

Research on the Experience and Practice of TCM Cough Treatment Based on Big Data Algorithm

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Abstract: Traditional Chinese medicine is a valuable experience in fighting various diseases in ancient China. It is a set of mature and complete Chinese medical theory gradually formed and developed after long-term clinical practice. Cough is a common clinical symptom with various causes and complex etiology and pathogenesis. Traditional Chinese medicine believes that the etiology and pathogenesis of cough can be summarized into four aspects: "exogenous wind and cold", "internal injury and miscellaneous diseases", "deficiency of Qi and blood" and "internal resistance of phlegm and dampness". Clinically, there are various treatment methods for cough with different curative effects. The experience and practice research of TCM (Traditional Chinese Medicine) cough treatment based on big data algorithm provides new ideas and methods for clinical diagnosis and treatment. The experimental results show that the cure rate of TCM cough treatment method based on big data algorithm can reach up to 97.9%, and it also has a good effect on improving the diagnostic accuracy and reducing the recurrence rate.

1. Introduction

Cough is a common clinical disease, and it is common in patients with cough as the main symptom, which seriously affects the quality of life of patients and may even be life-threatening. At present, there is no uniform standard for the treatment of cough in Chinese and Western medicine. In recent years, with the development of big data and artificial intelligence technology, data mining and analysis of clinical medical records through data mining algorithms to obtain effective information is of great significance to improve the level of clinical diagnosis and treatment.

At present, many professionals have conducted research on the traditional Chinese medicine treatment of cough. Among them, Xiong Qunhui discussed the effect of TCM massage nursing on children with chronic cough and its influence on serum indicators. The results show that TCM massage nursing for children with chronic cough can enhance the intervention effect, shorten the time for symptom relief in children, and inhibit the release of inflammatory mediators [1]. Xu Shaoju took the case of Director Bian Guoben as the research object. Director Bian Guoben believed that different stages of cough could be treated in stages. Dispelling the wind is the main

method during the onset period, resolving phlegm is the most important during the remission period, and strengthening the body is the most important during the stable period. At the same time, the rational use of insect drugs has a significant clinical effect [2]. Based on data mining technology, Ge Guolan summarized the distribution characteristics of TCM syndromes and the regularity of TCM prescriptions for children with chronic cough. The results show that children's chronic cough should distinguish between deficiency and excess, and the disease location is mainly in the lung and spleen. Wind clearing heat, reducing phlegm and relieving cough are the basic methods, which can be added or subtracted according to the symptoms [3]. The above content is very helpful for the traditional Chinese medicine therapy of cough, but there are still defects.

This article will mine cough-related data and information from clinical literature, including case diagnosis, symptoms and signs, and treatment options. According to the characteristics of data extraction, this article will analyze three common problems in cough diagnosis and treatment: first, this article uses the theory and method of diagnostics of traditional Chinese medicine to analyze the common indicators and abnormal values in cough diagnosis; secondly, adopts decision tree-based support vector machine method and hierarchical clustering algorithm to analyze cough symptoms; finally, uses association rule method in data mining technology to analyze the diagnostic accuracy, cure rate and recurrence rate of cough treatment plan.

2. Cough Diagnosis and Analysis

According to traditional Chinese medicine, the lungs govern Qi and control breathing. Coughing is caused by upward reversal of lung Qi. Traditionally, the lungs are considered to be delicate organs that are easily attacked by external pathogens. However, in recent years, with the acceleration of people's pace of life and the aggravation of environmental pollution, the etiology and pathogenesis of cough in traditional Chinese medicine have also undergone new changes. Modern medical research shows that colds, chronic pharyngitis, allergic rhinitis, etc. can all cause cough symptoms [4]. The understanding of the etiology and pathogenesis of cough in modern medicine is still unclear. Traditional Chinese medicine believes that the main etiology and pathogenesis are the invasion of exogenous evils, internal injuries and miscellaneous diseases, deficiency of Qi and blood, and internal resistance of phlegm and dampness. Among them, exogenous wind-cold, internal injuries and miscellaneous diseases, and deficiency of Qi and blood are the main etiology and pathogenesis [5].

2.1 Dispelling Wind is the Priority, and Ventilating Lung Qi is the Key

The six evils invade the lungs, because wind is the first of all diseases, whether it is wind-cold, wind-heat, or dryness of the lungs, it is all caused by wind-evil, so when treating, we must start with wind-evil; the lungs govern breathing, the lungs are unobstructed, and the breathing is natural and smooth. If there is an evil force invading and causing the lungs to be disordered, then when treating, one should first dredge the lungs to expel the evils, and the cough will naturally stop [6].

2.2 Relieve Cough and Treat Symptoms, Regulate Viscera and Strengthen the Foundation

When coughing, some people's lungs are diseased, which will affect other viscera. Because "the soil produces metal", the energy of the lungs depends on the water and grain essence produced by the spleen. If the spleen is always weak, the energy of the lungs will be exhausted, so the treatment method is "to cultivate the soil to produce metal". However, "the spleen is the source of phlegm, and the lungs are the storehouse for storing phlegm." If the spleen is not functioning well and moisture accumulates, phlegm will be produced, and phlegm will be deposited in the lungs, which

will cause coughing. Therefore, in terms of treatment, it is necessary to invigorate the spleen and dehumidify to eliminate phlegm [7]. From the point of view of meridian operation, the liver is connected to the lungs, and the Qi movement rises. If the liver Qi stagnates, it will cause the lungs to lose drainage and cause coughing, or the liver fire will surge up, which will cause the cough of "wood fire punishment". The method should be to clear the heart and tranquilize the mind, smooth the Qi and reduce the fire [8]. Breathing is controlled by the lungs, but the kidneys are needed to maintain the depth of breathing. If the kidney Qi is insufficient, there will be symptoms of "kidney not receiving Qi", that is, excessive breathing, and coughing during activities, so the treatment method is to start from the deficiency of kidney yang. Cough is not only related to the lungs, but also closely related to the spleen, liver, kidney and other organs. If it is a syndrome of mixed deficiency and excess, the treatment should focus on strengthening the body and eliminating the evil, but the order of strengthening the body and eliminating the pathogen should be selected according to the difference between the deficiency and the excess [9].

2.3 Regulating Qi and Resolving Phlegm, Smoothing Qi and Reducing Phlegm, Reducing Cough and Self-Elimination

Qi has the function of promoting the distribution and discharge of body fluid. If the Qi is deficient, the propulsion is weak, or the Qi movement is blocked, it will cause water and fluid metabolism disorder, resulting in internalization of phlegm. If phlegm congeals in the lungs, cough symptoms will appear or aggravate, and "elimination of phlegm" must first start with "Qi", which is the specific application of "elimination of phlegm". Regardless of whether there is a lot of phlegm, or no phlegm, or cold phlegm, hot phlegm, wet phlegm, or dry phlegm, it is necessary to regulate Qi and resolve phlegm, so as to moisten the air in the lungs and moisten the air in the lungs [10].

The method of treating cough in traditional Chinese medicine is usually to use cough powder. From the perspective of traditional Chinese medicine, no matter what the western medicine diagnoses, it can be treated with "Zhike San". If there are no clear symptoms of cold and heat, the original Zhisou powder can be used for treatment, but clinically, the treatment of cough needs to be added or subtracted based on factors such as the patient's age, constitution, etiology, and severity of the disease [11]. If one has wind-cold, phlegm and thin matter, it can use sage stems and almonds, and if one doesn't sweat, it can also use ephedra. For wind-heat, the phlegm will be mostly yellow in color, and mulberry leaves, chrysanthemums, and reeds can be used as main medicines; for dry mouth and less phlegm, nepeta, flavescens, Erdong, reed root, and mulberry bark can be used; for phlegm-dampness syndrome, Faxia and Poria are the main ones; if phlegm-dampness is stagnant and coagulated into heat, it can add *Scutellaria baicalensis*, *Houttuynia cordata*, and *Trichosanthes melon*; for patients with liver-fire attacking the lungs, it can take nepeta, orange red, and gardenia, *Scutellaria*, *Anemarrhena*, *Fritillaria*, *Ophiopogon japonicus*, *Gualou* and other drugs [12]. Patients with lung yin deficiency can take nepeta, tangerine, ginseng, Erdong, trichosanthin, and polygonatum; patients with bone steaming and hot flashes can take *Yinbupleurum* and *Digupi*; patients with hemoptysis and hematemesis can use *Baiji*, *Chinensis*, *orientalis* leaves.

3. Analysis of Cough Symptoms

Hierarchical clustering algorithm divides an object into several classes according to certain rules, and the center point of each class is the center point of the class, and merges each class until all objects are clustered. This article will use a hierarchical clustering algorithm to analyze cough diagnostic information, and its principle is similar to the decision tree method [13].

Table 1: Comparative analysis table

Index	Decision tree	Hierarchical clustering	Support vector machine
Time(s)	5.1	3.5	3.6
Accuracy	91.2%	93.6%	94.8%
Efficiency	87.5%	86.9%	88.1%
Stability	88.6%	91.7%	91.5%

Table 1 is a comparative analysis table between the three methods. Through comparative analysis, it is found that the decision tree method consumes more time, and the hierarchical clustering method and support vector machine have higher accuracy and stability than the decision tree method. Therefore, this article uses decision tree-based support vector machine method and hierarchical clustering algorithm to analyze cough symptoms. Among them, the formula of the support vector machine is shown in formula (1):

$$f(x) = h(\delta^t x) = \frac{1}{1 + e^{-\delta^t x}} \quad (1)$$

In formula (1), x is a dimensional feature vector. The formula of hierarchical clustering algorithm is shown in formula (2).

$$k(a, b) = \min[d(a_i, b_j)] \quad (2)$$

In formula (2), b is the initial class. The formula of the decision tree is shown in formula (3).

$$F(D) = -\sum \frac{|c_n|}{|D|} \log_2 \frac{|c_n|}{|D|} \quad (3)$$

In formula (3), n is the number of categories.

As mentioned above, cough in Chinese medicine is divided into exogenous cough and internal injury. There are two types of exogenous cough, one is wind-cold cough, and the other is wind-heat cough. Cough due to wind-cold mainly manifests as itchy throat, loud cough, white sputum, accompanied by headache, aversion to cold and fever, while cough due to wind-heat mainly manifests as sore throat, yellow phlegm, accompanied by thirst and body heat [14]. Cough due to internal injuries is more common in the phlegm-dampness accumulation lung type, and its symptoms are mainly manifested as recurrent coughs with a long course of disease, severe coughing in the morning, and a large amount of phlegm. The other is liver fire attacking lung type cough, mainly dry throat and bitter mouth [15]. At the same time, some people's throats become hoarse when they cough. According to Chinese medicine, this is mainly caused by lung heat or deficiency of lung yin. Lung heat is caused by too much yang in the human body, which makes the lungs heat up, which causes pharyngitis and hoarseness. Lung yin deficiency is the lack of yin fluid in the body, which can cause dry and hoarse throat. Some people also feel tightness in the chest when they cough. According to traditional Chinese medicine, this situation belongs to the category of Qi deficiency and blood stasis [16].

According to the theory of syndrome differentiation and treatment in traditional Chinese medicine, in the treatment of wind-cold cough, the main treatment should be to relieve the exterior and dispel cold; while for internal injury cough, the main treatment should be to clear away heat and eliminate phlegm. When classifying patient information, the symptoms and signs should be observed and analyzed first. For example, patients with wind-cold cough will have symptoms such as body fever, aversion to cold, and nasal congestion. Patients with wind-heat cough will have

symptoms such as sore throat, itchy throat, and cough. Secondly, it is also necessary to observe the color of the patient's tongue coating. If the tongue coating is light yellow or white, it is a cough due to wind-cold; if the coating is dark red, it is a cough due to wind-heat [17].

4. Analysis of Cough Treatment Options

How can we combine big data algorithms with traditional Chinese medicine cough treatment? First of all, it is necessary to search, and search relevant literature by browsing databases such as HowNet and Wanfang Data; then carry out inclusion and exclusion criteria. The criteria included in the article were clinical observation studies on TCM treatment of cough, and the exclusion criteria included animal experiments, reviews, and literature with incomplete prescription and drug information; and then the data were standardized according to the unified name of the relevant standards in "Clinical Diagnosis and Treatment of Traditional Chinese Medicine"; the last two steps are database establishment and statistical methods. The article conducts cluster analysis on TCM treatments, calculates the topological attribute values of TCM treatments in the network, and summarizes the rules of diagnosis and treatment [18]. After the above method is completed, the method will be compared with the traditional diagnosis and treatment plan, and analyzed from three perspectives: diagnostic accuracy (Figure 1), cure rate (Figure 2) and recurrence rate (Figure 3).

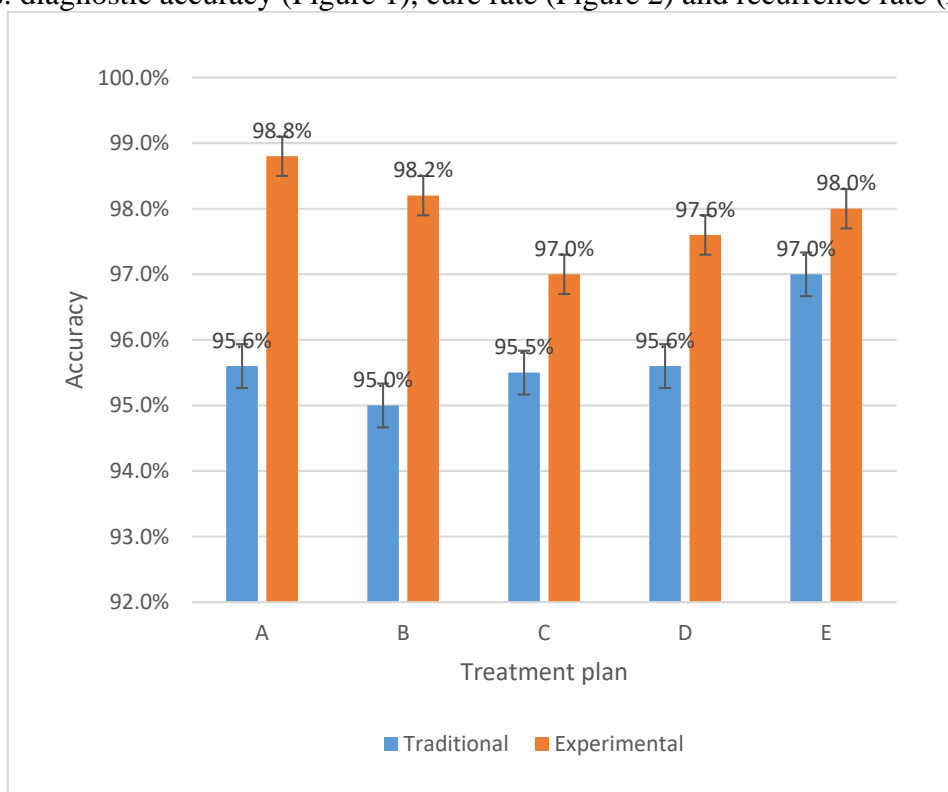


Figure 1: Diagnostic accuracy

It can be seen from Figure 1 that the diagnostic accuracy rate of the traditional diagnosis and treatment plan is the highest at 97%, the lowest at 95%, and the calculated average accuracy rate is 95.74%; the highest diagnostic accuracy rate of the experimental diagnosis and treatment plan was 98.8%, the lowest was 97%, and the calculated average accuracy rate was 97.92%. It can be seen that the diagnosis and treatment plan based on the big data algorithm used in the experiment has a higher diagnostic accuracy.

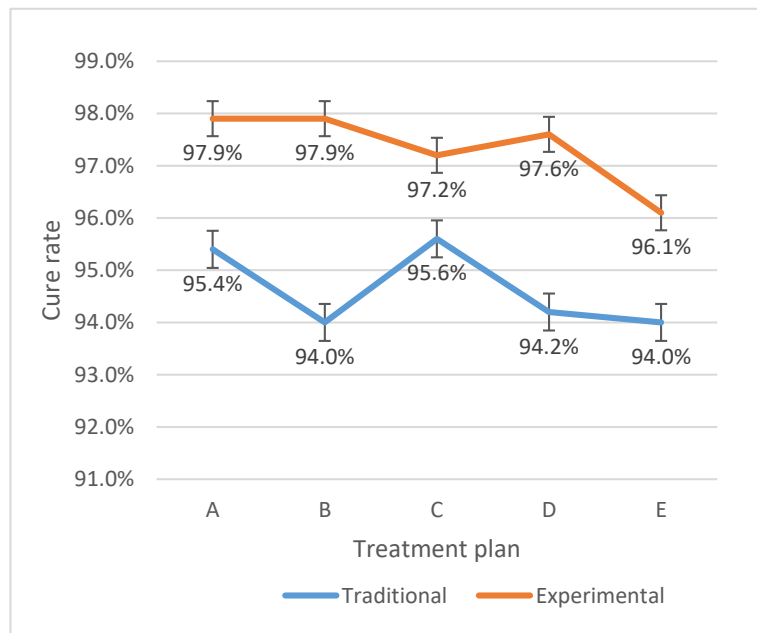


Figure 2: Cure rate

As can be seen from Figure 2, the highest cure rate of the traditional diagnosis and treatment plan is 95.6%, the lowest is 94%, and the calculated average cure rate is 94.64%; the highest cure rate of the experimental diagnosis and treatment plan was 97.9%, the lowest was 96.1%, and the calculated average cure rate was 97.34%. It can be seen that the diagnosis and treatment plan based on big data algorithm used in the experiment has a higher cure rate.

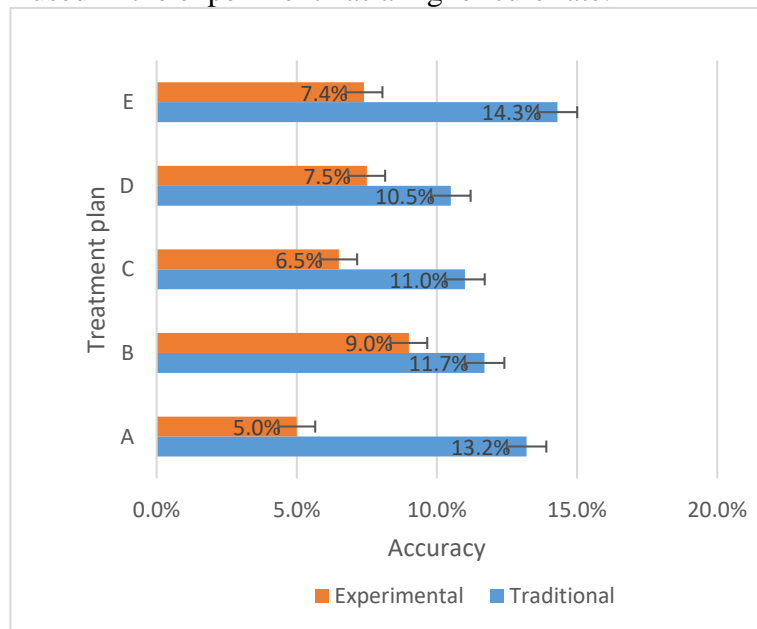


Figure 3: Relapse rate

It can be seen from Figure 3 that the highest recurrence rate of the traditional diagnosis and treatment plan is 14.3%, the lowest is 10.5%, and the calculated average recurrence rate is 12.14%; the highest recurrence rate of the experimental diagnosis and treatment plan was 9%, the lowest was 5%, and the calculated average recurrence rate was 7.08%. It can be seen that the diagnosis and treatment plan based on the big data algorithm used in the experiment has a lower recurrence rate.

At present, the understanding of the etiology and pathogenesis of cough in traditional Chinese medicine is still unclear, and there are various clinical treatment methods with different curative effects. Clinically, through the analysis of a large number of literature, physicians have summarized a relatively rich theory of cough etiology and pathogenesis and clinical treatment methods [19]. Modern medical research shows that cough is one of the most common symptoms of respiratory diseases, and its pathogenesis is complex, involving multiple systems and organs. With the advent of the era of big data, researchers are increasingly using modern medical technology to explore the etiology and pathogenesis of diseases. As an emerging research method, data mining refers to the process of extracting useful information and patterns hidden behind the data from a large amount of data. It has been widely used in many aspects such as disease diagnosis and treatment and clinical research in the medical field.

Through data mining of the literature on cough published in the past 30 years, two keywords "cough" and "wheezing" were obtained, which can be used to analyze the etiology and pathogenesis of cough. Through the analysis, it was found that the main methods for clinical treatment of cough include traditional Chinese medicine, western medicine and physical therapy, among which traditional Chinese medicine is the most common. For "cough", it is generally divided into two types: exogenous wind-cold and internal injury miscellaneous diseases; for "breathing", it can be divided into four types: Qi deficiency, blood deficiency, yin deficiency, and yang deficiency [20]. According to the above classification, commonly used drugs, drug combinations and commonly used traditional Chinese medicines for treating cough can be summarized. The frequency statistics and cluster analysis of commonly used traditional Chinese medicines, and the analysis of association rules can be used to obtain the correlation medicine pairs and medicine groups of "cough" and "breathing". The Apriori algorithm is used to cluster the medicines in the prescription, and the main categories of traditional Chinese medicines are obtained, and the association rules are analyzed. By studying the etiology, pathogenesis and medication rules of cough, it can further guide clinical treatment and improve the level of TCM diagnosis and treatment.

5. Conclusions

Through the above analysis, it is found that there are various treatment methods for cough and different curative effects. Therefore, when treating cough, clinicians should pay attention to the patient's general condition, medical history, symptoms, etc., conduct a comprehensive diagnosis, and choose an appropriate treatment method; at the same time, they should pay attention to the patient's physical condition and drug interactions, and avoid drug overdose or overuse. In the specific treatment, it should also be noted that the treatment methods for coughs caused by different etiologies and pathogenesis are also different. Therefore, clinicians should comprehensively analyze the patient's medical history, symptoms and other conditions to choose appropriate treatment methods to improve the curative effect of cough. In this paper, the TCM cough treatment method based on big data algorithms not only effectively improves the cure rate, but also improves the diagnostic accuracy in the diagnosis and treatment process, and reduces the recurrence rate. It is believed that this method will be widely used in the future. However, there are also some deficiencies in this article, such as lack of professionalism and so on.

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