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Synergistic immunomodulatory effects of *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* on elderly patients with recurrent pneumonia: A retrospective clinical controlled trial

Yuhan Zhang[1] and Jinying Liu[2]*

[1]Teaching and Research Section of Basic Theory of Traditional Chinese Medicine, Chengde Medical University, Chengde City, Hebei Province, China

[2]Teaching and Research Section of Acupuncture, Moxibustion and Tuina, Chengde Medical University, Chengde City, Hebei Province, China

Abstract: **Background**: Recurrent pneumonia in the elderly can repeatedly damage lung function and reduce quality of life, posing certain challenges to clinical treatment. **Objective**: To analyze the synergistic immune regulatory effects of *Cistanche deserticola*, *Schisandra chinensis and Cornus* officinalis on elderly patients with recurrent pneumonia. **Methods**: A total of 165 patients with recurrent pneumonia from Chengde Medical University from January 2024 to January 2025 were recruited, 158 were enrolled after exclusions, 8 lost to follow-up, and 150 finally analyzed. The 150 patients were divided into MC group (n=75) and MA group (n=75). Both groups were treated with Ma Xing Shi Gan Tang and Azithromycin, while the MC group was additionally treated with *Cistanche deserticola, Schisandra chinensis and Cornus officinalis*. The main evaluation includes the Traditional Chinese Medicine Syndrome Score (TCMSS), lung function indicators, inflammation indicators, immune indicator levels and clinical efficacy of two groups. Secondary outcomes include quality of life scores, incidence of complications and adverse reactions. **Results**: After treatment, the lung function indicators, immune indicators and clinical efficacy in MC group were higher than in the CC group; the TCMSS and inflammatory indicators were lower in the CC group (P<0.05). No significant difference in quality of life score, incidence of complications and adverse reactions between the two groups (P>0.05). **Conclusion**: This method has a good immunomodulatory effect on elderly patients with recurrent pneumonia and is worthy of further promotion and application.

Keywords: *Cistanche deserticola; Cornus officinalis;* Immunity; Recurrent pneumonia; *Schisandra chinensis*

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INTRODUCTION

Against the backdrop of an accelerating aging population, elderly health issues have become increasingly prominent, among which recurrent pneumonia has emerged as a major medical challenge. Compared with young people, the incidence of pneumonia among the elderly is remarkably higher and the risk of recurrence remains persistently high (Stogova, 2023). Epidemiological data show the incidence of pneumonia among elderly individuals is remarkably above to other age groups, with the disease recurrence rate remaining high; some elderly pneumonia patients experience recurrent episodes within one year of diagnosis. With advancing age, the immune function of the elderly gradually declines and coupled with the frequent presence of multiple chronic underlying diseases such as diabetes and cardiovascular diseases, their susceptibility to pathogens is remarkably increased (Chebib *et al.*, 2021). Recurrent pneumonia has a serious impact on the health of elderly people. Every time pneumonia recurs, it may lead to a new round of inflammatory damage to lung tissue, causing progressive decline in lung function, manifested as worsening breathing difficulties, reduced activity tolerance, etc., which severely affect the quality of life among elderly individuals. What is even more worrying is that frequent recurrence can easily lead to various serious complications, remarkably increasing the mortality rate of elderly people (Osman *et al.*, 2021). In addition, repeated hospitalization has increased the economic burden and caregiving pressure on families and has also caused remarkable consumption of social medical resources. Moreover, due to the atypical symptoms of pneumonia in the elderly, which may only manifest as non-specific symptoms such as fatigue, poor appetite and mental exhaustion, misdiagnosis and missed diagnosis can easily occur, delaying the optimal treatment time and further exacerbating the complexity and severity of the condition (Chojin *et al.*, 2021).

In the pathological process of recurrent pneumonia in the elderly, the balance between inflammatory response and immune regulation exerts a decisive influence in the development of the disease. As age increases, the immune system of elderly people shows remarkable decline, with a remarkable decrease in the number and activity of immune cells. This makes the immune response of the body slow when faced with the invasion of pneumonia pathogens, making it difficult to timely and effectively identify and eliminate the pathogens, laying hidden dangers for the persistence and recurrence of infection (B Chen *et al.*,

**Corresponding author:* e-mail: Jyljinying68@hotmail.com

2021). In terms of inflammatory response, elderly patients with recurrent pneumonia often exhibit an imbalance of inflammatory factors. When the lungs are invaded by pathogens, pro-inflammatory factors such as tumor necrosis factor - α (TNF-α) and interleukin-6 (IL-6) are released in large quantities, triggering an excessive and uncontrolled inflammatory storm that causes serious damage to lung tissue, destroys alveolar structure, affects gas exchange and ultimately leads to continuous deterioration of lung function. Immune regulatory function is equally crucial in the prevention and treatment of recurrent pneumonia in the elderly (Zhao *et al.*, 2023). Imbalance in immune regulation can lead to disrupted cooperation between immune cells, weakened immune function and prevent the body from quickly and accurately initiating specific immune responses when faced with previously infected pathogens, increasing the risk of pneumonia recurrence. Research has shown that restoring and improving the immune regulatory function of elderly patients can enhance the body's resistance to pathogens, reduce inflammatory damage and have important implications for reducing the recurrence rate of pneumonia and improving patient prognosis (Yao *et al.*, 2023).

In the treatment of recurrent pneumonia in elderly patients, the integration of traditional Chinese medicine and Western medicine encompasses various therapeutic methods. In the field of Western medicine, anti-infective treatment is the core approach and antibiotics such as penicillin, cephalosporins and quinolones are often used clinically. Azithromycin, as a macrolide antibiotic, has good antibacterial activity against common Mycoplasma pneumoniae, Chlamydia pneumoniae and some Gram positive bacteria. It can effectively inhibit pathogen reproduction and control lung infections (L Chen *et al.*, 2021). Antiasthmatic drugs such as salbutamol and aminophylline are used in patients with wheezing symptoms to dilate bronchial smooth muscle. For elderly patients with weakened immunity, it is also possible to use drugs such as thymosin and immunoglobulin to enhance immunity, but these drugs have limitations such as high cost, potential allergic reactions and limited long-term efficacy (Orders, 2021). Traditional Chinese medicine treatment for recurrent pneumonia in the elderly follows the principle of syndrome differentiation and treatment. Traditional Chinese Medicine categorizes pneumonia as "lung heat" and other related conditions, with the main treatment methods being clearing heat and detoxifying, promoting lung function and resolving phlegm (Xi *et al.*, 2020). Ma Xing Shi Gan Tang, from the Treatise on Cold Damage, is composed of ephedra, almonds, gypsum, licorice and other ingredients. The comprehensive prescription has the effects of promoting lung circulation, clearing heat, relieving cough and asthma and can effectively improve symptoms such as cough, sputum production and fever in elderly patients with pneumonia (H Jiang *et al.*, 2021). However, pure Western medicine treatment faces the challenge of bacterial resistance and is difficult to fundamentally correct the immune imbalance in elderly patients. Although traditional Chinese medicine treatment has obvious overall regulatory advantages, it lacks modern evidence-based medicine evidence to support its exact efficacy. Based on this, this study proposes a combined treatment plan of Maxing Shigan Tang and Azithromycin, hoping that the two can work synergistically. Western medicine can quickly control infections, while traditional Chinese medicine can regulate the overall immune and organ functions of the body. This plan aims to treat recurrent pneumonia in the elderly from multiple dimensions and open up new ideas for clinical treatment.

Cistanche deserticola, Schisandra chinensis and Cornus officinalis have a long history in the field of traditional Chinese medicine and modern research has gradually revealed their unique values. *Cistanche deserticola*, also known as "desert ginseng", is rich in phenylethanoid glycosides such as echinacoside, which have activities such as regulating immunity and delaying aging. Research has shown that it can excite the pituitary adrenal cortex system, enhance the body's immune function and its polysaccharide components can also enhance immune cell activity (Cheng *et al.*, 2023). *Schisandra chinensis* is famous for its astringent and astringent properties, as well as its ability to nourish qi, produce fluids and nourish the kidneys and heart. Schisandra chinensis can regulate the secretion of immune factors, improve immune cell function, inhibit excessive inflammatory reactions and help maintain immune balance in the body (Ji *et al.*, 2024; Kopustinskiene and Bernatoniene, 2021). *Cornus officinalis* also has the ability to nourish the liver and kidneys, as well as to absorb astringency and promote digestion. The cyclohexene ether terpenes, polysaccharides and other components isolated from *Cornus officinalis* can not only regulate immune cells, but also alleviate inflammatory damage. Adding these three traditional Chinese medicines to Ma Xing Shi Gan Tang is expected to produce a synergistic effect (Gao *et al.*, 2021). Ma Xing Shi Gan Tang focuses on clearing heat and promoting lung function, relieving cough and asthma, while *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* can enhance the therapeutic effect from the aspects of immune regulation and inflammation control. Together with Ma Xing Shi Gan Tang, the three can regulate the body's immune system from multiple targets, reduce lung inflammation, improve the overall condition of elderly patients with recurrent pneumonia and bring new hope for treatment.

The aim of this study is to investigate the synergistic immune regulatory effect of adding Cistanche *deserticola, Schisandra chinensis and Cornus officinalis* to Maxing Shigan decoction in combination with azithromycin on elderly patients with recurrent pneumonia. Specifically, we will closely observe the impact of combination therapy on

patients' immune indicators, evaluate its effectiveness in reducing inflammation, improving lung function and overall clinical symptoms. Based on previous research on three traditional Chinese medicines, we hypothesize that the combination of *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* with Maxing Shigan decoction can synergistically regulate immunity through multiple targets, enhance immune function in elderly patients and effectively inhibit inflammatory reactions. At the same time, when combined with azithromycin, it can quickly control infections using Western medicine and fundamentally improve patients' immune imbalance by leveraging the overall regulatory advantages of traditional Chinese medicine, reducing the risk of pneumonia recurrence without increasing remarkable adverse reactions. If the hypothesis of this study is validated, it will bring many positive implications for the clinical treatment of recurrent pneumonia in the elderly. It will provide clinical doctors with a new and effective integrated traditional Chinese and Western medicine treatment strategy, which will help reduce the number of hospitalizations and medical expenses for patients and alleviate the medical burden on families and society and remarkably improve the life quality, injecting new vitality into the development of elderly health.

MATERIALS AND METHODS

Study design

This study is a retrospective clinical controlled experiment aimed at exploring the synergistic immune regulatory effects of *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* on elderly patients with recurrent pneumonia. From January 2024 to January 2025, elderly patients with recurrent pneumonia at Chengde Medical University were divided into MC group and MA group based on their treatment preferences and drug tolerance assessment results in clinical practice. Both groups were treated with Maxing Shigan decoction combined with azithromycin. MC group received Maxing Shigan decoction with the addition of *Cistanche deserticola, Schisandra chinensis and Cornus officinalis*. A total of 165 data from patients were collected and after exclusion, 158 cases were included. Over the follow-up duration, 8 cases were lost to follow-up and a total of 150 cases were finally analyzed. This study mainly compares and analyzes the therapeutic effects of adding *Cistanche deserticola, Schisandra chinensis and Cornus officinalis*, providing a scientific basis for the clinical treatment of recurrent pneumonia in the elderly. The study flow chart is shown in fig. 1.

Inclusion and exclusion criteria

Inclusion criteria: (1) Meet the diagnostic criteria for pneumonia in Diagnosis and Treatment Guidelines for Pneumonia (Avdeev *et al.*, 2022); (2) Meet the diagnostic criteria for phlegm heat obstructing the lungs in traditional Chinese medicine (Chen, 2021); (3) The recurrence frequency of pneumonia in the past year is ≥ 2 times; (4) Age ≥ 60 years old; (5) The patient has good compliance and is willing to cooperate with treatment plan developed by the research (medication rate ≥ 80% verified based on electronic medical records within 3 months before enrollment); (6) No use of immune modulators (such as thymosin, immunoglobulin) or systemic glucocorticoids within one month prior to enrollment; (7) The overall mental state is good (the patient can clearly complain of symptoms and cooperate in completing the questionnaire evaluation). They can truthfully express their complaints about symptoms and answer relevant questions from medical staff; (8) Can tolerate the drugs associated with this study; (9) The patient and their family members are informed and agree and sign an informed consent form.

Exclusion criteria: (1) Patients with severe heart, liver, kidney and other organ failure; (2) Patients with underlying diseases that may affect immune function, such as malignant tumors, hematological disorders and autoimmune diseases; (3) Patients who are allergic to ingredients such as Ma Xing Shi Gan Tang, Azithromycin, *Cistanche deserticola, Schisandra chinensis and Cornus officinalis*; (4) Combine patients with coagulation dysfunction, or those with severe cardiovascular disease or other more serious illnesses; (5) Combined with chronic infectious diseases; (6) Complicated with active pulmonary tuberculosis, lung abscess, lung cancer and other lung diseases, or pneumonia caused by special pathogens such as fungi, viruses (such as novel coronavirus, influenza virus); (7) At the time of enrollment, there were severe septic shock, respiratory failure and other conditions that required intensive care treatment; (8) Patients who have already participated in clinical drug trials or clinical studies; (9) Request to stop treatment or be automatically discharged due to personal reasons; (10) Other situations that research physicians believe should not be included; (11) Other factors that may affect subsequent observation indicators.

During the sample screening stage, this study strictly followed the preset exclusion criteria for synchronous evaluation and ultimately excluded a total of 6 patients. The specific reasons and number of cases for exclusion are as follows: 2 cases with concurrent malignant tumors, 1 case with allergy to the study drug, 1 case with respiratory failure requiring intensive care at the time of enrollment, 1 case with concurrent active pulmonary tuberculosis and 1 case who has participated in other clinical studies. All exclusions were jointly determined by two researchers who independently checked the original medical records to ensure consistent application of exclusion criteria.

Quality control of herbal raw materials: The *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* used in this study were all purchased from Sichuan New Lotus Traditional Chinese Medicine Decoction Pieces Co., Ltd.

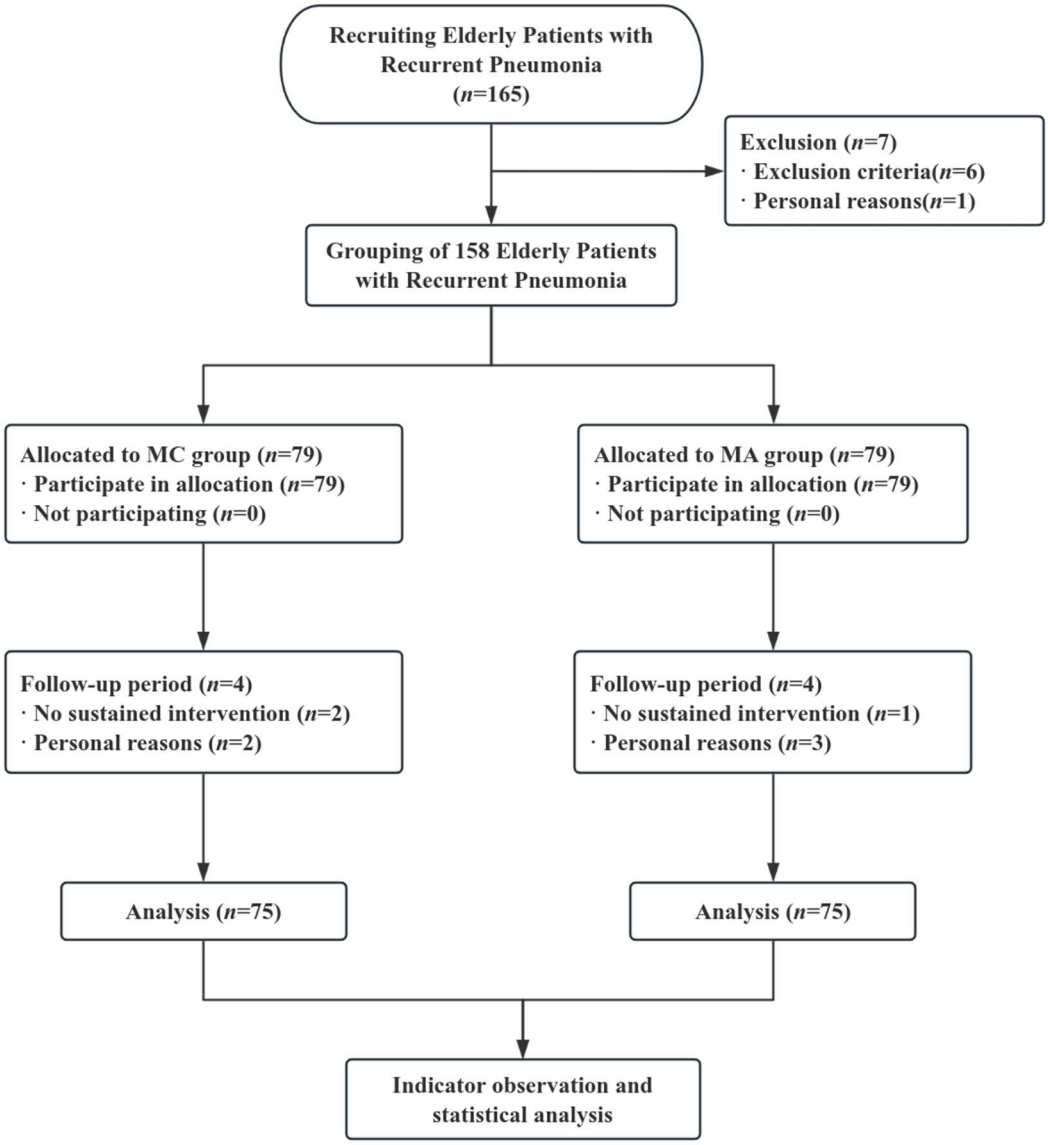

Fig. 1: Flow chart

(a fixed compliant supplier, one of the earlier domestic enterprises to pass the GMP certification for traditional Chinese medicine decoction pieces, with GSP certification qualifications and a pioneer in the standardized production of traditional Chinese medicine decoction pieces), involving three production batches (batch numbers: 20240115, 20240522 and 20240908). Each batch of raw materials is provided with a third-party quality inspection report by the supplier. The core indicators include moisture (*Cistanche deserticola* ≤ 10.0%, *Schisandra chinensis* ≤ 12.0%, *Cornus officinalis* ≤ 16.0%), total ash content (all ≤ 8.0%) and impurities (all ≤ 1.0%), all of which comply with the corresponding medicinal standards in the Chinese Pharmacopoeia (2020 edition). At the same time, the traditional Chinese medicine room of the hospital conducts thin-layer chromatography identification review on each batch of raw materials (using Echinochloa as a reference substance for *Cistanche deserticola, Schisandra chinensis* as a reference substance for Schisandrin A and *Cornus officinalis* as a reference substance for Mononucleoside and Magin), confirming that there are no counterfeit or inferior products mixed in. After verification, there was no significant difference in the routine indicators and identification results of the three batches of raw materials, ensuring the consistency of the quality of herbal raw materials and reducing the interference of inter batch differences on the research results.

Intervention measures

The formula for the modified Ma Xing Shi Gan Tang is: 10 g of medicinal almonds, 15 g of raw gypsum, 10 g of reed stems, 10 g of Artemisia annua, 5 g of Paeonia lactiflora, 10 g of Scutellaria baicalensis, 10 g of bamboo root, 3 g of loquat leaves, 10 g of mulberry bark, 10 g of Fritillaria thunbergii, 3 g of peach kernels, 5 g of roasted ephedra and 5 g of licorice. Boil 200 mL of the medicinal juice with

water and take orally, once in the morning and once in the evening.

The usage and dosage of azithromycin (Shaanxi Bosen Biopharmaceutical Group Co., Ltd., National Medical Products Administration Approval No. H20234287) are as follows: during initial intravenous infusion, a single dose of 10 mg/kg is calculated and added to 5% glucose injection for intravenous infusion once a day. After the patient's symptoms improve and their body temperature returns to normal, they will switch to oral administration of azithromycin dry suspension (Yichang Renfu Pharmaceutical Co., Ltd., National Medical Products Administration Approval No. H20234182), with a single dose of 10 mg/kg calculated once a day.

Both groups of patients were treated with Maxing Shigan Tang and azithromycin. Add 6 g of *Cistanche deserticola*, 3 g of *Schisandra chinensis* and 6 g of *Cornus officinalis* to MC group Maxing Shigan decoction. The usage remains unchanged. Both groups of patients were treated continuously for 14 days.

Observation indicators

Main indicators

Traditional Chinese Medicine Syndrome Score (TCMSS)

Referring to "Guidelines for Clinical Research of Traditional Chinese Medicine" and related clinical studies (Jianxin Wang *et al.*, 2024), cough and sputum, fever and irritability, shortness of breath and nasal irritation and facial redness and thirst are selected as the evaluation indicators for TCMSS. The score range for each item is 0-3 score (0 score: no such symptoms; 1 score: mild symptoms that do not affect daily life; 2 score: obvious symptoms that have a certain impact on daily life; 3 score: severe symptoms that seriously affect daily life). The TCMSS is the total score of all symptoms, with higher scores indicating more severe symptoms.

To reduce the subjectivity of scoring and verify the reliability of the results, the following quality control measures were implemented in this study: (1) Prior to scoring, two attending traditional Chinese medicine physicians were trained uniformly to clarify the details of the grading criteria for each symptom (such as "cough and sputum" requiring a comprehensive evaluation based on daily sputum volume and cough frequency and "fever and irritability" requiring synchronous recording of body temperature values and patient emotional state descriptions); (2) Using inter rater reliability analysis to verify consistency, 20 pre experimental cases were selected and independently double-blind scored by 2 traditional Chinese medicine practitioners. The intra group correlation coefficient (ICC) was calculated to be 0.89 (95% CI: 0.81~0.94), indicating good inter rater consistency; (3) During the research process, for cases with scoring differences (difference ≥ 1 point), two raters jointly reviewed the patient's original medical records (including symptom descriptions and sign records) to reach a unified judgment, ensuring the objectivity and stability of the scoring results.

Pulmonary function indicators

Pulmonary function indicators, including forced vital capacity (FVC), peak expiratory flow rate (PEF) and maximum ventilation volume (MVV), were measured using a pulmonary function tester (ALPH6000, Vitalograph, UK).

Inflammatory markers

According to the study by (Kanlioglu Kuman *et al.*, (2021), inflammatory factor indicators of both groups were analyzed. Collect 5 mL of fasting elbow vein blood sample in the morning, centrifuge and separate the serum and collect the supernatant. The laboratory department of our hospital uniformly used ELISA to detect the serum samples and recorded the postoperative serum inflammatory index levels of the patients. The levels of serum C-reactive protein (CRP), TNF-α and IL-6 were analyzed using the human CRP ELISA kit (PC190, Shanghai Beyotime Biotech Co., Ltd.), human TNF-α ELISA Kit (97072ES96, Shanghai Yeasen Biotech Co., Ltd.) and human IL-6 ELISA kit (PI325, Shanghai Beyotime Biotech Co., Ltd.), respectively.

The sensitivity of the test kit is: CRP ≥ 0.1 ng/mL, TNF - α ≥ 0.5 pg/mL, IL-6 ≥ 1 pg/mL. The intra batch coefficient of variation is ≤ 5% and the inter batch coefficient of variation is ≤ 8%, which meets the clinical testing standards. During the testing process, the following quality control requirements are strictly followed: 1. Draw a calibration curve using standard reagents (concentration gradient: CRP is 0.125-8 mg/L, TNF-α is 0.156-10 μg/L, IL-6 is 3.12-200 pg/mL) to ensure that the correlation coefficient (R^2) is ≥ 0.99 and the linear fit of the test results is guaranteed; 2. Blank control, negative control and positive control are set up for each batch of testing and 10% of the samples are subjected to repeated testing (parallel double wells), with a difference of ≤ 10% in repeated testing results to ensure testing repeatability and accuracy.

Levels of immune indicators

The levels of serum IgA, IgM and IgG from both groups were analyzed by Full-automatic biochemical analyzer (AU5841, Beckman Coulter, Inc.), respectively (Zhang *et al.*, 2020). The recommended normal threshold for adult serum immunoglobulin in the "Evidence based Guidelines for Interpretation of Clinical Laboratory Results" is 0.7-4.0 g/L for IgA, 0.5-2.2 g/L for IgM and 7.0-16.0 g/L for IgG. Among them, indicators below the lower limit often indicate weakened humoral immune function, while indicators above the upper limit need to be combined with clinical screening for infections, autoimmune diseases and other conditions to clarify the clinical reference significance of the test results.

Clinical efficacy

Based on the core observation indicators of this study, the clinical efficacy was divided into three grades; marked effect, effective and ineffective. *Marked effect*: TCMS score decreased by ≥70% compared with that pre-treatment; pulmonary function indicators improved by ≥30% compared with those pre-treatment; serum inflammatory indicators decreased by ≥50% compared with those pre-treatment; immune indicators (IgA, IgM, IgG) increased by ≥20% compared with those pre-treatment or returned to normal levels. *Effective*: TCMS score decreased by 30%–69% compared with that pre-treatment; pulmonary function indicators improved by 10%–29% compared with those pre-treatment; serum inflammatory indicators decreased by ≥30% compared with those pre-treatment; immune indicators increased by 10%–19% compared with those pre-treatment. *Ineffective*: TCMS score decreased by <30% compared with that pre-treatment, or symptoms indicated no improvement or even worsened; pulmonary function indicators improved by <10% compared with those pre-treatment, or decreased; serum inflammatory indicators did not decrease or increased; immune indicators indicated no remarkable change or decreased.

Secondary indicators

Quality of life score

The SF-36 Health Survey Scale was used to evaluate the patients' quality of life (Khusainova *et al.*, 2023). This scale includes 8 dimensions: physical functioning, role-physical, bodily pain, general health and so on. The rating range is from 0 to 100 and the higher the total score, the better the quality of life.

Complications

The complications incidence of both groups was recorded, including liver dysfunction, gastrointestinal inflammation, pharyngitis, abnormal renal function, rash, fever, etc.

Incidence of adverse reactions

The adverse reactions incidence of both groups during treatment was recorded, including nausea, vomiting, diarrhea, abdominal pain, loss of appetite, dizziness, headache, fatigue, constipation, etc.

Follow-up visits

Based on the follow-up data after treatment in clinical diagnosis and treatment records, it focuses on extracting the follow-up information at 3 months after the end of treatment to evaluate the durability of the curative effect. This follow-up node mainly focuses on the occurrence and treatment outcomes of adverse reactions and potential complications in elderly patients with recurrent pneumonia after combined treatment with *Cistanche deserticola, Schisandra chinensis and Cornus officinalis*. Although the follow-up period in retrospective studies is limited by the completeness of the original clinical records, this study still ensures the validity of the information at this node as much as possible through standardized data extraction criteria (such as clearly including cases with complete 3-month follow-up records), providing a basis for analyzing the long-term safety of the synergistic effect of the three Chinese medicines and their impact on the risk of recurrence.

Sample size calculation

Perform power analysis using G*Power 3.1 computer software to calculate sample size, with the aim of determining the minimum sample size required to detect statistically significant differences between groups. This study used the improvement of TCMSS as the main clinical efficacy indicator and the sample size calculation parameters were set based on the following criteria: referring to the intergroup effect size data of TCMSS in previous studies, combined with the results of the pilot study (n=20), the expected effect size Cohen's d was set to 0.6 (moderate effect size, consistent with the actual clinical effect level of this type of intervention). Based on the standard deviation (SD=3.2) of TCMSS in the pilot experiment, the variance estimate is set to 10.24 (SD^2), the test level α is set to 0.05 (two-sided test) and the test efficacy (1-β) is selected as 85%. This choice is mainly based on the clinical recruitment difficulty of elderly patients with recurrent pneumonia (characterized by multiple comorbidities and high risk of follow-up loss). Compared with the standard 80% test efficacy, it can reduce the risk of "false negative" results, while avoiding the larger sample size required for 90% test efficacy (which will significantly increase the recruitment cycle and cost) and balancing the scientific and feasibility of the research. Based on the above parameters, the software calculates that each group requires at least 59 patients. Considering potential uncertainties in the implementation of the study, such as patients withdrawing due to personal reasons, loss to follow-up and not meeting the final inclusion criteria, the actual recruitment sample size for this study is 75 cases per group to ensure that the final effective sample size meets the statistical analysis requirements and guarantees the reliability of the research conclusions.

Statistical analysis

Statistical analysis was performed using SPSS 28.0 software. Lucidchart is used to draw flowcharts. The data in this study were subjected to a normal distribution test. The baseline features are described as the number of people and variables (represented by $\bar{x}\pm s$). The TCMS, lung function indicators, inflammation indicators, immune indicators and quality of life scores in results are all expressed as $\bar{x}\pm s$. Paired t-tests were used to compare within group differences based on repeated measurements of the same study subject before and after treatment. Independent sample t-test was used to compare the treatment effects between two groups after controlling for baseline levels. The clinical efficacy, incidence of complications and adverse reactions in the results are expressed as percentages (%). Compare the both groups using the x^2 test for analysis. All statistical tests adopted a two-tailed approach, where a P-value < 0.05 was taken to denote a statistically significant difference.

RESULTS

Basic information

This study included 150 elderly patients with recurrent pneumonia who visited Chengde Medical University from January 2024 to January 2025. They were divided into MC group (n=75) and MA group (n=75) according to treatment methods, aiming to explore the synergistic immune regulatory effects of *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* on elderly patients with recurrent pneumonia. Prior to the initiation of the study, detailed baseline demographic= characteristics such as age, gender and disease duration were collected and recorded

for both groups of patients; And baseline clinical characteristics, including key information such as the number of pneumonia recurrences, combined basic diseases (such as hypertension, diabetes), are presented in Table 1. The findings indicated that no remarkable discrepancy was found in the baseline characteristics among both groups (P>0.05). This result ensures effective control of demographic and clinical confounding factors during the research process, reduces potential interference with research conclusions and lays a reliable foundation for accurately evaluating the synergistic immune regulatory effects of the three traditional Chinese medicines, ensuring the scientific validity and clinical reference value of the research results.

Main results

TCMSS

Before treatment, statistical analysis was conducted to compare the TCMSS of both groups of patients (Table 2). The findings indicated that there was no remarkable discrepancy among both groups in the scores of various symptoms such as cough and sputum, fever and irritability, shortness of breath and nasal irritation and facial redness and thirst (P>0.05), indicating that the TCMSS of both groups of patients was at a similar level pre-treatment and had good comparability. After treatment, the scores of both groups of patients were below in pre-treatment (P<0.05). Perform TCMSS evaluation on both groups of patients again. The data shows that the scores of MC group patients in terms of cough and sputum production, fever and irritability, shortness of breath and nasal irritation and facial redness and thirst are (0.77 ± 0.45) score, (0.85 ± 0.39) score, (0.79 ± 0.49) score and (0.81 ± 0.44) score, respectively; The corresponding symptom scores for the MA group were (1.22 ± 0.46) score, (1.24 ± 0.43) score, (1.26 ± 0.51) score and (1.33 ± 0.52) score, respectively. The outcomes indicated that there was a remarkable discrepancy in the scores of various symptoms among both groups (P<0.05), indicating that compared with the MA group, the MC group had a more remarkable effect in relieving symptoms such as cough, sputum, fever, irritability, shortness of breath, nasal irritation and facial redness and thirst.

Pulmonary function indicators

In this study, the lung function indicators of both groups of patients were evaluated pre-treatment (Table 3). The findings indicated that there was no remarkable discrepancy among both groups in FVC, PEF and MVV (P>0.05), indicating that the lung function of both groups of patients pre-treatment was at a similar level and had good balance and comparability. After treatment, the indicators of both groups of patients were above to pre-treatment. Reevaluate the lung function of both groups of patients. The FVC of the MC group patients reached (3.27 ± 0.43) L, PEF was (5.56 ± 1.38) L/s and MVV was (69.23 ± 6.22) L/min, while the FVC of the MA group was (2.74 ± 0.39) L, PEF was (3.84 ± 0.95) L/s and MVV was (61.47 ± 5.90) L/min. The findings indicated that there were remarkable discrepancy among both groups in the three lung function indicators of FVC, PEF and MVV (P<0.05). This result clearly indicates that compared to the MA group, the MC group has a more outstanding effect in improving patients' lung function, which strongly suggests that the treatment plan adopted by the MC group has remarkable advantages in improving patients' lung ventilation function and other aspects.

Inflammatory indicators

Before treatment, the inflammatory indicators of both groups of patients were analyzed (Table 4). The findings indicated that there was no remarkable discrepancy in the levels of CRP, TNF-α and IL-6 among both groups (P>0.05), indicating good consistency and comparability in the baseline levels of inflammatory indicators among both groups of patients. After treatment, the inflammatory state in both groups of patients was relieved and various inflammatory indicators remarkably decreased. The analysis of both groups of data after treatment indicated that the CRP, TNF-α and IL-6 levels in the MC group were (6.59 ± 1.04) mg/L, (0.85 ± 0.30) μg/L and (7.06 ± 2.29) pg/mL, respectively, while those in the MA group were (12.22 ± 3.57) mg/L, (1.65 ± 0.49) μg/L and (10.61 ± 2.15) pg/mL, respectively. The difference among both groups was statistically significant (P<0.05). This result clearly indicates that compared to the MA group, the MC group has a more prominent effect in reducing the inflammatory markers levels in patients, suggesting that the treatment plan of the MC group has remarkable advantages in inhibiting inflammatory responses.

Immune indicators

Before treatment, the immune indicators of both groups of patients were evaluated and the findings indicated that there was no remarkable discrepancy in IgA, IgG and IgM levels among both groups (P>0.05), indicating good comparability among both groups in terms of baseline immune function (Table 5). After corresponding treatment, the immune function of both groups of patients was improved to a certain extent. The analysis of both groups of data after treatment indicated that IgA, IgG and IgM levels in the MC group were (3.01 ± 0.14) g/L, (13.54 ± 1.99) g/L and (1.78 ± 0.10) g/L, respectively, while those in the MA group were (2.48 ± 0.19) g/L, (12.29 ± 1.96) g/L and (1.46 ± 0.14) g/L, respectively. The difference among both groups was statistically significant (P<0.05). This clearly indicates that compared to the MA group, the MC group has a more remarkable effect in improving the immune indicators levels in patients.

Clinical efficacy

The clinical efficacy of both groups was systematically evaluated and summarized in table 6. Conduct in-depth analysis on two sets of data based on pre-set efficacy evaluation criteria.

Table 1: Patient demographics and baseline disease characteristics ($\bar{x}$±s)

Parameter	MC group (*n*=75)	MA group (*n*=75)	95% CI		*Effect size*	t/x^2	*P*
			Lower	Upper			
Age (year)	65.28±5.67	64.92±5.69	-2.193	1.473	0.063	-0.388	0.699
Gender (male/female)	40/35	38/37	-	-	-	0.080	0.777
Height (year)	158.80±4.50	158.19±4.60	-2.078	0.858	0.137	-0.821	0.413
Weight (kg)	64.73±3.93	64.03±3.73	-1.936	0.536	0.182	-1.119	0.265
Body mass index (kg/m^2)	23.19±1.40	23.22±1.22	-0.394	0.454	0.023	0.140	0.889
Disease course (d)	4.67±2.60	4.64±2.18	-0.804	0.744	0.012	0.077	0.939
Hypertension (yes/no)	40/35	42/33	-	-	-	0.181	0.670
Diabetes (yes/no)	35/40	37/38	-	-	-	0.080	0.777
Smoking (yes/no)	57/18	55/20	-	-	-	0.237	0.626
Drinking alcohol (yes/no)	58/17	56/19	-	-	-	0.110	0.741
Temperature (℃)	36.31±0.40	36.34±0.39	-0.098	0.157	0.078	0.465	0.642
Breathing (breaths/min)	17.61±1.78	17.42±2.29	-0.852	0.472	0.093	-0.567	0.571
Heart rate (beat/min)	74.53±5.66	74.47±6.85	-2.088	1.968	0.009	-0.059	0.953
Systolic blood pressure (mmHg)	118.88±4.68	118.94±4.89	-1.484	1.604	0.013	0.077	0.939
Diastolic blood pressure (mmHg)	75.65±4.07	75.24±5.39	-2.083	1.263	0.089	-0.484	0.629

Table 2: TCMSS ($\bar{x}$±s, score)

Parameter	Time	MC group	MA group	95% CI		*Effect size*	*t*	*P*
				Lower	Upper			
Cough and sputum	Pre-treatment	2.55±0.35	2.48±0.46	-0.202	0.062	0.173	-1.049	0.296
	Post-treatment	0.77±0.45*	1.22±0.46*	0.303	0.597	0.970	6.056	<0.001
Fever and irritability	Pre-treatment	2.17±0.42	2.16±0.39	-0.141	0.121	0.025	-0.151	0.880
	Post-treatment	0.85±0.39*	1.24±0.43*	0.258	0.522	0.960	5.818	<0.001
Shortness of breath and nasal irritation	Pre-treatment	2.34±0.40	2.42±0.29	-0.034	0.194	0.228	1.386	0.168
	Post-treatment	0.79±0.49*	1.26±0.51*	0.309	0.631	0.960	5.755	<0.001
Facial redness and thirst	Pre-treatment	2.16±0.43	2.19±0.40	-0.104	0.164	0.073	0.442	0.659
	Post-treatment	0.81±0.44*	1.33±0.52*	0.365	0.675	1.09	6.611	<0.001

Note: "*" represents marked discrepancy compared with pre-treatment, *P*<0.05.

Table 3: Pulmonary function indicators ($\bar{x}$±s)

Parameter	Time	MC group	MA group	95% CI		*Effect size*	*t*	*P*
				Lower	Upper			
FVC (L)	Pre-treatment	2.34±0.41	2.37±0.36	-0.095	0.155	0.081	0.476	0.635
	Post-treatment	3.27±0.43*	2.74±0.39*	-0.662	-0.398	1.29	-7.907	<0.001
PEF (L/s)	Pre-treatment	2.77±0.67	2.78±0.61	-0.197	0.217	0.016	-0.096	0.924
	Post-treatment	5.56±1.38*	3.84±0.95*	-2.102	-1.338	1.52	-8.891	<0.001
MVV (L/min)	Pre-treatment	57.12±5.62	57.68±5.47	-1.230	2.350	0.101	0.618	0.537
	Post-treatment	69.23±6.22*	61.47±5.90*	-9.716	-5.804	1.290	-7.839	<0.001

Note: "*" represents marked discrepancy compared with pre-treatment, *P*<0.05.

Table 4: Inflammatory indicators ($\bar{x}$±s)

Parameter	Time	MC group	MA group	95% CI		*Effect size*	*t*	*P*
				Lower	Upper			
CRP (mg/L)	Pre-treatment	27.63±3.93	28.05±4.44	-0.933	1.773	0.105	0.613	0.541
	Post-treatment	6.59±1.04*	12.22±3.57*	4.782	6.478	2.060	13.112	<0.001
TNF-α (μg/L)	Pre-treatment	3.78±0.54	3.80±0.50	-0.148	0.188	0.039	0.235	0.814
	Post-treatment	0.85±0.30*	1.65±0.49*	0.669	0.931	2.020	12.059	<0.001
IL-6 (pg/mL)	Pre-treatment	17.86±2.72	17.27±3.64	-1.627	0.447	0.198	-1.124	0.263
	Post-treatment	7.06±2.29*	10.61±2.15*	2.833	4.267	1.620	9.788	<0.001

Note: "*" represents marked discrepancy compared with pre-treatment, *P*<0.05.

The findings indicated that the total effective rate of the MC group was 93.33% (70/75), while the total effective rate of the MA group was 84.00% (63/75). Statistical analysis was conducted on the total effective rates of both groups and the findings indicated that the difference among the groups was statistically remarkable (P<0.05). This findings clearly indicates that compared to the MA group, the treatment plan adopted by the MC group is more effective in improving the condition of elderly patients with recurrent pneumonia, promoting patient recovery more effectively and improving the overall clinical treatment effect.

Secondary results

Quality of life score

Before treatment, the quality of life scores of both groups were analyzed and the findings indicated that there was no statistically remarkable difference among both groups (P>0.05), indicating good comparability among both groups in terms of baseline quality of life status (Table 7). After treatment, the quality of life of both groups of patients was remarkably improved. The SF-36 scores of both groups were evaluated again, with the MC group scoring (94.06 ± 2.37) score and the MA group scoring (93.59 ± 2.31) score. At this point, independent sample t-test was used to analyze the two sets of data and the findings indicated no remarkable difference among both groups (P>0.05). This result indicates that both treatment regimens can remarkably improve the quality of life with recurrent pneumonia. Although the MC group has slightly higher scores than the MA group, statistically speaking, the both groups have similar effects in improving patients' quality of life. The findings indicated that under the conditions set in this study, there is no remarkable difference in the improvement of patients' quality of life between the two treatment methods.

Complications

In this study, the physical condition of both groups of patients during treatment was closely monitored and a systematic analysis was conducted on possible complications such as liver dysfunction and gastrointestinal inflammation. The specific results are summarized in table 8. After statistical analysis of the incidence of complications in the both groups, it was found that the incidence of complications in the MC group was 10.67% (8/75), while that in the MA group was 20% (15/75). There was no remarkable difference between the groups (P>0.05). This means that under the treatment conditions set in this study, the risk of complications such as liver dysfunction and gastrointestinal inflammation is similar between the two treatment regimens. In clinical practice, the occurrence of complications not only affects the patient's treatment experience, but may also interfere with the treatment process and delay recovery time. The findings indicated that the two treatment options perform equally well in terms of safety, providing important reference for subsequent clinical decision-making. When considering treatment options, there is no need to overly worry about a certain group of options remarkably increasing the risk of complications and more comprehensive selection can be made based on other efficacy indicators and individual patient conditions.

Incidence of adverse reactions

In this study, the physical reactions of both groups of patients during treatment were closely monitored and the occurrence of adverse reactions such as nausea was recorded in detail. The specific data is summarized in table 9. During the treatment process, the adverse reactions incidence in the MC group was 12.00% (9/75), while the MA group was 21.33% (16/75). According to statistical analysis, the incidence of adverse reactions both groups indicated no remarkable difference (P>0.05). This indicates that under the established treatment conditions in this study, the risks and manifestations of adverse reactions such as nausea are similar between the two treatment regimens.

DISCUSSION

Recurrent pneumonia in the elderly seriously affects their health and quality of life. As they age, the immune system function of the elderly gradually declines and the defense ability of the respiratory mucosa decreases, leading to a remarkable increase in their susceptibility to pathogens (Ocrospoma and Restrepo, 2024). At the same time, the elderly are often associated with a variety of chronic basic diseases, such as diabetes, which further weaken the immune function of the body and the defense mechanism of the lungs, leading to repeated attacks of pneumonia. Recurrent pneumonia not only causes damage to lung tissue, but may also lead to serious complications such as respiratory failure, septic shock and even life-threatening situations (Huang *et al.*, 2024; Tang *et al.*, 2022).

In modern medical treatment, anti-infection is the core link. Penicillins, cephalosporins and other antibiotics are commonly used for bacterial infections. But there are obvious limitations. The widespread use of antibiotics can easily lead to increased pathogen resistance, poor efficacy and even affect the already fragile digestive function of the elderly, causing adverse reactions such as diarrhea and abdominal distension (Cabellos *et al.*, 2022). In addition, expectorant drugs can only alleviate symptoms and cannot solve the root cause of pneumonia recurrence. Some drugs may also cause side effects such as palpitations and hand tremors, posing potential risks to elderly people with cardiovascular disease. Traditional Chinese medicine believes that pneumonia in the elderly is related to factors such as poor qi circulation, inflammation caused by deficiency fire and weak constitution and the treatment methods also have their own focuses (Dan *et al.*, 2022).

Table 5: Immune indicators ($\bar{x}$±s, g/L)

Parameter	Time	MC group	MA group	95% CI		*Effect size*	*t*	*P*
				Lower	Upper			
IgA	Pre-treatment	2.28±0.18	2.29±0.19	-0.050	0.070	0.059	0.331	0.741
	Post-treatment	3.01±0.14*	2.48±0.19*	-0.584	-0.476	3.190	-19.448	<0.001
IgG	Pre-treatment	10.04±2.15	10.08±1.97	-0.625	0.705	0.019	0.119	0.906
	Post-treatment	13.54±1.99*	12.29±1.96*	-1.887	-0.613	0.620	-3.876	<0.001
IgM	Pre-treatment	1.30±0.19	1.31±0.18	-0.050	0.070	0.054	0.331	0.741
	Post-treatment	1.78±0.10*	1.46±0.14*	-0.359	-0.281	2.650	-16.108	<0.001

Note: "*" represents marked discrepancy compared with pre-treatment, $P<0.05$.

Table 6: Clinical efficacy analysis [*n* (%)]

Group	Obvious effect (*n*)	Effective (*n*)	Ineffective (*n*)	Total effective rate (*n*, %)
MC group	35	35	5	70 (93.33)
MA group	30	33	12	63 (84.00)
x^2		3.979		
P		<0.05		

Table 7: SF-36 scores ($\bar{x}$±s, score)

Time		MC group	MA group	95% CI		*Effect size*	*t*	*P*
				Lower	Upper			
Pre-treatment		83.33±3.11	83.04±3.28	-1.321	0.741	0.091	-0.556	0.579
Post-treatment		94.06±2.37	93.59±2.31	-1.225	0.285	0.202	-1.230	0.221
95% CI	Lower	9.838	9.635					
	Upper	11.622	11.465					
Effect size		3.870	3.580					
t		23.765	22.774					
P		<0.001	<0.001					

Table 8: Complications [*n* (%)]

	MC group	MA group	x^2	*P*
Liver dysfunction	1 (1.33)	2 (2.66)	1.020	0.312
Gastrointestinal inflammation	2 (2.66)	3 (4.00)	0.148	0.700
Pharyngitis	1 (1.33)	2 (2.66)	1.020	0.312
Abnormal renal function	1 (1.33)	2 (2.66)	1.020	0.312
Rash	1 (1.33)	2 (2.66)	1.020	0.312
Fever	2 (2.66)	4 (5.33)	0.521	0470
Total incidence rate	8 (10.67)	15 (20.00)	3.092	0.079

Table 9: Adverse reactions [*n* (%)]

	MC group	MA group	x^2	*P*
Nausea	1 (1.33)	2 (2.66)	1.020	0.312
Vomiting	1 (1.33)	2 (2.66)	1.020	0.312
Diarrhea	1 (1.33)	2 (2.66)	1.020	0.312
Abdominal pain	1 (1.33)	1 (3.33)	0.000	1.000
Loss of appetite	1 (1.33)	1 (3.33)	0.000	1.000
Dizziness	1 (1.33)	2 (2.66)	1.020	0.312
Headache	1 (1.33)	2 (2.66)	1.020	0.312
Fatigue	1 (1.33)	2 (2.66)	1.020	0.312
Constipation	1 (1.33)	2 (6.67)	1.020	0.312
Total incidence rate	9 (12.00)	16 (21.33)	2.940	0.086

For example, Yinhua Pinggan granules have the effects of dispelling surface cold, warming the lungs and promoting diuresis and are suitable for acute pneumonia of alveoli and distal bronchi caused by bacterial, viral or other pathogenic microorganisms (Jiaoli Wang *et al.*, 2025). Ma Xing Shi Gan Tang can promote lung function, relieve asthma, clear heat and detoxify and is commonly used for diseases such as pneumonia and asthma. However, the efficacy of traditional Chinese medicine prescriptions is relatively slow to take effect, making it difficult to quickly control the progression of infection in critically ill elderly patients with recurrent pneumonia, which may delay the timing of treatment (Jieyu *et al.*, 2021).

Based on the above limitations, this study adopted an integrated traditional Chinese and Western medicine treatment regimen of "Ma Xing Shi Gan Tang+Azithromycin". Ma Xing Shi Gan Tang, as a classic traditional Chinese medicine formula, has remarkable effects in promoting lung function, clearing heat, relieving cough and asthma. Modern research has also shown that this formula has anti-inflammatory and immune regulating effects and can effectively improve the inflammatory state of the lungs (An *et al.*, 2023). Azithromycin belongs to the macrolide antibiotic class and has good antibacterial activity against common pneumonia pathogens, playing a key role in controlling infections (Leroy *et al.*, 2021). On this basis, this study further supplemented with *Cistanche deserticola, Schisandra chinensis and Cornus officinalis. Cistanche deserticola* has the effects of tonifying kidney yang and nourishing essence and blood, which helps to improve the overall function of the body and enhance resistance (Liu *et al.*, 2025). *Schisandra chinensis* is rich in various active ingredients, such as flavonoids, saponins, polysaccharides, etc. It can regulate the function of immune cells, enhance the body's resistance to pathogenic microorganisms and maintain immune balance by regulating cytokine levels (Ehambarampillai and Wan, 2025). *Cornus officinalis* also has immunomodulatory and antioxidant effects. When combined with *Schisandra chinensis*, it can further enhance the body's immune regulatory ability and improve the recurrent pneumonia caused by immune dysfunction in elderly patients (Deng *et al.*, 2024). Through this combination of traditional Chinese and Western medicine and the addition of specific Chinese herbal medicines, it is expected to open up a new path for the treatment of recurrent pneumonia in the elderly and bring better clinical efficacy to patients.

In this study, there was no noticeable discrepancy in baseline characteristics among both groups, which provides a reliable basis for comparing treatment effects in the future and ensures the comparability of the study. In terms of TCMSS, both groups were at similar levels pre-treatment and the scores of both groups remarkably decreased post-treatment, with the MC group being below in the MA group (P<0.05). Traditional Chinese medicine believes that recurrent pneumonia in the elderly is often caused by deficiency of vital energy, invasion of external pathogens and the accumulation of phlegm and blood stasis in the lungs (Li *et al.*, 2025). The MC group may have enhanced the body's positive qi by tonifying kidney yang and nourishing essence and blood with *Cistanche deserticola* and by tonifying the lungs and cough with *Schisandra chinensis*, nourishing qi and generating fluids, regulating the lung's function of promoting blood circulation and reducing blood pressure. *Cornus officinalis* also nourishes the liver and kidneys, further improving the overall physical condition. These three traditional Chinese medicines, combined with Ma Xing Shi Gan Tang, effectively improved patients' traditional Chinese medicine symptoms such as cough, sputum production, fever and irritability, resulting in a more remarkable decrease in TCMSS scores. Guo *et al (2018)*. found in their study on the treatment of emergency ventilator-associated pneumonia patients with conventional Western medicine combined with Qingqi Liangying decoction nasal feeding that this combination therapy can remarkably reduce the total score of traditional Chinese medicine syndromes and sub scores of tongue, pulse, symptoms and signs (P<0.05). After treatment, the scores of various traditional Chinese medicine syndromes in the experimental group were remarkably below in the control group treated with conventional Western medicine alone (P<0.05). This is consistent with the results of reducing TCMSS in the MC group in this study, indicating that the combination of traditional Chinese and Western medicine has common advantages in improving TCM syndromes in patients with lung diseases. That is, through the synergistic effect of TCM syndrome differentiation and Western medicine targeted intervention, the clinical symptoms of patients can be more comprehensively alleviated and the syndrome score can be reduced.

In terms of lung function indicators, the both groups were similar pre-treatment, but both indicated improvement after treatment, with the MC group being higher than the MA group (P<0.05). The active ingredients in *Cistanche deserticola* may improve blood circulation in the lungs, provide more sufficient nutrients for lung tissue and promote the recovery of lung function (S Jiang *et al.*, 2024). *Schisandra chinensis* can regulate immunity, reduce lung inflammation and damage to lung tissue, thereby improving lung ventilation function (Luan *et al.*, 2024). The antioxidant effect of *Cornus officinalis* may alleviate the damage of oxidative stress to alveoli and airways. Ma Xing Shi Gan Tang and Azithromycin themselves have therapeutic effects on pulmonary inflammation. On this basis, the addition of three traditional Chinese medicines makes the MC group more effective in improving lung function indicators such as FVC, PEF and MVV. It is found in a systematic review and meta-analysis on the treatment of stable chronic obstructive pulmonary disease with Qingjin Huatan Tang (QJHTD) that using QJHTD as an

adjuvant therapy for standard treatment can remarkably improve patients' lung function. Compared with standard treatment alone, the combination of QJHTD treatment remarkably increased the first second forced expiratory volume (FEV1), forced vital capacity (FVC) and FEV1/FVC of patients, without increasing the incidence of adverse reactions (Du *et al.*, 2025). This is consistent with the results of the MC group improving lung function in elderly patients with recurrent pneumonia in this study, indicating that traditional Chinese medicine adjuvant therapy has a common positive effect in improving lung function and enhancing clinical efficacy in patients with lung diseases. That is, traditional Chinese medicine can synergistically improve the pathological status of the lungs in multiple dimensions with good safety.

In terms of inflammation and immune indicators, the both groups were comparable pre-treatment. After treatment, the inflammatory state was relieved and the immune indicators were improved. The improvement effect of MC group was superior to MA group (P<0.05). Cistanche deserticola, Schisandra chinensis and Cornus officinalis may reduce the release of inflammatory factors by regulating immune cell function. Schisandra chinensis can inhibit the production of inflammatory factors such as TNF-α, thereby reducing lung inflammation. Simultaneously promoting T lymphocyte proliferation, regulating immune function and improving the body's immunity. Ma Xing Shi Gan Tang itself has the effects of clearing heat, purging fire, relieving cough and asthma and can alleviate lung heat symptoms and reduce inflammation. Azithromycin targets pathogens to control infections and reduce the source of inflammation. The combination of the three resulted in the MC group being superior to the MA group in reducing inflammatory indicators such as CRP, TNF-α, IL-6 and increasing levels of IgA, IgM and IgG. A clinical study on the combined treatment of traditional Chinese and Western medicine for severe acute pancreatitis associated acute lung injury/acute respiratory distress syndrome showed that the combination therapy can significantly improve the inflammatory indicators of patients (Han *et al.*, 2025). After treatment, the levels of $CD4^+$, $CD4^+/CD8^+$, IgA and IgM in the observation group increased compared to pre-treatment and were remarkably higher than those in the control group treated with conventional Western medicine alone (P<0.05). In terms of inflammatory indicators, the CRP, TNF-α and IL-8 levels in the observation group decreased compared to pre-treatment and were remarkably below in the control group (P<0.05) This is consistent with the results of the MC group in this study, which indicated an increase in immune function (IgA, IgM, IgG levels) and a decrease in inflammatory markers (CRP, TNF-α, IL-6 levels), indicating that the combined therapy of traditional Chinese and Western medicine has a similar positive effect in regulating immune function and reducing inflammatory response in elderly pneumonia patients. That is, through the synergy of traditional Chinese medicine and Western medicine, multi-target improvement of the body's immune status and inflammatory microenvironment can be achieved, thereby enhancing the therapeutic effect.

Based on the comprehensive factors mentioned above, the clinical efficacy of the MC group was above to the MA group. This is the advantage of the MC group in improving traditional Chinese medicine syndromes, lung function, reducing inflammatory indicators and enhancing immune function, which together promote the improvement of clinical efficacy and more effectively alleviate the condition of elderly patients with recurrent pneumonia.

In terms of quality of life, both groups indicated remarkable improvement after treatment, with the MC group being higher than the MA group, but the difference was not remarkable. Perhaps due to the advantages of the MC group in improving the overall health status of patients, including reducing symptoms, enhancing lung function and immune function, the quality of life of patients in terms of physiological function and other dimensions has been improved. However, due to various factors affecting the quality of life and remarkable individual differences, the difference among both groups did not reach a remarkable level. In terms of the incidence of complications and adverse reactions, the MC group was below in the MA group, but the difference was not remarkable. This indicates that the MC treatment regimen incorporating Cistanche deserticola, Schisandra chinensis and Cornus officinalis in this study also has good safety and may have reduced the occurrence of complications and adverse reactions to some extent due to the regulatory effect of traditional Chinese medicine. However, due to limitations in sample size and other factors, no remarkable differences were observed.

This study still has certain limitations. Firstly, the observation period of the study is relatively short and the treatment stage and follow-up period are also relatively short. However, the risk of recurrence in elderly patients with recurrent pneumonia may exist in the long term and the sustained immune regulatory effects of *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* after discontinuation, as well as the long-term recurrence rate of pneumonia, are not yet clear. Secondly, the research subjects are all from a single medical institution and there may be limitations in the geographical distribution and underlying disease composition of the sample. Therefore, caution should be exercised when extrapolating the results to other elderly populations (such as patients with other comorbidities). Although multiple immune and inflammatory indicators were tested in this study, there is a lack of in-depth exploration of the synergistic mechanism of "*Cistanche deserticola Schisandra chinensis Cornus officinalis*", such as its impact on gut lung axis microbial metabolites, which may limit the judgment on the direction

of optimizing traditional Chinese medicine compatibility. In addition, the study did not set up intervention groups with different doses of traditional Chinese medicine combinations, which makes it challenging to identify the optimal compatibility ratio of the three components and comprehensively evaluate their clinical advantages. This study considered the differences in adverse events among individuals and only recorded the occurrence of adverse events. No further severity grading or causal relationship assessment was conducted and no comparison was made with standardized pharmacovigilance standards. This study belongs to exploratory analysis and did not use multiple comparison correction. The conclusion needs to be confirmed through subsequent confirmatory studies. The study did not include smoking and alcohol consumption factors in the multivariate analysis model to control for their potential confounding effects, which may lead to confounding bias in the evaluation of certain effects. Subsequent studies can extend the follow-up period and explore the long-term immune regulatory effect and recurrence rates of *Cistanche deserticola, Schisandra chinensis and Cornus officinalis* on recurrent pneumonia in the elderly. Expand the sample source to multiple centers, include a wider population to improve the extrapolation of results and set different Chinese medicine dosage groups to clarify the optimal compatibility ratio and mechanism of action, enhance the accuracy of results and provide more sufficient basis for optimizing treatment plans.

CONCLUSION

This study compared and analyzed the synergistic immune regulatory effects of MC group and MA group in the treatment of elderly recurrent pneumonia by adding "*Cistanche deserticola, Schisandra chinensis and Cornus officinalis*" and adding three traditional Chinese medicines, providing scientific reference for optimizing clinical treatment plans. The findings indicated that the MC group had remarkable advantages in reducing TCMSS, improving lung function, alleviating inflammatory status, enhancing immune function and improving clinical efficacy. At the same time, they indicated comparable performance in improving quality of life, controlling complications and adverse reactions. However, the study has limitations such as a short follow-up period, single sample source and failure to explore the optimal dosage of traditional Chinese medicine. In the later stage, multi center, large sample, long-term follow-up clinical studies need to be conducted to further verify the efficacy of different populations and to combine molecular biology techniques to analyze the synergistic mechanism of traditional Chinese medicines, thereby fully verify its clinical value and optimize treatment strategies.

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Authors' contribution
Yuhan Zhang: Developed and planned the study, performed experiments and interpreted results. Edited and refined the manuscript with a focus on critical intellectual contributions. Provided substantial intellectual input during the drafting and revision of the manuscript.; Jinying Liu: Participated in collecting, assessing and interpreting the data. Made significant contributions in the interpretation and manuscript preparation.

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Data availability statement
The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethical approval
This study strictly follows international medical research ethics guidelines such as the Helsinki Declaration and all research processes comply with international standard ethical approval requirements. It has been reviewed and approved by the Ethics Chengde Medical University, with ethics approval number YZ-20230608.

Conflict of interest
The authors declare that they have no conflicts of interest.

Consent to participate
We secured a signed informed consent form from every participant.

REFERENCES

An X, Shi C, Han Y, Li X, Dong L, Li Y, Chen H, Wang Y, Li J and Liu G (2023). The rational dose for MaXingShiGan decoction is crucial for its clinical effectiveness in treating bronchial pneumonia: three randomized, double-blind, dose-parallel controlled clinical studies. *Front. Pharmacol.,* **14**: 1279519.

Avdeev S, Dekhnich A, Zaytsev A, Kozlov R, Rachina S, Rudnov V, Sinopal'nikov A, Tyurin I, Fesenko O and Chuchalin A (2022). Federal guidelines on diagnosis and treatment of community-acquired pneumonia. *Pulmonologiya.,* **32**(3): 295-355.

Cabellos C, Guillem L, Pelegrin I, Tubau F, Ardanuy C, Gudiol F, Ariza J and Viladrich PF (2022). Penicillin- and cephalosporin-resistant pneumococcal meningitis: treatment in the real world and in guidelines. *Antimicrob. Agents. Ch.,* **66**(12): e00820-00822.

Chebib N, Cuvelier C, Malézieux-Picard A, Parent T, Roux

X, Fassier T, Müller F and Prendki V (2021). Pneumonia prevention in the elderly patients: The other sides. *Aging. Clin. Exp. Res.,* **33**(4): 1091-1100.

Chen B (2021). Effect of modified maxing shigan decoction combined with ambroxol hydrochloride on traditional chinese medicine syndrome scores in elderly patients with severe pneumonia of phlegm-heat obstructing the lungs type. *Chin. J. Disaster Med.,* **37**(3): 121-123.

Chen B, Liu W, Chen Y, She Q, Li M, Zhao H, Zhao W, Peng Z and Wu J (2021). Effect of poor nutritional status and comorbidities on the occurrence and outcome of pneumonia in elderly adults. *Front. Med.,* **8**: 719530.

Chen L, Huang H and Chen X (2021). Distribution of pathogens in elderly chinese patients with pneumonia: A systematic review and meta-analysis. *Front. Med.,* **8**: 584066.

Cheng N, Wang H, Hao H, Rahman FU and Zhang Y (2023). Research progress on polysaccharide components of Cistanche deserticola as potential pharmaceutical agents. *Eur. J. Med. Chem.,* **245**: 114892.

Chojin Y, Kato T, Noguchi S, Rikihisa M, Omori M, Mukae H and Yatera K (2021). Evaluating a novel swallowing assessment as a predictor of mortality and recurring pneumonia in elderly patients with pneumonia. *Respir. Investig.,* **59**(6): 783-791.

Dan W, Wu C, Xue C, Liu J, Guo X and Lian Y (2022). Rules of Chinese herbal intervention of radiation pneumonia based on network pharmacology and data mining. *Evid Based Compl Alt.,* **2022**(1): 7313864.

Deng W, Liu Y, Guo Y, Chen J, Abdu HI, Khan MR, Palanisamy C P, Pei J and Abd El-Aty A (2024). A comprehensive review of Cornus officinalis: Health benefits, phytochemistry and pharmacological effects for functional drug and food development. *Front. Nutr.,* **10**: 1309963.

Du X, Li Y, Wang J, Jiang Y, Liu Y, Zhang D, Wu Q and Long S (2025). Effect of Qingjin Huatan decoction on pulmonary function and inflammatory mediators in stable chronic obstructive pulmonary disease: A systematic review and meta-analysis. *Plos One,* **20**(5): e0322779.

Ehambarampillai D and Wan MLY (2025). A comprehensive review of Schisandra chinensis lignans: Pharmacokinetics, pharmacological mechanisms and future prospects in disease prevention and treatment. *Chin. Med.,* **20**(1): 47.

Gao X, Liu Y, An Z and Ni J (2021). Active components and pharmacological effects of Cornus officinalis: Literature review. *Front. pharmacol.,* **12**: 633447.

Guo F, Zhang S and Yin X (2018). Effect of routine treatment of western medicine combined with nasal feeding of qingqi liangying decoction on inflammatory reaction, pulmonary function and TCM syndrome score in emergency patients with ventilator-associated pneumonia. *J. Clin. Med. Pract.,* **22**(7): 45-52.

Han X, Zhang M, Dou C, Shan L and Ni Q (2025). Assessment of the efficacy of Chinese herbal medicine combined with western medicine for treating severe acute pancreatitis-related acute lung injury/acute respiratory distress syndrome: A systematic review and meta-analysis based on randomized controlled trials. *Front. Pharmacol.,* **16**: 1551652.

Huang S, Chen L, Yang N, Zhang J, Wang Y and Chen X (2024). Relationships between human serum albumin levels and septic shock, in-hospital and out-of-hospital mortality in elderly patients with pneumonia in different BMI ranges. *Pneumonia,* **16**(1): 17.

Ji R, Wang Z and Kuang H (2024). Extraction, purification, structural characterization and biological activity of polysaccharides from Schisandra chinensis: A review. *Int. J. Biol. Macromol.,* **271**: 132590.

Jiang H, Zheng X, Zeng Y, Ma Y and Peng W (2021). Randomized controlled trial and Meta-figanalysis of the therapeutic effect of Maxing Shigan decoction combined with azithromycin on *Mycoplasma pneumoniae* pneumonia in children. *Chin. Pediatr. of Integr. Tradit. Western Med.,* **13**(2): 131.

Jiang S, Cui Y, Wang B, Fu Z and Dong C (2024). Acidic polysaccharides from Cistanche deserticola and their effects on the polarization of tumor-associated macrophages. *Int. J. Biol. Macromol.,* **282**: 137207.

Jieyu Z, Chulhun P, Chen KJY, Araci BCN, Doschak M and Raimar L (2021). Traditional Chinese medicine "pill", an ancient dosage form with surprising modern pharmaceutical characteristics. *Pharm. Res.,* **38**(2): 199-211.

Kanlioglu Kuman N, Kozaci LD, Sen S, Senturk E, Cokpinar S, Yaman E, Kilicaslan N and Karadag F (2021). Prognostic significance of inflammatory markers IL-6, sP-selectin, TNF-α, BNP-32 and procalcitonin levels in thoracic surgery. *Indian J. Surg.,* **83**(3): 740-748.

Khusainova MA, Ergashova MM, Eshmamatova FB and Khayitov SM (2023). Features of quality of life indicators in patients with pneumonia. *Sci. Ed.,* **4**(2): 138-144.

Kopustinskiene DM and Bernatoniene J (2021). Antioxidant effects of *Schisandra chinensis* fruits and their active constituents. *Antioxidants,* **10**(4): 620.

Leroy A G, Caillon J, Caroff N, Broquet A, Corvec S, Asehnoune K, Roquilly A and Cremet L (2021). Could azithromycin be part of *Pseudomonas aeruginosa* acute pneumonia treatment? *Front. Microbiol.,* **12**: 642541.

Li J, Wang M, Zhao P, Han W, Xie Y, Zhang H, Yang J, Wu L, Luo G and Xue X (2025). Efficacy of traditional chinese medicine in reducing readmission in elderly patients with community-acquired pneumonia. *J. Ethnopharmacol.,* **349**: 119970.

Liu X, Yang Z, Han M, Zhang Y, Muhammad H, Zhong H and Guan R (2025). Bioactive components, pharmacological properties and applications of *cistanche deserticola* YC Ma: A comprehensive review. *Nutrients,* **17**(9): 1501.

Luan F, Zou J, Zhang X, Zeng J, Peng X, Li R, Shi Y and Zeng N (2024). The extraction, purification, structural features, bioactivities and applications of *Schisandra chinensis* polysaccharides: A review. *Int. J. Biol. Macromol.,* **262**: 130030.

Ocrospoma S and Restrepo MI (2024). Severe aspiration pneumonia in the elderly. *J. Intensive Med.,* **4**(03): 307-317

Orders M (2021). Antibacterial drugs for community-acquired pneumonia. *Med. Lett. Drugs. Ther.,* **63**(1616): 10-14.

Osman M, Manosuthi W, Kaewkungwal J, Silachamroon U, Mansanguan C, Kamolratanakul S and Pitisuttithum P (2021). Etiology, clinical course and outcomes of pneumonia in the elderly: A retrospective and prospective cohort study in Thailand. *Am. J. Trop. Med. Hyg.,* **104**(6): 2009.

Stogova N (2023). Features of clinical and morphological manifestations of pneumonia complicated by exudative pleuritis in senile patients. *Pulmonologyiya,* **33**(3): 350-356.

Tang H, Yuan Z, Li J, Wang Q and Fan W (2022). The application of ambroxol hydrochloride combined with fiberoptic bronchoscopy in elderly patients with severe pneumonia: A meta-analysis and systematic review. *Medicine,* **101**(4): e28535.

Wang J, Hu H, Guo Y, Han J, Wan H, Tong Y, Luo M and Li X. (2025). Effectiveness of Yinhua Pinggan granules in community-acquired pneumonia: A randomized, double-blind clinical trial. *Front. Pharmacol.,* **16**: 1446319.

Wang J, Sun R, Si D, Guo M, Zhang L, Sun Y, Gao X and Gao R (2024). Clinical practice guidelines of Chinese patent medicine in China: A critical review. *Complement. Ther. Med.,* **85**: 103077.

Xi S, Li Y, Yue L, Gong Y, Qian L, Liang T and Ye Ya (2020). Role of traditional Chinese medicine in the management of viral pneumonia. *Front. Pharmacol.,* **11**: 582322.

Yao W, Wang W, Tang W, Lv Q and Ding W (2023). Neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR) and systemic immune inflammation index (SII) to predict postoperative pneumonia in elderly hip fracture patients. *J. Orthop. Surg. Res.,* **18**(1): 673.

Zhang H, Zhou W, Wang X, Tong G, Dong L, Wang X and Liu X (2020). Henoch-Schonlein purpura nephritis and their effects on immune function and prognosis of patients. *Int. J. Clin. Exp. Med.,* **13**(2): 1269-1276.

Zhao L, Chen J and Zhu R (2023). The relationship between frailty and community-acquired pneumonia in older patients. *Aging. Clin. Exp. Res.,* **35**(2): 349-355.