Visualization analysis of the research status of *FU Qingzhu's Obstetrics and Gynecology* based on bibliometrics

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A R T I C L E   I N F O

A B S T R A C T

Objective This study examined the research status and development process of *FU Qingzhu's Obstetrics and Gynecology* (*Fu Qing Zhu Nv Ke*,《傅青主女科》, *FQZNK*) in the past 40 years with bibliometrics and visual analysis.

Methods Retrieved all related literature in the research field of *FQZNK* from the domestic and foreign databases: China National Knowledge Infrastructure (CNKI), China Science and Technology Journal Database (VIP), Wanfang Database, and Web of Science (WOS) core database, including Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI), and Arts & Humanities Citation Index (A&HCI). The search range was from January 1, 1980 to March 10, 2021. In addition, bibliometrics and CiteSpace 5.7.R2 software were used to analyze literature types, published journals, cited literature, the number of author publications, co-author networks, co-institution networks, keyword co-occurrence networks, keyword clusters, and keyword bursts.

Results A total of 678 valid records were included in the final dataset. Literature types, high publication journals, highly cited literature, high-yield institutions, high-yield research teams, and high-productivity scholars in this research field were found through bibliometrics. Literature types can be divided into four categories, among which 451 are theoretical studies on academic thoughts of *FQZNK*, accounting for 66.5% of the included journals. *The Journal of Shanxi Traditional Chinese Medicine* had the largest volume of published articles (61), accounting for 9.0% of the total number of the included journals. The most cited literature was ZHOU Mingxin's article "Using the quantitative method to discuss author's authenticity and formula characteristics of *FU Qingzhu's Obstetrics and Gynecology*", which was cited 94 times. Hunan University of Chinese Medicine, the institution with the most publications, published 45 articles, and YOU Zhaoling, the most published author, published 33 articles. Moreover, it was found that most high-yield researchers came from high-yield institutions and that Hunan University of Chinese Medicine had the most research on *FQZNK*. Keyword co-occurrence analysis revealed that the keyword "*FQZNK*" had the highest frequency (597 times) and the highest centrality (1.00). Keyword cluster analysis used the Log-Likelihood Ratio (LLR) algorithm to form eleven important clusters: #0 treatment aiming at its root causes, #1 gynecopathy, #2 Siwu Decoction (四物汤), #3 FU Qingzhu, #4 post-partum, #5 infertility, #6

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dysmenorrhea, #7 sterility, #8 coordinate the heart and kidney, #9 Danggui Buxue Decoction (当归补血汤), and #10 treatment. It was found that the prescriptions of *FQZNK* were studied mainly before 2000, the theoretical studies were mainly conducted before 2010, and its clinical application was mainly explored from 2010 until now. Diseases such as dysmenorrhea, morbid vaginal discharge, infertility, metrorrhagia, and polycystic ovarian syndrome (PCOS) have recently become popular topics in this field.

Conclusion The current study provides more scientific, accurate, and comprehensive scientific support for further research and development of traditional Chinese medicine (TCM) in *FQZNK*. With this foundation, people can use burst detection to ascertain the current hotspots in research, get their development trends, and forecast future research directions. In addition, infertility, morbid vaginal discharge, flooding, and PCOS treatments based on TCM syndrome differentiation are currently popular research topics for *FQZNK*.

1 Introduction

FU Qingzhu's Obstetrics and Gynecology (Fu Qing Zhu Nv Ke,《傅青主女科》, FQZNK) was written in the twelfth year of Emperor Kangxi of the Qing Dynasty (1673) by FU Qingzhu, a scholar who was proficient in traditional Chinese culture, particularly traditional Chinese medicine (TCM) and Confucianism. He is renowned for his great achievements in TCM research, especially in the field of gynecology. The book's first volume is divided into five branches, namely, leukorrhea, massive hemorrhage, hysteromyoma (Gui Tai, 鬼胎), regulating menstruation, and promoting conception. The first volume contained 38 chapters, 39 syndromes, and 41 prescriptions. The following volume is divided into five branches, including pregnancy, miscarriage, dystocia, normal labor, and postpartum, with a total of 39 chapters, 41 syndromes, and 42 prescriptions [1]. The book is a monograph on obstetrics and gynecology with high clinical, teaching, and scientific research value. As such, it is an important source of diagnosis and treatment in the field of gynecology utilizing TCM. It systematically and profoundly elaborates on the mechanisms of disease, mainly common gynecological diseases such as morbid vaginal discharge, menopathy, and infertility. Moreover, the prescriptions listed here have been proven effective by doctors. *FQZNK* has been the subject of numerous academic studies. Therefore, how to systematically organize and summarize the academic thoughts of *FQZNK* is important to improve the level of clinical diagnosis and treatment and to effectively pass down its academic knowledge to subsequent generations.

In recent years, scientific knowledge graphs have developed rapidly in China as a new method of bibliometrics [2]. Bibliometrics takes the bibliometric system and bibliometric characteristics as the research object and conducts quantitative and qualitative analyses of the literature. It allows for quantitative measurements of contour distribution, as well as the study of relationships and clustering [3]. In addition to describing and predicting developments in a particular field of research, this type of analysis can also compare the contributions of different countries, institutions, journals, and scholars [4]. Many scholars have adopted this method of literature analysis in various fields of medicine, such as spinal surgery [5], single-cell sequencing technology [6], health information [7], neurogenetics [8], cardiovascular diseases [9], and endocrine diseases [10]. CiteSpace is an information visualization software developed by Professor CHEN Chaomei using the Java language [11]. The software can visualize the structure, law, and distribution of scientific knowledge, show the development trend, and present the hot spots and development course of the research frontier field [11].

This study used bibliometric and Excel 2016 software. CiteSpace 5.7.R2 software was used to analyze the literature types, journal situation, cited literature, authors, research institutions, and keywords in the research field of *FQZNK*. This paper summarizes and analyzes the research status, trends, hot spots, and frontiers in this field. To lay a foundation for the study of the knowledge graph of *FQZNK*, it first discusses the research status and development rule of *FQZNK*, and then presents and excavates its knowledge system.

2 Methods

2.1 Database

The following Chinese databases were searched in this study: China National Knowledge Infrastructure (CNKI), China Science and Technology Journal Database (VIP), and Wanfang Database. The Web of Science (WOS) core database, including Science Citation Index Expanded (SCIE), Social Sciences Citation Index (SSCI), and Arts & Humanities Citation Index (A&HCI) were also searched, but only two papers were retrieved, both of which were determined to have little correlation with *FQZNK*. This paper studies an ancient TCM book, about which little has been written outside Chinese literature. Results indicated that the CNKI database had the most comprehensive relevant data; it basically contained other database retrieval content. Therefore, the literature contents

examined in this study are all obtained from the CNKI database.

2.2 Searching strategy

First, "Medical" and "Health Science and Technology" were selected as the search subjects. Then, the theme of "*FQZNK*" or the keyword "*FQZNK*" or the title of the article "*FQZNK*" was searched in CNKI. The retrieval period was from January 1, 1980 to March 10, 2021.

2.3 Literature screening criteria

Inclusion criteria: (i) search fields are unified and complete; (ii) research data are authentic; (iii) the journal or dissertation is completed; and (iv) the research design of "*FQZNK*" is rigorous and the research methods and indicators are accurate.

Exclusion criteria: (i) literature that is publicly duplicated; (ii) literature with incomplete authorship or unclear year of publication; (iii) literature that is not relevant to the subject; and (iv) conference abstracts, news reports, notices, exercises, and other literature unrelated to the research content of *FQZNK*.

2.4 Data specifications

First, we combined the former name and the current name of the research institution and standardized it as the current name. Then, the name of each institution was unified as the first-level name of the institution. For example, "Hunan College of Traditional Chinese Medicine" was standardized as "Hunan University of Chinese Medicine". Finally, the included literature in the Refworks format in CNKI were exported and imported into CiteSpace 5.7.R2 software for format conversion after being renamed "download_.txt".

2.5 Data analysis

Excel 2016 software was used to analyze the data of annual publications, research type distribution, journal distribution, and highly cited literature analysis related to the study of *FQZNK*. CiteSpace 5.7.R2 software was used for the visual analysis of data such as authors, research institutions, and keywords. For the software parameter settings, the time span was set from January 1, 1980 to March 10, 2021, and the time partition was one year as a unit under the "Time Slicing" module. We set the node type to "author" "institution", and "keywords", respectively. For link strength between objects, we chose "cosine" "scope", and "with slices". For the selection criteria, we set "TopN" to 50; threshold (TopN Perslice) = 50, and g-index (k = 25). For pruning, pathfinder was used. The log-likelihood ratio (LLR), latent semantic indexing (LSI), and mutual information (MI) algorithms were used to carry out keywords clustering analysis and tag clustering labelling.

3 Results

3.1 Literature publication trend

As shown in Figure 1, during the period from January 1, 1980 to March 10, 2021, the number of published articles for *FQZNK* has been gradually increasing with periodic fluctuations. Two distinct stages can be identified. The first, 1980 – 2006 is the platform period. During this time, the number of annually published articles is generally low, no more than 20 articles per year. However, from 2007, the number of annually published papers began to exceed 20. During the second period, 2007 – 2020, the total number of published papers doubled and reached 41 in 2019 (Figure 1). The main research topics, presented in Figure 2, including *FQZNK*, FU Qingzhu, infertility, morbid vaginal discharge, menopathy, academic thoughts, medication rules, biochemical soup, etc.
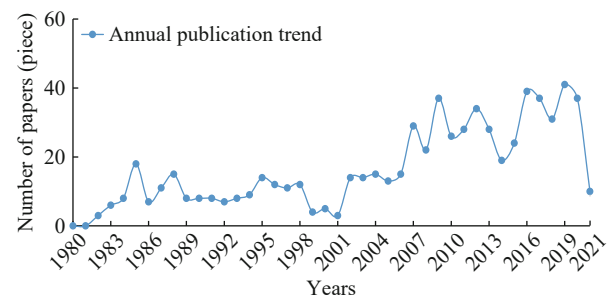

Figure 1　Temporal distribution of publications of *FQZNK*

Figure 2　Distribution of top 13 literature topics of *FQZNK* in CNKI
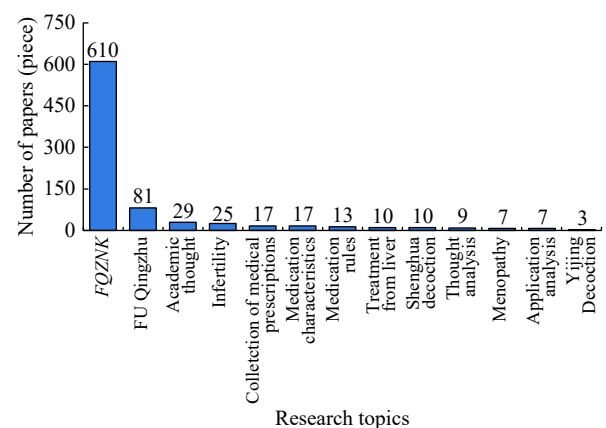
3.2 Literature types

FQZNK is an ancient clinical book of gynecology, the related research content of which can be roughly divided into the following four categories: academic thought and theory research, prescription law research, clinical case discussion, and famous doctors' experience. After reading all the literature and calculating manually, we found

that there were 451 theoretical studies on academic thought in *FQZNK*, accounting for 66.5%, and 181 studies on the rule of prescriptions, which accounted for 26.7% (Table 1). From these, we can see that most of the studies on *FQZNK* are stem from academic thought, theories, and rules for establishing formulas and descriptions.

Table 1 Literature types published on *FQZNK*

Literature type	Amount (n)	Proportion (%)
Academic thought	451	66.5
Regulation of prescription	181	26.7
Clinical application	10	1.5
Famous doctor's experience	14	2.1
Others	22	3.2

3.3 Published journal status

Among the included studies, 651 were journal papers, among which *The Journal of Shanxi Traditional Chinese Medicine* has the largest volume of published articles (61), accounting for 9.0% of the total number of included journals. The other three of the top four journals are *Chinese Medicine Modern Distance Education of China, Journal of Sichuan of Traditional Chinese Medicine, and Guangming Journal of Chinese Medicine*. The number of articles published in the top 10 journals of *FQZNK* is shown in Table 2.

Table 2 The number of articles published in the top 10 journals of *FQZNK*

Journal	Amount (n)	Proportion (%)
Shanxi Journal of Traditional Chinese Medicine	61	9.0
Chinese Medicine Modern Distance Education of China	30	4.4
Journal of Sichuan of Traditional Chinese Medicine	26	3.8
Guangming Journal of Chinese Medicine	23	3.4
Guiding Journal of Traditional Chinese Medicine and Pharmacy	20	2.9
Jiangsu Journal of Traditional Chinese Medicine	19	2.8
Western Journal of Traditional Chinese Medicine	18	2.7
Journal of New Chinese Medicine	17	2.5
Journal of Traditional Chinese Medicine	14	2.1
Journal of Liaoning University of Traditional Chinese Medicine	13	1.9

3.4 Author collaborative network analysis

A core group of authors is a group of authors who have a large number of publications and extensive influence in a particular subject area. We used CiteSpace software to visually analyze the author cooperation network of *FQZNK*. As a result of the analysis, we obtained 1 032 nodes, the size of which represents the frequency of the occurrence of the analysis object, and 1 142 lines, the thickness of which, between nodes, represents the strength of the co-occurrence relationship. The analysis shows that a total of 635 authors have published relevant literature in this field, and YOU Zhaoling, who is the author with the highest number of published articles, has published 33 articles to date. A high-frequency author cooperation network has been formed creating a large research team represented by YOU Zhaoling (Table 3 and Figure 3). There is a certain cooperative relationship between middle- and high-yield authors, and seven research teams have been formed around YOU Zhaoling, ZHANG Jianwei, LIU Chunsheng, and other prolific authors. The author cooperation network diagram (Figure 3) shows that there is less cooperation among different research teams, which may be related to the different research focuses and research directions of different teams.

Table 3 Most published authors on *FQZNK* ($n \geqslant 5$)

Author name	Number of papers (n)	Percentage (%)
YOU Zhaoling	33	4.9
ZHANG Jianwei	13	1.9
LIU Chunsheng	12	1.8
ZENG Qian	8	1.2
LIU Yanfeng	8	1.2
HAN Yanhua	6	0.8
WEI Shaobin	6	0.8
LIU Hongqi	6	0.8
BAI Junfeng	6	0.8
WANG Jingliang	6	0.8
ZHOU Huifang	5	0.7
WU Juanjuan	5	0.7

3.5 Institutional cooperation network analysis

In the *FQZNK* research, the top five organizations in terms of the number of articles published are Hunan University of Chinese Medicine (45 papers), Chengdu University of Traditional Chinese Medicine (24 papers), Shandong University of Traditional Chinese Medicine (22 papers), Shanxi University of Chinese Medicine (18 papers), and Heilongjiang University of Chinese Medicine

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Timespan: 1980-2021(Slice Length = 1)
Selection Criteria: Top 50 per slice, LRF = 3.0, LBY = 5, e = 1.0
Network: N = 1032, E = 1142(Density = 0.0021)
Largest CC: 51(4%)
Nodes　Labeled: 1.0%
Pruning: None

Figure 3　Authors collaboration network

(17 papers) (Table 4). The graph density of the institutional cooperation network in this field is low at only 0.001 5, indicating that inter-agency partnerships are fragmented. In addition, there is little cooperation among the issuing agencies in different regions, most of which occur at the universities of Chinese medicine and their affiliated hospitals in the same region, such as cooperation between Chengdu University of Traditional Chinese Medicine and Hospital of Chengdu University of Traditional Chinese Medicine, or cooperation between Shandong University of Traditional Chinese Medicine and Affiliated Hospital of Shandong University of Traditional Chinese Medicine (Figure 4).

3.6 Main research contents analysis

3.6.1 Analysis of cited high-frequency literature　Since the data exported from CNKI does not contain references, this study conducted manual interpretation of *FQZNK*-related articles in the past 40 years to obtain the top 11 works with the most citations (Table 5). The top 10 cited works were cited 94, 25, 25, 21, 21, 21, 20, 20, 18, and 17 times, respectively. This includes academic thought theory research, prescription law research, disease research, etc. The analysis revealed that the most frequently cited works mainly focused on the analysis of medication characteristics and rules of prescription formulation in *FQZNK*, with a total of six articles, and the most cited work was ZHOU Mingxin's discussion on the characteristics of prescriptions in *FQZNK* utilizing the quantitative method. From these, we can see that the prescriptions included in *FQZNK* have high clinical value. The textual research and application of the classic recipe, the

Table 4　Most published institutions on *FQZNK* ($n \geqslant 15$)

Institutional name	Number of papers (n)	Percentage (%)
Hunan University of Chinese Medicine	45	6.6
Chengdu University of Traditional Chinese Medicine	24	3.7
Shandong University of Traditional Chinese Medicine	22	3.2
Shanxi University of Chinese Medicine	18	2.7
Heilongjiang University of Chinese Medicine	17	2.5
Hospital of Chengdu University of Traditional Chinese Medicine	15	2.2
Guangzhou University of Chinese Medicine	15	2.2
Henan University of Chinese Medicine	15	2.2

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Timespan: 1980-2021(Slice Length = 1)
Selection Criteria: Top 50 per slice, LRF = 3.0, LBY = 5, e = 1.0
Network: N = 449, E = 153(Density = 0.0015)
Largest CC: 25(5%)
Nodes　Labeled: 1.0%
Pruning: None

Figure 4　Institutions collaboration network

Shenghua Decoction (生化汤), appeared twice in highly cited works, indicating that the Shenghua Decoction has high clinical practice value and is worthy of research and application by medical workers. The topics of morbid vaginal discharge (2 papers), dysmenorrhea (1 paper), and eight liver treating methods (1 paper) also appeared in the top ten highly cited articles, indicating that the discussion on morbid vaginal discharge and dysmenorrhea in *FQZNK* is incisive and thought-provoking from the perspectives of etiology and pathogenesis, syndrome differentiation, and prescription selection. It can be seen that *FQZNK*, a classic book of TCM gynecology, remains significant in guiding clinical practice, not only from the aspects of syndrome differentiation, treatment and principle-method-recipe-medicines, but also in terms of its
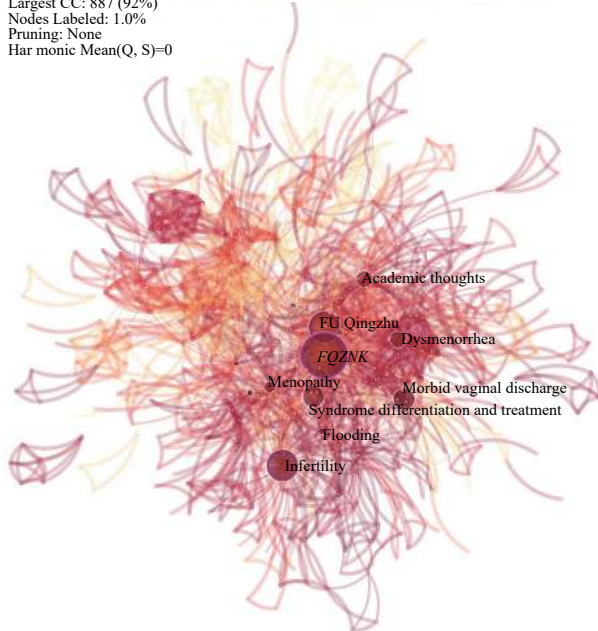
Table 5 List of top 11 cited references

Article title	First author	Published time	Journal	Citation frequency (n)	Percentage (%)
Using the quantitative method to discuss author's authenticity and formula characteristics of *FU Qingzhu's Obstetrics and Gynecology*	ZHOU Mingxin	1996.12	Chinese Journal of Basic Medicine in Traditional Chinese Medicine	94	13.9
TCM treatment of dysmenorrhea	WANG Tingting	2013.7	Journal of Liaoning University of Traditional Chinese Medicine	25	3.7
Discussion on morbid leucorrhea in *FU Qingzhu's Obstetrics and Gynecology*	LIU Dongping	2011.6	Tianjin Journal of Traditional Chinese Medicine	25	3.7
Shenghua Decoction: studies on its origin and schools and application by later generations	WANG Yanmei	2004.1	Journal of Shaanxi College of Traditional Chinese Medicine	21	3.1
Discussion on drug characteristics and composing principles in *FU Qingzhu's Obstetrics and Gynecology*	LIN Junsheng	2009.6	Beijing University of Chinese Medicine	21	3.1
Study on Baizhu's promptive use for lumbar and umbilicus in *FU Qingzhu's Obstetrics and Gynecology*	ZHANG Lin	2012.1	China Journal of Traditional Chinese Medicine and Pharmacy	21	3.1
Textual research on "production-dispersion decoction" originating from secret instruction of gynecology in a bamboo forest temple	WEI Musen	1999.4	Shanghai Journal of Traditional Chinese Medicine	20	2.9
Discussion on leukorrheal diseases treated following the viewpoint on the liver in *FU Qingzhu's Obstetrics and Gynecology*	GUO Shanshan	2010.9	Journal of Traditional Chinese Medicine	20	2.9
The eight methods of treating the liver in *FU Qingzhu's Obstetrics and Gynecology*	ZHOU Hongguang	2010.9	Jiangsu Journal of Traditional Chinese Medicine	18	2.6
Analysis of Angelica Tracks in *FU Qingzhu's Obstetrics and Gynecology*	YANG Hongbo	2011.6	Chinese Journal of Experimental Traditional Medical Formulae	17	2.5
Compatibility characteristics of rehmannia glutinosa and cornus officinalis in *FU Qingzhu's Obstetrics and Gynecology*	XU Chunyan	2016.5	Chinese Journal of Basic Medicine in Traditional Chinese Medicine	17	2.5

academic practice value. Thus, it is thought that our painstaking study was worthwhile and will benefit us immensely.

3.6.2 Keyword co-occurrence analysis CiteSpace software was used to extract the keywords in the literature, and the keyword co-occurrence network was plotted. The number of co-occurrences is the number of occurrences of the keyword and high-frequency keywords that can be used to present this field's research hotspots [12]. First, a visual map of keyword co-occurrence analysis was constructed for the *FQZNK* research works, which contain 966 nodes, 1 426 lines, and a network density of 0.003 1. Centrality is an index to evaluate the importance of network nodes' location in the network. In the keywords

co-occurrence, the keywords with high centrality are *FQZNK* (1.00), FU Qingzhu (0.37), infertility (0.13), and morbid vaginal discharge (0.11); their centrality was greater than 0.1 (Figure 5). There were nine keywords with a frequency ≥ 20 (Table 6). From the keyword co-occurrence analysis results, we can see that the disease research for *FQZNK* mainly focuses on vaginal discharge, menstrual regulation, and promoting conception (keywords: infertility, morbid vaginal discharge, dysmenorrhea, menopathy, flooding, etc.). The treatment of gynecological diseases in *FQZNK* also mainly focuses on the liver, spleen, and kidney (keywords: syndrome differentiation and treatment).
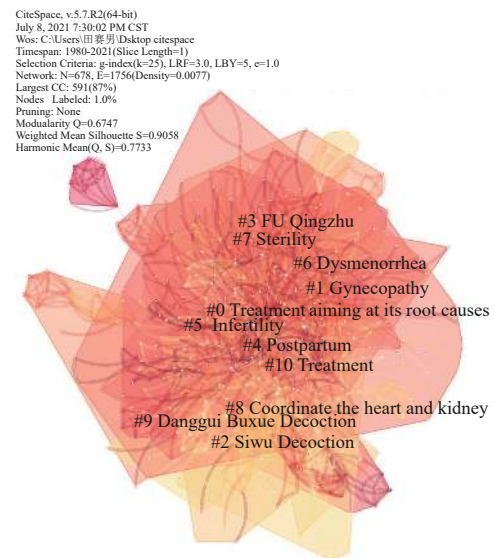
Figure 5 Keywords co-occurrence network

Table 6 The frequency of the keywords on *FQZNK* ($n \geqslant 20$)

Keywords	Count (n)	Centrality
FQZNK	597	1.00
FU Qingzhu	105	0.37
Infertility	37	0.13
Morbid vaginal discharge	31	0.11
Syndrome differentiation and treatment	27	0.04
Dysmenorrhea	24	0.07
Academic thought	21	0.04
Menopathy	20	0.04
Flooding	20	0.06

3.6.3 Keywords cluster analysis On the basis of the keyword co-occurrence network view, keyword clustering analysis and the LLR, MI, and LSI algorithms to mark the clusters can more clearly identify the hotspots in the research area. The modularity Q value was 0.664 6 and the clustering structure was significant with Q ≥ 0.5. The silhouette S value was 0.876 5 and the clustering results were reasonable with an S > 0.5, indicating that the silhouette can well reflect the research hotspots in the literature. Each cluster interacts with each other and is closely connected and eleven clusters are formed in each cluster. We used the LLR algorithm to form eleven important clusters (Figure 6)：#0 treatment aiming at its root causes, #1 gynecopathy, #2 Siwu Decoction (四物汤), #3 FU Qingzhu, #4 postpartum, #5 infertility, #6

dysmenorrhea, #7 sterility, #8 coordinate the heart and kidney, #9 Danggui Buxue Decoction (当归补血汤), and #10 treatment.

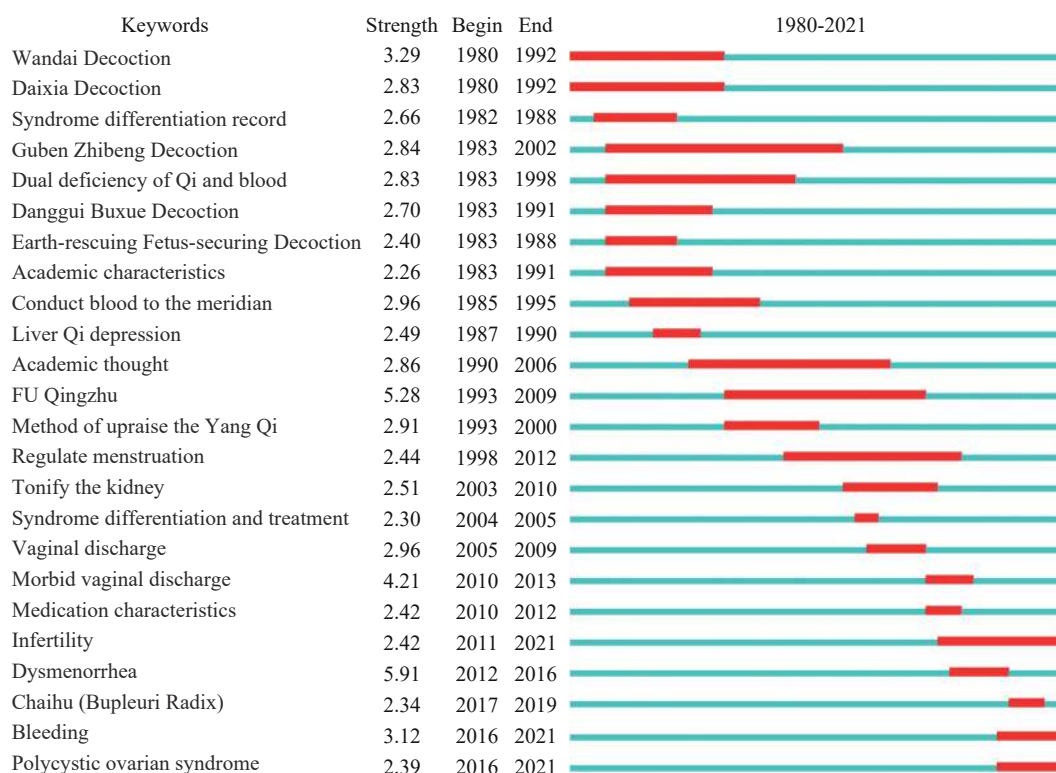**Figure 6** Keywords clustering network

3.6.4 Keywords burst analysis Keywords burst refers to a significant increase in the frequency of keyword use in a short period of time. Through the emergent analysis of keywords, people can confirm a certain period of time's research focus and hotspot(s), which in turn can help future researchers decide the development course, research direction, and research hotspots of this field [13]. The start and the end of the mutation are respectively indicated by "begin" and "end". "Strength" means the intensity of keywords mutation and the higher the intensity, the greater the influence. Keywords burst analysis in the literature on *FQZNK* (Figure 7) revealed that dysmenorrhea was the keyword with the highest mutation intensity (5.91). Other keywords with high mutation intensity were infertility, flooding, morbid vaginal discharge, Wandai Decoction (完带汤), etc.

4 Discussion

Through keywords co-occurrence and cluster and emergence analysis, it is revealed that the research content of *FQZNK* is comprehensive, mainly including the authors' background, academic thought, basic theory of TCM, diseases, syndrome differentiation, therapeutic principles and methods, and prescriptions. This article mainly analyzes the research team, diseases, therapeutic methods' theory, prescriptions, and frontier research analysis of *FQZNK*.

4.1 The main research team of *FQZNK*

Based on the analysis of cooperative networks between authors and research institutions, most high-yield

Keywords	Strength	Begin	End	1980-2021
Wandai Decoction	3.29	1980	1992	
Daixia Decoction	2.83	1980	1992	
Syndrome differentiation record	2.66	1982	1988	
Guben Zhibeng Decoction	2.84	1983	2002	
Dual deficiency of Qi and blood	2.83	1983	1998	
Danggui Buxue Decoction	2.70	1983	1991	
Earth-rescuing Fetus-securing Decoction	2.40	1983	1988	
Academic characteristics	2.26	1983	1991	
Conduct blood to the meridian	2.96	1985	1995	
Liver Qi depression	2.49	1987	1990	
Academic thought	2.86	1990	2006	
FU Qingzhu	5.28	1993	2009	
Method of upraise the Yang Qi	2.91	1993	2000	
Regulate menstruation	2.44	1998	2012	
Tonify the kidney	2.51	2003	2010	
Syndrome differentiation and treatment	2.30	2004	2005	
Vaginal discharge	2.96	2005	2009	
Morbid vaginal discharge	4.21	2010	2013	
Medication characteristics	2.42	2010	2012	
Infertility	2.42	2011	2021	
Dysmenorrhea	5.91	2012	2016	
Chaihu (Bupleuri Radix)	2.34	2017	2019	
Bleeding	3.12	2016	2021	
Polycystic ovarian syndrome	2.39	2016	2021	

Figure 7 Top 24 Keywords with the strongest citation bursts

researchers are from high-yield institutions. Among them, the research team with YOU Zhaoling as the core has the largest scale and the longest duration in the literature on *FQZNK*; it is a large team whose members work closely together. Moreover, the core author team led by YOU Zhaoling from Hunan University of Chinese Medicine has an outstanding advantage in the number of published papers, which indicates that Hunan University of Chinese Medicine has carried out research in this field earlier than other institutions and has been in the leading academic position for a long time. Its research content is extensive, involving topics such as theory, syndrome differentiation, treatment, and prescription medication of *FQZNK*, and its main research direction is infertility and morbid vaginal discharge research [14].

4.2 Disease research of *FQZNK*

Disease research has been the primary focus for the last ten years. Disease research on *FQZNK* focuses on menopathy, infertility, and morbid vaginal discharge. Dysmenorrhea is addressed in part of the first volume of *FQZNK*. FU Qingzhu treated dysmenorrhea by treating the liver and kidney while simultaneously nourishing the spleen [15]. As for morbid vaginal discharge, FU Qingzhu suggested that all vaginal discharges were damp syndromes, which provided important guidance for the treatment of the disease. FU Qingzhu also made great contribution to the diagnosis and treatment of infertility; from the seed chapters and sections of *FQZNK*, FU Qingzhu's treatment of infertility emphasized tonifying the

kidney, paying attention to the liver and spleen, coordinating the functions of the heart and kidney, reinforcing healthy Qi, and eliminating pathogenic factors [16]. In addition, in combination with the pregnancy and menstrual recuperation of *FQZNK*, we can see that FU Qingzhu had realized that to become pregnant, people needed to first regulate menstruation.

4.3 Theoretical study on *FQZNK*

Theoretical studies were mainly conducted before 2010. *FQZNK* treatments of gynecological diseases involve the kidney, liver, and spleen, also including regulating menstruation, the heart-kidney intersect, tonifying the kidney and soothing the liver, relieving the liver, conditioning Yin and Yang, tonifying the belt vessel, etc. FU Qingzhu focused on the inheritance and development of classical theories. He focused on the theory of the three viscera: Qi, blood, and meridians. He also paid attention to the syndrome differentiation of Qi and blood viscera, taking the kidney, liver, and spleen as fundamental and excelled at regulating and replenishing Qi and blood. For example, in view of excessive menstrual volume, FU Qingzhu put forward the view of "blood deficiency without returning", pointing out that "blood returns to the meridian, although it is flourishing and the meridian is not much; the blood does not return to the meridian, although it is declining and the meridian is also a lot" [17]. Therefore, the important viewpoint of "conducting the blood back to the meridian" was put forward, which had a profound influence on later generations.

4.4 Recipe research on *FQZNK*

Recipe studies were conducted before 2000. FU Qingzhu was good at using folk prescriptions and proved the value and effectiveness of various recipes in clinical practice. When making formulas and descriptions, the simplest method possible was applied and the medicines he used were gentle and practical. Keywords clusters included Wandai Decoction, Shenhua Decoction, Guben Zhibeng Decoction (固本止崩汤), Jingjie (Fineleaf Schizonepetae Herb), Huangqi (Astragali Radix), Danggui (Angelica Sinensis), Chaihu (Radix Bupleuri), Chuanxiong (Chuanxiong Rhizoma), etc. For example, he used the Wandai Decoction to treat leukorrhea, tonify the spleen and stomach, and added some gruds that can smooth the liver; consequently the spleen was healthy, moisture dissipated, and the leukorrhea was cured [18]. Those with postpartum should avoid cold and heat and false tonic discharge, so they were treated with warm herbs and a modified Shenghua Decoction in order to remove blood stasis and relieve pain [19].

4.5 Frontier research analysis

From the emergent keywords map, we further found that the study of *FQZNK* can be divided into the following three periods, and the first of which is from 1980 to 2000. The emergent keywords shown in this period can be divided into two broad categories: theoretical research, including keywords such as academic thought and characteristics, blood channeling to the meridian, the ascending Yang method, Qi and blood deficiency, and liver Qi stagnation. The other concerns prescription research, including some keywords such as Wandai Decoction, Guben Zhibeng Decoction, Shenghua Decoction, Danggui Buxue Decoction, Yuantu Gutai Decoction (援土固胎汤), etc. These show that the research on *FQZNK* from 1980 to 2000 mainly focuses on theoretical and prescription research. The second period is from 2000 to 2010. Emergent keywords found in this period were tonifying kidney, regulating menstruation, and syndrome differentiation and treatment. The third period is from 2010 to 2021. Emergent keywords appearing during this period were dysmenorrhea, morbid vaginal discharge, infertility, flooding, and polycystic ovarian syndrome (PCOS). As a result, we can see that prescriptions were mainly studied before 2000, theoretical research occurred before 2010, and the study of *FQZNK* shifted to specific diseases (e.g. dysmenorrhea, morbid vaginal discharge, infertility, flooding, and PCOS) after 2010. Since 2010, the number of articles published on dysmenorrhea, morbid vaginal discharge, infertility, and other related topics has remained high until now, and these research focuses are the current research hotspots and trend of future research. It is worth mentioning that Chaihu (Bupleuri Radix) emerged as a keyword from 2017 to 2019, which shows that Chaihu (Bupleuri Radix) was well used in FU Qingzhu's prescriptions and can play a role in treating diseases related to *FQZNK*.

5 Conclusion

The current study provides more scientific, accurate, and comprehensive scientific support for further research and development of TCM in *FQZNK*. With this foundation, people can use burst detection to ascertain the current hotspots in research, get their development trends, and forecast future research directions. In addition, infertility, morbid vaginal discharge, flooding, and PCOS treatments based on TCM syndrome differentiation are currently popular research topics for *FQZNK*.

However, this study had several limitations. First, the identified publications may not be fully representative of all studies on *FQZNK*. In addition, the current software makes it difficult to analyze data from multiple databases simultaneously. Because all the information is extracted by scientometric tools, there may also be homophones of the authors. These problems may be addressed in future studies.

Competing interests

The authors declare no conflict of interest.

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基于文献计量学的《傅青主女科》研究现状可视化分析

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【摘要】目的 利用文献计量学研究和可视化方法分析 40 年来国内外《傅青主女科》的研究现状及发展过程。方法 检索国内中国知网、维普、万方数据库和国外 WOS 核心合集数据库(包含 SCIE、SSCI 和 A&HCI),选取 1980 年 1 月 1 日至 2021 年 3 月 10 日收录的所有《傅青主女科》研究领域相关文献,运用文献计量学研究方法及 CiteSpace 5.7.R2 可视化软件进行文献类型分析、载文期刊情况分析、被引文献分析、作者发文量、合作作者网络、合作机构网络以及关键词共现网络、关键词聚类和关键词突现分析。结果 共纳入文献 678 篇,通过文献计量学分析分别找到该研究领域文献类型、高载文期刊、高被引文献、高产机构、研究团队和研究学者。文献类型主要分为四类,其中学术思想的理论研究有 451 篇,占纳入期刊文献比例的 66.5%。最高载文期刊为《山西中医》(61 篇),占纳入期刊文献总数的 9.0%。最高被引文献是周铭心的《用计量化方法探讨<傅青主女科>方药特点》,被引用 94 次。发文量最大的机构是湖南中医药大学,发文量为 45 篇;高产作者中尤昭玲发文 33 篇,是发文量最高的作者。且高产研究者大部分来自高产机构,湖南中医药大学对《傅青主女科》的研究最多。关键词共现分析发现关键词"傅青主女科"出现频次最高(597 次),中心性最高(1.00)。关键词聚类分析采用 LLR 算法形成 11 个较为重要的聚类:#0 治病求本、#1 妇科病、#2 四物汤、#3 傅青主、#4 产后、#5 不孕症、#6 痛经、#7 不孕、#8 心肾相交、#9 当归补血汤、#10 治疗。对《傅青主女科》的方药研究 2000 年以前较多,理论研究主要在 2010 年之前,2010 年至今主要挖掘其在临床上的应用。痛经、带下病、不孕症、血崩、多囊卵巢综合征等疾病,为近年来该研究领域的热点内容。结论 本研究为中医药在《傅青主女科》领域的进一步研究和发展,提供更加科学、准确、全面的科学支撑。在此基础上,通过突发检测来获取当前的热点问题及其发展趋势,预测研究的热点方向,不孕症、带下病、血崩和多囊卵巢综合征的中医辨证论治是目前针对《傅青主女科》的研究热点。

【关键词】《傅青主女科》;科学知识图谱;可视化分析;文献计量学;CiteSpace;妇科病;不孕症