interval to recurrent exacerbations and improved clinical symptoms, exercise tolerance, and lower-limb muscle strength. Direct evidence for acupuncture combined with oral herbal medicine or herbal atomization during the risk window phase remains insufficient, particularly for recurrent exacerbation rates, time to first recurrence, and long-term quality of life. Overall, external TCM therapies may serve as stage-specific adjuncts to conventional COPD care, but clinical adoption should be guided by disease phase, syndrome pattern, patient tolerance, and the certainty of the available evidence.

Mechanisms of TCM therapy

In recent years, TCM has shown considerable clinical efficacy in preventing and treating COPD. Evidence from multicenter, randomized, double-blind, placebo-controlled trials indicates that several formulae based on the therapeutic principle of "Tiaobu Feishen," including Bufei Jianpi Formula, Bufei Yishen Formula, and Yiqi Zishen Formula, as well as Qingjin Huatan Decoction, Suzi Jiangqi Decoction, and Liuwei Buqi Capsules, can improve pulmonary function, reduce acute exacerbation frequency, alleviate respiratory symptoms, and improve the quality of life in patients with COPD[38,76–77].

The mechanisms of TCM formulae for COPD are generally characterized by integrated, multi-component, multi-target, and multi-pathway regulation rather than modulation of a single molecular target. In general, the major consensus mechanisms include anti-inflammatory, antioxidant, immunomodulatory, epithelial-protective, and anti-remodeling effects (Figure 2). First, many formulae suppress airway and systemic inflammation by regulating nuclear factor-kappa B (NF-κB),

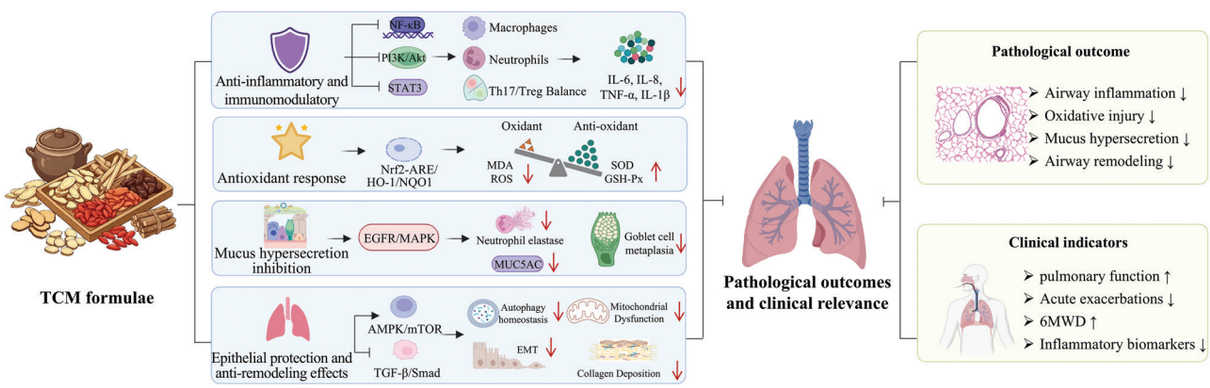


Figure 2. Multi-component and multi-pathway regulatory mechanisms of TCM formulae in COPD. 6MWD: 6-Minute walking distance; AMPK: AMP-activated protein kinase; ARE: Antioxidant response element; COPD: Chronic obstructive pulmonary disease; EGFR: Epidermal growth factor receptor; EMT: Epithelial-mesenchymal transition; GSH-Px: Glutathione peroxidase; HO-1: Heme oxygenase-1; IL: Interleukin; MAPK: Mitogen-activated protein kinase; MDA: Malondialdehyde; mTOR: Mechanistic target of rapamycin; MUC5AC: Mucin 5AC (MUC5AC); NF-κB: Nuclear factor-kappa B; NQO1: NAD(P)H: quinone oxidoreductase 1; Nrf2: Nuclear factor erythroid 2-related factor 2; PI3K/Akt: Phosphoinositide 3-kinase/protein kinase B; ROS: Reactive oxygen species; Smad: Sma- and mad-related protein; SOD: Superoxide dismutase; STAT3: Signal transducer and activator of transcription 3; TCM: Traditional Chinese medicine; TGF-β: Transforming growth factor-beta; Th17: T helper 17; TNF-α: Tumor necrosis factor-alpha.

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phosphoinositide 3-kinase/protein kinase B (PI3K/Akt), mitogen-activated protein kinase (MAPK), and signal transducer and activator of transcription (STAT)-related pathways. These effects may attenuate neutrophil- and macrophage-dominated airway inflammation and are clinically associated with reductions in symptoms and exacerbation risk. Second, TCM formulae can enhance antioxidant defense by activating the nuclear factor erythroid 2-related factor 2–antioxidant response element (Nrf2-ARE) pathway and increasing antioxidant enzymes, including superoxide dismutase, glutathione peroxidase, heme oxygenase-1 (HO-1), and NAD(P)H: quinone oxidoreductase 1 (NQO1), while decreasing reactive oxygen species and malondialdehyde levels. These effects may help protect airway epithelial and alveolar structures and delay progressive lung function decline. Third, TCM formulae may protect airway epithelial cells, alveolar epithelial cells, and endothelial cells by regulating AMP-activated protein kinase (AMPK)/mechanistic target of rapamycin (mTOR)-mediated autophagy, mitochondrial dysfunction, apoptosis, and epithelial barrier integrity. Importantly, these pathways do not act independently but form an interconnected regulatory network. For example, oxidative stress can amplify airway inflammation because excessive reactive oxygen species activate NF-κB, MAPK, and STAT3 signaling, resulting in increased release of inflammatory mediators[78]. Conversely, activation of Nrf2-ARE signaling reduces reactive oxygen species accumulation and may indirectly inhibit NF-κB–driven inflammatory responses, forming a negative regulatory loop between antioxidant and anti-inflammatory mechanisms[79].

The mechanistic emphasis differs between formulae used for stable COPD and those used for acute exacerbations. Formulae for stable COPD, such as Bufei Yishen Formula, Bufei Jianpi Formula, Yupingfeng Powder, Buzhong Yiqi Decoction, and Liuwei Buqi Capsules, are mainly characterized by *qi* supplementation. Their mechanisms are more closely related to long-term regulation of immune homeostasis, persistent low-grade inflammation, oxidative stress, and tissue repair. These mechanisms align with clinical goals in stable COPD, including improved lung function, exercise tolerance, symptom scores, and quality of life, as well as reduced future exacerbation risk. For example, Bufei Jianpi-related therapy has been reported to improve mitochondrial function and skeletal muscle performance and to protect epithelial barrier integrity, whereas Bufei Yishen therapy may regulate Th17/Treg imbalance and improve immune dysfunction[80–82].

In contrast, formulae for acute exacerbations, such as Qingjin Huatan Decoction, are mainly characterized by pathogen elimination. Their mechanisms focus more on the rapid suppression of acute inflammatory activation, oxidative bursts, neutrophil-dominated airway inflammation, mucus hypersecretion, and airway obstruction. For example, Qingjin Huatan Decoction has been reported to inhibit inflammatory mediator expression through p38 MAPK/NF-κB–related signaling and suppress neutrophil elastase/epidermal growth factor receptor (EGFR)/MAPK-mediated mucin 5AC (MUC5AC) overexpression, thereby reducing mucus secretion[83]. These effects are more directly related to clinical indicators of acute exacerbation, including cough, sputum viscosity, wheezing, dyspnea, and exacerbation duration. Thus, stable-stage formulae tend to emphasize the long-term restoration of host defense and tissue homeostasis, whereas acute exacerbation formulae tend to emphasize rapid inflammatory control.

TCM formulae exhibit distinct pharmacological profiles and molecular mechanisms, largely because of differences in their bioactive constituents. These bioactive substances constitute the chemical basis of the therapeutic effects of TCM formulae. Therefore, the systematic identification of the key active components responsible for efficacy is essential for elucidating mechanisms of action and optimizing formula design. However, the complex chemical composition and holistic mode of action of TCM formulae create substantial challenges for mechanistic interpretation and rational optimization. To address these challenges, researchers have proposed an integrative strategy of "analyzing the parts within the whole, returning from the parts to the whole, and balancing systems-level thinking with reductionist approaches," aiming to bridge the gap between complex chemical systems and multi-target pharmacological mechanisms. Based on the multi-component, weak-effect, and synergistic-interaction characteristics of TCM, an "iterative feedback screening strategy for equivalent component groups" was developed. Using this strategy, researchers identified an equivalent component group composed of 18 constituents with defined proportions in Fufang Danshen Formula and further revealed its system-level mechanism, including the activation of Nrf2 to alleviate cellular injury[84–86]. As an equivalent component group, it preserves the proportional composition of the original formula and reflects the effective constituent group responsible for pharmacological action. Based on the specificity of syndrome-formula correspondence in TCM efficacy, studies on the bioactive material basis of formulae should follow the path of syndrome diagnosis, formula efficacy evaluation, and analysis of directly acting substances *in vivo*. Accordingly, TCM syndrome-based metabolomics has been established by integrating serum pharmacochemistry and metabolomics. By identifying syndrome biomarkers, this approach has enabled the construction of formula efficacy evaluation systems, discovery of bioactive substances, and elucidation of system-level mechanisms underlying formula efficacy[87–88].

As an illustrative example, researchers established an integrated research paradigm that includes pharmacological action evaluation, bioactive substance identification, component compatibility, and mechanistic validation (Figure 3). In cigarette smoke exposure models combined with bacterial infection, Bufei Yishen Formula improved immune dysfunction, protease/antiprotease imbalance, oxidative stress injury, and right ventricular remodeling[89–93]. Through bioactivity-guided isolation, serum pharmacology, component knockout strategies, and biomimetic transformation approaches, active compounds were identified and optimized into effective component combinations[94–95]. Mechanistic studies further suggested

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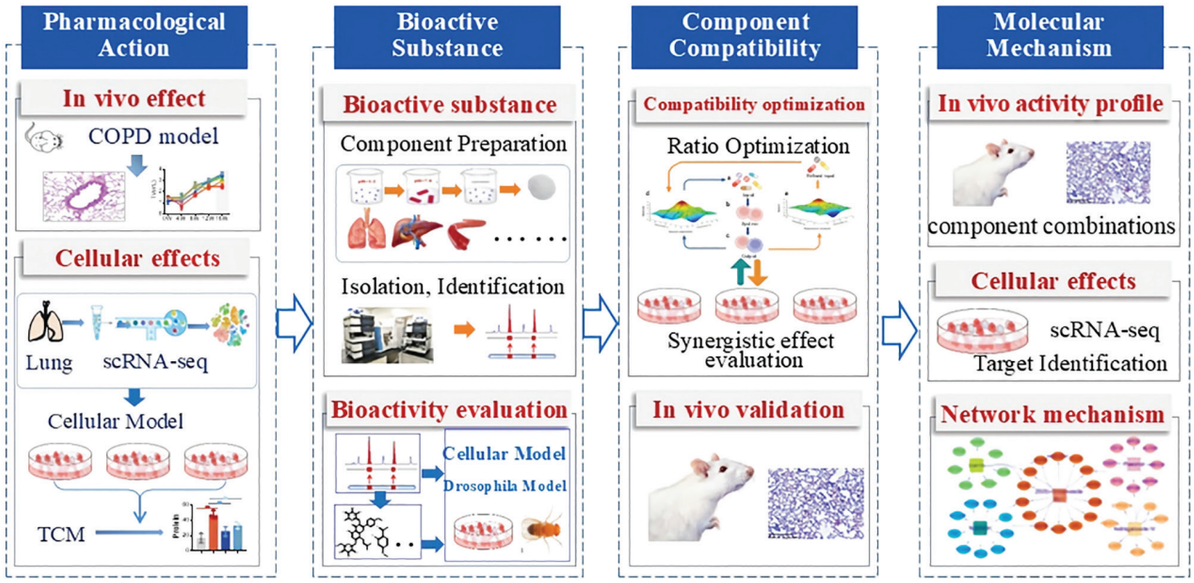


Figure 3. Integrated research paradigm for identifying bioactive substances and mechanisms of TCM formulae. COPD: Chronic obstructive pulmonary disease; scRNA: Single-cell RNA sequencing; TCM: Traditional Chinese medicine.

that these combinations may regulate COPD-related pathological processes by suppressing inflammatory and oxidative injury, improving epithelial barrier dysfunction, enhancing macrophage efferocytosis, reducing mucus hypersecretion, and correcting Th17/Treg imbalance[82,96–98]. These findings provide a useful example of systematic investigation into the material basis and mechanisms of a single formula, but they should not be interpreted as representative of all TCM interventions for COPD.

In summary, TCM formulae for COPD exert therapeutic effects through multi-component, multi-target, and multi-pathway regulation. At the field level, their common mechanisms involve coordinated modulation of inflammation, oxidative stress, immune imbalance, epithelial injury, mucus hypersecretion, and airway remodeling. At the disease-stage level, stable COPD formulae mainly emphasize long-term restoration of host defense, immune homeostasis, mitochondrial function, and tissue repair, whereas acute exacerbation formulae mainly emphasize rapid suppression of inflammatory activation, oxidative bursts, and airway obstruction. At the formula-specific level, systematic studies of Bufei Yishen Formula show how pharmacological action evaluation, bioactive substance identification, component compatibility, and mechanistic elucidation can be integrated to clarify the material basis and regulatory network of a single formula. This integrated paradigm aligns with key methodological considerations for non-clinical pharmacological research on TCM formulae discussed by Li et al.[99]. However, because this paradigm is mainly derived from studies of Bufei Yishen Formula, its applicability to other TCM formulae requires further validation in independent studies. Future research should establish a stronger evidence chain linking clinical efficacy, *in vivo* active substances, direct molecular targets, pathway networks, and clinically relevant outcomes.

Current issues and future perspectives

In summary, TCM has developed staged and graded diagnostic and therapeutic strategies for COPD. Accumulating evidence suggests that TCM interventions may improve clinical symptoms, reduce acute exacerbation frequency, and enhance quality of life. Nevertheless, several challenges remain. First, many clinical studies are limited by small sample sizes and heterogeneous designs, resulting in insufficient overall evidence strength. For example, the Governor Vessel moxibustion study[52] was a single-center trial involving only 40 participants, whereas the Mawangdui exercise trial[55] included only 54 participants from two centers. Considerable variation also exists across studies in intervention type, comparator, treatment duration, and follow-up period. Second, preventive strategies targeting high-risk populations remain underdeveloped, and standardized TCM-based approaches for early identification and intervention are still lacking. Although a six-center trial involving 336 patients evaluated syndrome-based TCM treatment during the risk window phase[46], the broader evidence base remains limited. For example, the risk window studies of Liuzijue[67] and Baduanjin[69] were single-center trials involving only 76 and 80 participants, respectively. Finally, mechanistic investigations have frequently focused on individual signaling pathways or molecular targets. For instance, studies of Liuwei Buqi Capsules primarily examined the STAT4/STAT6 and MMP-9/TIMP-1 axes[77] or the JAK/STAT pathway[100]. Although these studies provide valuable pathway-specific evidence, they do not fully elucidate the systemic synergistic effects characteristic of multi-component, multi-target, and multi-pathway TCM interventions.

Future research should prioritize the following directions. First, multicenter, large-scale, internationally collaborative randomized controlled trials, together with real-world studies, are needed to establish standardized treatment protocols and TCM-specific therapeutic

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modalities supported by high-quality evidence. Second, research should strengthen the identification of high-risk populations with COPD and develop an integrated TCM-based prevention and management framework encompassing risk assessment, early screening, and stratified intervention. Finally, mechanistic studies should adopt integrative approaches combining network pharmacology, multi-omics, bioinformatics, and artificial intelligence to delineate the multidimensional molecular regulatory networks underlying TCM interventions in COPD, thereby clarifying key active substances, molecular targets, and synergistic mechanisms.

Conflict of interest statement

The authors declare no conflict of interest.

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Author contributions

Jiansheng Li conceived and designed the study. Yang Xie, Peng Zhao, and Siyuan Lei wrote the original draft. Jiansheng Li, Yang Xie, Peng Zhao, and Siyuan Lei participated in discussion and manuscript revision. All authors read and approved the published version of the manuscript.

Ethical approval of studies and informed consent

Not applicable.

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None.

Data availability

All data generated or analyzed during this study are included in this published article.

Declaration of generative AI in scientific writing

During manuscript preparation and revision, the authors used OpenAI ChatGPT to support language editing and improve readability. The authors critically reviewed and revised all AI-assisted output and take full responsibility for the accuracy, integrity, and final content of the manuscript. AI tools were not used to generate or manipulate images or research data.

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