

# Analysis on the Law of External Treatment of *Saposhnikovia Divaricata* Based on Data Mining

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**Abstract—Objective:** To analyze the medication rule of compound prescription containing *Saposhnikovia divaricata* for external treatment, and to provide reference for guiding clinical medication and research and development of new prescriptions. **Method:** Taking the periodical literature collected by CNKI as the data source, and using Excel 2013 and Clementine12.0 statistical software as tools, the statistical processing and association rule analysis of traditional Chinese medicine included in the standard are carried out. **Result:** Among all the compounds included in the standard, the top five Chinese medicines with the highest cumulative frequency are *Saposhnikovia divaricata* (45times,100.0%), *Sophora flavescens* (22times,48.9%), *Phellodendron amurense* (19times, 42.2%), *Glycyrrhiza uralensis* (15times,33.3%) and *Dictamnus dasycarpus* (14 times,31.1%). By analyzing association rules of compound prescription containing *Saposhnikovia divaricata*, 12 common drug pairs were obtained. There are 7 kinds of common clinical diseases of traditional Chinese medicine in the treatment of diseases. The association rule analysis found that 8 kinds of combination of drug pairs with the highest association intensity for anorectal diseases and 8 kinds of combination of drug pairs with the highest association intensity for skin diseases. **Conclusion:** Through the analysis of compound prescription containing *Saposhnikovia divaricata*, the medication rule and compatibility characteristics of *Saposhnikovia divaricata* in external treatment for different diseases are reflected, which provides theoretical support for "simultaneous treatment of different diseases". Mathematical statistics is an important tool for analysis of medication rule in traditional Chinese medicine and provides modern research direction for guiding clinical medication.

**Keyword—***Saposhnikovia divaricata*; law of medication; data mining; compound prescription; association rule

## I. INTRODUCTION

*Saposhnikovia divaricata* is the dry root of *Saposhnikovia divaricata* of Umbelliferae. *Saposhnikovia divaricata*, also known as "screen", is first published in Shen Nong Ben Cao Jing. It is pungent, sweet in taste and slight warm in property, and belongs to bladder, lung, spleen and liver meridians. It has the effects of dispelling wind, relieving exterior syndrome, eliminating dampness, relieving pain, relieving spasm and itching. It is mainly used for exterior syndrome caused by exogenous pathogenic factors, rheumatic arthralgia, tetanus, rubella pruritus, spleen deficiency and dampness excess, etc. It is a widely used traditional Chinese medicine in clinic<sup>[1,2]</sup>. Due to the multi-component and multi-target characteristics of traditional Chinese medicine, it is usually used in combination of drug pairs in clinical practice<sup>[3]</sup>, which results in a large amount of information in clinical research data of traditional

Chinese medicine. Therefore, the existing compound prescriptions are summarized and sorted out by using mathematical statistics to sort out the potential network connection of traditional Chinese medicine in different compound prescriptions, which is conducive to summarizing the clinical application laws of traditional Chinese medicine, developing new drug pair combinations<sup>[4]</sup>.

## II. DATA AND METHODS

### A. Data Sources

The full-text search is carried out in the "Advanced Search" of CNKI database with "Traditional Chinese Medicine", "*Saposhnikovia divaricata*" and "External application". The time range is January 2015 - January 2019, and 266 journal documents are retrieved.

### B. Inclusion Criteria

Excluding experimental studies, reviews, combined use of drugs, no specific drugs or single traditional Chinese medicine and other documents. After preliminary screening of 266 journal documents, 45 standard compound are obtained, so as to establish a database of treating diseases with traditional Chinese medicine compound containing *Saposhnikovia divaricata* for external use.

### C. Data Processing

According to the "Chinese Pharmacopoeia" 2015 edition<sup>[5]</sup> Chinese medicine naming standards, the names of the Chinese medicines involved are unified, and the diseases entered into the compound therapy are classified according to the "National Standard of the People's Republic of China - Terms of Clinical Diagnosis and Treatment of Chinese Medicine".

### D. Statistical Processing<sup>[6]</sup>

All the Chinese medicines in 45 compound prescriptions that meet the standards are input into Excel 2013 to establish a database one by one, and the Chinese medicines in the database are classified and sorted, and Clementine12.0 is used for statistical processing and network display.

## III. RESULTS

### A. Use of Single Traditional Chinese Medicine

All the drugs in the 45 selected compounds are summed up to obtain a total of 124 traditional Chinese medicines, with a cumulative frequency of 461 times. Among them, there are 14 kinds of drugs with frequency  $\geq 9$ , with a cumulative occurrence of 209 times. The top five Chinese medicines with

the highest cumulative frequency in all prescriptions are *Saposhnikovia divaricata* (45times,100.0%), *Sophora flavescens* (22times,48.9%), *Phellodendron amurense* (19times,42.2%), *Glycyrrhiza uralensis* (15times,33.3%) and *Dictamnus dasycarpus* (14times,31.1%).

#### B. Major Diseases Containing *Saposhnikovia divaricata* Compound in External Treatment

According to the classification standard of traditional Chinese medicine diseases in "National Standard of the People's Republic of China - Terminology of Clinical Diagnosis and Treatment of Traditional Chinese Medicine", the statistical analysis of 45 main diseases including *Saposhnikovia divaricata* Compound shows that there are 7 kinds of common clinical diseases of traditional Chinese medicine: anorectal diseases, skin diseases, traumatic swelling and pain, otolaryngologic diseases, vulvar diseases, orthopedic diseases and mastopathy.

#### C. Core Drug Combination Containing *Saposhnikovia divaricata* Compound in External Treatment<sup>[7]</sup>

Using Clementine12.0 statistical software to analyze association rules, using network to show the association between drugs, using Apriori modeling to further mine the compatibility relationship between drugs, setting the support degree to 20%, confidence degree to 100%, maximum preceding paragraph number to 5, promotion  $\geq 1$  and other conditions to mine potential drug combinations in common compounds, and obtaining 12 core drug pair combinations in total. The promotion degree of all drug combinations is greater than 1, which indicates that these drug combinations are statistically significant<sup>[8]</sup>.

#### D. Examples of Drug Law Analysis of Diseases Treated Externally with *Saposhnikovia divaricata* Compound

1) *Analysis of Medication Laws for Anorectal Diseases:* There are a total of 10 compound prescriptions containing *Saposhnikovia divaricata* mainly for anorectal diseases, and the specific diseases are mainly hemorrhoids, perianal eczema, anal pruritus, etc. Using Clementine12.0 statistical software to analyze association rules, using network to show the association between drugs, using Apriori modeling to further mine the compatibility relationship between drugs, setting the support degree to 40.0%, the confidence degree to 100%, the maximum number of preceding items to 5, upgrading  $\geq 1$  and other conditions to mine potential drug combinations in common compounds, and obtaining a total of 8 core drug pair combinations. The promotion degree of all drug combinations is greater than 1, which indicates that these drug combinations are statistically significant.

2) *Analysis on Drug Use Law of Dermatitis:* There are a total of 15 compound prescriptions containing *Saposhnikovia divaricata* mainly for skin diseases, and the specific diseases are mainly dermatitis, eczema, tinea, etc. Using Clementine12.0 statistical software to analyze association rules, using network to show the association between drugs, using Apriori modeling to further mine the compatibility relationship between drugs, setting the support degree to 35%,

the confidence degree to 100%, the maximum number of preceding items to 5, the promotion  $\geq 1$  and other conditions to mine the potential drug combinations in common compounds, and obtaining a total of 8 core drug pair combinations. The promotion degree of all drug combinations is greater than 1, which indicates that these drug combinations are statistically significant.

#### IV. DISCUSSION

Through association rule analysis, it is found that there are 8 combinations of drug pairs with the highest association strength for the treatment of anorectal diseases, such as *Saposhnikovia divaricata* - *Rhizoma atractylodis* ( exterior - relieving drug - dampness - eliminating drug ), *Saposhnikovia divaricata* - *glycyrrhizae radix* ( exterior - relieving drug - deficiency - tonifying drug ), *Saposhnikovia divaricata* - cortex *phellodendri* ( exterior - relieving drug - heat - clearing drug ), etc. The theory of traditional Chinese medicine holds that common anorectal diseases, such as hemorrhoids, are mostly caused by improper diet, prolonged sedentary life, deficiency of viscera, etc., which lead to internal excess of damp - heat, stagnation of gas and blood in meridians. The treatment should focus on clearing heat, tonifying deficiency and eliminating dampness<sup>[9-11]</sup>. Therefore, in the treatment of anorectal diseases, attention should be paid to the compatibility of the exterior - relieving drug *Saposhnikovia divaricata* with the dampness - eliminating drug *Atractylodes lancea*, the heat-clearing drug *Phellodendron amurense*, *Sophora flavescens*, and the deficiency-tonifying drug *Glycyrrhiza uralensis*.

Through association rule analysis, it is found that there are 8 combinations of drug pairs with the highest association strength for treating dermatoses, such as *Saposhnikovia divaricata* - *Schizonepeta tenuifolia* ( exterior - releasing drug - exterior - releasing drug ), *Saposhnikovia divaricata* - *Kochia scoparia* ( exterior - releasing drug - diuretic and dampness - permeating drug ), *Saposhnikovia divaricata* - *Sophora flavescens* ( exterior - releasing drug - heat - clearing drug ), etc. According to the theory of traditional Chinese medicine, common skin diseases such as eczema tend to be "wet" as the main cause, and wind, dampness and heat are both pathogenic factors. Eczema is mainly caused by wind, dampness and heat, and has internal and external causes. Therefore, treatment mainly focuses on strengthening body resistance and eliminating pathogenic factors<sup>[12-14]</sup>. Furthermore, in clinical use, attention should be paid to the compatibility of windbreak with exterior - relieving drugs such as *Schizonepeta tenuifolia*, diuretic and dampness - permeating drugs such as *Kochia scoparia*, and antipyretic drugs such as *Sophora flavescens* ait.

Based on the induction and statistics of compound prescription containing *Saposhnikovia divaricata*, this paper preliminarily discusses its external treatment medication rules, and when treating anorectal diseases and skin diseases, *Saposhnikovia divaricata* exerts different effects through compatibility with different drugs, so as to adapt to clinical needs, reflect the medication rules and compatibility characteristics of *Saposhnikovia divaricata* in external treatment for different diseases, provide theoretical support for " simultaneous treatment of different diseases", provide basis

for standardization and scientization of clinical external treatment of *Saposhnikovia divaricata* <sup>[15-16]</sup>.

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