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**Research Article****Pattern Type and Treatment Rules of Modern Medical Records for Bronchial Asthma Based on Data Mining****Piaoqin Cheng¹, Xuan Gong^{2,*} Bihai Zhang³**

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Abstract

Objective: To explore the rules of pattern type and treatment of bronchial asthma (asthma) treated with Chinese materia medica (CMM) in modern medical records through the "Traditional Chinese Medicine Inheritance Support System (V2.5)", to provide data reference and ideas for the clinical use of CMM in the treatment of asthma. **Methods:** A retrospective study was conducted to search the literature on CMM treatment of asthma in China National Knowledge Infrastructure, Wanfang Database, and VIP database from January 1, 2000, to December 31, 2021. The asthma medical records that met the inclusion criteria were standardized and collated into Word documents to create an asthma medical record database, then entered into the TCMISS. Clustering, frequency, and association rules were used to analyze the rules of pattern type and treatment, and to explore potential new formulas for asthma treatment. **Results:** A total of 124 articles were included, 147 medical records were collected, and a total of 220 CMMs were used. The main pattern types were lung-kidney vacuity, heat wheezing, phlegm-heat lying depressed in the lung, and cold wheezing. The main treatment methods were transforming phlegm and calm panting, dispelling wind and transforming phlegm, depressing Qi and relieving asthma, and clearing heat and transforming phlegm. The high frequency for the treatment of asthma is mainly for the cough-suppressing panting-calming category, including *Radix Glycyrrhizae* (RG), *Herba Ephedrae* (HE), *Semen Armeniacae* (SA), *Rhizoma Pinelliae* (RP), etc. The four natures of drugs are mainly warm and cold, the five flavors of drugs are mainly acrid, bitter, and sweet, and the channel tropism of drugs is mainly the lung channel, spleen channel, and stomach channel. The core medicine pairs for the treatment of asthma were mainly HE-RG, SA-HE, RG-SA, and RP-HE, and 15 new formulas were found through cluster analysis. **Conclusion:** CMM treats asthma should adopt mainly

panting-calming medicinal while using warm properties medicines simultaneously. The treatment is based on the lung and spleen.

Key words: Bronchial asthma; Chinese materia medica; Rules of pattern type and treatment.

Introduction

Bronchial asthma (asthma) is a chronic airway inflammatory disease involving a variety of cells and cell components. The main clinical manifestations are wheezing, shortness of breath, chest tightness, cough, etc., accompanied by airway hyperresponsiveness and reversible airflow limitation (1). Relevant data show that (2) the prevalence of adult asthma in mainland China is high, and there is an increasing trend year by year. According to the "Chinese Adult Lung Health Study", the prevalence of asthma in Chinese people aged 20 years and above was 4.2%, with a total of 45.7 million patients. Glucocorticoids are the first choice for the treatment of asthma in modern medicine (3). However, long-term use of hormones can lead to significant adverse reactions which can bring physical and psychological damage to patients, there is an urgent need for a new treatment modality.

Chinese materia medica (CMM) is effective in the treatment of asthma, with few adverse reactions, and has certain advantages in improving symptoms and reducing recurrence (4). In the clinical observation of Peng Yanxian et al. (5) in the treatment of children with asthma, the treatment effect of Ginseng-Schisandrae Decoction (ren shen wu wei zi tang) combined with budesonide aerosol inhalation is more ideal than that of budesonide aerosol inhalation alone, and it can also improve the immune function of children to the disease and the level of T lymphocytes. Chen Haihua (6) found that the treatment of CMM significantly relieved the symptoms of asthma, but also improved the ventilation function, significantly inhibited the inflammatory response of the respiratory tract, and improved immunity. Tan Fang et al. (7) showed that

Center-Supplementing Qi4-Boosting Decoction (bu zhong yi qi tang) combined with conventional western medicine in the treatment of asthma can improve the symptoms and inflammatory factor levels of patients, reduce the times of waking up at night, and improve lung function.

Modern doctors have rich experience in the treatment of asthma with CMM and have accumulated a certain number of medical records. Professor Wang Peng (8) believes that in the treatment of asthma, we should pay attention to the combination of Viscera Syndrome Differentiation and Differentiation of Eight Principles, and use addition and subtraction of Zhixiao Pingchuan Decoction to depress Qi and relieve asthma, Clearing heat and transforming phlegm to treat asthma of pattern of phlegm-heat congesting the lung. Professor Xu Yanling (9) summarized the view of "In the attack stage, the lung was treated as well as the kidney, and in the remission stage, the kidney was treated as well as the lung". Wu Yingen (10) believed that yang2 vacuity with exuberant cold runs through all stages of wheezing, so in the treatment, yang2 vacuity with the exuberant cold is often started and good effects are obtained. The above doctors have their unique views on asthma, but there are few summaries of the rules of asthma of pattern type and formula. Through the data mining of modern medical records of asthma, through frequency analysis, association rule analysis, and cluster analysis, the rules of TCM treatment of asthma were summarized, to provide treatment ideas for TCM treatment of asthma.

1. Materials and Methods

1.1 Data sources

The Chinese National Knowledge Infrastructure (CNKI), Wanfang database and VIP database were searched for the medical records of asthma treated with traditional Chinese medicine in the past 20 years.

1.2 Literature inclusion and exclusion criteria

Inclusion criteria: In the medical records, asthma was diagnosed in western medicine, and wheezing was diagnosed in TCM; the symptoms, diagnosis, pattern type, treatment, and formula of medical records were completely recorded. TCM treatment is mainly based on oral Chinese medicine decoction and its curative effect is remarkable.

Exclusion criteria: Research progress, review, animal model, current situation analysis, pharmacological research.

1.3 Chinese Medicine data specification

According to the *Chinese materia medica* (9th edition), "processed *Radix Glycyrrhizae* (RG), raw RG and powdered RG" are classified as RG. "*Rhizoma Pinelliae Preparatum*" is classified as *Rhizoma Pinelliae* (RP); "honey-fried *Herba Ephedrae* (HE) and raw HE" are classified as HE; "ophiopogon and *Liriope spicata* Lour" are classified as *Radix Ophiopogonis*; "stir-fried white *atractylodes*" is classified as *Rhizoma Atractylodis Macrocephalae*; "Coral *Ardisia*" is classified as *Herba Ardisiae Japonicae*; "*Trichosanthes rind*" was classified as *Fructus Trichosanthis*; "*Perilla seeds*" is classified as *Fructus Perillae* (FP); "cooked aconite and raw aconite" are classified as *Radix Aconiti Lateralis Preparata*; "*Xianlingpi*" is classified as *Herba Epimedii*. Cicada molting is classified as *Periostracum Cicadae* (PC).

1.4 Data entry and analysis

The "TCMISS (V2.5)" was used as the analysis tool. Frequency statistics, association analysis, and cluster analysis were used to explore the rules of pattern type and treatment in medical records and dig out new formulas for asthma treatment.

2. Results

2.1 Literature Screening

A total of 2301 papers were retrieved in the database according to the retrieval formula, 534 papers in CNKI, 1722 papers in the Wanfang database, 45 papers in VIP, and 1847 papers were left after introducing EndNote2.0 to remove duplicates. The paper that did not meet the inclusion criteria were deleted by reading titles and abstracts, and the uncertain ones were read in full text. Finally, 124 papers were included, 147 medical records and 147 formulas were collected.

2.2 Frequency analysis of pattern type and treatment methods in medical records.

A total of 147 medical records were collected, including 50 pattern types and 95 treatments for asthma (Tables 1 and 2).

2.3 Frequency analysis of CMM, four natures, five flavours, and channel tropism.

A total of 147 medical records and 147 formulas were collected, a total of 220 Chinese herbs were used, and the total frequency was 2089 times (Tables 4, 5, 6, and 7).

2.4 Analysis of drug pairs and association rules

In the TCMISS software, data analysis was selected, formulas for asthma treatment were queried, and formula rules were analyzed. The "support" was set as 30, and the "confidence" was set as 0.8. A total of 30 medicine pairs were obtained, including 13 CMM. There are 13 groups with confidence coefficients greater than or equal to 0.8 (Tables 7 and 8).

2.5 New formulas by data mining

Hierarchical cluster analysis was performed on the formulas for asthma treatment. With the "correlation degree" set to 9 and the "punishment degree" set to 5, a total of 15 new formulas were excavated (Table 9).

Table 1. Asthma common pattern types statistics.

Serial number	Pattern type	Frequency (times)	Frequency (%)
1	lung-kidney vacuity	18	10.06
2	Heat wheezing	16	8.94
3	phlegm-heat lying depressed in the lung	11	6.15
4	cold wheezing	11	6.15
5	the pattern of wind phlegm obstructing the lung	10	5.59
6	wind-cold assailing the lung	10	5.59
7	the pattern of phlegm turbidity obstructing the lung	10	5.59
8	wind phlegm pattern	7	3.91
9	cold rheum lying latent in the lung	7	3.91
10	spleen-lung vacuity	6	3.35

Table 2. Common treatments for asthma.

Serial number	Method of treatment	Frequency (times)	Frequency (%)
1	transform phlegm and calm panting	34	11.64
2	dispel wind and transform phlegm	22	7.53
3	depressing Qi and relieving asthma	17	5.82
4	clear heat and transform phlegm	17	5.82
5	cough-suppressing panting-calming	14	4.79
6	enrich the lung and kidney	12	4.11
7	diffuse the lung and calm panting	9	3.08
8	clearing lung and eliminating phlegm	7	2.40
9	supplement the kidney to promote qi4 absorption	6	2.05
10	clearing heat and freeing lung	6	2.05

Table 3. Top 20 high-frequency CMM for asthma treatment.

Serial number	CMM	Frequency(times)	Frequency (%)
1	RG	104	4.98
2	HE	100	4.79
3	<i>Semen Armeniaca</i> (SA)	79	3.78
4	RP	76	3.64
5	FP	57	2.73
6	<i>Lumbricus</i> (LU)	55	2.63
7	<i>Radix Scutellariae</i>	50	2.39
8	<i>Bombyx Batryticatus</i>	44	2.11
9	PC	44	2.11
10	<i>Fructus Schisandrae Chinensis</i> (FSC)	42	2.01
11	<i>Rhizoma Belamcandae</i> (RB)	40	1.91
12	<i>Herba Asari</i> (HA)	37	1.77
13	<i>Cortex Mori</i> (CM)	37	1.77
14	<i>Pericarpium Citri Reticulatae</i> (PCR)	37	1.77
15	<i>Flos Farfarae</i> (FF)	35	1.68
16	<i>Radix Asteris</i>	34	1.63
17	<i>Radix Paeoniae Alba</i> (RPA)	33	1.58
18	<i>Poria</i>	31	1.48
19	<i>Semen Descurainiae</i>	31	1.48
20	<i>Radix Astragali seu Hedysari</i>	30	1.44

Table 4. Four properties statistics of CMM for asthma.

Four natures of drug	Frequency (times)	Frequency (%)
warm	891	44.24
cold	643	31.93
gentle	394	19.56
heat	44	2.18
cool	42	2.09

Table 5. Statistics of five flavors of CMM for asthma treatment.

Five flavors of drug	Frequency (times)	Frequency (%)
acidic	962	31.08
bitter	952	30.76
sweet	833	26.91
salty	166	5.36
sour	120	3.88
rough	62	2.00

Table 6. Statistics of high-frequency channel tropism of CMM for asthma.

Channel tropism	Frequency (times)	Frequency (%)
lung channel	1460	29.58
spleen channel	715	14.49
stomach channel	667	13.51
liver channel	562	11.39
heart channel	434	8.79
kidney channel	337	6.83
large intestine channel	302	6.12
bladder channel	256	5.19

Table 7. Statistics of commonly used medicine pairs for asthma.

Serial number	Medicine pairs	Frequency (times)
1	RG - HE	73
2	HE -SA	63
3	RG - SA	57
4	RP - RG.	56
5	RP - HE	56
6	RG - HE - SA	47
7	HE - LU	44
8	RP - RG - HE	44
9	<i>Radix Scutellariae</i> (RS) - RG	39
10	FP - HE	39
11	RP - SA	38
12	RS - HE	37
13	FP - RG	37
14	FP - SA	37
15	SA - LU	36
16	RG - LU	35
17	HE - HA	35
18	PCR - RG	34
19	RP - FP	34
20	RB - HE	33

Table 8. Associated drug confidence coefficient.

Serial number	Association rules	Confidence coefficient
1	HA ->HE	0.945946
2	PCR -> RG	0.918919

3	SA, LU ->HE	0.916667
4	RPA -> RG	0.909091
5	RG, LU -> HE	0.885714
6	RP, SA -> HE	0.868421
7	RP, SA -> RG	0.842105
8	RS, HE -> RG	0.837838
9	LU -> HE	0.830189
10	RB -> HE	0.825
11	FSC -> HE	0.825
12	RG, SA -> HE	0.824561
13	SA -> HE	0.818182

Table 9. New formulas for the treatment of asthma.

Serial number	New formulas
1	RPA _ SA _ LU _ HE _ <i>Gypsum Fibrosum</i>
2	PCR _ <i>Poria</i> _ <i>Cortex Cinnamomi</i> _ <i>Radix Codonopsis</i> _ <i>Rhizoma Atractylodis Macrocephalae</i>
3	<i>Radix Rehmanniae Preparata</i> _ <i>Fructus Corni</i> _ <i>Radix Ginseng(RGI)</i> _ <i>Rhizoma Alismatis</i>
4	<i>Scorpio</i> _ <i>Euphorbia helioscopia L</i> _ <i>Rhizoma Curcumae Longae</i> _ <i>Scolopendra</i>
5	<i>Radix Glehniae(RGL)</i> _ <i>Radix Rehmaniae Recens</i> _ <i>Funiculus umbilicalis</i> _ <i>trichosanthes root</i>
6	<i>Radix Asteris</i> _ <i>Fructus Jujubae</i> _ FF _ <i>Radix et Rhizoma Rhei(ReRR)</i>
7	<i>Flos Inulae</i> _ <i>Haematitum</i> _ <i>Flos Chrysanthemi Indici(FCI)</i> _ <i>Herba Patriniae</i>
8	<i>Radix Scutellariae</i> _ CM _ <i>houuttuynia cordata Thunb</i> _ <i>Ramulus Cinnamomi(RC)</i>
9	<i>Radix Angelicae Sinensis</i> _ <i>Radix Morindae Officinalis</i> _ <i>Cortex Lycii</i> _ <i>Thorny Elaeagnus Leaf</i>
10	<i>Rhizoma Dioscoreae</i> _ <i>Fructus Corni</i> _ RGI _ <i>Cortex Moutan Radicis</i>
11	<i>Rhizoma Dioscoreae Nipponicae</i> _ <i>Fructus Mume</i> _ <i>Radix Stellariae</i> _ <i>Rhizoma Picrorhizae</i>

12	PC _ <i>Rhizoma Zingiberis Recens</i> _ <i>Bombyx Batryticatus</i> _ <i>Rhizoma Zingiberis</i>
13	CM _ HA _ <i>Radix Adenophorae</i> _ FSC _ RC
14	<i>Folium Eriobotryae</i> _ <i>Fructus Trichosanthis</i> _ <i>Os Costaziae</i> _ <i>Herba Epimedii</i>
15	<i>Nidus Vespaee</i> _ <i>Radix Ophiopogonis</i> _ RGL _ <i>Radix Pseudostellariae</i> _ <i>Retinervis Luffae Fructus</i>

3. Discussion

3.1 Discussion of common pattern types and treatments of asthma

Asthma is called wheezing disease in TCM. The main pathological factor of the wheezing disease is "phlegm (A pathological product caused by a disorder of fluid metabolism)" (11). The occurrence of the wheezing disease is that phlegm is trapped in the lung, and every inducement such as external evil qi4 (It refers to various pathogenic factors), diet, emotion, and body deficiency triggers the latent phlegm, resulting in the rise of phlegm with qi4, the obstruction of qi4 due to phlegm, the obstruction of lung qi4, and eventually lead to the lung controlling dispersing outward and inwards function disorders. Feng Zhenzhen (12) sorted out the characteristics of diagnosis and treatment symptoms of modern famous and veteran TCM doctors wheezing, and the results showed that there were 6 common pattern types of wheezing disease, namely, the pattern of phlegm-heat congesting the lung, the pattern of wind-cold assailing the lung, lung qi4 vacuity pattern, lung yin1 vacuity pattern, the pattern of spleen-kidney yang2 vacuity and pattern of spleen-lung qi4 vacuity. Liu Jimin (13) proposed that wheezing disease is caused by fire and heat and is caused by phlegm. When treating wheezing disease, firstly, it should be divided into cold, heat, vacuous, and replete, and adjust the function of the zang-fu viscera, especially the function of the spleen and stomach. Secondly, it is based on fire and heat, the symptoms are treated when the attack occurs, and the root of the disease is treated when it is relieved. This study is basically

consistent with the pattern types and treatment methods of asthma in modern TCM.

3.2 Discussion of high-frequency drugs and four natures and five flavors of drugs in the treatment of asthma

RG is the most frequently used in this study, which has a sweet flavour and a gentle nature and can supplement the spleen and boost qi4, clear heat and resolve toxins, moisten the lung and suppress cough, and harmonize the nature of various medicines. CMM for asthma is often combined with large doses of RG, which can reduce the attack of asthma and reduce the adverse reactions caused by hormones (14). Therefore, the use of RG in the treatment of asthma can not only significantly improve the symptoms but also resist the side effects of hormones. As the second high-frequency CMM, HE is an essential medicine for effusing sweat and resolving the exterior, diffusing the lung, and calming panting. Zhao Meimei (15) found that HE containing formulas were widely used in the treatment of high fever, cough, asthma, and other diseases by analyzing the usage of 182 formulas in *Beiji Qianjin Yao Fang*. The third high-frequency CMM, SA, has to suppress cough and calm panting effects and is often used for the treatment of cough and pant (16). Amygdalin, the active component of SA, has pharmacological effects such as immune regulation, anti-inflammation, anti-pulmonary fibrosis, and anti-hyperoxia-induced lung injury (17). In addition to the effects of dry dampness and transforming phlegm, downbear counterflow and check vomiting, RP has pharmacological effects such as relieving cough and asthma, anti-inflammation, and antiemetic (18).

Phlegm-rheum is the root of wheezing, which belongs to Yin1 disease. According to the theory of "those who suffer from phlegm-rheum should be treated with warm-natured drugs" and "treatment of cold-syndrome with hot-natured drugs and treatment of heat-syndrome with cold-natured drugs", warm-natured drugs should be used to treat yin1-cold disease and lung is the delicate viscus. Therefore for lung diseases, warm-natured drugs should be used too much. Acrid-flavor drugs enter the lung channel and they are mostly used for the treatment of diseases of the pulmonary system. In conclusion, the treatment of asthma is based on RG, HE, SA, and RP, the four natures of drugs are mainly warm, the five flavours are mainly acrid, and the main channel tropism of drugs is the lung channel, which is in line with the understanding and knowledge of TCM on asthma.

3.3 Discussion of commonly used drug pairs for asthma

The frequently-used drug pairs for asthma are RG-HE, HE-SA, and RG-SA. RG-HE is a common drug pair of classical formulae. The combination of RG and HE, RG can harmonize HE's bitter and warm nature and reduce toxicity. The combination of the two drugs can supplement, drain, scatter and disappear, and relieve cough and asthma together. The main components of RG and HE can reduce airway inflammation and inhibit airway remodeling and other effects (19, 20); HE can free lungs, disperse colds, suppress cough, and calm panting. SA can downbear qi4, suppress cough, and calm panting. The combination of the two drugs is more effective in treating asthma. HE-SA can improve the integrity of cell membranes, maintain the homeostasis of the internal environment, inhibit airway damage, and relieve asthma symptoms (21). HE-SA can not only enhance the pharmacological effect of each other but also inhibit the toxic side effects of each other (22). RG has the functions of clearing heat and resolving toxins, dispelling phlegm and suppressing cough, and harmonizing the nature of various medicines. It is compatible

with SA to reduce toxicity, and can also strengthen the effect of dispelling phlegm, relieving cough, and relieving asthma. In conclusion, the high-frequency drug pairs in this study are not only consistent with the compatibility principle of CMM but also consistent with the clinical use guided by modern pharmacology.

3.4 Discuss the new formula

The function of new formula 1 is similar to that of Ephedra, Apricot Kernel, Gypsum, and Licorice Decoction (ma xing shi gan tang), which can be used for the pattern of phlegm-heat congesting the lung. The Ephedra, Apricot Kernel, Gypsum, and Licorice Decoction can effectively control the degree of asthma, improve the level of lung function, improve the immune function, reduce the level of inflammatory factors, and accelerate the repair of lung tissue inflammation and the recovery of endothelial cell structure and function (23-26). In new formula 1, LU can strengthen the effect of relieving asthma, RPA can boost yin1 and nourish the blood, and has a variety of pharmacological effects (27). The whole formula plays the role of clearing and draining lung heat, diffusing the lung, and calming panting. The function of new formula 2 is similar to Four Gentlemen Decoction (si jun zi tang), which can be used for spleen-lung vacuity. Four Gentlemen Decoction can improve the immune function (28) can supplement the qi4 of the body, fortify the spleen and transform phlegm. Spleen and stomach are the roots of later heaven and the source of blood and qi4 formation, qi4 and blood are the driving force to form the human body and maintain the life activities of the human body, with sufficient qi4 and blood, hundreds of diseases can be cured without a cure, and the spleen is the mother of the lung in five-phase theory, and spleen qi4 vacuity leads to lung qi4 vacuity, so asthma and low faint voice. This formula is used to treat spleen-lung vacuity, which can fortify the spleen, transform phlegm and boost lung qi4. In the new formula, PCR and *Radix Codonopsis* are used to strengthen the function of

dispelling phlegm, supplement the lung and fortify the spleen. New formulas 3 and 10 are like Six-Ingredient Rehmannia Pill (liu wei di huang wan), which can be used for lung-kidney vacuity. The lung is the governor of qi₄ and the kidney is the root of qi₄. The lung and kidney together to maintain normal breathing, and if the kidney fails to absorb qi₄, qi₄ counterflow to invading the lung, so asthma, with Six-Ingredient Rehmannia Pill to supplement the kidney to promote qi₄ absorption, asthma can be cured. Add RGI, it can greatly supplement original qi₄, supplement the spleen and boost the lung, and it belongs to the spleen and lung channel. RGI can be used for lung qi₄ vacuity, Weakness of cough, shortness of breath, and hasty panting. RGI also has anti-inflammatory and immune regulation effects (29, 30). New formulas 3 and 10 are more powerful and effective than Six-Ingredient Rehmannia Pill. The new formula 4 works like Tetany-Relieving Powder (zhi jing san), a strong effect of freeing the network vessels and dissipating binds, which can be used for the pattern of phlegm-stasis obstructing the lung. *Rhizoma Curcumae Longae* not only enters the blood aspect but also enters the qi₄ aspect, which has the effect of breaking blood, moving qi₄, freeing the network vessels, and relieving pain. *Euphorbia helioscopia L* can disinhibit water and disperse swelling, transform phlegm and dissipate binds, and the four herbs of new formulas 4 are used together to move qi₄, transform phlegm and disperse stasis, so that the airway open to maintain the lung function of promoting diffusion and depurative downbearing. Therefore, the new formula 4 is suitable for patients with stubborn phlegm and static blood for a long time, and right qi₄ is not vacuity. The functions of the new formula 5 are similar to Yin1-Nourishing Lung-Clearing Decoction (yang yin qing fei tang), which can be used for kidney yin1 vacuity and lung dryness pattern. *Radix Rehmaniae Recens* is sweet, bitter and cold, which can not only enrich kidney yin1 to relieve lung dryness, but also clear heat and cool the blood. RGL can clear the lung and engender liquid. *Radix Trichosanthis* can engender

liquid and suppress cough. The *Funiculus umbilicalis* has the effect of boosting the kidney to absorb qi₄. The new formula 5 is often used for panting and cough of kidney vacuity. The whole formula is compatible with nourishing the kidney and moistening the lung, mutual engendering of metal and water, and boosting the kidney to absorb qi₄. The function of new formula 6 is similar to Cough-Stopping Powder (zhi sou san) which can suppress cough, calm panting, and transform phlegm and can be used for the pattern of wind phlegm obstructing the lung. *Radix Asteris* and FF of the new formula go to the lung channel, which are essential medicines to suppress cough and transform phlegm. ReRR can transform phlegm, unobstructed the zang-fu viscera, and transform damp turbidity, can be used for old phlegm congestion and not to lie down for pants, and can also be for constipation. The lung and large intestine stand in the interior-exterior relationship. If the intestines are unobstructed, the lung qi₄ will go down, and symptoms such as cough, wheezing and shortness of breath are relieved. *Fructus Jujubae* can supplement qi₄ and nourish the blood, combined with ReRR can supplement and attack simultaneously, boost qi₄, and support right. The functions of new formula 7 like Lnula and Hematite Decoction (xuan fu dai zhe tang), can be used for qi₄ counterflow and phlegm obstructing patterns. *Flos Inulae* and *Haematitum* are good at downbear counterflow and dispersing phlegm. FCI and *Herba Patriniae* can clear heat and resolve toxins. FCI also has antibacterial, antiviral, anti-inflammatory, and immune effects (31). The new formula 8 functions like Panting-Stabilizing Decoction (ding chuan tang), which can be used for the pattern of phlegm-heat lying depressed in the lung. Studies have found that Panting-Stabilizing Decoction can improve lung function and reduce inflammatory response (32, 33). CM can drain the lung and calm panting, RS can clear heat and transform phlegm, *houத்துய්නියා cordata Thunb* can diuresis, and RC can transform qi₄. The above four drugs are combined to make the water-damp can be dispersed, and

avoid phlegm, heat, and dampness bonding to each other. The whole formula played together to clear heat and transform phlegm, and benefit move and transform the water-damp. The new formula 9 of the combination of *Radix Angelicae Sinensis*, *Cortex Lycii*, and *Thorny Elaeagnus Leaf* can not only nourish the blood, quicken the blood, and cool the blood but also clear lung heat. It is compatible with *Radix Morindae Officinalis*, which can warm and supplement kidney yang², so that the lung qi⁴ absorption by the lung is returned to the kidney, taken by the kidney, to maintain the depth of breath. The formula can be used for cough, pant, hemoptysis, and nephrostenia syndrome. The new formula 11 functions like Guominjian decoction, which can be used for various allergic diseases caused by vacuity wind. Peng Yu et al. (34) Meta-analysis found that the combination of Guominjian decoction had better clinical efficacy in the treatment of asthma. Wang Jiaran et al. (35) found that multiple components of Guominjian decoction have a certain preventive and therapeutic effect on allergic asthma by acting on multiple targets and regulating multiple pathways. New formula 11, compared with allergic decoction, uses *Rhizoma Dioscoreae Nipponicae* to strengthen the effect of cough and asthma and uses *Rhizoma Picrorhizae* to strengthen the effect of clear vacuity heat. In new formula 12, *Bombyx Batryticatus* can dispel wind, transform phlegm and dissipate binds, *Rhizoma Zingiberis Recens* can warm the lung and dissipate cold, transform phlegm and suppress cough, PC can disinhibit the throat, *Rhizoma Zingiberis* can warm the lung and transform rheum. The new formula 12 can be used for severe cold-pathogen and inhibited throat syndrome. *Bombyx Batryticatus* and PC have a variety of pharmacological effects (36, 37), and the combination of new formula 12 can effectively control asthma symptoms and reduce the occurrence and development of asthma. The new formula 13 has similar functions as Minor Green-Blue Dragon Decoction (xiao qing long tang), which can be used for the pattern of cold

rheum lying latent in the lung. Xu Shuo et al. (38) found that the combination of Minor Green-Blue Dragon Decoction in the treatment of asthma can improve the pulmonary ventilation function of patients and reduce the inflammatory response more significantly. The new formula 13 combined with CM can both transform water-rheum and strengthen the effect of calm panting, while the *Radix Adenophorae* (39) has pharmacological effects such as immune regulation and scavenging free radicals. Compared with Minor Green-Blue Dragon Decoction, the new formula 13 has stronger calm panting power and better effect. New formulas 14 and 15 are similar to Dryness-Clearing Lung-Rescuing Decoction (qing zao jiu fei tang) and Glehnia and Ophiopogon Decoction (mai dong tang), which can be used for the pattern of yin¹ vacuity lung dryness. The former is more suitable for patients with severe yin¹ vacuity and dryness-heat, while the latter is milder in dryness-heat. Ren Yubin et al. (40) found that Dryness-Clearing Lung-Rescuing Decoction could significantly reduce airway inflammatory response and clinical symptoms, shorten the course of the disease, improve lung function, improve asthma control effect, and MP-IgM negative conversion rate. In the new formula 14, *Os Costariae* is added to clear lung heat, transform old phlegm, soften hardness, and treat the asthma of phlegm-heat pattern with accumulation lump and old phlegm. *Herba Epimedii* can supplement kidney yang². Compared with Dryness-Clearing Lung-Rescuing Decoction, the new formula 14 can transform phlegm power and supplement the kidney.

4. Summary

In conclusion, the modern TCM treatment of asthma is mainly to calm panting, transform phlegm, suppress cough, supplement the lung and boost the kidney. The core drugs are mostly RG, HE, SA, RP, FP, and LU. Common drug pairs are RG-HE, HE-SA, RG-SA, RP-RG, RP-RG, and RP-HE. The nature of drugs is mainly warm, the drug's flavour

is mainly acrid, and the channel tropism of the drug is mainly the lung channel. The number of literature included in this paper is small, and there are still some limitations, and asthma can occur in different seasons and ages. However, the pattern type, Characteristics of medication, and dose-effect relationship of TCM in the treatment of asthma in different seasons and ages have not been analyzed. Therefore, in future further research, the sample size should be expanded, and pattern type and treatment rules of TCM treatment of asthma in each season and age should be subdivided, so as to provide more data reference for clinical treatment of asthma.

Declarations

1) **Consent to publication**

We declare that all authors agreed to publish the manuscript at this journal based on the signed Copyright Transfer Agreement and followed publication ethics.

2) **Ethical approval and consent to participants**

Not applicable.

3) **Disclosure of conflict of interests**

We declare that no conflict of interest exists.

4) **Funding**

None.

5) **Availability of data and material**

We declare that the data supporting the results reports in the article are available in the published article.

6) **Acknowledgement**

None.

7) **Authors 'contribution**

Authors contributed to this paper with collect data (PQC, XG, BHZ), writing (PQC), revision (XG), editing (XG and BHZ) and final approval (XG).

8) **Authors' biography**

None

1. Asthma Group, Chinese Society of Respiratory Medicine. Guidelines for the prevention and treatment of bronchial asthma (2020 edition). *Chinese Journal of Tuberculosis and Respiratory*. 2020 , 43(12):1023-1048 [Chinese]. DOI: 10.3760/cma.j.cn112147-20200618-00721
2. Liao XG, Zhu AY, Wang XG, Wang F. Meta-analysis of the prevalence of asthma in Chinese adults. *Chinese Journal of Evidence-Based Medicine*. 2020;20(10):1164-1172 [Chinese]. DOI: 10.7507/1672-2531.202003207
3. Zhou J. Review of traditional Chinese and western medicine in the treatment of bronchial asthma. *Inner Mongolia Traditional Chinese Medicine*. 2021;40(01):167-168 [Chinese]. DOI: 10.16040/j.cnki.cn15-1101.2021.01.096
4. Zhang HL, Cai X, Jin PP, Shen XH, Su KG. Research progress of traditional Chinese medicine in the treatment of bronchial asthma. *Traditional Chinese Medicine in western China*. 2021;34(12):155-158 [Chinese]. DOI: 10.12174/j.issn.2096-9600.2021.12.42
5. Peng YX, Zhou YW, Dong XF. To study the effect of Ginseng and Schisandra Decoction in the treatment of children with asthma in the remission period and its influence on immune function. *China Medicine and Pharmacy*. 2021;11(03):97-99 [Chinese]. DOI: 10.3969/j.issn.2095-0616.2021.03.025
6. Chen HH. Clinical observation of bank up earth and engender metal in the treatment of 69 children with asthma in remission period of the pattern of spleen-lung qi4 vacuity. *Journal of pediatrics of traditional Chinese medicine*. 2018;14(01):29-32 [Chinese]. DOI: 10.16840/j.issn1673-4297.2018.01.10
7. Qin F, Jiao L. Clinical study of Center-Supplementing Qi4-Boosting Decoction combined with western medicine in the treatment of bronchial asthma. *Henan Traditional Chinese Medicine*. 2022;42(05):712-715 [Chinese]. DOI: 10.16367/j.issn.1003-5028.2022.05.0155

References

8. Zheng L, Wang L, Wang Peng. Professor Wang Peng's clinical application experience of Zhixiao Pingchuan decoction is summarized. *Journal of emergency in traditional Chinese medicine*. 2014;23(10):1843-1844[Chinese]. DOI: 10.3969/j.issn.1004-745X.2014.10.028
9. Zhao KM, Xu YL. Professor Xu Yanling's experience in treating bronchial asthma from the perspective of the kidney. *World Journal of Integrated Chinese and Western Medicine*. 2019;14(11):1523-1525+1558 [Chinese]. DOI: CNKI:SUN:SJZX.0.2019-11-012
10. Yu Z, Zhang Y, Ni W. Wu Yingen gave some examples of asthma treatment based on yang2 vacuity with exuberant cold. *Journal of Practical Chinese Medicine*. 2015;31(11):1050-1051 [Chinese]. DOI: 10.3969/j.issn.1004-2814.2015.11.056
11. Tian LR. Wheezing disease. *Journal of Practical Rural Doctors in China*. 2021;28(12):11-14 [Chinese]. DOI: 10.3969/j.issn.1672-7185.2021.12.005
12. Feng ZZ, Ma JD, Li JS, Sun SM, Li QL, Cai YM, Zhang P. Literature study on the characteristics of diagnosis, treatment and pattern of wheezing disease in modern famous old Chinese medicine. *Chinese Journal of Basic Medicine of TCM*. 2019;25(01):30-33 [Chinese]. DOI: CNKI:SUN:ZYJC.0.2019-01-012
13. Liu JM, Wang T. Fire theory of wheezing. *Modern distance education of traditional Chinese medicine*. 2018;16(21):67-69 [Chinese]. DOI: 10.3969/j.issn.1672-2779.2018.21.027
14. Liu HP. Professor Shi Suo-fang discusses the experience of treating bronchial asthma with a large dose of licorice. *Journal of Chinese Medicine*. 2010;25(02):230-231 [Chinese]. DOI: CNKI:SUN:HNZK.0.2010-02-017
15. Zhao MM, Tang XL, Yuan JL. A brief analysis of prescriptions containing Ephedra in *Beiji Qianjin Yaofang*. *Modern distance education of traditional Chinese medicine*. 2022;20(13):61-63 [Chinese]. DOI: CNKI:SUN:ZZYY.0.2022-13-025
16. Chen X, Li JP. Study on the quality control system of bitter almond and its preparation. *Chinese Journal of Experimental Medicine*. 2021;27(19):200-205. DOI: 10.13422/j.cnki.syfjx.20211651
17. Lv JZ, Deng JG. Advances in pharmacological effects of amygdalin. *Modern Medicine and clinical practice*. 2012;27(05):530-535 [Chinese]. DOI: CNKI:SUN:GWZW.0.2012-05-026
18. Zhao L, Zhang C, Pan QQ, Luo LT. Studies on chemical composition and pharmacological activity of Pinellia. *Guangzhou Chemical Industry*. 2022;50(08):15-17+26 [Chinese]. DOI: 10.3969/j.issn.1001-9677.2022.08.006
19. Qu Y, Qu WP, Li Y, Mai WB, Qin YH. Mechanism of ephedra-glycyrrhiza in the treatment of childhood asthma based on network pharmacology. *Liaoning Journal of Traditional Chinese Medicine*. 2020;47(08):22-28+222 [Chinese]. DOI: CNKI:SUN:LNZY.0.2020-08-007
20. Yuan WY, Wei P, Bao KF, Yao L, Wang XT, Wang SQ, Zheng J, Hong M, Jiang GR. Preliminary study on the inhibitory effect of ephedra-glycyrrhiza on allergic asthma and its mechanism. *Journal of Nanjing University of traditional Chinese medicine*. 2020;36(01):41-45 [Chinese]. DOI: 10.14148/j.issn.1672-0482.2020.0041
21. Zhang Y, Li WH, Xiao X, Lei T, Zhou KW, Ao B, Ma JX, Liao YQ. Protective effects of the ephedra-almond drug on RTE cell injury induced by histamine phosphate. *Asia-Pacific Traditional Medicine*. 2021;17(09):13-18 [Chinese]. DOI: 10.11954/ytctyy.202109005
22. Zhu Mingdan, Zhang Lihong, Lin Yang, Du Wuxun. To explore the scientific connotation of synergism and attenuation of ephedra-almond based on network pharmacology. *Asia-Pacific Traditional Medicine*. 2021;17(04):156-161 [Chinese]. DOI: 10.11954/ytctyy.202104041
23. Xie YZ, Ji SL, Zhan SF, Zhuang HF, Huang HT, Yang LL, Liu XH. Literature analysis and

- trial sequential analysis of Ephedra, Apricot Kernel, Gypsum, and Licorice Decoction in the treatment of acute exacerbation of chronic obstructive pulmonary disease. *Chinese Journal of Basic Medicine of TCM*. 2022;28(06):909-918 [Chinese]. DOI: 10.19945/j.cnki.issn.1006-3250.2022.06.007
24. Wang J, Wang SM, Jin X, Mao QD. Study on Ephedra, Apricot Kernel, Gypsum, and Licorice Decoction combined with induced sputum elimination technique in the treatment of wheezing cough caused by mycoplasma infection. *Clinical Journal of Traditional Chinese Medicine*. 2022;34(06):1132-1136 [Chinese]. DOI: 10.16448/j.cjctcm.2022.0634
25. Zhu J, Luo LP, Chen JC. Clinical observation of modified Ephedra, Apricot Kernel, Gypsum, and Licorice Decoction in the treatment of pattern of phlegm-heat congesting the lung of community-acquired pneumonia. *Modern distance education of traditional Chinese medicine*. 2022;20(10):90-92 [Chinese]. DOI: 10.3969/j.issn.1672-2779.2022.10.033
26. Li XD, Cui ZP, Chen H, Guo SX, He FL. Clinical efficacy of Ephedra, Apricot Kernel, Gypsum, and Licorice Decoction enema in the treatment of infantile pneumonia with wheezing and the intervention mechanism of the lung-intestinal microenvironment. *Chinese Journal of Experimental Medicine*. 2022;28(07):127-133 [Chinese]. DOI: 10.13422/j.cnki.syfjx.20220691
27. Zou BX. Effects of total glucosides of paeony on the expression of STAT3 and related cytokines in TNBS-induced experimental colitis rats [master's thesis]. Luzhou China: *Southwest Medical University*; 2018 [Chinese]. DOI: CNKI:CDMD:2.1018.178681
28. Tang B, Wu YY, Cao XJ, Li YJ. To investigate the effect of Four Gentlemen Decoction on the immune function after radical gastrectomy for gastric cancer. *Pharmaceutical Industry in China*. 2022;31(15):104-107 [Chinese]. DOI: 10.3969 / j.issn.1006 - 4931.2022.15.024
29. Yu XN, Feng XG, Zhang JM, Huang JJ, Zhang Q. Advances in chemical constituents and pharmacological effects of ginseng. *Study on ginseng*. 2019;31(01):47-51 [Chinese]. DOI: CNKI:SUN:RSYJ.0.2019-01-013
30. Yao MJ, Lv JP, Zhang Q, Zhang H, Sun JM. Studies on chemical constituents and pharmacological effects of ginseng. *jilin journal of traditional Chinese medicine*. 2017;37(12):1261-1263 [Chinese]. DOI: 10.13463/j.cnki.jlzyy.2017.12.022
31. Cai HF. Advances in chemical composition and medicinal use of wild chrysanthemum. *China Healthcare Innovation*. 2007; (18):118-120 [Chinese]. DOI: CNKI:SUN:YLQY.0.2007-18-081
32. Yan YF, Zhu J. To investigate the effect of Panting-Stabilizing Decoction on the inflammatory lesion of lung tissue and Th2 cell-related inflammatory factors in asthmatic mice. *Jiangsu Traditional Chinese Medicine*. 2019;51(01):81-85 [Chinese]. DOI: 10.3969/j.issn.1672-397X.2019.01.030
33. Li HJ, Wang YP, He W, You ZX. To observe the effect of Panting-Stabilizing Decoction combined with conventional western medicine in the treatment of cough variant asthma and its influence on serum ICAM-1 and Eotaxin levels. *Journal of New Chinese Medicine*. 2022;54(10):61-65 [Chinese]. DOI: 10.13457/j.cnki.jncm.2022.10.014
34. Peng Y, Tang AL, Liu D, Zhang HC. Meta-analysis of modified Guominjian decoction in the treatment of asthma [newspaper]. Shenyang, China: *Journal of Liaoning University of Traditional Chinese Medicine*; 1-15[2022-08-23] [Chinese]. DOI: 10.13194/j.issn.1673-842x.2022.10.027
35. Wang JR, Pang LJ, Zang NZ, Zhang HY, Lv XD. To explore the molecular mechanism of Guominjian decoction in the treatment of allergic asthma based on network pharmacology and molecular docking. *Journal of Liaoning*

- University of Traditional Chinese Medicine*.2022;24(07):109-114 [Chinese]. DOI: 10.13194/j.issn.1673-842x.2022.07.025
36. Zhao ZJ, Zhou GR, Wang Y, Zhang H, Sun JM. Studies on chemical constituents and pharmacological effects of *Cicada decidua*. *Jilin journal of traditional Chinese medicine*. 2017;37(05):491-493 [Chinese]. DOI: 10.13463/j.cnki.jlzyy.2017.05.018
37. Dan Caiyun, Cui Shiyao, Li Conghui, Liu Xue, Li Wen-le, Jiang Xue, Shi Lian-gen. Overview of research on the active ingredients and their medicinal effects of *Bombyx alba*. *Bulletin of Sericulture*. 2021;52(01):1-5 [Chinese]. DOI: 10.3969/j.issn.0258-4069.2021.01.001
38. Xu S, Li SS. Effect of Xiaoqinglong decoction on inflammatory factors and lung function in an acute attack of bronchial asthma. *Modern Chinese doctors*. 2022;60(17):168-170 [Chinese]. DOI: 1001-9677(2022)08-0015-04
39. Wei W, Wu J, Guo ZG. Research progress on chemical constituents and pharmacological effects of *Radix Adenophorae*. *Drug Evaluation Studies*. 2011;34(04):298-300 [Chinese]. DOI: 10.7501/j.issn.0253-6376.
40. Ren YB, Qu HF, Gu XM, Zhang B. Clinical study of modified Dryness-Clearing Lung-Rescuing Decoction combined with western medicine in the treatment of bronchial asthma complicated with mycoplasma pneumonia. *Traditional Chinese medicinal materials*. 2022;(04):991-995[2022-08-23] [Chinese]. DOI: 10.13863/j.issn1001-4454.2022.04.039