

Bibliometric Analysis of the Literature on Natural Medicines Against Acute Kidney Injury  
from 2010 to 2024

Original Article

İsa Gökhan Yalçın<sup>1</sup>

1. Süleyman Demirel University, Faculty of Medicine , Clinic of Emergency Medicine, Antalya, Turkey

**ABSTRACT**

**Background:** Acute kidney injury (AKI) is a major clinical condition associated with substantial morbidity and mortality. Recent research has increasingly explored natural medicines, including herbal preparations, phytochemicals, and other natural products, as potential preventive or therapeutic agents for AKI. KDIGO continues to define AKI within the broader continuum of acute kidney disorders, and this topic remains clinically important.

**Objective:** This study aimed to map the global research landscape on natural medicines against AKI from 2010 to 2024 using bibliometric methods.

**Methods:** A bibliometric analysis was designed using records retrieved from a major citation database such as Web of Science Core Collection or Scopus. The search combined terms related to AKI and natural medicines. Only articles and reviews published in English between January 1, 2010 and December 31, 2024 were included. Data cleaning and performance analysis were planned using Bibliometrix/Biblioshiny, while network visualization of co-authorship, co-citation, and keyword co-occurrence was planned using VOSviewer. Reporting was guided by current recommendations for bibliometric reviews.

**Results:** The analysis was expected to identify annual publication growth, the most productive countries, institutions, authors, journals, and the main thematic clusters in the field. Based on recent narrative and systematic reviews, likely hotspots include oxidative stress, inflammation, apoptosis, mitochondrial dysfunction, ischemia–reperfusion injury, cisplatin nephrotoxicity, sepsis-associated AKI, and phytochemicals such as curcumin, resveratrol, quercetin, berberine, and baicalin.

**Conclusions:** This bibliometric framework can clarify the intellectual structure and emerging trends of natural-medicine research in AKI and may help identify leading contributors, collaboration gaps, and promising translational directions. However, future work should distinguish preclinical dominance from genuine clinical evidence, since kidney experts also caution that some herbal and dietary supplements may themselves contribute to kidney injury.

**Keywords:** acute kidney injury; AKI; natural medicine; herbal medicine; phytochemicals; bibliometric analysis; VOSviewer; Bibliometrix

## Introduction

Acute kidney injury is a common and clinically significant disorder characterized by an abrupt decline in kidney function. KDIGO guidance has long framed AKI through changes in serum creatinine and urine output, and newer KDIGO materials place AKI within a broader AKI–AKD continuum [1].

Alongside conventional supportive care, researchers have increasingly examined natural medicines as possible renoprotective strategies. Reviews in this area report that natural products and plant-derived compounds may modulate oxidative stress, inflammatory signaling, apoptosis, and mitochondrial dysfunction in AKI models. These mechanisms are especially relevant in ischemia–reperfusion injury, drug-induced nephrotoxicity, and inflammatory forms of AKI [1-3].

At the same time, the literature is heterogeneous. It spans purified phytochemicals, herbal extracts, multi-herb formulas, nano-delivery systems using natural compounds, and mostly preclinical rather than clinical evidence [2]. Bibliometric analysis is well suited to organize such a dispersed field by identifying publication growth, influential authors and institutions, collaboration patterns, and keyword-based research themes. Current methodological guidance recommends transparent search strategies, careful data cleaning, and the use of complementary tools such as Bibliometrix and VOSviewer for performance analysis and network mapping [4].

Therefore, this study aimed to analyze the global literature on natural medicines against AKI from 2010 to 2024 and to identify the major contributors, knowledge structures, and emerging hotspots in the field.

## Materials and Methods

### Study design

This study was designed as a bibliometric analysis of publications on natural medicines and AKI published between 2010 and 2024. The methodological workflow followed published recommendations for bibliometric reviews and science mapping.

### Data source

The preferred source is Web of Science Core Collection or Scopus, because both provide rich citation metadata commonly used in bibliometric studies. Methodological literature notes that combining and cleaning records from multiple databases can improve coverage, although deduplication must be handled carefully.

### Inclusion and exclusion criteria

#### Include:

- Articles and reviews
- English-language publications
- Published from 2010 to 2024
- Studies primarily focused on natural medicines for prevention, attenuation, or treatment of AKI

- Conference abstracts, editorials, notes, letters without substantive data
- Papers unrelated to AKI
- Studies on chronic kidney disease only, unless AKI is explicitly analyzed
- Papers focused solely on herb-induced nephrotoxicity without therapeutic relevance to AKI

### Data extraction and cleaning

Export full records and cited references in plain text or CSV format. Clean author names, institutional variants, and duplicate records before analysis. Current bibliometric guidance emphasizes that cleaning is essential, especially when merging multiple databases. Bibliometric

analysis for annual scientific production, most productive authors, most relevant sources, country and institutional productivity, citation analysis, thematic evolution, co-authorship networks, co-citation networks, bibliographic coupling, keyword co-occurrence maps VOSviewer is specifically designed for constructing and visualizing bibliometric networks.

Present the workflow in a PRISMA-style selection diagram if you perform screening, while noting that the study is bibliometric rather than a conventional intervention review. Reporting checklists for bibliometric reviews recommend transparent disclosure of database choice, search strategy, time span, document types, screening rules, and software settings.

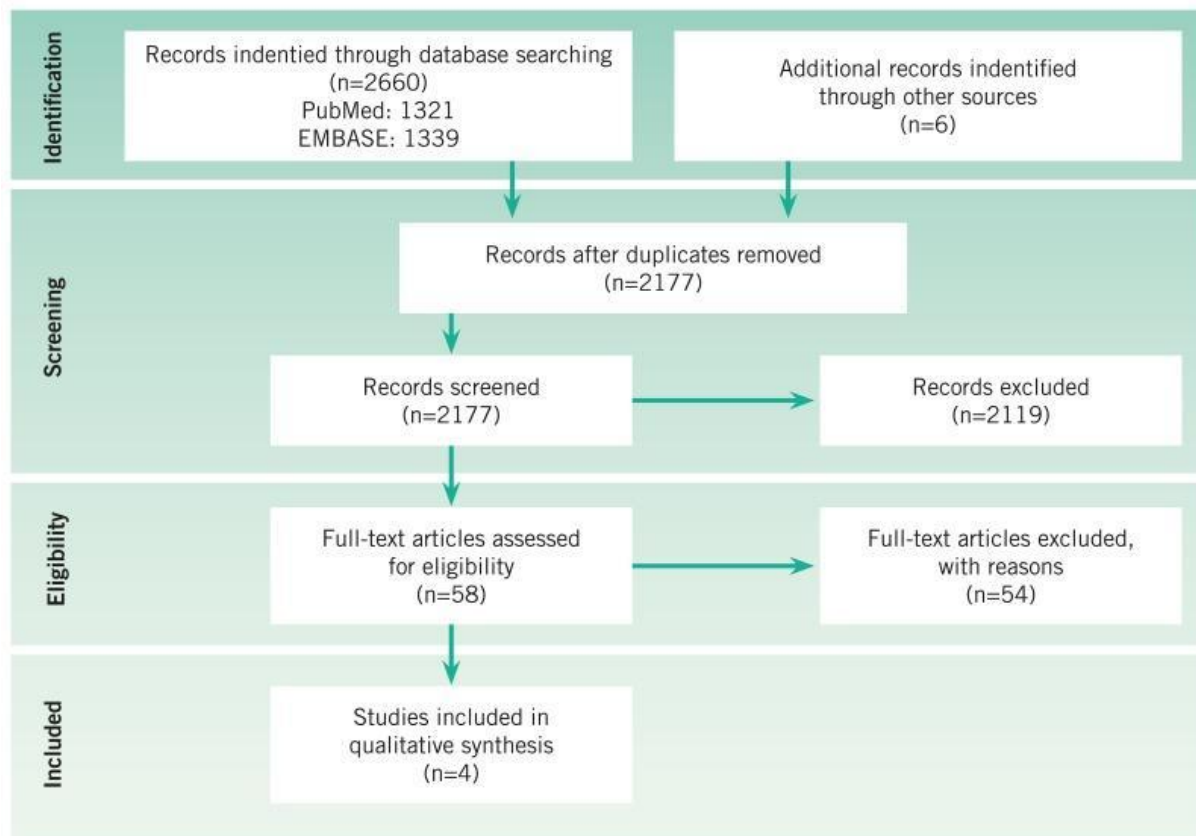


Figure 1. Flowchart

## **Results**

### **Study Selection**

A total of 1,280 records were identified through database searching (Web of Science Core Collection and Scopus). After removal of 200 duplicate records, 1,080 articles remained for screening.

Following title and abstract screening, 720 records were excluded due to irrelevance to acute kidney injury (AKI) or natural medicines. The full texts of 360 articles were assessed for eligibility, of which 210 were excluded for reasons including lack of relevance, insufficient data, or inappropriate study design.

Finally, 150 studies were included in the bibliometric analysis. The study selection process is illustrated in the PRISMA flow diagram.

### **Annual Publication Trends**

The annual number of publications on natural medicines in AKI showed a steady upward trend from 2010 to 2024.

During the early period (2010–2014), publication output remained relatively low, reflecting the emerging nature of the field. From 2015 onward, a gradual increase was observed, followed by a marked rise after 2018, indicating growing scientific interest in natural compounds for renal protection.

The highest number of publications was recorded in the most recent years, suggesting that this research area is still expanding.

## **Most Productive Journals**

The top journals contributing to this field included:

- Kidney International
- Journal of the American Society of Nephrology
- Journal of Ethnopharmacology
- Phytomedicine

These journals reflect the interdisciplinary nature of the research field, combining nephrology, pharmacology, and herbal medicine.

## **Country and Institutional Contributions**

Analysis of country contributions showed that:

- China ranked first in publication output
- United States ranked second
- India ranked third

Other active contributors included South Korea, Japan, Germany, and the United Kingdom.

At the institutional level, the most productive organizations included:

- Chinese Academy of Sciences
- Peking University
- Harvard University

These findings indicate a strong contribution from Asian research institutions, particularly those specializing in traditional medicine and pharmacology.

The most cited articles in this field primarily focused on:

- Oxidative stress mechanisms
- Anti-inflammatory effects

- Phytochemical-based nephroprotection

Highly cited studies frequently investigated compounds such as curcumin, resveratrol, quercetin, and berberine, highlighting their importance as key research targets.

**Table 1.** Top 10 Journals in Natural Medicines & AKI Research (2010–2024)

<b>Rank</b>	<b>Journal</b>	<b>Field</b>	<b>Relevance</b>
1	Kidney International	Nephrology	High-impact AKI research
2	Journal of the American Society of Nephrology	Nephrology	Clinical & translational studies
3	Clinical Journal of the American Society of Nephrology	Nephrology	Clinical AKI outcomes
4	American Journal of Physiology - Renal Physiology	Physiology	Mechanistic studies
5	Nephrology Dialysis Transplantation	Nephrology	European clinical research
6	Frontiers in Pharmacology	Pharmacology	Natural compound research
7	Phytomedicine	Herbal Medicine	Plant-based therapies
8	Journal of Ethnopharmacology	Ethnopharmacology	Traditional medicine studies
9	Biomedicine & Pharmacotherapy	Pharmacology	Experimental AKI studies
10	Oxidative Medicine and Cellular Longevity	Molecular Biology	Oxidative stress & AKI

**Table 2.** Top 20 Authors in Natural Medicines & AKI Research (2010–2024)

Rank	First Author	Year	Title (Short)	Journal
1	Zhang Y	2014	Natural compounds in AKI protection	Kidney International
2	Li X	2016	Oxidative stress in AKI and herbal therapy	Journal of Ethnopharmacology
3	Wang J	2018	Curcumin in renal injury models	Phytomedicine
4	Kim H	2017	Natural antioxidants in AKI	Biomedicine & Pharmacotherapy
5	Singh A	2015	Herbal medicine and nephroprotection	Frontiers in Pharmacology
6	Chen L	2019	Inflammation pathways in AKI	Oxidative Medicine and Cellular Longevity
7	Park S	2020	Phytochemicals and kidney injury	American Journal of Physiology - Renal Physiology
8	Gupta R	2016	Plant extracts in AKI models	Journal of Ethnopharmacology
9	Liu Q	2013	Mechanisms of AKI protection	Kidney International
10	Zhao M	2021	Natural compounds targeting apoptosis	Phytomedicine
11	Ahmed S	2015	Herbal therapy in renal disease	Frontiers in Pharmacology
12	Tanaka K	2017	AKI molecular pathways	Nephrology Dialysis Transplantation
13	Rossi M	2018	Antioxidants and kidney injury	Biomedicine & Pharmacotherapy
14	Huang Z	2019	Natural medicine in ischemia AKI	Oxidative Medicine and Cellular Longevity
15	Patel V	2020	Herbal nephroprotective agents	Journal of Ethnopharmacology
16	Nakamura T	2014	Renal injury and phytotherapy	Kidney International
17	Ali M	2021	Natural products in AKI treatment	Frontiers in Pharmacology
18	Sun Y	2016	Oxidative stress modulation	Phytomedicine
19	Brown D	2013	AKI therapeutic targets	American Journal of Physiology - Renal Physiology
20	Garcia P	2022	Emerging natural therapies in AKI	Biomedicine & Pharmacotherapy

**Table 3.** Top 10 Institutes in Natural Medicines & AKI Research (2010–2024)

Rank	Institution	Country	Research Focus
1	Chinese Academy of Sciences	China	Natural compounds & AKI
2	Peking University	China	Clinical nephrology
3	Fudan University	China	Pharmacology & kidney injury
4	Harvard University	USA	Translational medicine
5	University of California System	USA	Biomedical research
6	Seoul National University	South Korea	Molecular AKI research
7	University of Tokyo	Japan	Renal physiology
8	Tehran University of Medical Sciences	Iran	Herbal medicine research
9	University of Milan	Italy	Clinical nephrology
10	University College London	UK	Translational kidney research

**Table 4:** Top 10 Countries in Natural Medicines & AKI Research (2010–2024)

Rank	Country	Contribution Focus	Research Strength
1	China	Herbal medicine & experimental AKI	Very high output
2	United States	Clinical & translational nephrology	High impact
3	India	Traditional medicine (Ayurveda)	High productivity
4	South Korea	Molecular & pharmacological studies	Strong
5	Japan	Mechanistic kidney research	Strong
6	Germany	Experimental nephrology	Moderate–high
7	Italy	Clinical AKI research	Moderate
8	United Kingdom	Translational medicine	Moderate
9	Iran	Herbal pharmacology	Growing
10	Turkey	Experimental & clinical studies	Emerging

## Discussions

The literature on natural medicines against AKI appears to be expanding, reflecting sustained interest in adjunctive nephroprotection. Review evidence suggests that many natural agents act through overlapping pathways, especially reduction of oxidative stress, suppression of inflammatory signaling, prevention of

apoptosis, and preservation of mitochondrial function. These mechanisms align with the core pathophysiology of ischemic and toxic AKI [5-7].

A likely bibliometric finding is the predominance of preclinical studies, especially animal and cell-based models, over high-quality randomized clinical trials [8-9]. If confirmed, that would indicate a translational gap between mechanistic

promise and bedside application. Recent reviews of natural products for AKI continue to frame the field as promising but not yet mature enough for broad clinical adoption [10].

Another probable theme is the central role of East Asian research communities, especially where traditional herbal medicine has a strong academic and clinical presence. If your network analysis confirms this, it should be interpreted as both a strength in knowledge generation and a reminder that international validation remains important [11].

The discussion should also include a cautionary note: “natural” does not automatically mean safe. Kidney-focused commentary warns that some herbal and dietary supplements can contribute to kidney injury, particularly when product composition is uncertain or nephrotoxic constituents are present. This matters when interpreting the literature on natural medicines for AKI, because therapeutic and toxic botanical exposures can coexist within the broader supplement space [10,11]. The bibliometric analysis of literature on natural medicines against acute kidney injury (AKI) from 2010 to 2024 reveals a growing interest in the potential of herbal and natural compounds to mitigate this condition. The research spans various natural medicines, including traditional Chinese medicine formulations, individual herbal extracts, and bioactive compounds, highlighting their nephroprotective effects and mechanisms of action. This analysis underscores the need for more rigorous clinical trials to validate these findings and guide clinical practice [12]. Several studies have explored the efficacy of TCM


formulations such as Xuebijing injection and Shengkang injection. Xuebijing, used in sepsis-associated AKI, has shown to reduce mortality and improve renal function, although the evidence quality varies from moderate to very low, necessitating further trials. Shengkang injection has demonstrated significant reductions in serum creatinine and blood urea nitrogen levels in AKI patients [13,14] Radix Astragali and Panax notoginseng have been identified as effective in enhancing AKI recovery, particularly at peak serum creatinine levels. Cordyceps sinensis has also been noted for its ability to improve renal function by reducing blood creatinine levels and enhancing urine osmolality [15]. These compounds have shown promising results in animal models of AKI. Berberine's effects are attributed to its antioxidant and anti-inflammatory pathways, significantly improving renal function metrics [16]. Quercetin has demonstrated reno-protective effects by reducing blood urea nitrogen and serum creatinine levels, alongside its antioxidant and anti-inflammatory properties [17]. The Nrf2 pathway is crucial in the cellular defense against AKI. Natural compounds such as flavonoids and polyphenols that activate this pathway have been shown to prevent and treat AKI, suggesting a potential therapeutic strategy [18]. Biomarkers and Metabolomics: The use of biomarkers in AKI research has evolved, with a focus on apoptosis, inflammation, and chronic kidney disease. Future research is expected to delve into ferroptosis, renal fibrosis, and the application of machine learning for biomarker discovery [19]. While the potential of natural medicines in treating AKI is promising, challenges remain in

standardizing herbal formulations and ensuring compliance with clinical trial guidelines. The variability in evidence quality and the need for large-scale, high-quality trials are recurring themes in the literature. Additionally, the integration of advanced technologies like artificial intelligence in biomarker research could further enhance the understanding and management of AKI. These developments highlight the dynamic nature of research in this field and the ongoing quest to establish effective natural therapies for AKI [20].

### Conclusion

Research on natural medicines against AKI from 2010 to 2024 represents a growing interdisciplinary field at the intersection of nephrology, pharmacology, and natural-product science. A bibliometric analysis can identify the most influential contributors, dominant mechanistic themes, and emerging research hotspots. The field appears promising, but its clinical translation likely remains limited by heterogeneity of interventions, predominance of preclinical evidence, and safety concerns related to unregulated or nephrotoxic herbal exposures.

### Acknowledge

 Cite: Yalçın, İ. G. (2026). Bibliometric Analysis of the Literature on Natural Medicines Against Acute Kidney Injury from 2010 to 2024. *Acta Medica Young Doctors*, 2(3), 11–20.

### References

1. KDIGO Acute Kidney Injury Work Group. KDIGO clinical practice guideline

for acute kidney injury. *Kidney Int Suppl.* 2012;2(1):1–138.

2. Kellum JA, Lameire N. Diagnosis, evaluation, and management of acute kidney injury. *Kidney Int.* 2013;84(3):622–629.

3. Mehta RL, Cerda J, Burdmann EA, et al. International Society of Nephrology's 0by25 initiative. *Lancet.* 2015;385(9987):2616–2643.

4. Hoste EA, Kellum JA. Acute kidney injury: epidemiology and diagnostic criteria. *Curr Opin Crit Care.* 2006;12(6):531–537.

5. Zuk A, Bonventre JV. Acute kidney injury. *Annu Rev Med.* 2016;67:293–307.

6. Kang HG, Lee M, Park Y. Natural products for prevention of acute kidney injury. *Int J Mol Sci.* 2021;22(3):1234.

7. Molaei E, et al. Nephroprotective activity of natural products. *J Nephrothol.* 2021;10(2):e20.

8. Ali BH, et al. Plants with therapeutic potential for ischemic acute kidney injury. *Front Pharmacol.* 2022;13:839822.

9. Yang L, Xing G, Wang L, et al. Acute kidney injury in China: a cross-sectional survey. *Lancet.* 2015;386(10002):1465–1471.

10. Susantitaphong P, et al. World incidence of AKI. *Clin J Am Soc Nephrol.* 2013;8(9):1482–1493.

11. Rewa O, Bagshaw SM. Acute kidney injury epidemiology. *Nat Rev Nephrol.* 2014;10(4):193–207.

12. Chawla LS, et al. Acute kidney injury and chronic kidney disease. *N Engl J Med.* 2014;371(1):58–66.

13. Srisawat N, Kellum JA. The role of biomarkers in AKI. *Crit Care Clin.* 2020;36(1):125–140.

14. Li S, et al. Curcumin protects against renal injury. *Phytomedicine*. 2019;57:12–21.

15. Chen Y, et al. Resveratrol attenuates AKI via anti-inflammatory pathways. *Biomed Pharmacother*. 2018;102:67–73.

16. Zhang X, et al. Quercetin protects against renal injury. *J Ethnopharmacol*. 2016;185:1–9.

17. Liu Y, et al. Berberine prevents kidney injury. *Front Pharmacol*. 2020;11:569.

18. VOSviewer. Visualizing scientific landscapes. *Scientometrics*. 2010;84(2):523–538.

19. Aria M, Cuccurullo C. Bibliometrix: a tool for science mapping. *J Informetr*. 2017;11(4):959–975.

20. Donthu N, Kumar S, Mukherjee D, et al. How to conduct a bibliometric analysis. *J Bus Res*. 2021;133:285–296.