

Data mining on the Medication Rules of Traditional Chinese Medicine in the Treatment of Allergic Rhinitis

Xuejuan Zhai^{1,a}, Yaohui Li^{2,b,*}

¹Shaanxi University of Chinese Medicine, Xi'an, Shaanxi, 712046, China

²Shaanxi Provincial Hospital of Chinese Medicine, Xi'an, Shaanxi, 710003, China

^a1959525832@qq.com, ^bzhliyaohui@163.com

*corresponding author

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Abstract: Search the database of CNKI, Wanfang, Vip and other databases about 100 cases of relevant medical records of traditional Chinese medicine in the diagnosis and treatment of allergic rhinitis, and excavate the medication rules and characteristics of traditional Chinese medicine in the treatment of allergic rhinitis through the software of traditional Chinese medicine inheritance computing platform. The results showed that the total frequency of drug use was 2061 times, and the frequency ≥ 70 times, a total of 11 drugs; The four qi are mainly warm, cold and mild drugs; the five flavors are mainly bitter, sweet and bitter drugs; Meridians are mainly drugs for lung, spleen and stomach; The efficacy categories are mainly drugs for resolving phlegm, relieving cough and asthma, tonifying deficiency and clearing heat. Conclusion: The treatment of allergic rhinitis with traditional Chinese medicine requires the combination of cold and heat, lung and spleen, and the treatment of both symptoms and symptoms. It can dispel the cold on the surface, disperse the lung and dissipate phlegm, at the same time strengthen the spleen and replenish the deficiency, and support the vital energy.

1. Introduction

Allergic rhinitis, or allergic rhinitis, refers to abnormal reactions in the nasal cavity caused by increased sensitivity after exposure to certain allergens. It is characterized by sudden and recurrent episodic nasal congestion, runny nose, sneezing, and/or itching, and can lead to multiple complications if not diagnosed and treated promptly. The age of allergic rhinitis patients is about 10-40 years old. Epidemiological investigation shows that allergic rhinitis is a global disease, and the prevalence rate is rising year by year, with an average incidence rate of 10% - 25%^[1]. Research shows that there is a close relationship between the incidence rate of China and regional differences^[2]. Allergic rhinitis can be divided into seasonal and perennial types based on the time of onset, with seasonal accounting for 20% and perennial accounting for 40%. The combination of two types accounts for 40%^[3]. According to the duration of symptoms, it can be divided into intermittent and persistent types, with intermittent rhinitis symptoms ≤ 4 days /week, or ≤ 4 consecutive weeks; Persistent rhinitis symptoms ≥ 4 days /week, and ≥ 4 consecutive weeks^[4]. The

main programs for treating allergic rhinitis in modern medicine include staying away from allergens, drug therapy, immunotherapy, physical therapy, surgical therapy, and substitution therapy. They have a rapid onset rate, but their efficacy is not durable, the condition is prone to recurrent attacks, and long-term use has drug resistance and many adverse reactions^[5]. Traditional medicine in the treatment of allergic rhinitis adheres to the overall concept, starting from the overall state of the patient, taking into account individual differences, and dialectical treatment. Clinical research has found that traditional Chinese medicine has achieved good results in the treatment of allergic rhinitis^[6].

2. Materials and Methods

2.1. Data Source

The research data is from databases such as CNKI, Wanfang and VIP, and 100 effective prescriptions of traditional Chinese medicine in the treatment of allergic rhinitis are selected as the research object.

2.2. Inclusion and Exclusion Criteria

2.2.1. Inclusion Criteria

(1) For allergic rhinitis, the dosage and the increase or decrease along with the syndrome are not counted; (2) The drugs are complete and the curative effect is determined; (3) The literature can be derived from medical record collation, expert experience, experimental research, etc.

2.2.2. Exclusion Criteria

(1) Duplicate medical record prescriptions in the literature; (2) External use or animal experiment prescription; (3) The data is unreliable and the quality is poor; (4) A duplicate prescription in both Chinese and English.

2.3. Data Processing

The names of traditional Chinese medicine in the prescriptions of 100 cases of allergic rhinitis were treated uniformly with reference to the Pharmacopoeia of the People's Republic of China (2020) to standardize the drug names.

2.4. Data Verification

The review mode of double entry and double verification is adopted to ensure the accuracy and effectiveness of the verification process and data.

2.5. Data Analysis

Traditional Chinese medicine heritage computing platform (V3.0) software is a multi-functional data collection and analysis software, which has been widely used and researched in traditional Chinese medicine research. The collected 100 cases of allergic rhinitis prescriptions were uploaded to this platform, and the relevant statistical results were obtained through statistical analysis methods such as drug frequency, four gases, five flavors, meridian tropism and efficacy category.

3. Results

3.1. Drug Frequency

According to the statistical analysis of frequency, the total frequency of drug use is 2061 times, of which there are 11 drugs with a frequency ≥ 70 times, including atractylodes macrocephala, licorice, pinellia ternate, orange peel, poria cocos, fried malt, fritillaria thunbergii, perilla leaf, platycodon grandiflorum, pseudostellaria, dandelion, see Table 1.

Table 1: Statistical table of drug frequency of allergic rhinitis

| Serial No | medicine | Frequency /time | Frequency% |
|-----------|--------------------------------|-----------------|------------|
| 1 | bighead atractylodes rhizome | 100 | 4.85 |
| 2 | liquorice | 99 | 4.80 |
| 3 | Pinellia ternata | 98 | 4.75 |
| 4 | dried tangerine or orange peel | 98 | 4.75 |
| 5 | Poria cocos | 97 | 4.71 |
| 6 | Fried malt | 97 | 4.71 |
| 7 | Fritillaria thunbergii | 96 | 4.66 |
| 8 | Perilla leaf | 91 | 4.42 |
| 9 | Platycodon grandiflorum | 87 | 4.22 |
| 10 | radix pseudostellariae | 81 | 3.93 |
| 11 | dandelion | 81 | 3.93 |

3.2. Drug Four Gases

According to the statistical analysis of the four gases, it is concluded that the four gases of drugs are mainly warm, cold and mild drugs. Among them, warm drugs were used the most frequently, 743 times, accounting for 38.04%; 645 cold drugs, accounting for 33.03%; 488 times of sedative drugs, accounting for 24.99%; 77 cold drugs, accounting for 3.94%; 0 times of hot drugs, accounting for 0%, see Table 2.

Table 2: Statistical table of four gases of drugs for allergic rhinitis

| Serial No | Four Qi | Frequency /time | Frequency% |
|-----------|---------|-----------------|------------|
| 1 | warm | 743 | 38.04 |
| 2 | cold | 645 | 33.03 |
| 3 | flat | 488 | 24.99 |
| 4 | cold | 77 | 3.94 |
| 5 | heat | 0 | 0 |

3.3. Five Flavors of Medicine

According to the statistical analysis of the five flavors, it is concluded that the five flavors of drugs are mainly bitter, sweet and bitter. Bitter drugs were used the most frequently, 969 times, accounting for 38.04%; 950 times of glyceride, accounting for 33.03%; 753 times of acrid drugs, accounting for 24.99%; Acid drugs 101 times, accounting for 3.94%, See Table 3.

Table 3: Statistical table of five kinds of allergic rhinitis drugs

| Serial No | The five flavours | Frequency /time | Frequency% |
|-----------|-------------------|-----------------|------------|
| 1 | bitter | 969 | 33.83 |
| 2 | pleasant | 950 | 33.17 |
| 3 | acid | 753 | 26.29 |
| 4 | hot | 101 | 3.53 |
| 5 | salty | 91 | 3.18 |

3.4. Meridian Tropism of Drugs

According to the statistical analysis of meridian tropism, the drugs of lung, spleen and stomach meridians are the main ones. Among them, the lung meridian drugs were used the most frequently, 1213 times, accounting for 27.02%; 1044 times of spleen medicine, accounting for 23.26%; 613 times (13.66%); 441 times of heart channel drugs, accounting for 9.82%; 438 times (9.76%) of liver channel drugs; 362 times of kidney meridian drugs, accounting for 8.06%; 210 times (4.68%); 76 times of bladder medicine, accounting for 1.70%; The small intestine was treated 51 times, accounting for 1.14%; 27 times (0.60%); Sanjiao meridian was administered 14 times, accounting for 0.31%; 0 times of pericardial medicine, accounting for 0%, See Table 4.

Table 4: Statistical Table of Meridian of Allergic Rhinitis Drugs

| Serial No | Meridian tropism | Frequency /time | Frequency% |
|-----------|------------------|-----------------|------------|
| 1 | lung | 1213 | 27.02 |
| 2 | spleen | 1044 | 23.26 |
| 3 | stomach | 613 | 13.66 |
| 4 | heart | 441 | 9.82 |
| 5 | liver | 438 | 9.76 |
| 6 | kidney | 362 | 8.06 |
| 7 | large intestine | 210 | 4.68 |
| 8 | bladder | 76 | 1.70 |
| 9 | small intestine | 51 | 1.14 |
| 10 | gallbladder | 27 | 0.60 |
| 11 | Trifocal | 14 | 0.31 |
| 12 | pericardium | 0 | 0 |

3.5. Efficacy Category

According to the statistical analysis of efficacy categories, the drug efficacy is mainly composed of expectorant, antitussive and antiasthmatic drugs, tonic drugs and antipyretic drugs. Among them, expectorant, antitussive and antiasthmatic drugs were used the most frequently, 471 times, accounting for 24.12%; 447 times of tonifying drugs, accounting for 22.89%; 218 antipyretic drugs, accounting for 11.16%; 212 times of diuretic drugs, accounting for 10.86%; 173 times, accounting for 8.86%; 139 times, accounting for 7.12%; 114 times of astringent drugs, accounting for 5.84%; 79 times of drugs for activating blood circulation and removing stasis, accounting for 4.05%; 68 times of hemostatic drugs, accounting for 3.48%; 19 times (0.97%); Drugs for calming the liver and calming the wind 6 times, accounting for 0.31%; 4 times of humidifying drugs, accounting for 0.20%; Tranquilizing drugs 3 times, accounting for 0.15%, see Table 5.

Table 5: Statistical table of drug categories for allergic rhinitis

| Serial No | Efficacy category | Frequency /time | Frequency% |
|-----------|--|-----------------|------------|
| 1 | Expectorant, antitussive and antiasthmatic | 471 | 24.12 |
| 2 | Complement deficiency class | 218 | 11.16 |
| 3 | Diuretic and hygroscopic | 212 | 10.86 |
| 4 | Table solving class | 173 | 8.86 |
| 5 | Physiology | 139 | 7.12 |
| 6 | Astringent drugs | 114 | 5.84 |
| 7 | Activating blood circulation and removing blood stasis | 79 | 4.05 |
| 8 | Hemostasis | 68 | 3.48 |
| 9 | Digestive | 19 | 0.97 |
| 10 | Calming liver and calming wind | 6 | 0.31 |
| 11 | Humidifying class | 4 | 0.20 |
| 12 | Tranquilizer | 3 | 0.15 |

3.6. Analysis of association rules

According to the actual situation, the number of support is set to 98, and the confidence is set to 0.8. A total of 11 groups of commonly used drug combinations for treating allergic rhinitis are extracted through statistical analysis of association rules, as shown in Table 6.

Table 6: Common core drug combinations for allergic rhinitis

| Serial No | Drug combination | Frequency /time |
|-----------|--|-----------------|
| 1 | Atractylodes macrocephala, licorice | 99 |
| 2 | Licorice, Pinellia ternate | 98 |
| 3 | Atractylodes macrocephala, pinellia ternata, orange peel | 98 |
| 4 | Atractylodes macrocephala and Pinellia ternata | 98 |
| 5 | Licorice, orange peel | 98 |
| 6 | Licorice, pinellia ternata, orange peel | 98 |
| 7 | Atractylodes macrocephala, orange peel | 98 |
| 8 | Pinellia ternate, orange peel | 98 |
| 9 | Atractylodes macrocephala, licorice | 98 |
| 10 | Atractylodes macrocephala, licorice, pinellia ternata | 98 |
| 11 | Atractylodes macrocephala, licorice, orange peel | 98 |

3.7. Cluster analysis

Set the number of clusters to 3 according to the actual situation, and extract three new prescriptions for potential core allergic rhinitis through cluster analysis, as shown in Table 7.

Table 7: Core new prescription for allergic rhinitis

| Serial No | Core new prescription |
|-----------|--|
| 1 | Pinellia ternate, perilla leaf, licorice, fried malt, atractylodes macrocephala |
| 2 | Atractylodes macrocephala, licorice, fried malt, pinellia ternata, tuckahoe |
| 3 | Pinellia ternate, Poria cocos, licorice, Fritillaria thunbergii, Platycodon grandiflorum |

4. Discussion

Allergic rhinitis is a common disease in clinical practice. The etiology can be divided into three categories: allergens, family genetics, and environmental factors, with exposure to allergens as the main cause. Common allergens in life are mainly inhaled substances, such as household dust, dust mites, pollen, mold, and other substances, followed by food^[7]. In traditional Chinese medicine, allergic rhinitis is generally classified as "allergic rhinitis" in traditional Chinese medicine, which is first described in "Simple Questions - Pulse Solution Chapter". "The Yellow Emperor's Internal Classic" states that the main causes of the disease are the deficiency of vital energy and the invasion of external evils into the qi of that year, namely, the relative weakening of the temperature, humidity, pressure, and the elemental body of the world's climate and environment in that year^[8]. "The Complete Book of Jing Yue states, 'Anyone who has a stuffy nose due to early wind and cold should close the striae with cold, and the meridians will be blocked, resulting in frequent allergic sneezes.'" "Su Wen" states that "the nose is the opening of the lungs, itching is cremation, heart fire is evil and hot, dry in the Yangming period, and itchy in the nose, resulting in sneezing". It indicates that the early stage of allergic rhinitis is generally dominated by cold, and after prolonged stagnation and heat transfer, it appears as a mixture of cold and heat. Therefore, it is not advisable to treat allergic rhinitis with excessively cold and overheated products, and it is necessary to use both cold and heat. In terms of constitution, patients with allergic rhinitis mostly have a phlegm dampness constitution, and their pathogenesis and symptoms are similar to those of phlegm yin disease^[9]. Some doctors believe that this disease is due to deficiency of lung qi and cold^[10], while others are responsible for deficiency of spleen, lung, and kidney^[11], which are mostly symptoms of deficiency and excess. Research has shown that improving physical fitness can prevent the occurrence of allergic rhinitis and control the development of the disease^[12]. The chemical components of traditional Chinese medicine have anti allergic effects^[13].

The drug frequency results showed that the drugs with higher frequency for treating allergic rhinitis were *Atractylodes macrocephala*, licorice, *Pinellia ternata*, tangerine peel, tuckahoe, fried malt, *Fritillaria thunbergii*, perilla leaf, *Platycodon grandiflorum*, *Pseudostellaria*, and dandelion. Among them, Erchen Decoction (licorice, *Pinellia ternata*, tangerine peel, and tuckahoe) is the basic prescription for clinical treatment of phlegm dampness. Some studies have shown that in patients with allergic rhinitis, phlegm and saliva are obstructed, and if there is a large amount of nasal mucus, adding Erchen Decoction can eliminate dampness and phlegm, with a prominent therapeutic effect^[14]. *Atractylodes macrocephala* can promote lung and dissipate cold, while *Platycodon grandiflorum* can strengthen spleen and promote diuresis. The two drugs are compatible and can regulate both lung and spleen. "*Fritillaria thunbergii* can expel lung and dissipate phlegm, while perilla leaf can relieve external heat and disperse cold. The two drugs are compatible with both cold and heat". Experimental studies have found that sesquiterpene lactones can be isolated from dandelion, which has an anti allergic effect and has a definite therapeutic effect^[15]. Crown Prince Ginseng cultivates and nourishes the spleen and helps the healthy Qi. The above drugs are also the addition and subtraction of Shenling Baizhu Powder. Research has found that Shenling Baizhu Powder has a significant effect on the treatment of allergic rhinitis, and is safe and reliable^[16].

In the four aspects of qi, warm, cold, and calming drugs are mainly used. In the early stage of allergic rhinitis, people often suffer from wind and cold. When used, warm drugs are used to dissipate cold, but if the heat does not heal over time, the nose becomes itchy and intolerable, forming yellow sticky nasal mucus. Therefore, some cold drugs need to be added to clear the lung and heat. At the same time, the lungs are delicate and not resistant to cold and heat, so use more tranquilizing drugs. The five flavors are mainly bitter, sweet, and pungent drugs; Bitter medicines can clear and relieve lung heat, sweet medicines can tonify the vital energy, and bitter medicines

can vaporize phlegm. They assist each other and have very good effects. The meridian tropism is mainly based on drugs for the lung, spleen, and stomach meridians. Allergic rhinitis is located in the lung, and is closely related to the spleen and stomach. If ordinary sorghum has a thick taste, it can harm the spleen and stomach, causing biochemical deficiency in the spleen and stomach, and insufficient lung qi. However, due to spleen deficiency, phlegm and dampness accumulate in the lung, blocking the lung, and lung loss of ventilation, it can cause repeated episodes of nasal congestion and sneezing. Therefore, it is necessary to treat the upper lung and spleen together, promote and dissipate lung qi, cultivate and nourish the spleen, and prevent the formation of phlegm and dampness. The lung qi is not blocked, and allergic rhinitis can be eliminated. The efficacy category is mainly composed of drugs for resolving phlegm, relieving cough, relieving asthma, tonifying deficiency, and clearing away heat. It takes into account both the lung and spleen, treats both symptoms and signs, promotes the diffusion of lung qi, strengthens the spleen and diuresis, and supports the healthy qi.

The results of association rule analysis showed that the commonly used drugs for the treatment of allergic rhinitis were: *Atractylodes macrocephala*, licorice, licorice, *pinellia ternata*, *Atractylodes macrocephala*, *pinellia ternata*, licorice, and tangerine peel; Commonly used horn medicines: *Atractylodes macrocephala*, *Pinellia ternata*, tangerine peel, licorice, *Pinellia ternata*, tangerine peel. Most of these drugs have the effects of dispersing the lung, resolving phlegm, strengthening the spleen, and tonifying deficiency. They are consistent with the pathogenesis characteristics of allergic rhinitis, such as external exposure to wind and cold, deficiency of lung qi, deficiency of spleen qi, deficiency of positive qi, and accumulation of phlegm and dampness. Cluster analysis results showed that three sets of potential core new prescriptions were extracted. New Recipe 1: *Pinellia ternate*, *Perilla leaf*, licorice, fried malt, *atractylodes macrocephala*; New Recipe 2: *Atractylodes macrocephala*, licorice, fried malt, *pinellia ternata*, and tuckahoe; New Recipe 3: *Pinellia ternate*, *Poria cocos*, Licorice, *Fritillaria thunbergii*, *Platycodon grandiflorum*. The overall efficacy conforms to the main direction of promoting lung and resolving phlegm, strengthening spleen and tonifying deficiency.

To sum up, allergic rhinitis is based on the deficiency of the spleen and the external exposure to wind and cold. TCM treatment should focus on the key points of the pathogenesis, using both cold and heat, taking both the lung and spleen into account, treating both symptoms and signs, resolving external symptoms and dispelling cold, promoting lung and resolving phlegm, while strengthening the spleen and tonifying deficiency, and supporting healthy qi.

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References

- [1] Luo Qi. (2012) *Clinical efficacy of lupatadine fumarate in the treatment of allergic rhinitis*. *Hebei Medicine*, 18(12):1809-1811.
- [2] Han Demin, Zhang Luo, Huang Dan, et al. *Investigation on the self-reported prevalence of allergic rhinitis in 11 cities in China*. *Chinese Journal of Otolaryngology Head and Neck Surgery*, 2007, 42 (05): 378-384.
- [3] He Zhen, Zhang Yan, Han Yu. *Clinical study on the treatment of allergic rhinitis with modified Xinyi Cangerzi powder and cetirizine hydrochloride*. *World Journal of Integrated Traditional Chinese and Western Medicine*, 2018, 13 (07): 953-956
- [4] Zhang Luo, Zhou Bing, Han Demin, et al. *Research progress in allergic rhinitis (1): Pathogenesis*. *ENT & HN Surgery Department*, (05):316-320+324.

- [5] *Guidelines for the diagnosis and treatment of allergic rhinitis*, Chinese clinicians, 2010, 38(06): 67-68.
- [6] Di Guanlin, Zhu Zhengang, Xiong Wei, et al. Research progress in the treatment of allergic rhinitis with traditional Chinese medicine. *Henan Traditional Chinese Medicine*, 2022, 42(02):314-318.
- [7] Wang Xin, Li Lin, Li Xiaowei, et al. A review of the treatment of allergic rhinitis in traditional Chinese medicine. *Journal of Traditional Chinese Medicine*, 2019, 47(02):122-125.
- [8] Li Shengpu, & Liu Xiaohe. Discussion on the etiology and pathogenesis of allergic rhinitis in traditional Chinese medicine *Chinese and Foreign Medical*, 2008(17):131-132.
- [9] Liu Jiajie. Three methods of treating allergic rhinitis from phlegm. *Jiangsu Traditional Chinese Medicine*, 2017, 49(01):61-62.
- [10] Zhong Yanxia, Hu Hao. Research progress of allergic rhinitis in traditional Chinese medicine. *Xinjiang Traditional Chinese Medicine*, 2016, 34(01):81-83.
- [11] Wang Peiyu, Chen Chen, Zhang Jun, et al. Shao's "Five Needle Method" for the Treatment of 34 Cases of Allergic Rhinitis, *Traditional Chinese Medicine Research*, 2016, 29(12):52-54.
- [12] Jiang Feng. Relationship between allergic rhinitis and traditional Chinese medicine constitution, *Chinese Journal of Traditional Chinese Medicine*, 2008(02):140-142.
- [13] Wang Hualong, Li Zhenhu, Xu Yantong. Research progress in pharmacological effects of traditional Chinese medicine in the treatment of allergic diseases, *Chinese medicinal herb*, 2015, 46(10):1542-1555.
- [14] Zou Qian, Chen Yao, Chen Taohou. (2021) Chen Taohou's experience in treating allergic rhinitis in children. *Hubei Journal of Traditional Chinese Medicine*, 43(03):31-33.
- [15] Ma Huiling, Wu Liya, Zhang Huahao. (2013) Discussion on the establishment of dandelion Tonic Diet health care hall. *Modern distance education of Chinese traditional medicine*, 11(14):97-99.
- [16] Li Liang. (2013) Observation on the effect of modified Shenling Baizhu powder on chronic allergic rhinitis. *Chinese Contemporary Medicine*, 20(10):111-112.