ISSN 2618-1584 Vol. 5, Issue 7: 119-124, DOI: 10.25236/FMSR.2023.050719

Study on the Drug Use Pattern of Professor Li Jun's Treatment of Coronary Heart Disease Based on Association Rules and Entropy Clustering of Complex Systems

Yu Zhang[1,a], Jun Li[2,b], Youcai Yuan[2,c,*]

[1]Shaanxi University of Chinese Medicine, Xianyang, Shaanxi, 712046, China
[2]Affiliated Hospital of Shaanxi University of Chinese Medicine, Xianyang, Shaanxi, 712000, China
[a]1548252673@qq.com, [b]1791865970@qq.com, [c]965899524@qq.com
[*]Corresponding author

Abstract: *To apply data statistics to analyze the drug use rules of Professor Li Jun in the treatment of coronary heart disease.Based on the software of the TCM Inheritance Auxiliary Platform, the 2015-2017 coronary heart disease cases treated by Professor Li Jun, a famous old Chinese medicine doctor in Shaanxi Province, were collected, and 50 valid cases were screened out from them, and a party database of coronary heart disease was constructed, and the data collection and analysis functions of the software were used to analyze the input data for statistical analysis of drug frequency, prescription rules, and new prescriptions. Among the 50 prescriptions for the treatment of coronary heart disease, a total of 80 Chinese medicines were involved; the most frequent drug use was: Pinellia Ternate,Pericarpium Citri Reticulate , the root of Kudzu Vine,Ground Beetle, Ligusticum Wallichii; the five places with the highest frequency of drug combinations were: "Pinellia Ternate, Pericarpium Citri Reticulate", "Pinellia Ternate,the root of Kudzu Vine", "Pinellia Ternate, Ground Beetle", "Pericarpium Citri Reticulate, the root of Kudzu Vine", "Pinellia Ternate, Pericarpium Citri Reticulate, the root of kudzu Vine",and 18 drug core combinations and 9 new combinations were excavated. Taking sputum stasis as the basic mechanism for the treatment of coronary heart disease,the treatment method of gasification of phlegm and blood circulation is adopted, and the clinical effect is remarkable, which provides a broader reference value for the clinical treatment of coronary heart disease.*

Keywords: *Coronary heart disease; Professor Li Jun; Medication law; Association rule; Cluster analysis*

1. Preface

Li Jun (1954-), male, from Sanyuan County, Shaanxi. Shaanxi Province famous traditional Chinese medicine practitioner, national old Chinese medicine expert academic experience inheritance instructor, 40 years of medical practice, cardiovascular and cerebrovascular diseases treatment rich in testing, the treatment of coronary heart disease, stroke, hypertension and other diseases has its own uniqueness. In recent years, the mortality rate of coronary heart disease has shown an increasing trend, and in 2018, the mortality rate of coronary heart disease ranked first among major diseases. With the continuous improvement and development of the TCM system, TCM has a good effect on improving its clinical symptoms in the treatment of coronary heart disease. In this study, by collecting, collating and screening Professor Li Jun's prescriptions for the treatment of coronary heart disease, based on data analysis integration software, using data mining methods such as association rules and complex system entropy clustering, this study analyzes the medication rules of the group, and gradually clarifies Professor Li Jun's drug ideas for the treatment of coronary heart disease, in order to provide clinical value for his treatment from the perspective of traditional Chinese medicine.

2. Clinical data and analytical methods

2.1. Data sources, filtering

In this study, 50 prescriptions for coronary heart disease were screened using Professor Li Jun's outpatient prescriptions from 2015 to 2017, and the "Clinical Coronary Heart Disease Diagnosis and

ISSN 2618-1584 Vol. 5, Issue 7: 119-124, DOI: 10.25236/FMSR.2023.050719

Treatment Guidelines" [1] was used as the inclusion criterion for coronary heart disease prescriptions.

2.2. Data analysis software

The application is the "TCM Inheritance Assistance System (V2.50)" software jointly developed by the Institute of Chinese Materia Medica, Chinese Academy of Chinese Medical Sciences and the Institute of Automation, Chinese Academy of Sciences.

2.3. Data entry, reconciliation

The above 50 prescriptions that meet the inclusion criteria were entered into the TCM inheritance assistance platform system. Try to be consistent with the aliases of the drugs used in the prescription to ensure the accuracy of the software when performing statistical analysis of the data. At the same time, it is considered that the errors that may occur in the whole process of prescription entry are related to human factors, that is, the entered data is reviewed and checked again by the two people.

2.4. Data analysis

2.4.1. Extract data

We enter "coronary heart disease" in the "Western Medical Disease" column and "Li Jun" in the "Prescribing Physician" column to extract all the prescriptions of Professor Li Jun for the treatment of coronary heart disease.

2.4.2. Statistics on the frequency of drug use

The frequency of use of 80 flavors of drugs in the prescription for coronary heart disease was sorted in descending order (from largest to smallest), and the "drug use frequency statistics" result was exported.

2.4.3. Analysis of Drug Composition Rules

Analysis of drug composition rules Set the "Number of support" (indicating the frequency of simultaneous occurrence in all drugs) to 37 and "Confidence" to 0.9, click the corresponding function item to export, and sort the analysis results in descending order according to the frequency of drug combinations.

2.4.4. New prescription analysis

On the basis of the above steps, we selects the appropriate relevance and punishment degree according to multiple cases in the software manual of the TCM inheritance assistance platform, clicks the corresponding function button, performs cluster analysis, mines the core combination (the basic algorithm is entropy cluster analysis of complex systems), discovers new prescriptions (the basic algorithm is unsupervised entropy level cluster analysis), and realizes network visualization for display.

3. Outcome

3.1. Frequent medication results

Table 1: Drugs with a frequency of more than 20 in coronary heart disease prescriptions

serial number	Name of traditional Chinese medicine	Frequency	serial number	Name of traditional Chinese medicine	Frequency
1	Half summer	48	12	Calamus	33
2	Tangerine Peel	46	13	Medicated leaven	31
3	Pueraria	45	14	angelica	30
4	Earthen Turtle worm	43	15	hawthorn	30
5	Chuanxiong	42	16	Gallbladder South Star	29
6	Red peony	41	17	turmeric	27
7	Gastrodia Elata	40	18	Raw Rehmania	26
8	Leech	39	19	Fusso	25
9	Bai Zhi	38	20	Puhuang	24
10	safflower	37	21	malt	23
11	Walnuts	35	22	Xue Bai	23

From 2015 to 2017, the "frequency statistics" of 80 flavored Chinese medicines involved in the 50 prescriptions screened by Professor Li Jun for the treatment of coronary heart disease were carried out,

ISSN 2618-1584 Vol. 5, Issue 7: 119-124, DOI: 10.25236/FMSR.2023.050719

and 22 flavored medicines with a frequency higher than 20 were in the top five in descending order, namely Banxia, Tangerine Peel, Kudzu, Earthen Turtle and Chuanxiong. (See Table 1)

3.2. The results of the group rule analysis

The system sorted the frequency of drug combinations in descending order, and the top five were "Banxia, Tangerine Peel", "Banxia, Kudzu", "Banxia, Turtle Worm", "Tangerine Peel, Kudzu", "Banxia, Tangerine Peel, Kudzu" (see Table 2), and the medication rules of drug combinations were obtained by using the association rule analysis method (see Table 3).

Table 2: Combinations with a frequency of more than 37 used in coronary heart disease formulas

serial number	Drug pattern	Frequency	serial number	Drug pattern	Frequency
1	Banxia, tangerine peel	46	15	Kudzu, Chuanxiong	38
2	Banxia, Kudzu	43	16	Earthen turtle worm, leech	38
3	Half summer, earthen turtle worm	41	17	Banxia, Tangerine peel, Chuanxiong	38
4	Tangerine peel, Kudzu root	41	18	Banxia, Red Peony, Chuanxiong	38
5	Banxia, tangerine peel, kudzu	41	19	Banxia, Kudzu, Tianma	38
6	Banxia, Chuanxiong	40	20	Bai Zhi, half summer	37
7	Red peony, Chuanxiong	40	21	Bai Zhi, tangerine peel	37
8	Kudzu, Tianma	40	22	Half summer, leeches	37
9	Half summer, red peony	39	23	Tangerine peel, red peony	37
10	Tangerine peel, earthen turtle worm	39	24	Kudzu, red peony	37
11	Kudzu, earthen turtle worm	39	25	Bai Zhi, Banxia, Tangerine Peel	37
12	Banxia, tangerine peel, earthen turtle worm	39	26	Banxia, tangerine peel, red peony	37
13	Banxia, Tianma	38	27	Banxia, Kudzu, Turtle worm	37
14	Tangerine peel, Chuanxiong	38			

Table 3: Association rules of coronary heart disease prescription drug combinations (confidence greater than 0.9)

serial number	rules	Confidence	serial number	rules	Confidence
1	Tangerine peel -> half summer	1	22	Red peony, Chuanxiong -> half summer	0.95
2	Tianma - > Kudzu	1	23	Banxia, Chuanxiong -> red peony	0.95
3	Tangerine peel, Chuanxiong -> Banxia	1	24	Kudzu, Tianma -> Banxia	0.95
4	Tangerine peel, earthen turtle -> half summer	1	25	Tianma -> Banxia, Kudzu	0.95
5	Tangerine peel, kudzu -> half summer	1	26	Leeches -> Half summer	0.948718
6	Banxia, Tianma -> Kudzu	1	27	Banxia, red peony -> tangerine peel	0.948718
7	Red Peony - > Chuanxiong	0.97561	28	Kudzu, Terracotta -> Half summer	0.948718
8	Leeches - > Earthen turtle worms	0.974359	29	Red Peony -> Banxia, Chuanxiong	0.926829
9	Banxia, Red Peony -> Chuanxiong	0.974359	30	Kudzu - > tangerine peel	0.911111
10	Bai Zhi -> Half summer	0.973684	31	Kudzu root -> half-summer, tangerine peel	0.911111
11	Pycnogenol - > tangerine peel	0.973684	32	Earthen turtle - > tangerine peel	0.906977
12	Banxia -> tangerine peel	0.958333	33	Earthen turtle worm -> Pueraria Red peony	0.906977
13	Kudzu -> half summer	0.955556	34	Earthen turtle worm -> Half summer, Tangerine peel	0.906977
14	Earth Turtle Worm -> Half summer	0.953488	35	Chuanxiong -> Tangerine peel	0.904762
15	Banxia, Kudzu -> tangerine peel	0.953488	36	Chuanxiong -> Pueraria	0.904762
16	Chuanxiong -> Half summer	0.952381	37	Chuanxiong -> Half summer, Tangerine peel	0.904762
17	Chuanxiong -> red peony	0.952381	38	Chuanxiong -> Half summer, Red peony	0.904762
18	Red Peony -> Half summer	0.95122	39	Red peony -> Tangerine peel	0.902439
19	Banxia, earthen turtle -> tangerine peel	0.95122	40	Red peony -> Pueraria	0.902439
20	Tianma -> Half summer	0.95	41	Half summer, Earthen turtle worm -> Pueraria	0.902439
21	Banxia, Chuanxiong -> tangerine peel	0.95			

ISSN 2618-1584 Vol. 5, Issue 7: 119-124, DOI: 10.25236/FMSR.2023.050719

3.3. Analysis of formula formula formula based on entropy clustering

3.3.1. Analysis of drug-drug correlations

According to the number of data entered, the pre-reading of the number of data obtained by different parameters with the experience of individuals using the software, the correlation coefficient is set to 8, the penalty coefficient is set to 4, and the cluster analysis is carried out based on the improved mutual information method, and the correlation degree between 80 flavors of Chinese medicine in the coronary heart disease prescription is obtained, and the drug pair with a correlation coefficient of 0.04 or more are displayed in a list (see Table 4).

Table 4: Analysis of correlation between drugs

Drug combination	Correlation coefficient	Drug combination	Correlation coefficient
Hundreds,Porridge	0.0701713	Salvia,forsythia	0.04622406
tuckahoe,Cassia seed	0.0665122	Raw Rehmania,Fushin	0.04611792
Hundreds,hawthorn	0.0654569	safflower,Epimedium	0.0460301
Hundreds,leech	0.0618805	Immortal grass,baizhu	0.04062283
Hundreds,Xue Bai	0.06097028	Immortal grass,Incense	0.04062283
safflower,Coptis	0.05632016	Epimedium,Party ginseng	0.04062283
tuckahoe,Laijizi	0.05457157	Epimedium,baizhu	0.04062283
safflower,Bitter ginseng	0.05333287	Epimedium,Incense	0.04062283
tuckahoe,Cooked ground yellow	0.05311164	Fine spices,baizhu	0.04062283
Hundreds,licorice	0.05068529	Earthen turtle worm,baizhu	0.0406228
Cassia seed,earthworm	0.05068529	Five spirit fat,nard	0.04007575
Salvia,Coptis	0.05014184	Five spirit fat,Cooked ground yellow	0.04007575
Salvia,zhimu	0.05014184		

3.3.2. Analysis of drug core composition

Based on the results of the correlation degree analysis between drugs, according to the correlation coefficient and penalty coefficient constraints set in the previous step, and using the entropy clustering method of complex system, the core combination of 3-4 flavored drugs, a total of 18 drug pairs were analyzed (see Table 5).

Table 5: Analysis of drug core composition

serial number	Core Portfolio	serial number	Core Portfolio
1	Hundreds,dandelion,Gallbladder South Star	10	Hundreds,Gallbladder South Star,Fine spices
2	Blood exhaustion,safflower,Raw Rehmania	11	Blood exhaustion,safflower,angelica
3	Cicada molt,Divine,hawthorn	12	Divine,hawthorn,Fushin
4	Puhuang,Five spirit fat, Yujin	13	Five spirit fat,Yujin,Hook vine
5	Walnuts,Salvia, Cassia seed	14	Salvia,safflower,Cassia seed
6	Walnuts,Cassia seed,Raw Rehmania	15	safflower,Cassia seed,Raw Rehmania
7	tuckahoe, Chuanxiong, Raw Rehmania	16	tuckahoe,Chuanxiong,angelica,Fine spices
8	tuckahoe,Chuanxiong,forsythia	17	tuckahoe,forsythia,Red peony
9	Earthen turtle worm,malt,nard	18	Earthen turtle worm,malt,Peony peel

3.3.3. New Party Analysis

Table 6: New Party analysis

serial number	New prescriptions
1	Hundreds, dandelion, Gallbladder South Star, Fine spices
2	Blood exhaustion, safflower, Raw Rehmania, angelica
3	Cicada molt, Divine, hawthorn, Fushin
4	Puhuang, Five spirit fat, Yujin, Hook vine
5	Walnuts, Salvia, Cassia seed, safflower
6	Walnuts, Cassia seed, Raw Rehmania, safflower
7	tuckahoe, Chuanxiong, Raw Rehmania, angelica, Fine spices
8	tuckahoe, Chuanxiong, forsythia, Red peony
9	Earthen turtle worm, malt, nard, Peony peel

Using the unsupervised entropy hierarchical clustering analysis method, the core combination was clicked on the corresponding functional items and recombined to obtain 9 new prescriptions for the treatment of coronary heart disease (see Table 6).

ISSN 2618-1584 Vol. 5, Issue 7: 119-124, DOI: 10.25236/FMSR.2023.050719

4. Discussions

In this paper, the "TCM Inheritance Auxiliary Platform System" software was used to mine and process the data collected, screened and entered, and the 50 prescriptions screened for the treatment of coronary heart disease were analyzed regularly, and the frequency of drug use, drug pairs and correlation coefficients, 18 core combinations, and 9 new prescriptions were obtained for the treatment of coronary heart disease. Professor Li Jun's commonly used drugs for the treatment of coronary heart disease include Half summer, Tangerine peel, Pueraria, Earthen turtle worm, Chuanxiong, Red peony, Tianma, leech, etc., most of these drugs have the effect of dissolving phlegm, promoting qi, activating blood and dissolving stasis, showing its characteristics of drugs for the treatment of coronary heart disease. Professor Li Jun often uses a combination of drugs for the treatment of coronary heart disease: “Half summer, Tangerine peel”, “Half summer, Pueraria”, “Half summer, Earthen turtle worm”, “Tangerine peel, Pueraria”, “Half summer, Tangerine peel, Pueraria”, “Half summer, Chuanxiong”, “Red peony, Chuanxiong”, “Pueraria, Tianma”. Commonly used drug pairs are mainly Hundreds-Porridge, tuckahoe-Cassia seed, Hundreds-hawthorn, Hundreds-leech. Through the software processing and analysis data, the medication rules of Professor Li Jun for the treatment of the disease were summarized, which was convenient for academic and experience dissemination and provided certain guiding ideas for clinical practice.

Coronary heart disease belongs to the category of "chest paralysis" in traditional Chinese medicine, which is mostly closely related to pathogenic factors such as poor diet and emotional disorders, which can produce blood stasis, phlegm turbidity pathological products, and the two interact to cause disease. As stated in "Liu Xuan's Four Medical Cases Selection of Jizhitang Medical Cases" [2], "Chest pain is a name chest paralysis, the paralyzed person's chest is not open, and the phlegm is more than enough, this disease is not only phlegm, but also has bruising, and intersects between the diaphragms." Professor Li Jun [3] believes that phlegm and stasis are knotted, and cardiac pulse obstruction is the key to the disease, and the treatment is based on gasification and phlegm and blood circulation. Zhu Chunlin [4] et al. concluded through data analysis that the frequency order of Half summer in the present side is 6, and the ranking of the ancient side is 10; Tangerine peel is used in the order of frequency in the present side as 17 and in the ancient side as 5; Chuanxiong is ranked as 2 in the present side and 20 in the ancient formula, and the above data can reflect the frequent application of drugs with the effects of qi, phlegm and blood revitalization in medicine from ancient times to the present. Among the commonly used drugs used by Professor Li Jun for the treatment of coronary heart disease, Half summer is a warm cold phlegm medicine, spicy and warm, good at drying and dehumidifying evil and dissolving phlegm drink; Tangerine peel is a qi medicine, Xin Xing Wentong, into the lungs and spleen meridians, Qi ventilation; Pueraria is an antidote, spicy taste, into the lungs and spleen meridians, can be through the meridian activation. Pueraria is the main component of Pueraria and plays an extremely important role. Studies have found that Puerariacin can reduce the degree of endothelial vascular damage, which is mainly completed by inhibiting the transmembrane transport of Na + and K + plasmas, and can also slow down atherosclerosis by reducing inflammatory factors and exerting anti-inflammatory functions [5-6]; Earthen turtle worm is a blood circulation and stasis removal medicine, salty and cold, into the liver meridian, good sex, strong blood circulation and stasis; Chuanxiong is a blood circulation and stasis rejuvenating medicine, spicy fragrance spreads, and warms the blood veins. Zhao Xinwang [7] et al. believe that Chuanxiong may treat coronary heart disease through anticoagulation, antioxidant, anti-inflammatory, dilation of blood vessels, regulation of blood pressure, etc. Through a large number of literature searches, it was found that the proportion of modern formulas using blood circulation and stasis removal drug combinations is relatively large, while the ancient prescriptions pay more attention to the combination of phlegm and qi drugs, and Professor Li Jun combines the two to treat coronary heart disease, treating the same specimen and root cause, and the clinical effect is very good.

Based on the TCM inheritance assistance system platform, this study analyzes and mines the medication rules of Professor Li Jun, and statistically summarizes the prescriptions for the treatment of coronary heart disease, and analyzes the frequency of traditional Chinese medicine use, drug combinations, core drug combinations and new prescriptions, which provides a reference for the in-depth mining and inheritance of Professor Li Jun's coronary heart disease treatment experience. However, the core combination and the clinical value of new prescriptions in the analysis results also have limitations, which need to be judged by clinicians' interpretation and clinical efficacy research, so as to provide a wider reference value for the clinical treatment of coronary heart disease.

ISSN 2618-1584 Vol. 5, Issue 7: 119-124, DOI: 10.25236/FMSR.2023.050719

References

[1] Yan Hongbing. Guidelines for the diagnosis and treatment of clinical coronary heart disease[M]. Beijing: People's Medical Publishing House, 2010:76-77.
[2] Chen Yushu, Wang Kerang. Liu Xuan. Four Medical Cases Selection of Jizhitang Medical Cases[J]. Journal of Xingyuan Traditional Chinese Medicine Literature, 1994, (1X):8-10.
[3] Tian Panpan, Wu Xiaobo, Zhao Wei, Li Jun. Professor Li Jun's Experience in Treating Angina Pectoris of Coronary Heart Disease[J].World Journal of Integrated Traditional and Western Medicine, 2021, 16(2):270-273.
[4] Zhu Chunlin, Li Ruihan, Jing Ruiqing, Huang Li. Prescription Regularity of Traditional Chinese Medicine in the Treatment of Coronary Heart Disease in Ancient and Modern Literatures[J]. Chinese Journal of Integrative Medicine on Cardio-Cerebrovascular Disease, 2022, 04:586-591.
[5] He Xinxin, Wang Junyan, Song Yan, Jia Lianqun, Yang Guanlin, Chen Wenna, Zhang Zhe. Potential Molecular Mechanisms of Puerarin in Treatment of Atherosclerosis Based on Network Pharmacology[J].Chinese Archives of Traditional Chinese Medicine, 2020, 09:116-120+262-263.
[6] Shi Chenxu, Du Jiarong, Wu Wei, Liu Lianxuan, Yang Guanlin, Zhang Huiyong. Chemical Constituents and Pharmacological Action of Puerariae Lobatae Radix: A Review[J]. Modern Chinese Medicine, 2021, 12:2177-2195.
[7] Zhao Xinwang, Xu Wenhua, Zhao Yang, Wu Yanhong, Luo Wei, Zhu Ziming, Zheng Jinghui. Action mechanisms of Chuanxiong Rhizoma in treating coronary heart disease based on network pharmacology [J].Chinese Traditional Patent Medicine, 2019, 09:2096-2101.