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Visualization Analysis of Shenkang Injection based on CiteSpace Study

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Abstract: ***Objective:*** *To explore the current research status and trend of Shenkang injection in the treatment of chronic kidney disease (CKD).* ***Methods:*** *By using CiteSpace6.2.R6 software, we could visually analyze the literature on Shenkang injection in the treatment of chronic kidney disease on CNKI, such as the number of documents issued, authors, institutions, keywords, and emergent word system, in order to better understand the latest research progress in this field.* ***Results:*** *A total of 827 relevant articles were retrieved through analysis and screening, and 663 articles were finally included after screening according to the inclusion and exclusion criteria. Through the systematic analysis, it is concluded that the number of documents issued by relevant research in this research field generally presents a good upward trend, and forms a cooperative team of authors with different numbers of members. According to the author of the document, the top three are Yunhong Wang, Yujie Hao, Yanying Lv, Sudong Tong and so on. According to the number of documents issued, the top three were Qian'an People's Hospital of Hebei Province, Beijing University of Chinese Medicine and Hebei Medical University. After analysis, 342 keywords, 8 keyword clusters, and 14 emergent words were obtained. Through the analysis of emergent words, it is concluded that "renal function", "renal failure", "adverse reactions", "alprostadil", "extracellular matrix" and "therapeutic effect" have become the research hotspots of everyone in the past 5 years.* ***Conclusion:*** *The research hotspots of Shenkang injection mainly focus on improving renal function, clinical therapeutic effect, adverse drug reactions and integrated traditional Chinese and western medicine. Shenkang injection has a good development trend in the treatment of chronic kidney disease, but the cooperation and sharing between different institutions need to be strengthened.*

Keywords: Shenkang injection, Chronic kidney disease, CiteSpace, Visual analysis.

1. Introduction

Shenkang injection is a traditional Chinese medicine preparation widely used in clinical practice, which consists of four traditional Chinese medicines, which are rhubarb, astragalus, salvia miltiorrhiza, and safflower. It can effectively reduce adverse turbidity, invigorate qi and promote blood circulation, and remove dampness from the bowels [1]. Studies have found that Shenkang injection can effectively inhibit the expression of proteins and genes associated with renal fibrosis [2], thereby effectively protecting renal function and reducing the possibility of its damage, thus helping to improve the quality of life of patients with chronic kidney disease. Some recent studies have also confirmed that Shenkang injection can greatly improve renal function, reduce blood urea nitrogen, inflammatory response and renal interstitial fibrosis factor [3-4]. Shenkang injection is widely used in clinical practice. In this study, we collected the literature on Shenkang injection from the establishment of China National Knowledge Infrastructure (CNKI) database to January 2024. Through CiteSpace6.2.R6 software, we were able to visually analyze the relevant literature of Shenkang injection by authors, institutions and keywords, and deeply understand the latest developments in this field, so as to better guide clinicians and help more patients with kidney disease benefit.

2. Materials and Methods

2.1 Data Source

Data from CNKI. In this study, we used "Shenkang Injection" as the search method, and finally collected 827 articles from the CNKI self-built database to the corresponding Chinese journals in January 2024, and strictly screened the articles. After the completion of screening, a researcher read and checked and removed the articles unrelated to the topic in detail, and finally screened 663 articles that met the inclusion criteria, which were exported in the format of Refworks, and the exported documents were named after the corresponding name.

2.2 Literature Processing

2.2.1 Inclusion Criteria: Journal articles related to the study of Shenkang injection.

2.2.2 Exclusion Criteria: Reviews such as progress, conferences, newspapers, books, patents, expert consensus, dissertations; incomplete information or duplicate literature.

2.3 Study Method

The retrieved literatures were read for title and abstract, and the eligible literatures were included. The final screened literature title was exported and named as download1-663. The CiteSpace built-in converter was selected to convert the exported files into identifiable format. Data transformation of the exported Refworks format literature was performed using citeSpace software to meet citeSpace 's processing requirements. Parameter setting: 1991 is the first literature related to Shenkang injection. Therefore, the literature search time is from 1991 to January 2024. In Time slicing, it is set as one year. In Node Types, the author, institution and keywords are selected, topN is set as 50%, and Pathfinder, Pruning sliced networks are selected for trimming mode.

3. Results

3.1 Analysis of Number of Documents Issued:

Carry out statistics on the number of documents issued for 663 articles that meet the standards (see Figure 1). The first report on Shenkang injection emerged in 1991, through which it was found that the number of documents issued from 1991 to 2010 was relatively low, and the number of documents issued from 2011 to 2019 increased dramatically, which may be related to the effect of Shenkang injection in the treatment of chronic kidney disease found by researchers, or to the increase in the number of patients at this stage. From 2020 to 2023, the number of documents issued gradually showed a downward trend. According to the trend line of issued quantity, it can be seen that the research heat in recent years is gradually in a downward trend, but it can also be clearly seen that the number of relevant research literatures of Shenkang injection is generally increasing and tends to be stable, but the overall base number is still relatively small, and it remains to be studied why the research on Shenkang injection is in a downward trend. In recent years, the research heat of Shenkang injection has decreased significantly, and the trend line of issued quantity also shows that, despite this, the overall number of research literatures related to Shenkang injection is still increasing.

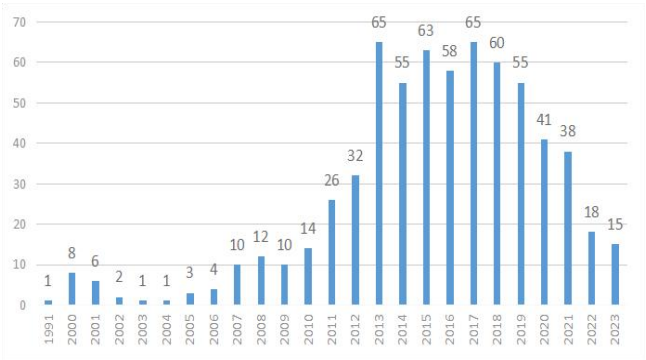

Figure 1: Distribution diagram of publication time of relevant literatures on Shenkang injection in the treatment of chronic kidney disease

3.2 Authors and Institutional Cooperation:

AFound in co-occurrence with author of document, the top three are Yunhong Wang, Yujie Hao, Yanying Lv, Sudong Tong and so on.After mapping, the authors found that Guiying Wang, Yunhong Wang, Yujie Hao and Xiaojie Gao had close cooperation (see Table 1 and Figure 2), and all of them were cooperation in the same field or between the same institution. According to the number of documents issued, the top three were Qian'an People's Hospital of Hebei Province, Beijing University of Chinese Medicine and Hebei Medical University. After analyzing the chromatograms of the issuing institutions, it was found that the cooperation of Beijing University of Chinese Medicine and Dongfang Hospital of Beijing University of Chinese Medicine was close. And it can be seen from Figure 3 that the map density of the visual map cooperated by institutions in this field is 0.0012.The density of the map is relatively low, indicating that the cooperation between institutions is sparse, and through further research, we can clearly find that the cooperation between institutions and teams is mainly concentrated between connected schools and hospitals, and there is less cooperation across regions and provinces.

Table 1: Top 3 authors in terms of number of documents issued

Serial Number	Name	Amount issued	Date of first issuance
1	YunHong Wang	6	2010
2	YuJie Hao	6	2010
3	GuiYing Wang	6	2010
4	XiaoJie Gao	6	2010
5	LIMing Tian	6	2010
6	YanYingLv	4	2011
7	QingLi Cheng	3	2010
8	Sheng Liu	3	2010
9	Nan Zhou	3	2014
10	SuDong Tong	3	2012
11	Yang Liu	3	2018
12	WenLin Song	3	2011
13	Guang Yang	3	2010

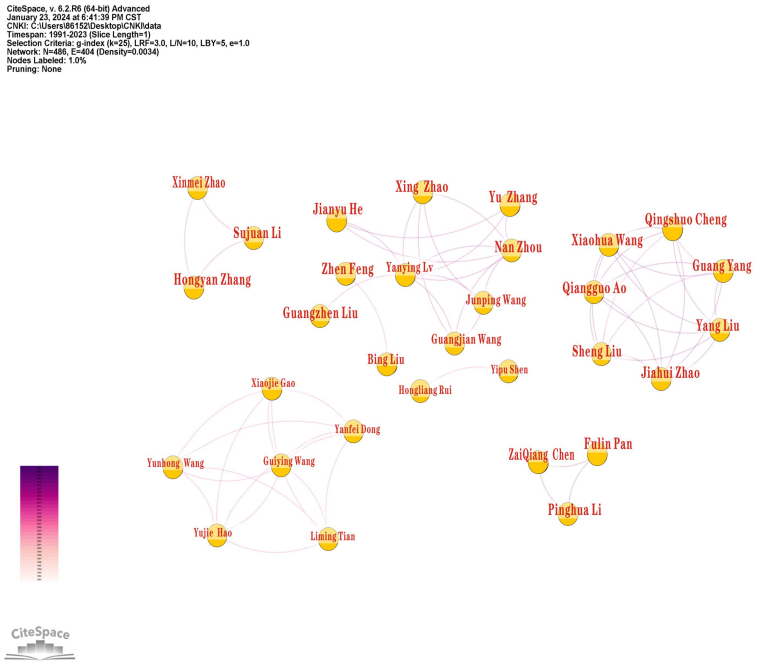

Figure 2: Co-occurrence diagram of author cooperation

Table 2: Institutions with Issuance Volume ≥ 3

Serial Number	Issuing institution	Amount issued	Date of first issuance
1	Qian'an People 's Hospital	5	2010
2	Beijing University of Chinese Medicine	4	2000
3	Hebei Medical University	3	2010
4	Xi'an Century Shengkang Pharmaceutical Co., Ltd.	3	2011

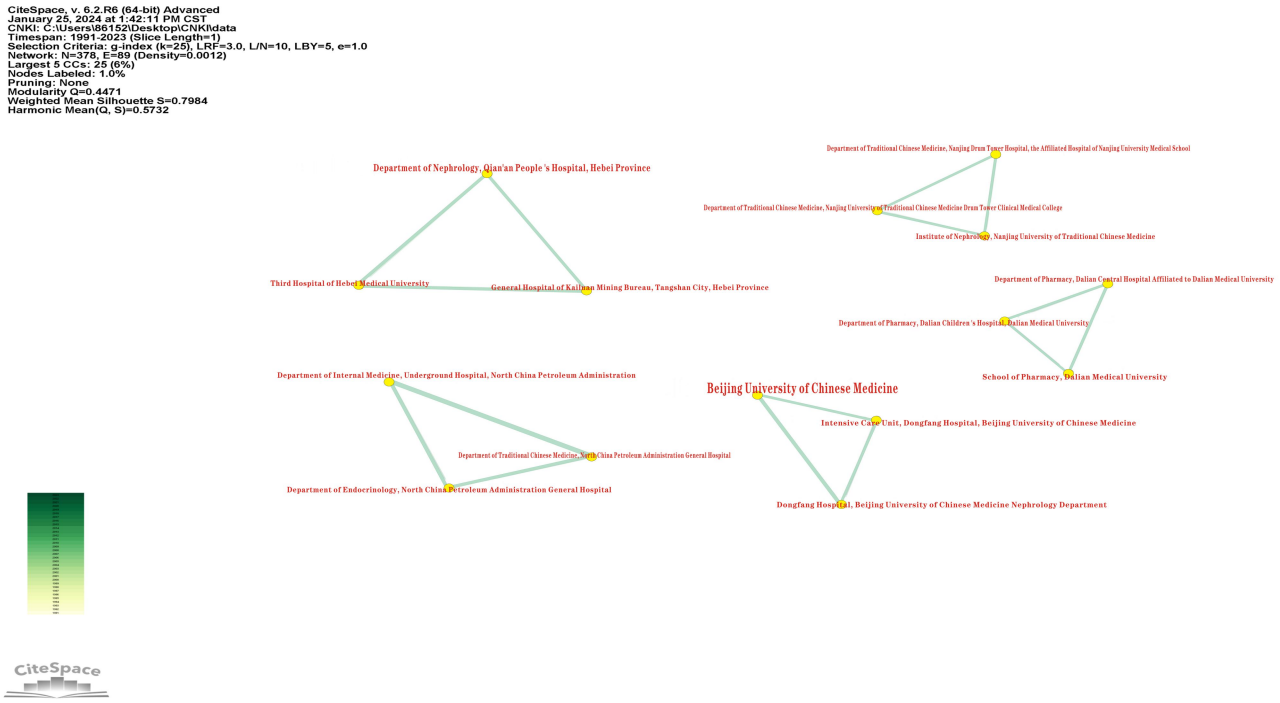

Figure 3: Co-occurrence Diagram of Institutional Cooperation

3.3 Keyword Visual Analysis

3.3.1 Keyword co-occurrence analysis: CiteSpace6.2.R6 software was used to analyze the keywords of the research literature. The results show that there are 342 nodes, 1152 connections, and the network density is 0.0198. In an article, the role of keywords is very large, which can reflect the central idea of an article. When frequency analysis is performed on keywords, the cutting-edge direction of this research field can be further understood. Centrality is a measure of the importance of keywords in co-occurrence networks, and he can reflect the influence of this keyword, and when the value of centrality is high, the influence of representing this keyword in this research field is strong. Mediation centrality is an attribute that each node has and refers to the ability to "mediate" through as the shortest path between the other 2 nodes, and keywords with centrality ≥ 0.1 have high school centrality. Among them, there is one key word for high school heart, which is Shenkang injection.

Table 3: Key words with frequency > 18

Key Words	Centrality	Frequency
Shenkang Injection	1.68	592
Diabetic nephropathy	0.09	103
Efficacy	0.02	74
Chronic renal failure	0.04	70
Renal function	0.04	69
Alprostadil	0.02	67
Hemodialysis	0.02	47
Clinical efficacy	0.02	35
Chronic kidney disease	0.01	34
Glomerulonephritis	0.01	21
serum creatinine	0.01	18
renal failure	0.05	18

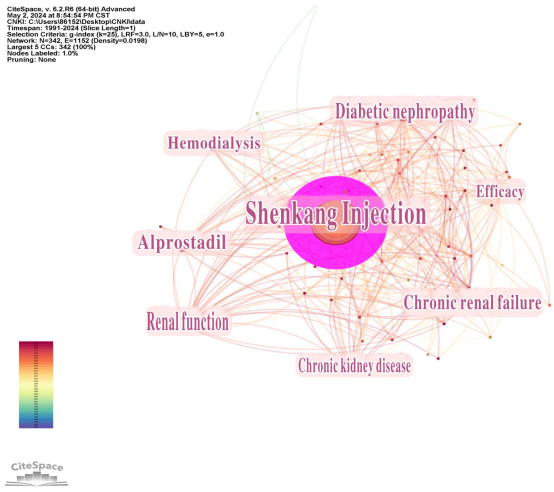

Figure 4: Key Words Co-occurrence Network Analysis Diagram

3.3.2 Cluster co-occurrence analysis of keywords: The meaning of co-occurrence clustering of keywords is cluster analysis based on co-occurrence of keywords to explore research clusters in a certain research field. The LLR algorithm was used to extract keyword tags to form keyword clustering profiles. Eight cluster labels were obtained by keyword cluster analysis, and the cluster module value Q was 0.4471 (>0.3), indicating that the cluster structure was significant, and the average profile value S was 0.7984 (> 0.7), indicating that the cluster was credible. Multiple closely linked keywords together form a cluster, and when the number of cluster labels is smaller, it indicates that the size of this cluster is larger, resulting in eight clusters: chronic renal failure, diabetic nephropathy, renal failure, renal function,

glomerulonephritis, renal injury, chronic kidney disease, and hemodialysis. #0, #1, #2, #4, #5, #6, #7 mainly focus on the clinical application study of Shenkang injection,#3 Study on the application of Shenkang injection in renal laboratory examination. Through keyword cluster analysis, it can be seen that the cluster size of #0 is the largest (87), indicating that the current research on Shenkang injection mainly focuses on its treatment of chronic renal failure.

Table 4: Key word cluster analysis table

Clustering	Scale	Year	Cluster label	Main keywords
0	87	2013	Chronic renal failure	Chronic renal failure; chronic renal failure; Bailing capsule; rhubarb; transforming growth factor-β
1	47	2013	diabetic nephropathy	Irbesartan; albumin; proteinuria; diabetic nephropathy; diabetes mellitus
2	35	2010	renal failure	Peritoneal dialysis; Traditional Chinese medicine; Injection; Fibrosis; Traditional Chinese medicine
3	29	2014	renal function	Chronic nephritis; inflammatory factors; inflammatory factors; hypertensive nephropathy; Lotensin
4	27	2015	glomerulonephritis	Combination; interstitial nephritis; glomerulonephritis; combination; acute interstitial nephritis
5	26	2016	renal impairment	Inflammatory response; kidney injury; oxidative stress; gentamicin; acute kidney injury
6	23	2015	chronic kidney disease	Chronic kidney disease; Safety; Kidney disease; Calcium dobesilate; Urinary conductivity
7	22	2015	hemodialysis	Uremia; hemodialysis; integrated traditional Chinese and western medicine treatment; residual renal function; quality of life

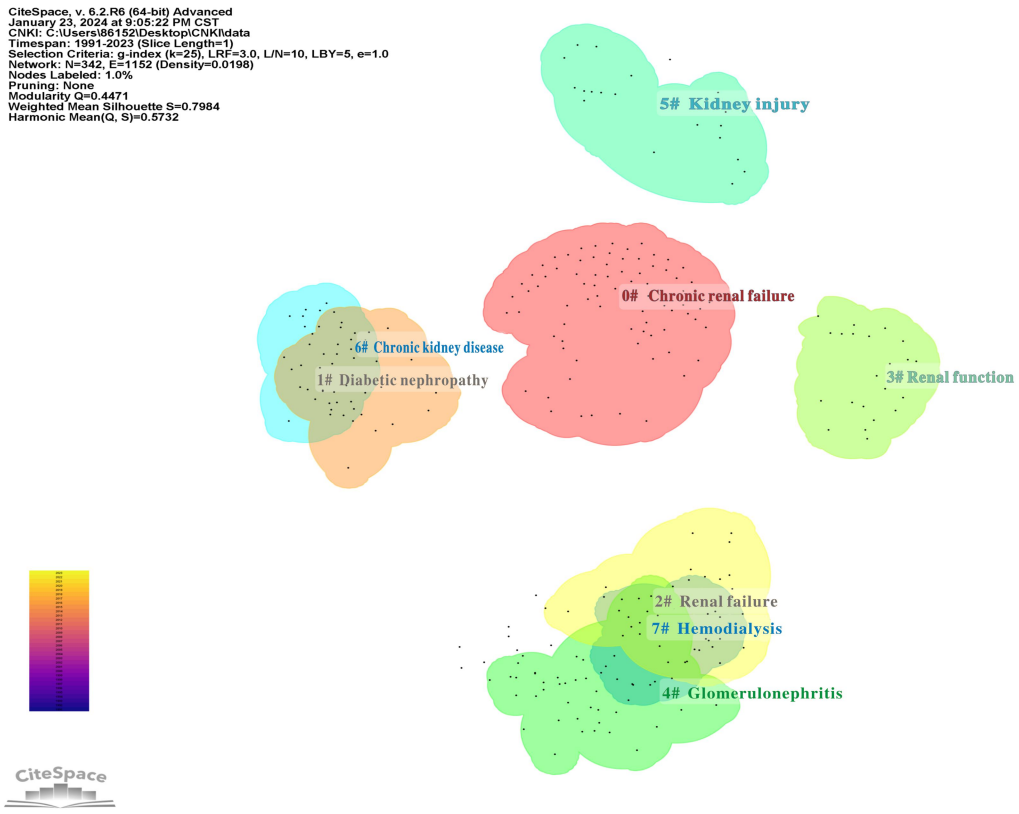

Figure 5: Keyword clustering profile

3.3.3 Key word emergent analysis: In the article keywords burst detection and chronological order, the emergent words are obtained as shown in Figure 7. Among them, "renal function" is the keyword with the highest emergent intensity, followed by "renal failure", "adverse reactions", "alprostadil", "extracellular matrix", and "therapeutic effect", indicating that these emergent words have received the most attention of researchers. A total of 14 keywords were entered into the map, of which renal function, treatment effect, adverse reactions, and alprostadil have become the research boom in the past 5 years. The emergent intensity indicates the change of keywords in a certain moment, and the higher emergent intensity represents that the subject has gained importance in the current stage. According to the following figure, the intensity of renal function (8.2), renal failure (5.59) and adverse reactions (4.09) is high, of which renal function, therapeutic effect and adverse reactions are the research hotspots in recent years.

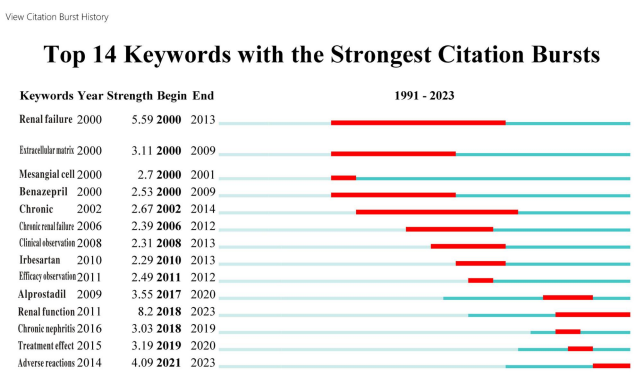

Figure 6: Key words emergent diagram

4. Discuss

Shenkang injection is a relatively commonly used traditional Chinese medicine preparation in clinical practice. Data have shown that Shenkang injection can act on ion channels and multi-pathway target molecules related to inflammation, apoptosis and proliferation to treat chronic kidney disease, inhibit TGF-β1-induced fibroblast proliferation and activation, delay renal fibrosis, and improve renal function [5]. Shenkang injection is widely used in clinical practice, which is mainly composed of four kinds of traditional Chinese medicines: rhubarb, astragalus, salvia miltiorrhiza, and safflower, and has the effects of reducing adverse effects and expelling turbidity, supplementing qi and activating blood circulation, and tonifying fu-dampness [1]. An experimental study showed that rhubarb could down-regulate TGF-β1, thereby reducing renal fibrosis and thereby protecting residual nephrons [6]. Another study showed that astragaloside IV [7] could limit the release of (IL-6) and TNF-α inflammatory substances and prevent renal fibrosis. Salvia miltiorrhiza powder [8] can effectively reduce the levels of scr and BUN in rats to a certain extent, thereby reducing the damage to the renal interstitium and renal tubules and protecting the renal tissue. Carthamus tinctorius injection [9-10] inhibits the synthesis of TGF-β1 and reduces the accumulation of extracellular matrix. In the early stage, some researchers analyzed on the basis of network pharmacology that Shenkang injection has multiple main components such as 3 '-O-gallic acid, tanshinone IIA, and can regulate multiple targets such as vascular endothelial growth factor A, interleukin-6, and endothelial nitric oxide synthase, and treat chronic renal failure through multiple pathways such as glycation product-receptor, nitrogen metabolism, and cancer so Shenkang injection has a good therapeutic effect on improving renal function and delaying renal deterioration in patients [11].

4.1 Paper Analysis:

After visual analysis of the literature, it was found that the first report on Shenkang injection emerged in 1991, and the number of documents issued was relatively low from 1991 to 2010, increased dramatically from 2011 to 2019, and gradually showed a decreasing trend from 2020 to 2023.According to the trend line of issued quantity, the research heat has gradually decreased in recent years, but the number of relevant research literatures on Shenkang injection has generally increased. It can be seen that the attention of Chinese researchers to Shenkang injection is still relatively high. Due to the decline of literature in recent years, whether Shenkang is the topic of injection has cooled, there is no clear conclusion at present, and more statistical analysis is needed to obtain the final conclusion temporarily.

4.2 Institution Issuing Documents and Analysis of Author:

From Figure 2 and Figure 3, it can be seen that the authors of the first 3 documents areYunhong Wang, Yujie Hao and Guiying Wang. The top three documents issued were Qian'an People's Hospital of Hebei Province, Beijing University of Chinese Medicine and Hebei Medical University. After mapping analysis of the authors, it was found that Guiying Wang, Yunhong Wang, Yujie Hao and Xiaojie Gao had close cooperation. After analyzing the chromatograms of the issuing institutions, it was found that the cooperation of Beijing University of Chinese Medicine and Dongfang Hospital of Beijing University of Chinese Medicine was close. It can be seen from Figure 2 that the cooperation between each team is relatively close, but the cooperation outside the team and outside the region is relatively weak. It can be seen from Figure 3 that the communication and cooperation between institutions across provinces and cities are relatively deficient. Therefore, each institution and team can strengthen the close cooperation between each institution and institution and between the team and the team according to their own actual situation, integrate the advantages, expand the depth and intensity of the study, in order to obtain better research results, so as to strengthen the understanding of Shenkang Injection by researchers and clinicians.

4.3 Keyword AnalysisIn the Analysis of Keywords:

It was found that the study methods were generally clinical observations, and the outcome measures were renal function, inflammatory factors, and oxidative stress. Keyword plays a very important role, it can reflect the central idea of an article, when the keyword frequency analysis, can further understand the frontier direction of the research field [12]. Renal failure is an early emergent word with the longest emergent time and an intensity of 5.59, and renal function, therapeutic effect, and adverse reactions have become popular in recent years, with intensities of 8.2, 3.19, and 4.09, respectively. Shenkang injection is widely used in the treatment of chronic kidney disease in clinical practice, and the effect is significant, and the clinical effect has always been a hot spot and focus of research.

Nodule

In this paper, after visual analysis of Shenkang injection using CiteSpace software, a preliminary understanding of the current research status and hotspots of Shenkang injection has been obtained, suggesting that the research of Shenkang injection in recent years mainly focuses on clinical efficacy, strengthening the cooperation between authors and institutions, in order to integrate advantages and obtain better research results. On the other hand, we hope to provide researchers with more valuable references and directions in order to help researchers broaden their horizons. Expanding the research area to gain deeper understanding.

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