Biomedical Data Science
2025, VOL. 5, NO. 2, 46-51
DOI: 10.47297/wspbdsWSP2752-630508.20250502

Bibliometric and visual analysis of hypertensive nephropathy based on CiteSpace

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ABSTRACT

Objective To conduct a visual analysis of the research status, trends, and hotspots of hypertensive nephropathy. Methods Relevant literature on hypertensive nephropathy from January 2014 to October 21, 2024, was retrieved from the CNKI and the Web of Science core collection databases. The Cite Space 6.3.R1 software was applied for a visual analysis of countries, authors, keywords, etc. Results From 2014 to 2024, studies on hypertensive nephropathy showed that the number of Chinese publications decreased year by year (1,436 articles), while the number of English publications increased slightly (268 articles). The research was mainly concentrated in China, the United States, and Japan. In Chinese research, the core authors were Li Wei, Li Xia, and Li Jing, while in English research, Kohagura Kentaro was a leading author. High-frequency keywords in both Chinese and English centered on drug intervention (valsartan), oxidative stress, and cystatin C diagnosis. In Chinese literature, 10 clusters were formed, with a focus on hemodialysis. In English literature, 8 clusters were identified, with a focus on kidney injury and apoptosis.Conclusion English research delves deeply into the apoptosis mechanism of kidney injury (such as the RAAS-oxidative stress axis), while Chinese research emphasizes the optimization of clinical diagnosis and treatment techniques (multi-marker detection). In the future, attention should be paid to the interaction mechanism between apoptosis and fibrosis, new markers, and the synergistic treatment of traditional Chinese and Western medicine to break through the bottleneck in the prevention and treatment of end-stage renal disease.

KEYWORDS

Cite Space; hypertensive nephropathy; Bibliometric visualization

The kidneys are one of the most commonly targeted organs for hypertension. According to the China Kidney Disease Network, hypertensive nephropathy accounts for 20.78% of hospitalized patients with chronic kidney disease in China, making it the second leading cause of end-stage renal disease [1]. Long-term elevated blood pressure affects renal vascular, glomeruli, and tubulointerstitium, and can cause vitreous degeneration and sclerosis of interlobular and afferent arterioles, as well as patchy fibrosis of the glomeruli and tubulointerstitium [2].poses a serious threat to human health. It is of great significance to perform analysis of hypertensive nephropathy (HN) studies.

Bibliometrics is the use of collected objective literature data to analyze and explore the basic overview of the research, the number and connections of important contents, and hot spots [3-4]. Cite Space was used to visualize the current status of HN research content, research focus, and hot spots, so as to provide a theoretical basis for the diagnosis and treatment of clinicians [5].

1 Information and Methodology

1.1 General Information

CNKI and Web of Science Core Collection Database (WoSCC) were selected, and the subject search formula: Chinese= hypertensive nephropathy OR hypertensive nephropathy OR Hypertensive kidney damage selection journal and paper type; (TS= ("Hypertensive Nephropathy" OR "hypertensive nephrosclerosis" OR "Hypertensive Renal Damage" OR "hypertension renal disease" OR "Hypertensive renal injury" OR "Hypertensive kidney injury" OR "Hypertensive kidney damage" OR "hypertension kidney disease")) AND LA=(English))), select "article".

1.2 Exclusion Criteria

Exclusion criteria: incomplete information, duplicate publications and conferences, solicitation of papers, news reports, etc.

1.3 Research Methodology

In this paper, Cite Space 6.3.R1 software is used to analyze the nodes, select Top 50 node thresholds, and select 1 year for time slices to visualize nodes.

2 Results

2.1 Analysis of the number of publications

A total of 1436 Chinese articles were searched, and the number of articles published gradually decreased from April to 2024, 201. A total of 268 articles were searched in English, with a slight increase in the number of published articles. See Figure 1. However, as the data cut-off date is October 2024, this data is not fully representative of the research results in 2024.

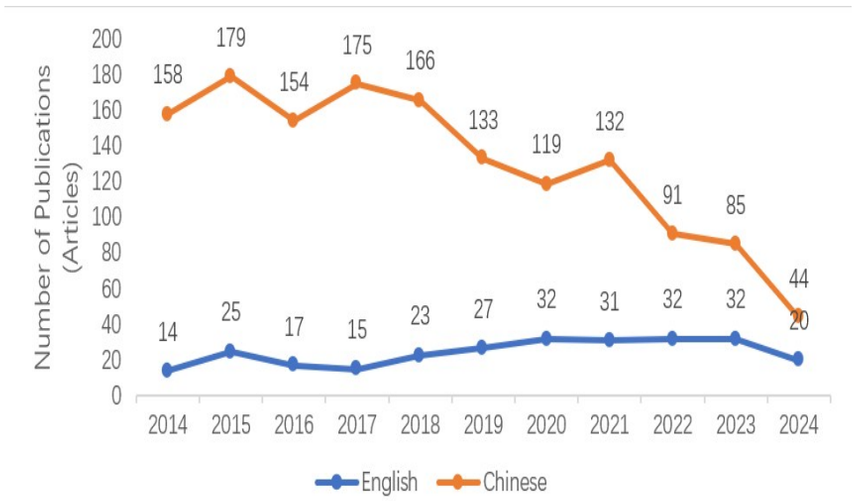

Figure. 1 Trends in Chinese and English literature.

2.2 Analysis of country cooperation

In the past 11 years, the relevant research on English literature has mainly focused on China (131 papers), the United States (47 papers), and Japan (22 papers). See Figure 2.

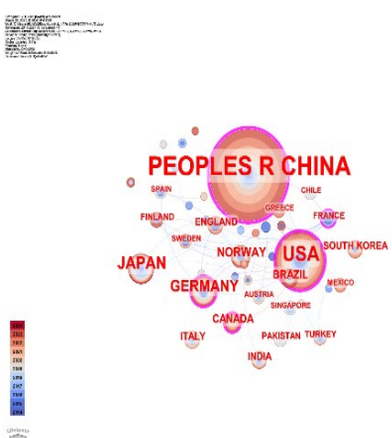

Figure.2 Diagram of country cooperation network.

2.3 Author distribution analysis

The authors of Chinese and English literature were analyzed to obtain the author co-occurrence diagram (Figs. 3-4), where the node size represents the word frequency, and the fuchsia outer circle represents important nouns. The top three authors in terms of the number of Chinese literature published are Li Wei (9 articles), Li Xia (9 articles), and Li Jing (7 articles); The top three authors were Kohagura, Kentaro (5 papers), Wang, Yan (5 papers), and Peng and Jun(5 articles).

2.4 Keyword co-occurrence analysis

2.4.1 Chinese literature

High-frequency keywords include hypertension (368 times), Renal Injury (294 times), Cystatin C (138 times), etc., as

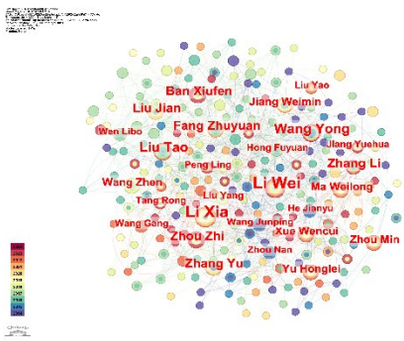

Figure.3 Chinese literature author cooperation network.

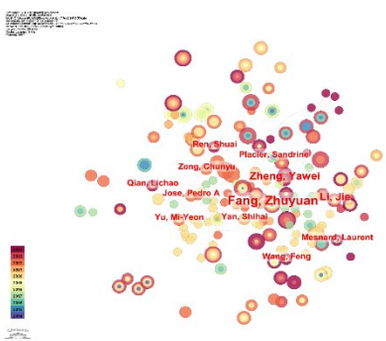

Figure.4 Author collaboration network diagram of English literature.

shown in Figure 5. The key words were clustered into 10 categories, including valsartan, kidney injury, hypertension, and cystatin C. The clustering map showed that Q=0.4802>0.3 showed a significant clustering structure, and S=0.8296>0.5, which was considered reasonable for clustering, as shown in Fig. 6. In recent years, the focus on diagnostic value, blood pressure, hemodialysis, etc. (the intensity of the emergence was 3.22, 2.86, 3.52), as shown in Figure 7.

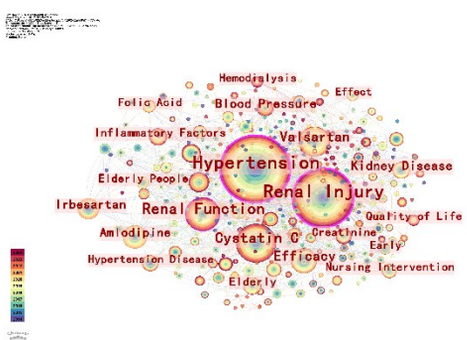

Figure.5 Co-occurrence of keywords in Chinese literature.

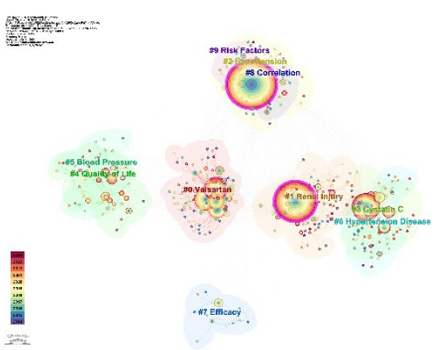

Figure.6 Keyword clustering diagram of Chinese literature.

2.4.2 English literature

The high-frequency keywords are hypertensive nephropathy (65 times) and hypertensive renal damage (29 times), chronic kidney disease (25 times) and so on, see Figure 8. The keyword clustering was hypertensive nephropathy, oxidative stress, hypertensive nephrosclerosis, and angiotensin IIWait; The keyword clustering map shows Q=06964, S=

Keywords	Year	Strength	Begin	End	2014 - 2024
Early stage	2014	2.92	**2016**	2017	
Nursing	2014	2.8	**2016**	2017	
Telmisartan	2014	2.71	**2017**	2017	
The elderly	2014	2.67	**2018**	2018	
Diagnostic value	2014	3.22	**2020**	2024	
Blood pressure	2014	2.86	**2021**	2022	
Hemodialysis	2015	3.52	**2022**	2024	

Figure 7 Keyword prominence map of Chinese literature.

0.9293, see Figure 9. In recent years, attention has been paid to kidney injury, apoptosis, hypertensive nephropathy, etc. (the emergent intensity is 2.16,2.57,3.4) See Figure 10.

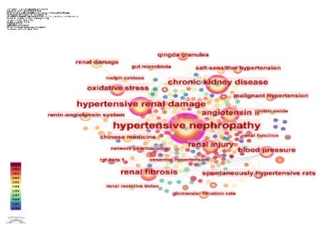

Figure 8 Co-occurrence of keywords in English literature.

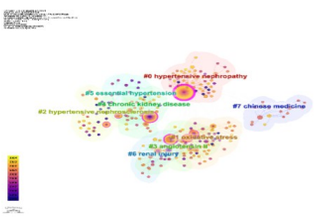

Figure 9 Keyword clustering diagram of English literature.

Keywords	Year	Strength	Begin	End	2014 - 2024
podocytes	2015	2.22	**2015**	2017	
progression	2017	2.89	**2017**	2020	
diabetic nephropathy	2017	2.14	**2020**	2021	
system	2014	2.16	**2021**	2022	
kidney injury	2016	2.16	**2021**	2022	
apoptosis	2016	2.57	**2022**	2024	
hypertensive nephropathy	2014	3.4	**2023**	2024	

Figure 10 Keyword prominence in English literature.

3 Discussion

In recent years, there has been a slight decline in the number of HN publications, which may be related to the difficulty of carrying out epidemic experiments and too many restrictions in the exclusion of literature. The authors of Chinese literature cooperated closely; The overall cooperation between the authors of foreign literature is not high.

High-frequency keywords and clusters in Chinese and English focus on drug intervention, inflammatory/oxidative stress mechanisms, and accurate assessment systems. The pathogenesis of HN is complex and may be related to hemodynamic abnormalities of the kidney, vascular remodeling, renin-angiotensin-aldosterone system (RAAS) overactivation, immune inflammation, lipid metabolism disorders, insulin resistance, genes and genetics, and other factors. Wait. Long-term elevated blood pressure can cause vitreous degeneration and sclerosis of interlobular and afferent arterioles, as well as patchy fibrosis of the glomeruli and tubulointerstitium [6]; Renal biopsy and morphology are the gold standard for diagnosis, and on light microscopy, the glomeruli appear as ischemic lesions or constricted glomerulosclerosis [7]. Immunofluorescence shows that vitreous arterioles typically have IgM and C3 deposition, and some can see IgG, IgA, and microproteogen deposition [8]. Electron microscopy showed thickening of the glomerular basement membrane. There are collagen fibers and scattered cells in the cyst cavity [9]. Currently, the diagnosis of hypertension relies primarily on the assessment of blood pressure, serum creatinine levels, and proteinuria [10]. It was found that urine protein sodium dodecyl sulfate-agarose gel electrophoresis (SDS-AGE) combined with urine protein and urine microalbumin (mAlb), β 2-microglobulin (β2-MG), retinol-binding protein (RBP), and serum cystStatin C (CysC), blood urea nitrogen (BUN), and creatinine have been found in chemical tests in patients with hypertensive nephropathy, which can improve the sensitivity of the test and contribute to the early and accurate diagnosis of kidney injury [11]. 4-Hydroxyphenylacetic acid, bilirubin, uracil, and iminodiacetic acid have potential diagnostic value in early HN [12]. Immunological methods such

as immunoturbidimetry and enzyme-linked immunoassay can also be used to detect urinary podocyte-specific marker proteins [13]. The Western medicine treatment of hypertensive kidney damage is mainly based on antihypertensive and proteinuria, supplemented by lipid lowering, etc., and the main types of drugs include angiotensin-converting enzyme inhibitors (ACE inhibitors), angiotensin II receptor blockers (ARBs), calcium channel blockers (CCBs), β receptor blockers and diuretics. Valsartan is an angiotensin II receptor blocker that blocks angiotensin II-1 (AT1) receptors, thereby inhibiting the renin-angiotensin-aldosterone system. Valsartan is effective in improving renal damage caused by hypertension [14]. Valsartan in combination with other types of agents may be more effective in relieving hypertensive nephropathy [15].

From the emergent analysis of keywords, it is found that there is some overlap between the research hotspots and the research trends. In recent years, Chinese literature has focused on diagnostic value, blood pressure, hemodialysis, and the improvement of diagnosis and prognosis of HN. In recent years, the research focus of English literature has been kidney injury and apoptosis in HN, which are interrelated core pathological changes, involving oxidative stress, inflammation and multi-pathway activation of RAAS system. Hypertension can induce podocyte injury and secondary apoptosis [16], and the exogenous apoptotic pathway of hypertensive kidney tissue is activated, resulting in significant oxidative damage [17]. While existing treatments cannot completely reverse hypertensive nephrosclerosis and eventually develop end-stage renal disease (ESRD), intensive hemodialysis can reduce blood pressure and the need for antihypertensive drugs [18]. Angiotensin-converting enzyme (ACE) inhibition can prevent and ameliorate systemic, renal and glomerular hemodynamic changes, as well as pathological changes in nephrosclerosis [19]. Exercise is also an effective preventive and therapeutic tool to improve kidney function and quality of life in patients with kidney disease [20].

Due to the short time span of data sources, the comprehensiveness of comparative analysis and the identification of hot spots are affected by the shortness of the data source. In addition, only two databases were searched, resulting in a small number of included literatures, incomplete research enthusiasm and preface analysis, and certain deviations, so it is necessary to deepen the mechanism research and promote the transformation of precision diagnosis and treatment through multi-center collaboration in the future.

Funding

This work has been funded by the Northwest Minzu University Fundamental Research Funds for the Central Universities Program for Young Faculty Innovation (Project Number: 31920210048) to promote innovative research.

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